In presenting this thesis in partial fulfillment of the requirements for an advanced degree at Idaho State University, I agree that the Library shall make it freely available for inspection. I further state that permission for extensive copying of my thesis for scholarly purposes may be granted by the Dean of the Graduate School, Dean of my academic division, or by the University Librarian. It is understood that any copying or publication of this thesis for financial gain shall not be allowed without my written permission.

Signature _____
Brittany J. Grayson

Date _____

LEVEL 1 PROBABILISTIC RISK ASSESSMENT OF AN AIR INGRESS EVENT AT A PYRO-PROCESSING FACILITY

by

Brittany J. Grayson

A thesis submitted in partial fulfillment of the

requirements for the degree of

MASTER OF SCIENCE

IN

NUCLEAR SCIENCE AND ENGINEERING

IDAHO STATE UNIVERSITY

2017

To the Graduate Faculty:

The members of the committee appointed to examine the thesis of BRITTANY J. GRAYSON find it satisfactory and recommend that it be accepted.

_____

Dr. Chad Pope,
Major Advisor

_____

Dr. Leslie Kerby,
Committee Member

_____

Dr. Hossein Mousavinezhad,
Graduate Faculty Representative

Dedicated to my parents for their endless

love and support. Without whom, this would

not have been possible.

Acknowledgements

I would like to acknowledge my thesis advisor, Dr. Pope, for making this research possible and for his continued support throughout the entire process.

I would also like to acknowledge the committee for taking time out of their schedules to help me complete my Master's Degree.

Table of Contents

Table of Figures ix

List of Tables xxvii

Abstract xlv

1. Introduction 1

1.1 Probabilistic Risk Assessment 2

1.1.1 History 2

1.1.2 US Nuclear Regulatory Commission Position 4

1.2 Probabilistic Risk Assessment Theory 5

1.2.1 Event Tree Analysis 6

1.2.2 Fault Tree Analysis 6

1.2.3 Probability Equations for Independent Events 9

1.2.4 Importance Measures 10

1.2.5 Common Cause Failures 10

1.2.6 Risk Focused Maintenance 11

1.2.7 Uncertainty 12

1.2.8 SAPHIRE 14

1.3 Pyro-processing 15

2. Methods 20

3. Results & Discussion 37

3.1 Basic Generalized Model – No Door Interlocks 37

3.1.1 Failure Probability Results 37

3.1.2 Importance Measures – Fussell-Vesely Results 43

3.1.3 Cut Sets and Identification of Risk Critical Components for a Discussion on Risk-Informed Maintenance 55

3.1.4 Uncertainty Discussion 59

3.2 Basic Generalized System with Door Interlocks 61

3.2.1 Failure Probability Results 61

3.2.2 Fussell-Vesely 67

3.2.3 Uncertainty Discussion 85

3.3 Extended System 87

3.3.1 Failure Probability Results 87

3.3.2 Fussell-Vesely 92

3.3.3 Cut Sets and Identification of Risk Critical Components for a Discussion on Risk-Informed Maintenance 103

3.3.4 Uncertainty Discussion 112

3.4 Extended Pathways with Door Interlocks 114

3.4.1 System Failure Probability Results 114

3.4.2 Fussell-Vesely 119

3.4.3 Uncertainty Discussion 130

4. Conclusions 132

Bibliography 135

Appendix 138

Appendix A – Event Trees 138

Appendix B – Fault Trees 146

Appendix C – Fussel-Vesely Results 160

Appendix D – Mechanical Failure System Cut Sets 446

Table of Figures

Figure 1: Sample event tree. 6

Figure 2: Example fault tree. 8

Figure 3: 'And' gate symbol and 'or' gate symbol. 9

Figure 4: A two-item redundant system.....11

Figure 5: Probability density function example.....13

Figure 6: Cumulative distribution function example. 14

Figure 7: A diagram of the FCF layout. (23) 16

Figure 8: The electrorefiner. (23).....18

Figure 9: The cathode processor and ingots. (22).....19

Figure 10: Simplified system for a pyro-processing hot-cell.....20

Figure 11: Air lock with SV-1 and SV-3 air ingress. 22

Figure 12: Human error event tree.....25

Figure 13: Original failure rates for solenoid valve fault tree 26

Figure 14: Fault tree for field failure data of solenoid valves.....27

Figure 15: Fault tree for SV-A.....27

Figure 16: System fault tree for the basic model. 29

Figure 17: Air-Lock diagram for simplified system with door interlocks.....30

Figure 18: Fault tree for the argon door interlock.....31

Figure 19: Argon door human error fault tree including door interlocks. 31

Figure 20: Combination human error and mechanical failure event tree with door interlocks.....32

Figure 21: An extended generalized air-lock system.....33

Figure 22: Extended generalized air-lock system with door interlocks. 34
Figure 23: System fault tree for the extended design. 36
Figure 24: Importance graph for the basic system. 45
Figure 25: Importance graph for Bruce B door fault rate. 47
Figure 26: Importance graph for general system with Bruce B fault rate and a diagnostic HE component. 49
Figure 27: Importance graph for the basic system with SV_OL fault rate. 50
Figure 28: Importance graph for the SV_OL fault rate and a diagnostic HE component. 52
Figure 29: Importance graph for the basic system with SV_OH fault rate. 53
Figure 30: Importance graph for the basic system with SV_MAN fault rate. 55
Figure 31: PDF of the basic system over 1 year. 60
Figure 32 CDF for the generalized system using the 'pathways' model. 60
Figure 33: Importance graph for generalized system with door interlocks. 69
Figure 34: Importance graph for basic system with door interlocks and a diagnostic HE event. 71
Figure 35: Importance graph for the general system with door interlocks and Bruce B fault rate 73
Figure 36: Importance graph for SV_OL fault rate for the basic system with door interlocks 75
Figure 37: Importance graph for generalized system w/ door interlocks and SV_OH fault rate 77
Figure 38: Importance graph for the basic system with SV_OM with diagnostic HE component and door interlocks 79

Figure 39: Importance graph for basic system with door interlocks, HE diagnostic event, and SV_MAN fault rate. 80
Figure 40: Importance graph for the basic system w/ door interlocks, SV_MAN fault rate, and a diagnostic HE event....82
Figure 41: Importance measures for SV_NRPD fault rate for basic system with door interlocks. 83
Figure 42: Importance graph for the basic system with door interlocks, SV_NRPD fault rate, and diagnosis HE event. 85
Figure 43: PDF distribution for the generalized system with door interlocks. 86
Figure 44: CDF distribution for the generalized system with door interlocks 86
Figure 45: Importance graph for the extended system....94
Figure 46: Importance graph for Bruce B fault rate for the extended system. 96
Figure 47: Importance graph for the extended system using SV_OL 99
Figure 48: Importance graph for the extended system with SV_OM fault rate....101
Figure 49: Importance graph for the extended system with SV_OH fault rate. 103
Figure 50: CDF for extended system and original failure rates. 113
Figure 51: PDF for extended system with original failure rates. 113
Figure 52: Importance graph for extended pathways with door interlock....121
Figure 53: Importance graph for Bruce B fault rate and extended pathways with door interlocks. 123
Figure 54: Importance graph for SV_OL for the extended system with door interlocks. 126

Figure 55: Importance graph for SV_OM fault rate with original system plus door interlocks. 128
Figure 56: Importance graph for SV_NRPD for extended system with door interlocks. 130
Figure 57: CDF for generalized system with door interlocks. 131
Figure 58: PDF for generalized system with door interlocks. 131
Figure 59: HE event tree for the basic system. 138
Figure 60: MF event tree for the basic system. 139
Figure 61: Generalized system combination event tree. 140
Figure 62: Combination errors event tree for basic system and door interlocks. 141
Figure 63: Human error ET for extended system. 142
Figure 64: MF ET for extended system. 143
Figure 65: Combinations ET for extended system. 144
Figure 66: Combinations ET for extended system with door interlocks. 145
Figure 67: Air MF fault tree. 146
Figure 68: Air HE fault tree. 146
Figure 69: Ar MF fault tree. 147
Figure 70: Ar door HE fault tree. 147
Figure 71: Air door fault tree. 148
Figure 72: Argon door fault tree. 148
Figure 73: SV-1 HE fault tree. 149
Figure 74: SV-2 HE fault tree. 149
Figure 75: SV-3 HE fault tree 149
Figure 76: SV-1 MF fault tree. 150

Figure 77: SV-2 MF fault tree 150
Figure 78: SV-3 MF fault tree. 150
Figure 79: VP-1 MF fault tree. 151
Figure 80: SV-1 fault tree. 151
Figure 81: SV-2 fault tree. 152
Figure 82: SV-3 fault tree. 152
Figure 83: MF SV-1 FT for FFD. 153
Figure 84: MF SV-2 FT for field failure data. 153
Figure 85: MF SV-3 FT for FFD 153
Figure 86: Air door interlock fault tree. 154
Figure 87: Ar door interlock fault tree. 154
Figure 88: HE Air door FT w/door interlocks. 154
Figure 89: HE argon door FT w/ door interlocks. 155
Figure 90: FT for mechanical failure of generalized system. 156
Figure 91: System fault tree for generalized system. 157
Figure 92: Extended system fault tree. 158
Figure 93: Extended system fault tree for MF only. 159
Figure 94: Importance graph for FV results for basic system. 161
Figure 95: Importance graph for FV results for basic system w/SV_OL. 162
Figure 96: Importance graph for FV results for basic system w/ SV_OM. 163
Figure 97: Importance graph for FV results for basic system for SV_OH. 164
Figure 98: Importance graph for FV results for basic system w/ SV_DOW. 165
Figure 99: Importance graph for FV results for basic system for SV_MAN. 166

Figure 100: Importance graph for FV results for basic system for SV_NRPD. 167
Figure 101: FV importance graph for basic system w/ diagnostic HE component. 168
Figure 102: FV importance graph for basic system w/ diagnostic HE component & SV_OL. 169
Figure 103: FV importance graph for basic system w/ diagnostic HE component & SV_OM. 170
Figure 104: FV importance graph for basic system w/ diagnostic HE component & SV_OH. 172
Figure 105: FV importance graph for basic system w/ diagnostic HE component for SV_DOW. 174
Figure 106: FV importance graph for basic system w/ diagnostic HE component & SV_MAN. 175
Figure 107: FV importance graph for basic system w/ diagnostic HE component & SV_NRPD. 176
Figure 108: Importance graph of FV results for basic system w/ Bruce B fault rate. 178
Figure 109: Importance graph of FV results for basic system w/ Bruce B fault rate and SV_OL. 179
Figure 110: Importance graph of FV results for basic system w/ Bruce B fault rate and SV_OM. 180
Figure 111: Importance graph of FV results for basic system w/ Bruce B fault rate and SV_OH. 181
Figure 112: Importance graph of FV results for basic system w/ Bruce B fault rate and SV_DOW. 183

Figure 113: Importance graph of FV results for basic system w/ Bruce B fault rate and SV_MAN. 184
Figure 114: Importance graph of FV results for basic system w/ Bruce B fault rate and SV_NRPD. 185
Figure 115: FV importance graph for the basic system w/ Bruce B fault rate and diagnostic HE. 187
Figure 116: FV importance graph for the basic system w/ Bruce B fault rate and diagnostic HE and SV_OL. 188
Figure 117: FV importance graph for the basic system w/ Bruce B fault rate and diagnostic HE and SV_OM. 189
Figure 118: FV importance graph for the basic system w/ Bruce B fault rate and diagnostic HE and SV_OH. 190
Figure 119: FV importance graph for the basic system w/ Bruce B fault rate and diagnostic HE and SV_DOW. 191
Figure 120: FV importance graph for the basic system w/ Bruce B fault rate and diagnostic HE and SV_MAN. 192
Figure 121: FV importance graph for the basic system w/ Bruce B fault rate and diagnostic HE and SV_NRPD. 193
Figure 122: Importance graph for FV results for basic system w/ Bruce A fault rate. 195
Figure 123: Importance graph for FV results for basic system w/ Bruce A fault rate and SV_OL. 196
Figure 124: Importance graph for FV results for basic system w/ Bruce A fault rate and SV_OM. 197

Figure 125: Importance graph for FV results for basic system w/ Bruce A fault rate and SV_OH. 198
Figure 126: Importance graph for FV results for basic system w/ Bruce A fault rate and SV_DOW. 199
Figure 127: Importance graph for FV results for basic system w/ Bruce A fault rate and SV_MAN. 200
Figure 128: Importance graph for FV results for basic system w/ Bruce A fault rate and SV_NRPD. 202
Figure 129: Importance graph for FV results for basic system with Bruce A fault rate and diagnostic HE component. 204
Figure 130: Importance graph for FV results for basic system with Bruce A fault rate and diagnostic HE component and SV_OL. 205
Figure 131: Importance graph for FV results for basic system with Bruce A fault rate and diagnostic HE component and SV_OM. 206
Figure 132: Importance graph for FV results for basic system with Bruce A fault rate and diagnostic HE component and SV_OH. 207
Figure 133: Importance graph for FV results for basic system with Bruce A fault rate and diagnostic HE component and SV_DOW. 208
Figure 134: Importance graph for FV results for basic system with Bruce A fault rate and diagnostic HE component and SV_MAN. 209
Figure 135: Importance graph for FV results for basic system with Bruce A fault rate and diagnostic HE component and SV_NRPD. 210
Figure 136: Importance graph for basic system with door interlocks. 212

Figure 137: Importance graph for basic system with door interlocks and SV_OL. 214
Figure 138: Importance graph for basic system with door interlocks and SV_OM. 215
Figure 139: Importance graph for basic system with door interlocks and SV_OH. 217
Figure 140: Importance graph for basic system with door interlocks and SV_DOW. 219
Figure 141: Importance graph for basic system with door interlocks and SV_MAN. 220
Figure 142: Importance graph for basic system with door interlocks and SV_NRPD. ...222
Figure 143: Importance graph for basic system with door interlocks and diagnostic HE. 224
Figure 144: Importance graph for basic system with door interlocks and diagnostic HE and SV_OL. 226
Figure 145: Importance graph for basic system with door interlocks and diagnostic HE and SV_OM. 228
Figure 146: Importance graph for basic system with door interlocks and diagnostic HE and SV_OH. 230
Figure 147: Importance graph for basic system with door interlocks and diagnostic HE and SV_DOW. 232
Figure 148: Importance graph for basic system with door interlocks and diagnostic HE and SV_MAN. 234
Figure 149: Importance graph for basic system with door interlocks and diagnostic HE and SV_NRPD. 236
Figure 150: Importance graph for basic system w/ door interlocks and Bruce B fault rate. 238

Figure 151: Importance graph for basic system w/ door interlocks and Bruce B fault rate and SV_OL. 240
Figure 152: Importance graph for basic system w/ door interlocks and Bruce B fault rate and SV_OM. 242
Figure 153: Importance graph for basic system w/ door interlocks and Bruce B fault rate and SV_OH. 244
Figure 154: Importance graph for basic system w/ door interlocks and Bruce B fault rate and SV_DOW. 246
Figure 155: Importance graph for basic system w/ door interlocks and Bruce B fault rate and SV_MAN. 247
Figure 156: Importance graph for basic system w/ door interlocks and Bruce B fault rate and SV_NRPD. 249
Figure 157: Importance graph for basic system w/door interlocks, Bruce B fault rate, and diagnostic HE. 251
Figure 158: Importance graph for basic system w/door interlocks, Bruce B fault rate, and diagnostic HE and SV_OL. 253
Figure 159: Importance graph for basic system w/door interlocks, Bruce B fault rate, and diagnostic HE and SV_OM. 255
Figure 160: Importance graph for basic system w/door interlocks, Bruce B fault rate, and diagnostic HE and SV_OH. 257
Figure 161: Importance graph for basic system w/door interlocks, Bruce B fault rate, and diagnostic HE and SV_DOW. 259

Figure 162: Importance graph for basic system w/door interlocks, Bruce B fault rate, and diagnostic HE and SV_MAN. 261
Figure 163: Importance graph for basic system w/door interlocks, Bruce B fault rate, and diagnostic HE and SV_NRPD. 263
Figure 164: Importance graph for basic system w/ door interlocks and Bruce A failure data. 265
Figure 165: Importance graph for basic system w/ door interlocks and Bruce A failure data and SV_OL. 267
Figure 166: Importance graph for basic system w/ door interlocks and Bruce A failure data and SV_OM. 269
Figure 167: Importance graph for basic system w/ door interlocks and Bruce A failure data and SV_OH. 271
Figure 168: Importance graph for basic system w/ door interlocks and Bruce A failure data and SV_DOW. 273
Figure 169: Importance graph for basic system w/ door interlocks and Bruce A failure data and SV_MAN. 275
Figure 170: Importance graph for basic system w/ door interlocks and Bruce A failure data and SV_NRPD. 277
Figure 171: Importance graph for the basic system with door interlocks, Bruce A fault rate, and diagnostic HE. 279
Figure 172: Importance graph for the basic system with door interlocks, Bruce A fault rate, and diagnostic HE and SV_OL. 281

Figure 173: Importance graph for the basic system with door interlocks, Bruce A fault rate, and diagnostic HE and SV_OM. 282
Figure 174: Importance graph for the basic system with door interlocks, Bruce A fault rate, and diagnostic HE and SV_OH. 284
Figure 175: Importance graph for the basic system with door interlocks, Bruce A fault rate, and diagnostic HE and SV_DOW 286
Figure 176: Importance graph for the basic system with door interlocks, Bruce A fault rate, and diagnostic HE and SV_MAN. 288
Figure 177: Importance graph for the basic system with door interlocks, Bruce A fault rate, and diagnostic HE and SV_NRPD. 289
Figure 178: Importance graph for extended system. 291
Figure 179: Importance graph for extended system and SV_OL. 293
Figure 180: Importance graph for extended system and SV_OM. 295
Figure 181: Importance graph for extended system and SV_OH. 297
Figure 182: Importance graph for extended system and SV_DOW. 299
Figure 183: Importance graph for extended system and SV_MAN. 301
Figure 184: Importance graph for extended system and SV_NRPD. 303
Figure 185: Importance graph for extended system w/ diagnostic HE. 305
Figure 186: Importance graph for extended system w/ diagnostic HE and SV_OL. 307
Figure 187: Importance graph for extended system w/ diagnostic HE and SV_OM. 309
Figure 188: Importance graph for extended system w/ diagnostic HE and SV_OH. 311
Figure 189: Importance graph for extended system w/ diagnostic HE and SV_DOW. 313
Figure 190: Importance graph for extended system w/ diagnostic HE and SV_MAN. 315

Figure 191: Importance graph for extended system w/ diagnostic HE and SV_NRPD. .317
Figure 192: Importance graph for extended system w/ Bruce B fault rate. 319
Figure 193: Importance graph for extended system w/ Bruce B fault rate and SV_OL..321
Figure 194: Importance graph for extended system w/ Bruce B fault rate and SV_OM.323
Figure 195: Importance graph for extended system w/ Bruce B fault rate and SV_OH. 325
Figure 196: Importance graph for extended system w/ Bruce B fault rate and SV_DOW. 327
Figure 197: Importance graph for extended system w/ Bruce B fault rate and SV_MAN. 329
Figure 198: Importance graph for extended system w/ Bruce B fault rate and SV_NRPD. 331
Figure 199: Importance graph for extended system with Bruce B fault rate and diagnostic human error. 333
Figure 200: Importance graph for extended system with Bruce B fault rate and diagnostic human error and SV_OL. 335
Figure 201: Importance graph for extended system with Bruce B fault rate and diagnostic human error and SV_OM. 337
Figure 202: Importance graph for extended system with Bruce B fault rate and diagnostic human error and SV_OH. 339
Figure 203: Importance graph for extended system with Bruce B fault rate and diagnostic human error and SV_DOW. 341
Figure 204: Importance graph for extended system with Bruce B fault rate and diagnostic human error and SV_MAN. 343

Figure 205: Importance graph for extended system with Bruce B fault rate and diagnostic human error and SV_NRPD. 345
Figure 206: Importance graph for extended system w/ Bruce A fault rate. 347
Figure 207: Importance graph for extended system w/ Bruce A fault rate and SV_OL. 349
Figure 208: Importance graph for extended system w/ Bruce A fault rate and SV_OM. 351
Figure 209: Importance graph for extended system w/ Bruce A fault rate and SV_OH. 353
Figure 210: Importance graph for extended system w/ Bruce A fault rate and SV_DOW. 355
Figure 211: Importance graph for extended system w/ Bruce A fault rate and SV_MAN. 357
Figure 212: Importance graph for extended system w/ Bruce A fault rate and SV_NRPD. 359
Figure 213: Importance graph for extended system w/ Bruce A fault rate and diagnostic HE component. 361
Figure 214: Importance graph for extended system w/ Bruce A fault rate and diagnostic HE component and SV_OL. 363
Figure 215: Importance graph for extended system w/ Bruce A fault rate and diagnostic HE component and SV_OM. 365
Figure 216: Importance graph for extended system w/ Bruce A fault rate and diagnostic HE component and SV_OH. 367
Figure 217: Importance graph for extended system w/ Bruce A fault rate and diagnostic HE component and SV_DOW. 369

Figure 218: Importance graph for extended system w/ Bruce A fault rate and diagnostic HE component and SV_MAN. 371
Figure 219: Importance graph for extended system w/ Bruce A fault rate and diagnostic HE component and SV_NRPD. 373
Figure 220: Importance graph for the extended system w/ door interlocks. 375
Figure 221: Importance graph for the extended system w/ door interlocks and SV_OL. 377
Figure 222: Importance graph for the extended system w/ door interlocks and SV_OM. 379
Figure 223: Importance graph for the extended system w/ door interlocks and SV_OH. 381
Figure 224: Importance graph for the extended system w/ door interlocks and SV_DOW. 383
Figure 225: Importance graph for the extended system w/ door interlocks and SV_MAN. 385
Figure 226: Importance graph for the extended system w/ door interlocks and SV_NRPD. 387
Figure 227: Importance graph for extended system w/ door interlocks and diagnostic HE 389
Figure 228: Importance graph for extended system w/ door interlocks and diagnostic HE and SV_OL. 390
Figure 229: Importance graph for extended system w/ door interlocks and diagnostic HE and SV_OM. 392

Figure 230: Importance graph for extended system w/ door interlocks and diagnostic HE and SV_OH. 393
Figure 231: Importance graph for extended system w/ door interlocks and diagnostic HE and SV_DOW. 395
Figure 232: Importance graph for extended system w/ door interlocks and diagnostic HE and SV_MAN. 397
Figure 233: Importance graph for extended system w/ door interlocks and diagnostic HE and 399
Figure 234: Importance graph for extended system w/ Door Interlocks and Bruce B fault rate 401
Figure 235: Importance graph for extended system w/ Door Interlocks and Bruce B fault rate and SV_OL. 403
Figure 236: Importance graph for extended system w/ Bruce B fault rate and SV_OM. 405
Figure 237: Importance graph for extended system w/ Door Interlocks and Bruce B fault rate and SV_OH. 407
Figure 238: Importance graph for extended system w/ Door Interlocks and Bruce B fault rate and SV_DOW. 409
Figure 239: Importance graph for extended system w/ Door Interlocks and Bruce B fault rate and SV_MAN. 410
Figure 240: Importance graph for extended system w/ Door Interlocks and Bruce B fault rate and SV_NRPD. 412
Figure 241: Importance graph for extended system w/ door interlocks and Bruce B fault rate and diagnostic HE. 414

Figure 242: Importance graph for extended system w/ door interlocks and Bruce B fault rate and diagnostic HE and SV_OL. 415
Figure 243: Importance graph for extended system w/ door interlocks and Bruce B fault rate and diagnostic HE and SV_OM. 417
Figure 244: Importance graph for extended system w/ door interlocks and Bruce B fault rate and diagnostic HE and SV_OH. 419
Figure 245: Importance graph for extended system w/ door interlocks and Bruce B fault rate and diagnostic HE and SV_DOW. 420
Figure 246: Importance graph for extended system w/ door interlocks and Bruce B fault rate and diagnostic HE and SV_MAN. 422
Figure 247: Importance graph for extended system w/ door interlocks and Bruce B fault rate and diagnostic HE and SV_NRPD. 423
Figure 248: Importance graph for extended system w/ door interlocks and Bruce A fault rate. 425
Figure 249: Importance graph for extended system w/ door interlocks and Bruce A fault rate and SV_OL. 427
Figure 250: Importance graph for extended system w/ door interlocks and Bruce A fault rate and SV_OM. 428
Figure 251: Importance graph for extended system w/ door interlocks and Bruce A fault rate and SV_OH. 430
Figure 252: Importance graph for extended system w/ door interlocks and Bruce A fault rate and SV_DOW. 431

Figure 253: Importance graph for extended system w/ door interlocks and Bruce A fault rate and SV_NRPD. 433
Figure 254: Importance graph for extended system w/ door interlocks and Bruce A fault rate and SV_NRPD. 434
Figure 255: Importance graph for extended system w/ door interlocks and Bruce A fault rate and diagnostic HE component. 436
Figure 256: Importance graph for extended system w/ door interlocks and Bruce A fault rate and diagnostic HE component and SV_OL. 438
Figure 257: Importance graph for extended system w/ door interlocks and Bruce A fault rate and diagnostic HE component and SV_OM. 439
Figure 258: Importance graph for extended system w/ door interlocks and Bruce A fault rate and diagnostic HE component and SV_OH. 441
Figure 259: Importance graph for extended system w/ door interlocks and Bruce A fault rate and diagnostic HE component and SV_DOW. 442
Figure 260: Importance graph for extended system w/ door interlocks and Bruce A fault rate and diagnostic HE component and SV_MAN. 444
Figure 261: Importance graph for extended system w/ door interlocks and Bruce A fault rate and diagnostic HE component and SV_NRPD. 445

List of Tables

Table 1: Mechanical Failure Air Ingress Sequences.....21

Table 2: Human Error Air Ingress Sequences 22

Table 3: Combination Mechanical Failure and Human Error Air Ingress Sequences.....23

Table 4: Original Failure Data 24

Table 5: Field Failure Rates for Solenoid Valves 24

Table 6: Airlock Seal Failure Rate Data 24

Table 7: Human Error Event Probabilities.....25

Table 8: Door MOC Interlock Failure Rate 30

Table 9: Alpha Factors for CCCG=2 34

Table 10: Basic System Failure Probability.....38

Table 11: Failures for the Basic System with a Diagnostic Human Error Component 39

Table 12: Mechanical Failure of the Generalized System 39

Table 13: Basic System with Door Seal Failure Rate of 1.48/y 40

Table 14: Results for the Basic System with a Door Seal Failure Rate of 1.48/yr and a Diagnostic HE Component 41

Table 15: Mechanical Failure for Basic System with Bruce B Door Failure Rate.....41

Table 16: Results for Basic System with Door Failure Rate 0.23/yr.....42

Table 17: Results for Basic System with Door Failure Rate 0.23/y and Diagnostic HE...42

Table 18: Mechanical Error System Failure Results for Bruce A Door Failure Data 43

Table 19: SAPHIRE Generated Importance Model for the Basic System over 1-year 44

Table 20: Bruce B Door Failure Results for Pathways System 46

Table 21: Pathways Importance Measures with Bruce B Failure and a Diagnostic HE Component 48
Table 22: Importance Measures for the Basic System with the SV_OL Configuration 50
Table 23: Basic System for SV_OL with a Diagnostic HE Component 51
Table 24: Importance Measures for Basic System with SV_OH 53
Table 25: Basic System Importance Measures for SV_MAN 54
Table 26: Mechanical Failure Cut Sets for the Original System 57
Table 27:Mechanical Failure Cut Sets for the Original System with SV_OL 57
Table 28: Mechanical Failure Cut Sets for the Original System with SV_OM 58
Table 29: Mechanical Failure Cut Sets for the Original System with SV_OH 58
Table 30: Mechanical Failure Cut Sets for the Original System with SV_DOW 58
Table 31: Mechanical Failure Cut Sets for the Original System with SV_MAN 59
Table 32: Mechanical Failure Cut Sets for the Original System with SV_NRPD 59
Table 33: Failure Results for Basic System w/ Door Interlocks 62
Table 34: Failure Results for the Basic System with Door Interlocks and Diagnostic HE Component 62
Table 35: Mechanical Failure Results for the Basic System with Door Interlocks 63
Table 36: Failure Results for the Basic System with Door Interlocks and Bruce B Failure Data 64
Table 37: Basic System with Door Interlocks, Diagnostic HE, and Bruce B Door Failure Data 65
Table 38: Mechanical Failure Results for the Basic System with Door Interlocks and Bruce B Door Failure Rate 65

Table 39: Failure Results for the Generalized System with Door Interlocks and Bruce A Failure Data.....66
Table 40: Generalized System with Door Interlocks and Bruce A Door Failure 66
Table 41: Generalized System with Door Interlocks, Bruce A Failure, and Diagnostic HE 67
Table 42: Importance Results Generalized System for the Original System and Door Interlocks.....68
Table 43: Importance Measures for Pathways Fault Rates and a Diagnostic HE 70
Table 44: Pathways Data w/ Bruce B Fault Rate and Door Interlock 72
Table 45:FV Results for SV_OL Fault Rate for Generalized System with Door Interlocks 74
Table 46: FV Results for Generalized System w/ Door Interlocks for SV_OH Fault Rate 76
Table 47: FV Results for SV_OH Fault Rate, Diagnostic HE, and Door Interlocks.....78
Table 48: FV for Generalized System, SV_MAN Fault Rate, and Door Interlocks 80
Table 49: FV for Generalized System w/ Diagnostic HE and SV_MAN Fault Rate 81
Table 50: FV Generalized System w/ Door Interlocks for SV_NRPD 83
Table 51: Generalized System with Door Interlocks for SV_NRPD Fault Rate and Diagnostic Human Error 84
Table 52: Failure Results for the Extended System.....87
Table 53: Failure Results for Extended System w/ Diagnostic HE Event.....88
Table 54: Mechanical Failure Results for Extended System 88
Table 55: Extended System with Bruce B Fault Rate.....89

Table 56: Extended System with Bruce B Fault Rate and Diagnostic HE Comp 89

Table 57: Mechanical Failure Results for Extended System with Bruce B Fault Rate 90

Table 58: Results for Extended Pathways with Bruce A Fault Rate 91

Table 59: Extended Pathways for Bruce A Fault Rate and Diagnostic HE.....91

Table 60: Mechanical Failure of Ext. System with Bruce A Fault Rate and Diagnostic HE Comp.....92

Table 61: FV for Extended System and Original Fault Rate 93

Table 62: FV for Extended System w/ Bruce B Fault Rate.....95

Table 63: FV for Extended Pathways with SV_OL Fault Rate 98

Table 64: FV for the Extended System with SV_OM Fault Rate.....100

Table 65: FV for Extended Pathways with SV_OH Fault Rate.....102

Table 66: Mechanical Failure Cut Sets for Extended System 104

Table 67: Mechanical Failure Cut Sets for Extended System with SV_OL.....109

Table 68: Mechanical Failure Cut Sets for the Extended System with SV_OM.....110

Table 69: Mechanical Failure Cut Sets for the Extended System with SV_OH 110

Table 70: Mechanical Failure Cut Sets for Extended System with SV_DOW.....111

Table 71: Mechanical Failure Cut Sets for the Extended System with SV_MAN.....111

Table 72: Mechanical Failure Cut Sets for the Extended System with SV_NRPD.....112

Table 73: Failure Rate Results for the Extended System with Door Interlocks 114

Table 74: Extended System w/ Door Interlocks and Diagnostic HE Component 115

Table 75: Mechanical Failure for Extended System with Door Interlock 115

Table 76: Failure Results for Extended System with Door Interlocks and Bruce B Fault Rate 116

Table 77: Failure Results for the Extended System with Door Interlocks, Bruce B Fault Rate, and Diagnostic HE Comp 116

Table 78: Mechanical Failure for Extended System with Door Interlocks and Bruce B Fault Rate 117

Table 79: Failure Results for Extended Pathways with Bruce A Fault Rate and Door Interlocks 118

Table 80: Failure Probability for Extended System with Door Interlocks, Bruce A Fault Rate, and Diagnostic HE Comp 118

Table 81: Mech. Failure of Ext. System with DI, Diagnoses HE Comp, and Bruce A Fault Rate 119

Table 82: FV Results for Extended Pathways DI System 119

Table 83: FV Results for Original Valve Fault Data with Human Error Event and Bruce B Door Fault 122

Table 84: FV for SV_OL for Extended System with Door Interlocks 125

Table 85: FV for SV_OM for Extended System with Door Interlocks 127

Table 86: FV Results for SV_NRPD fault rate for Extended System with Door Interlocks 129

Table 87: Summary Results for the Original Fault Rate Data with a diagnostic HE Component 133

Table 88: Basic System FV 160

Table 89: FV Original System SV_OL 161

Table 90: FV for Original System SV_OM 162

Table 91: FV for Basic System SV_OH 163

Table 92: FV for Basic System w/ SV_DOW 164
Table 93: FV for Basic System with SV_MAN 165
Table 94: FV for Basic System with SV_NRPD 166
Table 95: FV Results for Basic System w/Diagnostic HE Component 167
Table 96: FV Results for Basic System w/Diagnostic HE Component & SV_OL 168
Table 97 FV Results for Basic System w/Diagnostic HE Component & SV_OM 169
Table 98:FV Results for Basic System w/Diagnostic HE Component & SV_OH 171
Table 99: FV Results for Basic System w/Diagnostic HE Component and SV_DOW ..173
Table 100: FV Results for Basic System w/Diagnostic HE Component and SV_MAN.174
Table 101: FV Results for Basic System w/Diagnostic HE Component and SV_NRPD 175
Table 102: FV Results for Basic System w/ Bruce B Fault Rate 177
Table 103: FV Results for Basic System w/ Bruce B Fault Rate & SV_OL 178
Table 104: FV Results for Basic System w/ Bruce B Fault Rate and SV_OM 179
Table 105: FV Results for Basic System w/ Bruce B Fault Rate and SV_OH 180
Table 106: FV Results for Basic System w/ Bruce B Fault Rate and SV_DOW 182
Table 107: FV Results for Basic System w/ Bruce B Fault Rate and SV_MAN 183
Table 108: FV Results for Basic System w/ Bruce B Fault Rate and SV_NRPD 184
Table 109: FV Results for Basic System w/ Bruce B Fault Rate and Diagnostic HE 186
Table 110: FV Results for Basic System w/ Bruce B Fault Rate and Diagnostic HE and SV_OL 187
Table 111: FV Results for Basic System w/ Bruce B Fault Rate and Diagnostic HE and SV_OM 188

Table 112: FV Results for Basic System w/ Bruce B Fault Rate and Diagnostic HE and SV_OH.....189
Table 113: FV Results for Basic System w/ Bruce B Fault Rate and Diagnostic HE and SV_DOW.....190
Table 114: FV Results for Basic System w/ Bruce B Fault Rate and Diagnostic HE and SV_MAN.....191
Table 115: FV Results for Basic System w/ Bruce B Fault Rate and Diagnostic HE and SV_NRPD.....192
Table 116: FV Results for Basic System w/ Bruce A Fault Rate.....194
Table 117: FV Results for Basic System w/ Bruce A Fault Rate and SV_OL.....195
Table 118: FV Results for Basic System w/ Bruce A Fault Rate and SV_OM.....196
Table 119: FV Results for Basic System w/ Bruce A Fault Rate and SV_OH.....197
Table 120: FV Results for Basic System w/ Bruce A Fault Rate and SV_DOW.....198
Table 121: FV Results for Basic System w/ Bruce A Fault Rate and SV_MAN.....199
Table 122: FV Results for Basic System w/ Bruce A Fault Rate and SV_NRPD.....201
Table 123: FV Results for Basic System w/ Bruce A Fault Rate and Diagnostic HE Component.....203
Table 124: FV Results for Basic System w/ Bruce A Fault Rate and Diagnostic HE Component and SV_OL.....204
Table 125: FV Results for Basic System w/ Bruce A Fault Rate and Diagnostic HE Component and SV_OM.....205
Table 126: FV Results for Basic System w/ Bruce A Fault Rate and Diagnostic HE Component and SV_OH.....206

Table 127: FV Results for Basic System w/ Bruce A Fault Rate and Diagnostic HE Component and SV_DOW 207
Table 128: FV Results for Basic System w/ Bruce A Fault Rate and Diagnostic HE Component and SV_MAN.....208
Table 129: FV Results for Basic System w/ Bruce A Fault Rate and Diagnostic HE Component and SV_NRPD 209
Table 130: FV Results for Basic System w/ Door Interlocks.....211
Table 131: FV Results for Basic System w/ Door Interlocks and SV_OL.....213
Table 132: FV Results for Basic System w/ Door Interlocks and SV_OM.....214
Table 133: FV Results for Basic System w/ Door Interlocks and SV_OH 216
Table 134: FV Results for Basic System w/ Door Interlocks and SV_DOW 218
Table 135: FV Results for Basic System w/ Door Interlocks and SV_MAN.....219
Table 136: FV Results for Basic System w/ Door Interlocks and SV_NRPD 221
Table 137: FV Results for Basic System w/ Door Interlocks and Diagnostic HE 223
Table 138: FV Results for Basic System w/ Door Interlocks and Diagnostic HE and SV_OL 225
Table 139: FV Results for Basic System w/ Door Interlocks and Diagnostic HE and SV_OM.....227
Table 140: FV Results for Basic System w/ Door Interlocks and Diagnostic HE and SV_OH.....229
Table 141: FV Results for Basic System w/ Door Interlocks and Diagnostic HE for SV_DOW.....231

Table 142: FV Results for Basic System w/ Door Interlocks and Diagnostic HE and SV_MAN 233
Table 143: FV Results for Basic System w/ Door Interlocks and Diagnostic HE and SV_NRPD 235
Table 144: FV Results for Basic System w/ Door Interlocks and Bruce B Fault Rate ... 237
Table 145: FV Results for Basic System w/ Door Interlocks and Bruce B Fault Rate and SV_OL 239
Table 146: FV Results for Basic System w/ Door Interlocks and Bruce B Fault Rate and SV_OM 241
Table 147: FV Results for Basic System w/ Door Interlocks and Bruce B Fault Rate and SV_OH 243
Table 148: FV Results for Basic System w/ Door Interlocks and Bruce B Fault Rate and SV_DOW 245
Table 149: FV Results for Basic System w/ Door Interlocks and Bruce B Fault Rate and SV_MAN 246
Table 150: FV Results for Basic System w/ Door Interlocks and Bruce B Fault Rate and SV_NRPD 248
Table 151: FV Results for Basic System w/Door Interlocks, Bruce B Fault Rate, and Diagnostic HE Component 250
Table 152: FV Results for Basic System w/Door Interlocks, Bruce B Fault Rate, and Diagnostic HE Component and SV_OL 252
Table 153: FV Results for Basic System w/Door Interlocks, Bruce B Fault Rate, and Diagnostic HE Component and SV_OM 254

Table 154: FV Results for Basic System w/Door Interlocks, Bruce B Fault Rate, and Diagnostic HE Component and SV_OH.....256
Table 155: FV Results for Basic System w/Door Interlocks, Bruce B Fault Rate, and Diagnostic HE Component and SV_DOW.....258
Table 156: FV Results for Basic System w/Door Interlocks, Bruce B Fault Rate, and Diagnostic HE Component and SV_MAN.....260
Table 157: FV Results for Basic System w/Door Interlocks, Bruce B Fault Rate, and Diagnostic HE Component and SV_NRPD.....262
Table 158: FV Results for Basic System w/ Door Interlocks and Bruce A Fault Rate ...264
Table 159: FV Results for Basic System w/ Door Interlocks and Bruce A Fault Rate and SV_OL.....266
Table 160: FV Results for Basic System w/ Door Interlocks and Bruce A Fault Rate and SV_OM.....268
Table 161: FV Results for Basic System w/ Door Interlocks and Bruce A Fault Rate and SV_OH.....270
Table 162: FV Results for Basic System w/ Door Interlocks and Bruce A Fault Rate and SV_DOW.....272
Table 163: FV Results for Basic System w/ Door Interlocks and Bruce A Fault Rate and SV_MAN.....274
Table 164: FV Results for Basic System w/ Door Interlocks and Bruce A Fault Rate and SV_NRPD.....276
Table 165: FV Results for Basic System w/ Door Interlocks, Bruce A Fault Rate, and Diagnostic HE.....278

Table 166: FV Results for Basic System w/ Door Interlocks, Bruce A Fault Rate, and Diagnostic HE and SV_OL.....280
Table 167: FV Results for Basic System w/ Door Interlocks, Bruce A Fault Rate, and Diagnostic HE and SV_OM.....281
Table 168: FV Results for Basic System w/ Door Interlocks, Bruce A Fault Rate, and Diagnostic HE and SV_OH 283
Table 169: FV Results for Basic System w/ Door Interlocks, Bruce A Fault Rate, and Diagnostic HE and SV_DOW 285
Table 170: FV Results for Basic System w/ Door Interlocks, Bruce A Fault Rate, and Diagnostic HE and SV_MAN.....287
Table 171: FV Results for Basic System w/ Door Interlocks, Bruce A Fault Rate, and Diagnostic HE and SV_NRPD 288
Table 172: FV Results for Extended System.....290
Table 173: FV Results for Extended System and SV_OL.....292
Table 174: FV Results for Extended System and SV_OM.....294
Table 175: FV Results for Extended System and SV_OH 296
Table 176: FV Results for Extended System and SV_DOW 298
Table 177: FV Results for Extended System and SV_MAN.....300
Table 178: FV Results for Extended System and SV_NRPD 302
Table 179: FV Results for Extended System w/ Diagnostic HE 303
Table 180: FV Results for Extended System w/ Diagnostic HE and SV_OL 306
Table 181: FV Results for Extended System w/ Diagnostic HE and SV_OM.....308
Table 182: FV Results for Extended System w/ Diagnostic HE and SV_OH.....310

Table 183: FV Results for Extended System w/ Diagnostic HE and SV_DOW.....312
Table 184: FV Results for Extended System w/ Diagnostic HE and SV_MAN.....314
Table 185: FV Results for Extended System w/ Diagnostic HE and SV_NRPD.....316
Table 186: FV Results for Extended System w/ Bruce B Fault Rate 317
Table 187: FV Results for Extended System w/ Bruce B Fault Rate and SV_OL.....320
Table 188: FV Results for Extended System w/ Bruce B Fault Rate and SV_OM.....322
Table 189: FV Results for Extended System w/ Bruce B Fault Rate and SV_OH 324
Table 190: FV Results for Extended System w/ Bruce B Fault Rate and SV_DOW.....326
Table 191: FV Results for Extended System w/ Bruce B Fault Rate and SV_MAN.....328
Table 192: FV Results for Extended System w/ Bruce B Fault Rate and SV_NRPD.....330
Table 193: FV Results for Bruce B Fault Rate and Diagnostic HE.....331
Table 194: FV Results for Bruce B Fault Rate and Diagnostic HE and SV_OL 334
Table 195: FV Results for Bruce B Fault Rate and Diagnostic HE and SV_OM 336
Table 196: FV Results for Bruce B Fault Rate and Diagnostic HE and SV_OH.....338
Table 197: FV Results for Bruce B Fault Rate and Diagnostic HE and SV_DOW 340
Table 198: FV Results for Bruce B Fault Rate and Diagnostic HE and SV_MAN 342
Table 199: FV Results for Bruce B Fault Rate and Diagnostic HE and SV_NRPD.....344
Table 200: FV Results for Extended System w/ Bruce A Fault Rate.....345
Table 201: FV Results for Extended System w/ Bruce A Fault Rate and SV_OL.....348
Table 202: FV Results for Extended System w/ Bruce A Fault Rate and SV_OM.....350
Table 203: FV Results for Extended System w/ Bruce A Fault Rate and SV_OH 352
Table 204: FV Results for Extended System w/ Bruce A Fault Rate and SV_DOW 354
Table 205: FV Results for Extended System w/ Bruce A Fault Rate and SV_MAN.....356

Table 206: FV Results for Extended System w/ Bruce A Fault Rate and SV_NRPD 358
Table 207: FV Results for Extended System w/ Bruce A Fault Rate and Diagnostic HE 359
Table 208: FV Results for Extended System w/ Bruce A Fault Rate and Diagnostic HE and SV_OL 362
Table 209: FV Results for Extended System w/ Bruce A Fault Rate and Diagnostic HE and SV_OM 364
Table 210: FV Results for Extended System w/ Bruce A Fault Rate and Diagnostic HE and SV_OH.....366
Table 211: FV Results for Extended System w/ Bruce A Fault Rate and Diagnostic HE and SV_DOW 368
Table 212: FV Results for Extended System w/ Bruce A Fault Rate and Diagnostic HE and SV_MAN 370
Table 213: FV Results for Extended System w/ Bruce A Fault Rate and Diagnostic HE and SV_NRPD.....372
Table 214: FV Results for Extended System w/ Door Interlocks.....373
Table 215: FV Results for Extended System w/ Door Interlocks and SV_OL 376
Table 216: FV Results for Extended System w/ Door Interlocks and SV_OM 378
Table 217: FV Results for Extended System w/ Door Interlocks and SV_OH.....380
Table 218: FV Results for Extended System w/ Door Interlocks and SV_DOW 382
Table 219: FV Results for Extended System w/ Door Interlocks and SV_MAN 384
Table 220: FV Results for Extended System w/ Door Interlocks and SV_NRPD 386

Table 221: FV Results for the Extended System w/Door Interlocks and Diagnostic HE 387
Table 222: FV Results for the Extended System w/Door Interlocks and Diagnostic HE and SV_OL 389
Table 223: FV Results for the Extended System w/Door Interlocks and Diagnostic HE and SV_OM 391
Table 224: FV Results for the Extended System w/Door Interlocks and Diagnostic HE and SV_OH 392
Table 225: FV Results for the Extended System w/Door Interlocks and Diagnostic HE and SV_DOW 394
Table 226: FV Results for the Extended System w/Door Interlocks and Diagnostic HE and SV_MAN 396
Table 227: FV Results for the Extended System w/Door Interlocks and Diagnostic HE and SV_NRPD 398
Table 228: FV Results for Extended System w/ Door Interlocks and Bruce B Fault Rate 399
Table 229: FV Results for Extended System w/ Door Interlocks and Bruce B Fault Rate and SV_OL 402
Table 230: FV Results for Extended System w/ Door Interlocks and Bruce B Fault Rate and SV_OM 404
Table 231: FV Results for Extended System w/ Door Interlocks and Bruce B Fault Rate and SV_OH 406

Table 232: FV Results for Extended System w/ Door Interlocks and Bruce B Fault Rate and SV_DOW 408
Table 233: FV Results for Extended System w/ Door Interlocks and Bruce B Fault Rate and SV_MAN 409
Table 234: FV Results for Extended System w/ Door Interlocks and Bruce B Fault Rate and SV_NRPD 411
Table 235: FV Results for Extended System w/ Door Interlocks and Bruce B Fault Rate and Diagnostic HE 412
Table 236: FV Results for Extended System w/ Door Interlocks and Bruce B Fault Rate and Diagnostic HE and SV_OL 414
Table 237: FV Results for Extended System w/ Door Interlocks and Bruce B Fault Rate and Diagnostic HE and SV_OM 416
Table 238: FV Results for Extended System w/ Door Interlocks and Bruce B Fault Rate and Diagnostic HE and SV_OH 418
Table 239: FV Results for Extended System w/ Door Interlocks and Bruce B Fault Rate and Diagnostic HE and SV_DOW 419
Table 240: FV Results for Extended System w/ Door Interlocks and Bruce B Fault Rate and Diagnostic HE and SV_MAN 420
Table 241: FV Results for Extended System w/ Door Interlocks and Bruce B Fault Rate and Diagnostic HE and SV_NRPD 422
Table 242: FV Results for Extended System w/ Door Interlocks and Bruce A Fault Rate 424

Table 243: FV Results for Extended System w/ Door Interlocks and Bruce A Fault Rate and SV_OL 426
Table 244: FV Results for Extended System w/ Door Interlocks and Bruce A Fault Rate and SV_OM 427
Table 245: FV Results for Extended System w/ Door Interlocks and Bruce A Fault Rate and SV_OH 429
Table 246: FV Results for Extended System w/ Door Interlocks and Bruce A Fault Rate and SV_DOW 430
Table 247: FV Results for Extended System w/ Door Interlocks and Bruce A Fault Rate and SV_MAN 431
Table 248: FV Results for Extended System w/ Door Interlocks and Bruce A Fault Rate and SV_NRPD 433
Table 249: FV Results for Extended System w/ Door Interlocks and Bruce A Fault Rate and Diagnostic HE 435
Table 250: FV Results for Extended System w/ Door Interlocks and Bruce A Fault Rate and Diagnostic HE and SV_OL 437
Table 251: FV Results for Extended System w/ Door Interlocks and Bruce A Fault Rate and Diagnostic HE and SV_OM 438
Table 252: FV Results for Extended System w/ Door Interlocks and Bruce A Fault Rate and Diagnostic HE and SV_OH 440
Table 253: FV Results for Extended System w/ Door Interlocks and Bruce A Fault Rate and Diagnostic HE and SV_DOW 441

Table 254: FV Results for Extended System w/ Door Interlocks and Bruce A Fault Rate and Diagnostic HE and SV_MAN 443
Table 255: FV Results for Extended System w/ Door Interlocks and Bruce A Fault Rate and Diagnostic HE and SV_NRPD.....444
Table 256: MF Cut Sets for Basic System.....446
Table 257: MF Cut Sets for Basic System w/ SV_OL 446
Table 258: MF Cut Sets for Basic System w/ SV_OM 447
Table 259: MF Cut Sets for Basic System w/ SV_OH.....447
Table 260: MF Cut Sets for Basic System w/ SV_DOW 447
Table 261: MF Cut Sets for Basic System w/ SV_MAN 448
Table 262: MF Cut Sets for Basic System w/ SV_NRPD.....448
Table 263: MF Cut Sets for Basic System w/ Bruce B Fault Rate 449
Table 264: MF Cut Sets for Basic System w/ Bruce B Fault Rate and SV_OL.....449
Table 265: MF Cut Sets for Basic System w/ Bruce B Fault Rate and SV_OM.....450
Table 266: MF Cut Sets for Basic System w/ Bruce B Fault Rate and SV_OH. 450
Table 267: MF Cut Sets for Basic System w/ Bruce B Fault Rate and SV_DOW.....450
Table 268: MF Cut Sets for Basic System w/ Bruce B Fault Rate and SV_MAN.....451
Table 269: MF Cut Sets for Basic System w/ Bruce B Fault Rate and SV_NRPD 451
Table 270: MF Cut Sets for Basic System w/ Bruce A Fault Rate.....452
Table 271: MF Cut Sets for Basic System w/ Bruce A Fault Rate and SV_OL.....452
Table 272: MF Cut Sets for Basic System w/ Bruce A Fault Rate and SV_OM 453
Table 273: MF Cut Sets for Basic System w/ Bruce A Fault Rate and SV_OH 453
Table 274: MF Cut Sets for Basic System w/ Bruce A Fault Rate and SV_DOW 453

Table 275: MF Cut Sets for Basic System w/ Bruce A Fault Rate and SV_MAN.....454

Table 276: MF Cut Sets for Basic System w/ Bruce A Fault Rate and SV_NRPD 454

Table 277: MF Cut Sets for Extended System.....454

Table 278: MF Cut Sets for Extended System and SV_OL 459

Table 279: MF Cut Sets for Extended System and SV_OM 460

Table 280: MF Cut Sets for Extended System and SV_OH.....460

Table 281: MF Cut Sets for Extended System and SV_DOW 461

Table 282: MF Cut Sets for Extended System and SV_MAN 461

Table 283: MF Cut Sets for Extended System and SV_NRPD.....462

Table 284: MF Cut Sets for Extended System w/ Bruce B Fault Rate.....462

Table 285: MF Cut Sets for Extended System w/ Bruce B Fault Rate and SV_OL 467

Table 286: MF Cut Sets for Extended System w/ Bruce B Fault Rate and SV_OM 468

Table 287: MF Cut Sets for Extended System w/ Bruce B Fault Rate and SV_OH 468

Table 288: MF Cut Sets for Extended System w/ Bruce B Fault Rate and SV_DOW ...469

Table 289: MF Cut Sets for Extended System w/ Bruce B Fault Rate and SV_MAN ...469

Table 290: MF Cut Sets for Extended System w/ Bruce B Fault Rate and SV_NRPD ..470

Table 291: MF Cut Sets for Extended System w/ Bruce A Fault Rate.....470

Table 292: MF Cut Sets for Extended System w/ Bruce A Fault Rate and SV_OL 475

Table 293: MF Cut Sets for Extended System w/ Bruce A Fault Rate and SV_OM 476

Table 294: MF Cut Sets for Extended System w/ Bruce A Fault Rate and SV_OH.....476

Table 295: MF Cut Sets for Extended System w/ Bruce A Fault Rate and SV_DOW ...477

Table 296: MF Cut Sets for Extended System w/ Bruce A Fault Rate and SV_MAN ...477

Table 297: MF Cut Sets for Extended System w/ Bruce A Fault Rate and SV_NRPD ..478

Abstract

This research applied probabilistic risk assessment to a pyro-processing facility to calculate the probability of an air ingress event occurring. Four configurations of the system were modeled, first a generalized system, second being the generalized system with door interlocks, third being an extended system with redundant solenoid valves, and fourth being the extended system with the addition of door interlocks. Eight fault rates for solenoid valves and three fault rates for door seals were used. For a one-day interval, the addition of the extra valves was significant, however, a one-year test interval showed little improvement for the total air ingress probability, which is resultant of some, possibly questionable, fault rates. The failure probability was found to be between the 10^{-3}-10^{-1} range per year. An analysis of maintenance of risk critical components indicated that with monthly testing, the overall air ingress probability was reduced to 10^{-5}-10^{-4} per year.

1. Introduction

Probabilistic Risk Assessments (PRAs) are used frequently when evaluating nuclear power plants. PRAs, however, have not yet been applied to that of a pyro-processing facility. This document discusses a Level 1 PRA as it applies to a generic model of the inert argon atmosphere in a pyro-processing hot cell.

The Nuclear Regulatory Commission (NRC) document NUREG-2150 issued in 2012 discusses, in the fuel cycle section, the US NRC basis for fuel cycle facilities like the one that is studied here. A high-level hazard analysis was completed previously as a separate part of a pyro-processing investigation, which addressed air ingress scenarios and estimated an unlikely event probability of 10^{-4} to 10^{-5}. Because the air locks are pivotal to the safety and operation of the facility and because there are various sequences by which air may enter the inert hot-cell and possibly lead to a pyrophoric fire, the application of PRA techniques are justified. While this PRA is not specifically measuring the core damage failure probability, it is in line with what a Level 1 PRA calculates and will therefore be considered a Level 1 PRA.

To complete this research, a generic diagram was created, possible air ingress pathways were considered, failure data was found, and the Idaho National Laboratory (INL) produced program, SAPHIRE, was used to create the event trees and fault trees, and to calculate the air ingress probability over one day, one month, and one year. Chapter 1 is the Introduction chapter, Chapter 2 is the Methods chapter, Chapter 3 is the Results and Discussion chapter, and Chapter 4 is the Conclusions.

1.1 Probabilistic Risk Assessment

1.1.1 History

PRA was first considered in the nuclear industry with the WASH-740 report in March of 1957. Also called the "Brookhaven Report", WASH-740 was criticized for its production of extremely high consequences for the worst-case accident scenario and for its non-use of appropriate probabilities - something that there was no formal methodology for at the time. The WASH-740 report was based on the judgement of experts. (1)

In 1965, an update to the WASH-740 report was created with the intention of improving the results reported prior given the assumption that new containment buildings and safety systems would show an improvement in safety. However, there was no new research to account for any differences from the original research and the update produced even worse results. The AEC then contracted with Research Planning Corporation to amend and ideally improve the poor results produced by this update. The Research Planning Corporation ultimately failed due to an underestimation of the probabilities and the AEC did not publish the report. In the early 1970s, the AEC committed to a new study that would eventually become WASH-1400. Through 1971 and into 1972, the AEC searched for outside experts to recruit. The ultimate goal of the WASH-1400 report was to acknowledge every credible accident scenario and its corresponding probability. WASH-1400 covered airborne analysis and an offsite dose analysis. In 1974 congress abolished the AEC and replaced it with the Nuclear Regulatory Commission (NRC) in 1975. Once published, the WASH-1400 report received criticism for being overly optimistic in its conclusions given that they reported very large uncertainties and for having a pro-nuclear bias.

In 1978, NUREG/CR-0400, "Risk Assessment Review Group Report to the U.S. Nuclear Regulatory Commission", otherwise known as the Lewis Report, was published by the Risk Assessment Review group. The Lewis Report was a review of the WASH-1400 report and while it praised the use of PRA techniques, it criticized the overly optimistic conclusions because there was some question of the accuracy of the atmospheric dispersion model, evacuation schemes were overly optimistic and thus fatality rates could be lower, seismic events, fires, and human error were not appropriately defined, accidents were only considered for plants operating at full power. WASH-1400 did, for the first time, acknowledge the significance of a small loss of coolant accident (LOCA) while the large LOCA was found to be less significant than previously thought. The Three Mile Island incident proved WASH-1400 right when a small break LOCA led to a core melt. WASH-1400 also identified that accident frequencies were higher than expected but the corresponding accident consequence to be smaller than thought.

In 1984, a study called "The Industry Degraded Core Rulemaking" or IDCOR used an early form of PRA to justify the prevention of rulemaking for severe nuclear accidents with the conclusions that 1. the probability of such accidents occurring is incredibly low 2. the fission product source terms are probably much less than other accidents predicted and 3. the consequences to the public if a nuclear accident were to occur is lower than the risk levels incorporated by the NRC.

In 1995, 60 FR 42622, published by the NRC, supported the use for risk informed initiatives. The NRC then published two different reports that strongly supported the use of PRA in the nuclear industry and for its current use in regulations, in 1998 and 2004, respectively, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed

Decisions of Plant-Specific Changes to the Licensing Basis" and "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities." In 2012, NUREG-2150, "A Proposed Risk Management Regulatory Framework," was released. NUREG-2150 recommended a formally established regulatory framework for risk management. The NRC has not made any formal policy implementation of NUREG-2150.

1.1.2 US Nuclear Regulatory Commission Position

As mentioned, in 2012, the US NRC released "A Proposed Risk Management Regulatory Framework", of which, the abstract states (2):

> ***"...develop a strategic vision and options for adopting a more comprehensive, holistic, risk-informed, performance based regulatory approach for reactors, materials, waste, fuel cycle, and transportation that would continue to ensure the safe and secure use of nuclear material."***

NUREG-2150 has a fuel cycle section which acknowledges a regulatory approach for fuel cycle facilities that centers on an integrated safety analysis (ISA) approach. In both PRA and ISA, all significant accident sequences must be considered and their consequences determined, however, unlike PRA, ISA does not sum risks from multiple individual sequences. It is also acknowledged in NUREG-2150 that, unlike nuclear power plants, fuel cycle facilities do not have many complex safety controls and instead use process steps, thus human error dominates.

NUREG-2150 does not recommend the exclusive use of PRA in establishing the safety of fuel cycle facilities, instead, they recommend the continued use and evolution of ISA. PRA integration into ISA is a way of evolving the ISA.

In 2011, just prior to publishing NUREG-2150, the US NRC issued a draft report (3) that provided recommendations for licensing and regulating fuel cycle facilities. One recommendation being the use of a hybrid ISA-PRA approach where PRA is used for high and very high consequence events. Intermediate consequences that have been determined as unlikely may also need further development in the form of PRA. Based on these recent reports, the use of PRA in the field of reprocessing is likely to increase for all facilities regulated by the US NRC. PRA techniques are therefore justified in the pyro-processing facility analysis.

1.2 Probabilistic Risk Assessment Theory

PRA estimates risk by answering three questions: 1) What can go wrong? 2) How likely is it to go wrong? and 3) What are the consequences? (4) The traditional definition of risk is defined as the frequency with which a given consequence occurs. Frequency refers to how often each consequence occurs over a given period of time (5). Most PRA is modeled using the minimum cut sets of the system, meaning that only the very minimum amount of component failures that cause a system failure to occur. If one of the components does not fail, then it is not a cut set, and the system does not fail (6). To elaborate, say there is some system with three components – component A, component B, and component C. If all three components are required to fail for the system to fail, then a fault in A and in B and in C is a cut set. However, if only A and B fail, then there is not a cut set. If there is some fourth component D that also fails, with A and B and C, then the failure of A and B and C and D is not a cut set since the combination of A and B and C is the cut set since cut sets apply to the minimum amount of component failures that lead to a fault.

1.2.1 Event Tree Analysis

Event tree analysis (ETA) is a technique used in PRA that allows for the identification and evaluation of all of the sequences of events for an accident scenario given a particular initiating event through a structured and methodical approach. ETA may acknowledge and help calculate the probabilities for many outcomes for a single initiating event. A sample event tree is given in Figure 1. In event trees, the accident split is binary, either a top event results in failure or it does not fail. It is shown in Figure 1 the initiating event followed by a tree diagram in which a success of an event is indicated by upward movement in the tree and failure of an event is denoted by downward movement in the tree. Not every outcome results in an accident or possible accident. Since ETs may only use one initiating event at a given time, it may become necessary to have multiple ETs to fully evaluate the system and the consequence of multiple initiating events (7).

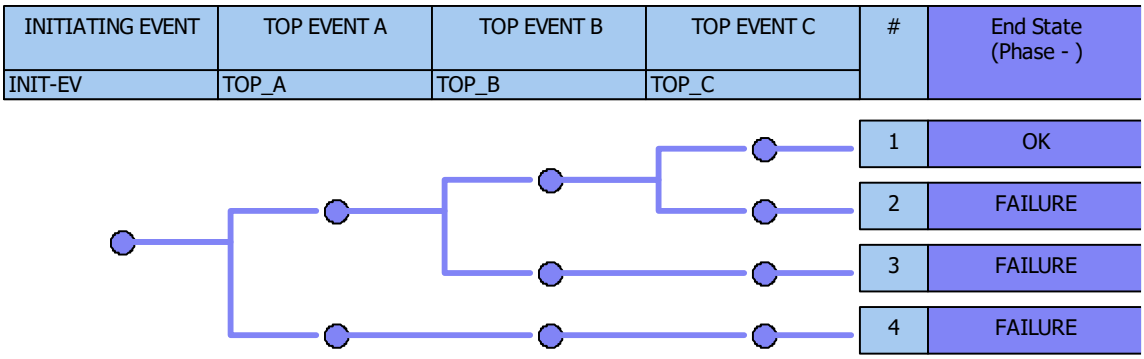


Figure 1: Sample event tree.

1.2.2 Fault Tree Analysis

In combination with ETA, fault tree analysis (FTA) is used to produce a fully formed PRA model. NUREG-0492 from 1961 (8)

> ***"A fault tree analysis can be simply described as an analytical technique, whereby an undesired state of the system is specified (usually a state that is critical from a safety standpoint), and the system is then analyzed in the context of its environment and operation to find all credible ways in which the undesired event can occur."***

Fault trees are a graphical model of all of the most important faults of a system. On their own, fault trees are not a model of all possible failures of a system, they are tailored to the failure of the top event and only model the most credible of those failures. While technically a qualitative model, fault trees may be, fault trees may be, and often are, evaluated qualitatively. An example fault tree is shown in Figure 2.

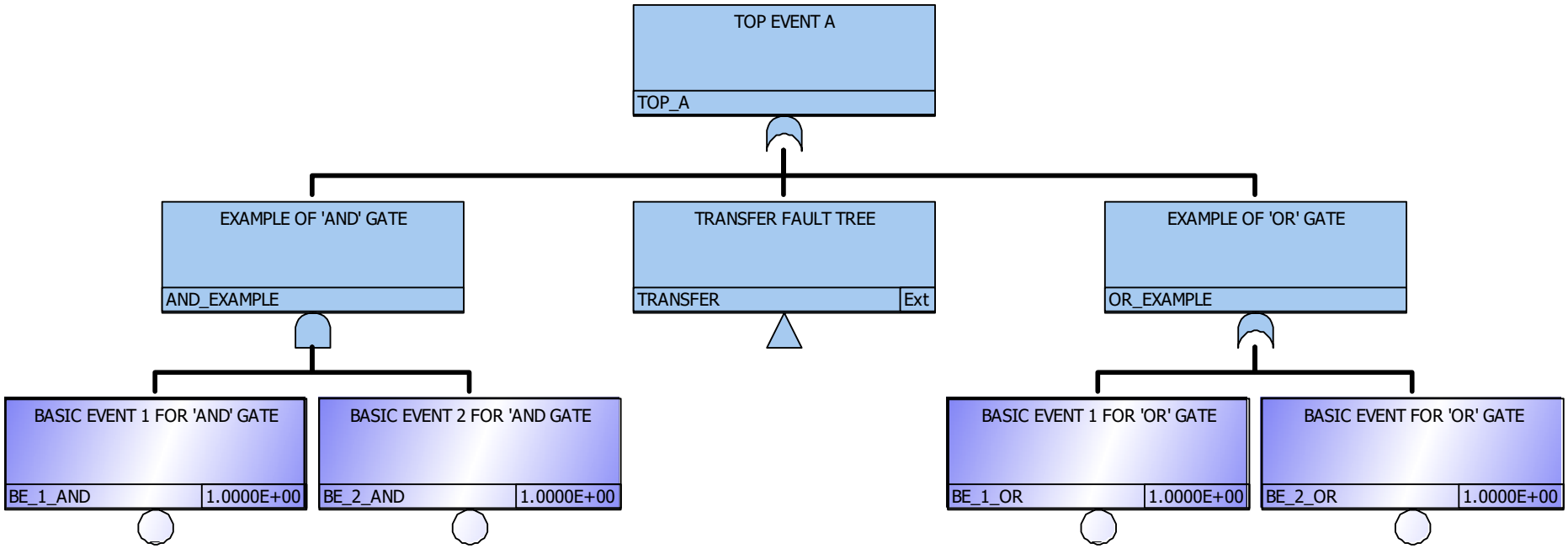


Figure 2: Example fault tree.

In fault trees, the circles represent a basic event that do not require any further development, the triangles represent transfers, which pull in other sub-fault trees into a larger fault tree, the diamonds represent an undeveloped event. Undeveloped events either contain insufficient consequences or inadequate information for further development. The tag shaped primary event symbol is an external event, or an event that is expected to occur. The rectangles represent intermediate events, or fault events that are dependent on the failures of subsequent events in the tree. Figure 3 represents the two most commonly used gates – 'and' gates and 'or' gates, along with the transfer symbol and the basic event symbol.

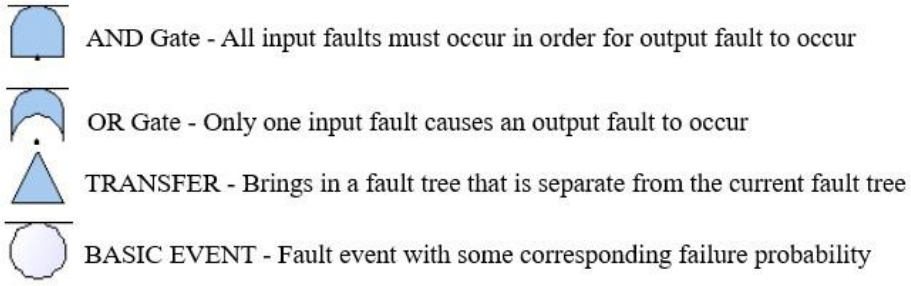


Figure 3: 'And' gate symbol and 'or' gate symbol.

As stated in the figure, 'and' gates require all of the input faults to occur to consider the system to be failed while 'or' gates only require one of the input faults to occur.

1.2.3 Probability Equations for Independent Events

A majority of the events that are calculated in this PRA are considered to be independent. That is, the failure of some Event A has no effect on the probability of the failure of B. Equation (3) is the probability of events A and B occurring given that they are independent (9).

$$P(A \cap B) = P(A) * P(B) \quad (1)$$

Equation (2) is the probability of event A or event B occurring.

$$P(A \cup B) = P(A) + P(B) - P(A \cap B) \quad (2)$$

or for independent events

$$P(A \cup B) = P(A) + P(B) - P(A) * P(B) \quad (3)$$

The probabilities that are used as dependent failures are considered common cause failures that only apply to redundant systems and are explained in a later section.

1.2.4 Importance Measures

Importance measures are a way of analyzing the contribution of individual system components to the total risk. Importance measures provide a valuable, quantitative insight on the main contributors of risk. There are a few different kinds of importance measures, but for the purpose here, only Fussell-Vesely (FV) will be analyzed. FV "measures the percent contribution of cut sets containing a basic event of interest to the total risk." Fussell-Vesely ranges from 0 to 1 and is calculated by Equation (4) (10).

$$FV_{xi} = \frac{F(i)}{F(x)} \quad (4)$$

where F(i) is the risk from the cut sets that contain the event of interest, and F(x) is the total risk.

1.2.5 Common Cause Failures

Common cause failures (CCF) exist when two or more components, typically of a redundant system, fail due to a single root cause. CCFs failures may occur at exactly the same time or they may occur within a short time of each other. The alpha-factor model of CCF is used for this PRA analysis. The alpha-factor method is "the fraction of failure events that occur in a group of m-items and involve failure of exactly k-items due to a common cause." Equation (5) describes the alpha-factor model (11).

$$\alpha_{k:m} = \frac{\binom{m}{k} * Q_{k:m}}{\sum_{j=1}^{m} \binom{m}{j} * Q_{j:m}} \quad (5)$$

The numerator of the equation is the probability of exactly k-items failing while the denominator is the summation of all of the possibilities of items failing via common cause. Letting Q_t be the total failure probability encompassing all of the independent and common cause events, the probability of k-items failing via common cause is:

$$Q_{k:m} = \frac{k}{\binom{m-1}{k-1}} * \frac{\propto_{k:m}}{\propto_t} * Q_t = \frac{m}{\binom{m}{k}} * \frac{\propto_{k:m}}{\propto_t} * Q_t \quad (6)$$

where

$$\propto_t = \sum_{k=1}^{m} k * \propto_{k:m} \quad (7)$$

the alpha factor may then be inferred as

$$\hat{\propto}_{k:m} = \frac{n_k}{\sum_{j=1}^{m} n_j} \quad (8)$$

Now it is possible to determine the CCF contribution using an estimate of Q_t and to determine n_k for k=1,2,..,m.

Common cause failures generally apply to a redundant system. If a component of a system has a similar backup component in case of failure, then the component is redundant. A system is redundant when redundant components exist (12). Figure 4 shows a system with two redundant components that both lead to some switch (13).

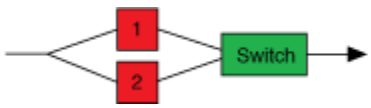


Figure 4: A two-item redundant system.

1.2.6 Risk Focused Maintenance

NUREG/CR—5695, published in 1991, titled "A Process for Risk Informed Maintenance" recommended a process to establish maintenance procedures by identifying the risk-critical

components of a system. The risk-critical components are those components which, when the mechanical failure cut sets, as a percentage of the total fault rate, sum to some identified value, usually 90%. For example, if a system had 100 cut sets, but the top 5 cut sets summed to over 90% of the total failure probability, then those 5 cut sets would contain the risk-critical components. Risk-critical components are either identified through quantitative analytical assessment or through failure history. Quantitative analysis consists of identifying the risk-critical components through failure mode and effects analysis or from fault trees. Cut sets generated from fault trees are then used to determine dominant component failures and failure modes which are then used to determine the maintenance requirements via engineering judgement. (14)

1.2.7 Uncertainty

The US NRC published NUREG-1855, "Guidance on the Treatment of Uncertainties Associated with PRAs in Risk-Informed Decision Making" in 2009 to provide guidance on uncertainties in the risk-informed decision-making process (15). Three types of uncertainty (parameter, model, and completeness) are defined and explained. Parameter uncertainty is the uncertainty related to the single components of the PRA model. Model uncertainty is not typically used since it requires weights that represent the degree of credibility of each model. Completeness uncertainty refers to the uncertainty related to the level of completeness of scope and detail in the PRA.

The distribution of uncertainty can be reported using the cumulative density function (CDF) or the probability density function (PDF). The PDF is the derivative of the CDF, therefore, with continuity assumed, the PDF is defined by Equation (9) and the CDF by equation (10).

$$F_X(x) = f_X(u)du \tag{9}$$

$$F_X(x) = \int_{-\infty}^{x} f_X(u)du \tag{10}$$

There are three main principles for a PDF (16)

1. $f_x(x) \geq 0$ for all $x \in \mathbb{R}$
2. $\int_{-\infty}^{\infty} f_X(u)du = 1$
3. $P(a < X \leq b) = F_X(b) - F_X(a) = \int_a^b f_X(u)du$
4. for a set A, $P(X \in A) = \int_A f_X(u)du$

A typical Gaussian PDF, calculated from 0 to 1 in increments of 0.01 with a standard deviation of 0.1 and a mean of 0.5, is given by Figure 5 (17). The corresponding CDF plot is given in Figure 6.

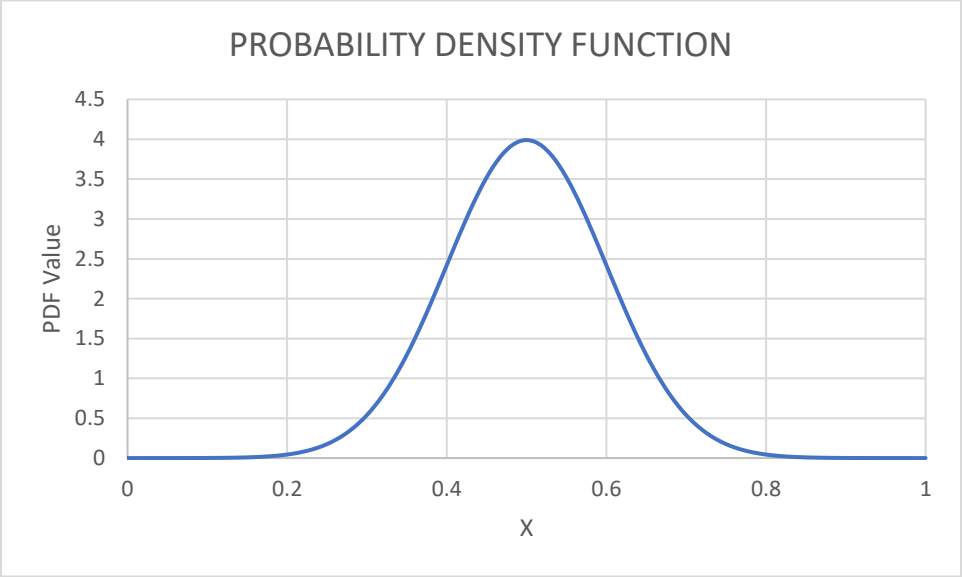


Figure 5: Probability density function example.

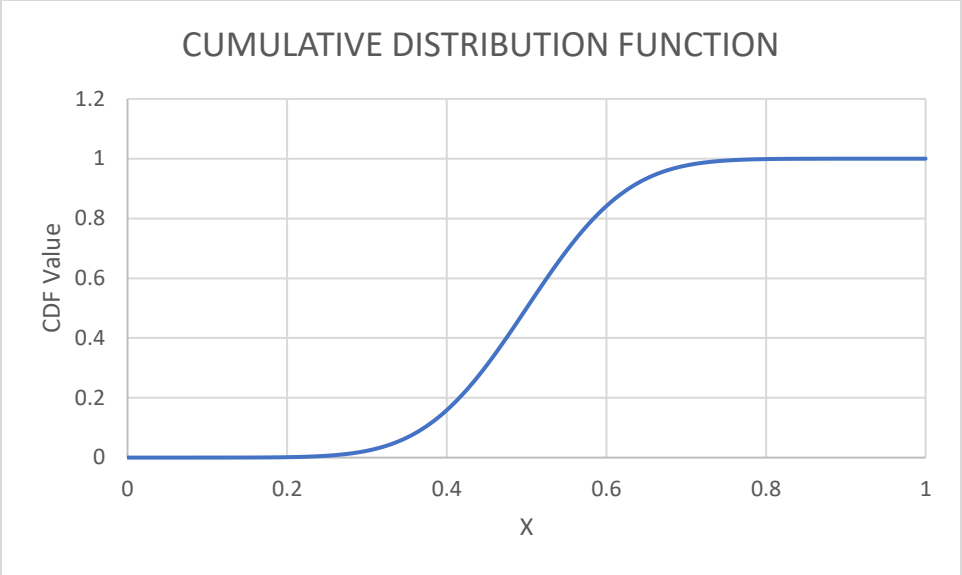


Figure 6: Cumulative distribution function example.

1.2.8 SAPHIRE

The Systems Analysis Program for Hands-on Integrated Reliability Evaluations (SAPHIRE) is a software application developed by the Idaho National Laboratory to perform PRA on windows-based operating systems. SAPHIRE is currently on version 8. SAPHIRE may be used to create event trees and fault trees, calculate and compare cut sets, perform uncertainty analysis and end state analysis, and to calculate importance measures (18). SAPHIRE also contains the SPAR-H model to calculate human reliability given certain parameters such as the level of training and the amount of time allowed to complete a task.

The SPAR-H model allows the user to model whether an operator is required to make a diagnosis before performing some action or whether they may just perform the action, or both. For both of the configurations used in this analysis, all of the SPAR-H criterion were set to nominal. Typically, for the SPAR-H human reliability model, a constrained non-informative distribution is used (19). The constrained non-informative

distribution, or Jeffreys noninformative prior distribution is explained in the abstract of Constrained Noninformative Priors by Corwin L. Atwood (20) as:

> ***"The Jeffreys noninformative prior distribution for a single unknown parameter is the distribution corresponding to a uniform distribution in the transformed model where the unknown parameter is approximately a location parameter. To obtain a prior distribution with a specified mean but with diffusion reflecting great uncertainty, a natural generalization of the noninformative prior is the distribution corresponding to the constrained maximum entropy distribution in the transformed model."***

1.3 Pyro-processing

Electro-metallurgical reprocessing, or pyro-processing, is a process by which sodium-bonded nuclear fuel is reprocessed. The pyro-process works best with metallic fuel. Oxide fuel may be used in the pyro-process, but it must be reduced to metallic fuel prior to entering the pyro-process (21). The pyro-process is conducted within a hot cell that is filled with inert argon gas. The gas within the hot cell must be inert due to the pyrophoric nature of some of the materials involved and to maintain the product purity. If air were to enter the hot cell, then combustion could occur and result in a release of radioactive material. (22) (23)

One application of pyro-processing exists at the Fuel Conditioning Facility, FCF, located at Idaho National Laboratory, INL. FCF was created to reprocess the spent nuclear fuel from the Experimental Breeder Reactor II, EBR-II, and to demonstrate an ability to recycle and reprocess spent nuclear fuel. EBR-II fuel may not be directly disposed of in a geological repository due to the presence of sodium.

The hot cell must maintain an inert environment during electrometallurgical treatment because certain portions of the pyro-process, like cathode deposits, are pyrophoric. FCF consists of an argon-filled annular portion, where the pyro-process is conducted in the annulus, and a rectangular portion that is used for storage of spent fuel and other products. The annular area is a hexadecagon and contains the argon environment and the rectangular area contains an air environment. Items are transferred into the argon cell either through the small transfer lock, located in the wall between the air and argon cells, or through the equipment transfer lock in the floor between the argon cell and a transfer tunnel connected to the air cell. Figure 7 is the FCF layout. The argon hot cell typically contains less than 100 parts per million (ppm) O_2 for normal operations with a safety limit of less than 1% O_2. Fire starts in the hot cell at approximately 4% O_2.

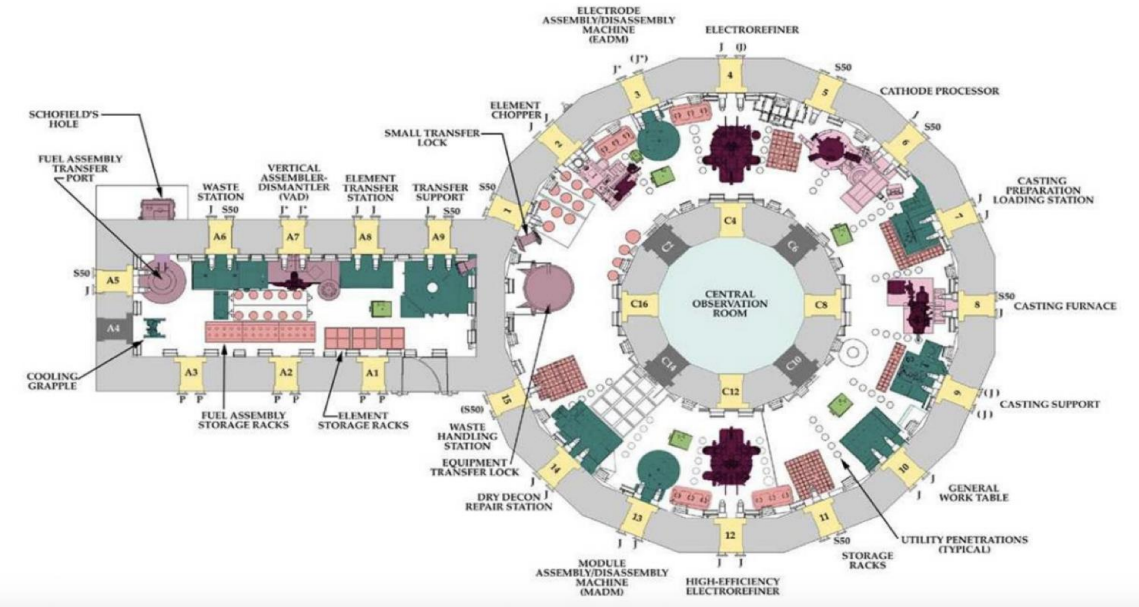


Figure 7: A diagram of the FCF layout. (23)

There are two different categories of spent fuel from FCF. Driver fuel consisting of uranium-zirconium alloy fuel pins, sodium bonding, and stainless-steel cladding, and blanket fuel which consists of depleted uranium metal pins, sodium bonding, and stainless-

steel cladding. The two categories are processed in parallel, beginning with the respective elements being chopped into segments. From there the chopped elements are placed in a basket and the basket and a stainless-steel mandrel are lowered into an electrorefiner containing molten salt. The electrorefiner is maintained at 500 °C and contains about 300 kg of molten LiCl-KCl salt, which behaves as an electrolyte, and about 100 kg of molten cadmium, which behaves as a cathode or anode.

Chlorides are formed in the electrorefiner from active metal fission products, transuranic metals, and sodium metal from the fuel pins through the process of chemical oxidation. Between the mandrel and the basket, voltage is applied. The mandrel acts as the cathode and the basket acts as the anode. The applied voltage causes electro-chemical oxidation by the uranium metal in the spent fuel and forms uranium chloride. Uranium metal is deposited at the mandrel through the electro-chemical reduction of the uranium chlorides. The fission products, plutonium, and other transuranic metals remain in the salts as chlorides and are treated as waste. The electrorefiner is shown in Figure 8.

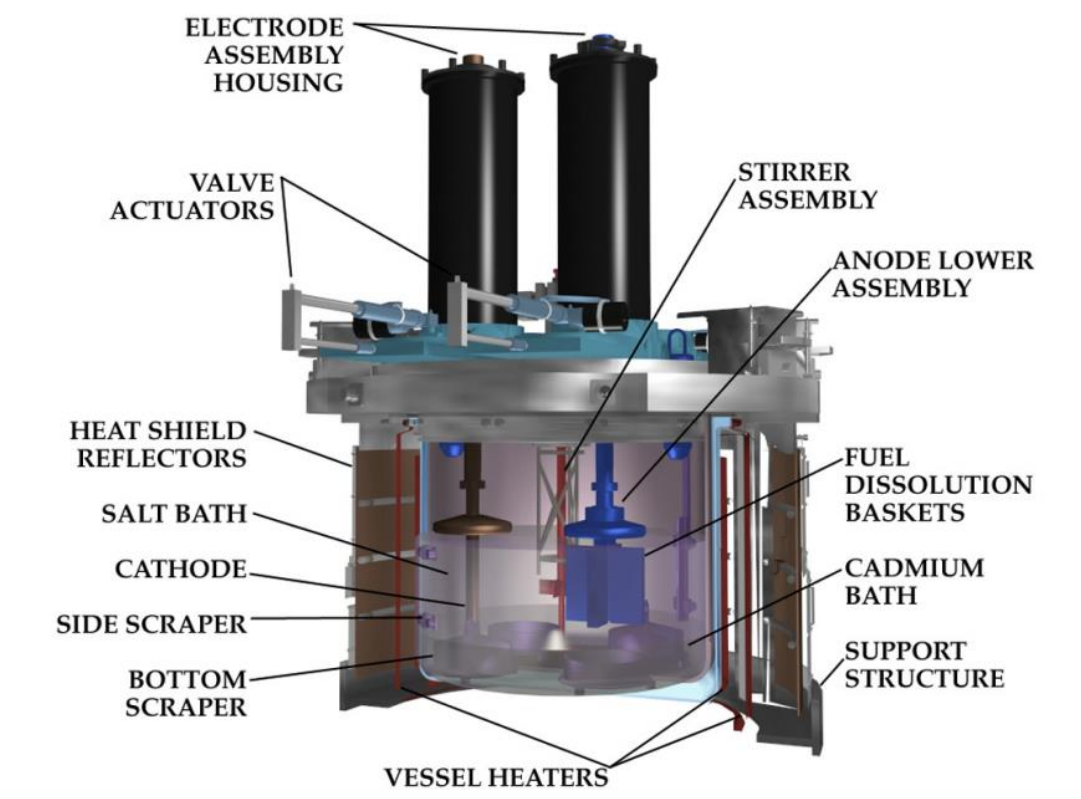


Figure 8: The electrorefiner. (23)

The mandrel containing the uranium deposits and some salts is removed from the electrorefiner with a typical ratio of 80 wt% uranium and 20 wt% salts. The mandrel is then placed in a graphite cathode processer crucible that is placed in a furnace that is operated at a temperature of 1200 ºC and a pressure of 150 miliTorr. In the crucible, the salt boils and is separated into a condenser assembly where it enters a separate crucible and the uranium is melted and formed into an ingot. The cathode processor and ingots are shown in Figure 9. The upper right ingot is the uranium ingot and the lower right ingot is the salt ingot.

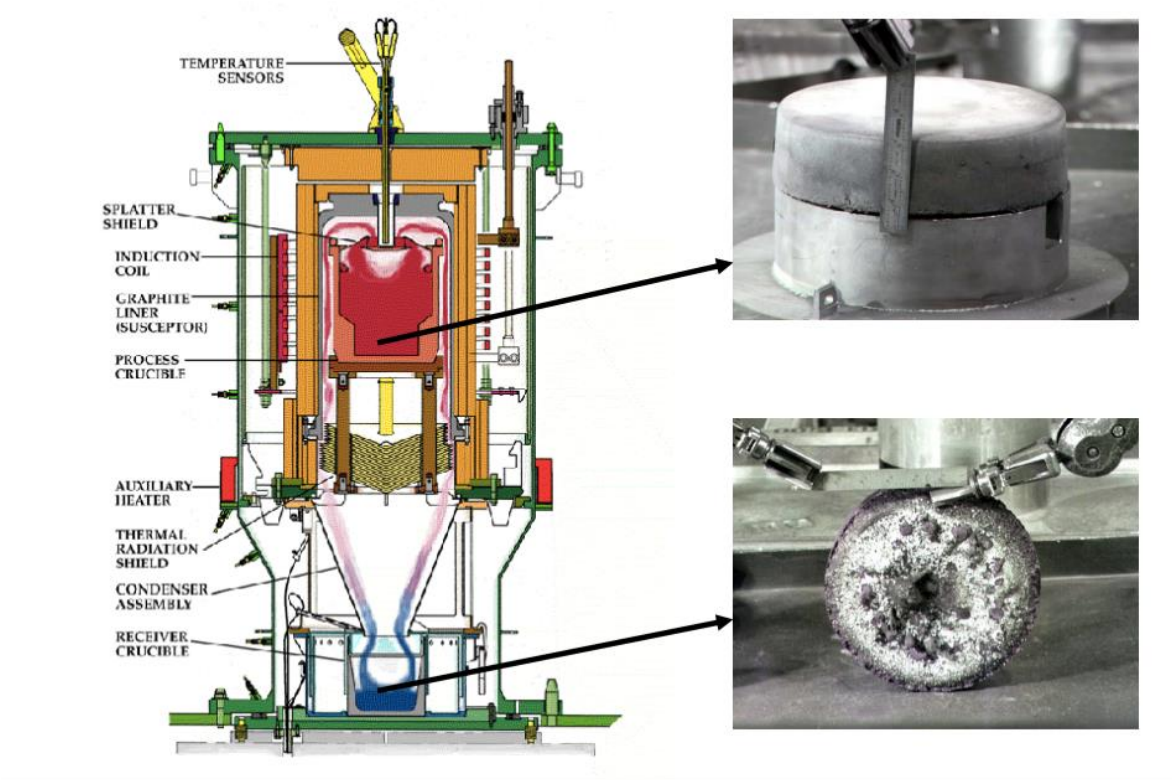


Figure 9: The cathode processor and ingots. (22)

In the case of a driver fuel deposit, the uranium enrichment is reduced to below 50% through the addition of depleted uranium to the cathode processer crucible. An additional step exists for the driver fuel assembly only. The ingot is placed in the in a graphite crucible with more depleted uranium so that the resulting homogenous mixture is below 20% enrichment. Ingots are then transferred and stored in a long-term storage facility.

A breach in which air is allowed into the argon cell can cause fuel to oxidize, making it unfit for pyro-processing, or, the material can burn and may result in radioactive fire escaping through the air ingress pathway. Radioactive fire may result in dose to the personnel and dose to the public through dispersion via atmospheric travel.

2. Methods

The research started with a simplified system for a pyro-processing hot cell air lock. The simplified system is shown in Figure 10. SV-1, SV-2, and SV-3 are air cell equalization solenoid valves and VP-1 is a positive displacement vacuum pump. The air lock utilizes sealed doors on the air cell side of the lock and on the argon cell side of the lock. The normally closed solenoid valves and the vacuum pump and piping are used to evacuate the air-lock chamber, fill the chamber with argon gas and equalize the pressure in the chamber so the argon cell door may be opened and transfers may take place. The air lock has a volume of about 20 cubic feet and the argon cell has a volume of about 66,000 cubic feet.

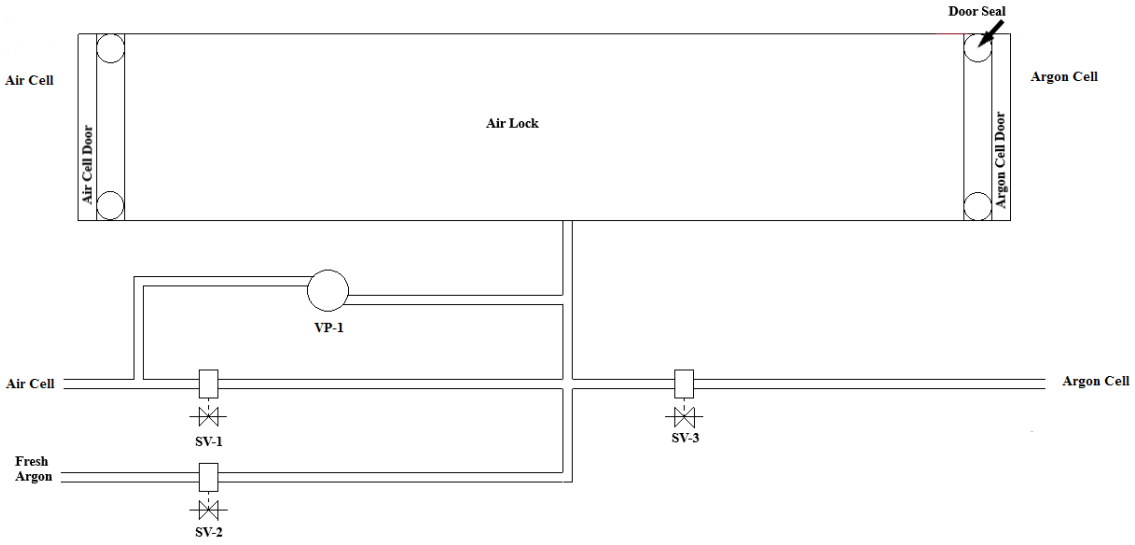


Figure 10: Simplified system for a pyro-processing hot-cell.

A transfer into the air lock occurs as follows: 1) ensure SV-1 and SV-3 are closed 2) equalize the air-lock chamber pressure by opening SV-1 briefly 3) opening the air cell door and placing the item to be transferred inside, 4) closing the air-lock door, 5)

evacuating the air from the air-lock chamber using a vacuum pump (VP-1), 6) filling the air lock with fresh argon gas by opening SV-2, 7) equalizing the pressure by momentarily opening SV-3, and 8) opening the argon cell door and transferring the item. Transferring an item out of the argon side is a similar process, but lacks the evacuation by vacuum pump since the transfer of argon to air is of no consequence.

Table 1 shows the six-identified air ingress sequenced for mechanical failures in the system. The models were developed over three time-spans: one day, one month, and one year. From the system shown in Figure 10, the components likely to fail were identified and their corresponding failure probabilities were established from existing data. From Figure 10, the pathways in which air may enter the inert argon environment inappropriately, are identified. Identifying all of the unique pathways for possible air ingress is the only way to approximate a reasonable total probability of air ingress.

Table 1: Mechanical Failure Air Ingress Sequences

1	Air Cell Door Seal Fails	Argon Cell Door Seal Fails
2	Air Cell Door Seal Fails	Argon Cell Equalization Valve (SV-3) Fails
3	Air Cell Equalization Valve (SV-1) Fails	Argon Cell Equalization Valve (SV-3) Fails
4	Argon Cell Door Seal Fails	Air Cell Equalization Valve (SV-1) Fails
5	Positive Displacement Vacuum Pump (VP-1) Fails	Argon Cell Equalization Valve (SV-3) Fails
6	Positive Displacement Vacuum Pump (VP-1) Fails	Argon Cell Door Seal Fails

For example, Figure 11 shows the air ingress event for sequence 3 in Table 1 – Both air equalization valves, SV-1 and SV-3 fail. If SV-1 and SV-3 fail, then there is a direct path between the air cell and the argon cell, which will increase the air content in the argon cell and eventually cause a fire due to the pyrophoric materials.

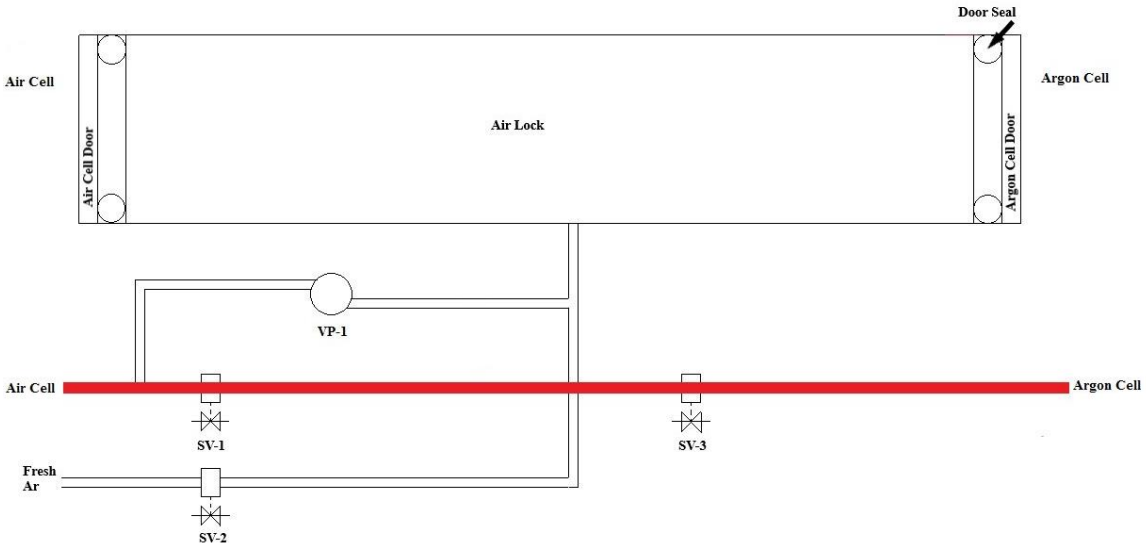


Figure 11: Air lock with SV-1 and SV-3 air ingress.

Table 2 shows the human error sequences which could lead to an air ingress event. No single human error event identified in this study leads to an air ingress event.

Table 2: Human Error Air Ingress Sequences

1	Air Cell Door Inadvertently Left Open	Argon Cell Door Inadvertently Left Open
2	Air Cell Door Inadvertently Left Open	Argon Cell Equalization Valve (SV-3) Inadvertently Opened
3	Argon Cell Equalization Valve (SV-3) Inadvertently Opened	Air Cell Equalization Valve (SV-1) Inadvertently Opened
4	Air Cell Equalization Valve (SV-1) Inadvertently Opened	Argon Cell Door Inadvertently Left Open

Table 3 shows the possible combinations of human error and mechanical failure air ingress sequences that were then calculated over an interval of one day, one month, and one year. In total, there are twenty possible air ingress events for the simplified hot-cell air lock system shown in Figure 10. Again, all of the air ingress sequences applied to the air-lock were analyzed for a period of one day, one month, and one year.

Table 3: Combination Mechanical Failure and Human Error Air Ingress Sequences

1	Air Cell Door Seal Fails	Argon Cell Door Left Open
2	Air Cell Door Seal Fails	Argon Cell Equalization Valve (SV-3) Accidentally Opened
3	Argon Cell Door Seal Fails	Air Cell Door Left Open
4	Argon Cell Door Seal Fails	Air Cell Equalization Valve (SV-1) Accidentally Opened
5	Argon Cell Equalization Valve (SV-3) Fails	Air Cell Door Left Open
6	Argon Cell Equalization Valve (SV-3) Fails	Air Cell Equalization Valve (SV-1) Accidentally Opened
7	Air Cell Equalization Valve (SV-1) Fails	Argon Cell Equalization Valve (SV-3) Accidentally Opened
8	Air Cell Equalization Valve (SV-1) Fails	Argon Cell Door Left Open
9	Positive Displacement Vacuum Pump (VP-1) Leaks	Argon Cell Door Left Open
10	Positive Displacement Vacuum Pump (VP-1) Leaks	Argon Cell Equalization Valve (SV-3) Accidentally Opened

The established failure probability of the components of the system shown in Figure 10 is shown in Table 4. LN for the distribution stands for log-normal probability distribution. Originally, failure rates for solenoid valves was broken into different failure modes. The original solenoid valve fault rate data and the fault rate data for VP-1, came from IAEA-Tecdoc-478: Component Reliability Data for the Use in Probabilistic Safety Assessment, along with the failure rate for the vacuum pump (24). The original door seal failure rate came from the LaCrosse Boiling Water Reactor: Integrated Safety Plant Assessment draft report (25).

Table 4: Original Failure Data

Component	Failure Mode	Failure Rate	Distribution	Error Factor
Solenoid Valve Fails Mechanically	Rupture	1.0E-08/hr	LN	10
	Leak	4.0E-05/d	LN	3
	Fails to Shut	8.0E0-4/d	LN	3
Vacuum Pump Fails Mechanically	Leak	1.0E-07/hr	LN	3
Door Seal Fails Mechanically	Leak	5.3E-06/hr	LN	10

One disadvantage of the door seal failure rate is that the probability distribution and the error factor was not reported, so it was assumed to be a log-normal distribution with an error factor of 10. Other models were created using different solenoid valve failure rate data. The new solenoid valve fault rate data came from Field Failure Data – The Good, the Bad, and the Ugly (26), reported in Table 5.

Table 5: Field Failure Rates for Solenoid Valves

Field Failure Data	Failure rate	Distribution	Error Factor
Solenoid Valve - Operated Low	6.79E-07/hr	LN	10
Solenoid Valve - Operated Median	4.87E-05/hr	LN	10
Solenoid Valve - Operated High	1.89E-04/hr	LN	10
NRPD95- Pneumatic Solenoid Valve	1.67E-05/hr	LN	10
DOW Plant Study - Solenoid Valve	7.02E-07/hr	LN	10
Manufacturer Study - Solenoid Valve	1.70E-08/hr	LN	10

The error factor and distribution were not reported in the report, so it was assumed to be of a log-normal distribution with the error factor of 10. Models were also made evaluating new door or airlock seal failure rate data (27), that is shown in Table 6.

Table 6: Airlock Seal Failure Rate Data

Airlock Seal Failure Rate Data	Failure Rate	Distribution	Error Factor
Bruce A	0.23/yr	LN	10
Bruce B	1.48/yr	LN	10

Once the probabilities and pathways were established, SAPHIRE was used to create a PRA model. To model the human error, the SAPHIRE SPAR-H model was used and the analysis was done using just an action type event and by using both action and diagnosis type human error events. It is typical to use a constrained non-informative distribution when using the SPAR-H model (28). The human error event probabilities are shown in Table 7.

Table 7: Human Error Event Probabilities

Human error	Probability	Distribution
Action-only Event	1.00E-03	Constrained Non-informative
Action & Diagnosis Event	1.10E-02	Constrained Non-informative

The building of the PRA models began with creating the event tree to acknowledge accident scenarios, unfortunately event trees become very large very quickly, so Figure 1 is the smallest event tree.

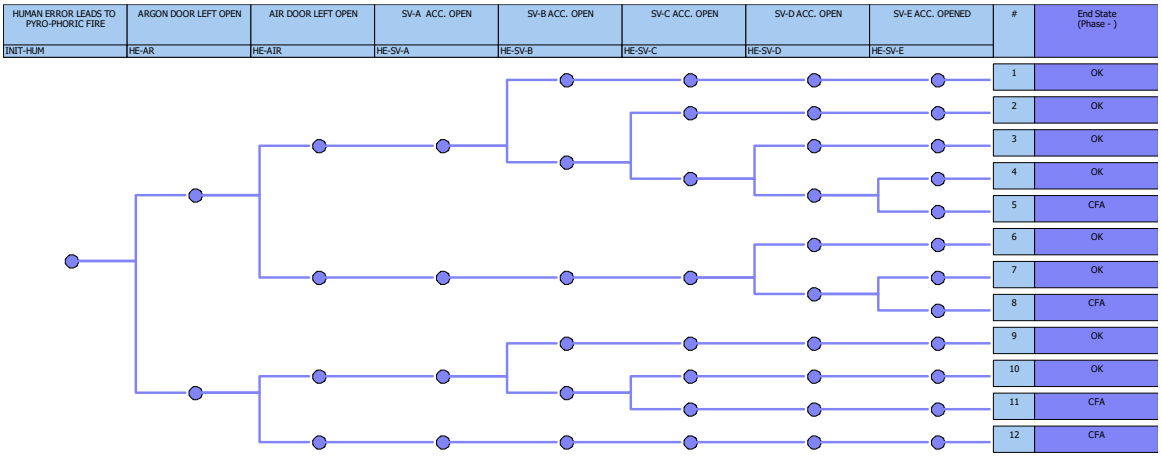


Figure 12: Human error event tree.

Typically, the initiating event for a fault tree would be something like a loss of cooling accident while the top events would be the failure or success of systems such as the auxiliary feedwater system, but the event trees for the simplified air-lock were created in a more unconventional way so that all of the scenarios could be seen for a specified type of failure (mechanical failure, human error failure, and combination mechanical failure and human error failure). The simplified airlock that the PRA is centering around also doesn't have as many separate mechanical systems to model as the typical nuclear power plant. The creation of event trees was followed by creating fault trees for each of the listed components broken down into human error and mechanical failure factors.

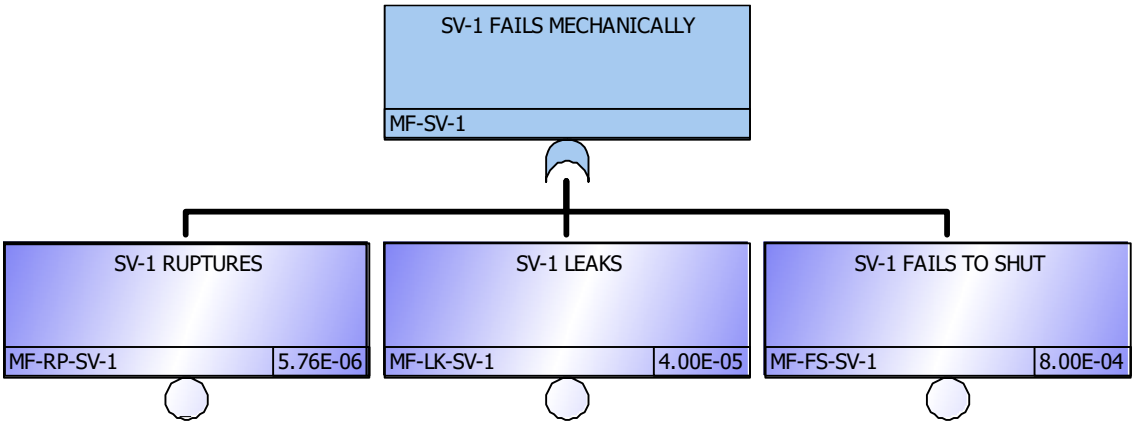


Figure 13: Original failure rates for solenoid valve fault tree

When the solenoid valve failure rates switch from solenoid valve data that was taken from the IAEA-Tecdoc-478 to the to the solenoid valve failure rates take from Field Failure Data – The Good, the Bad and the Ugly, the fault tree changes to Figure 14.

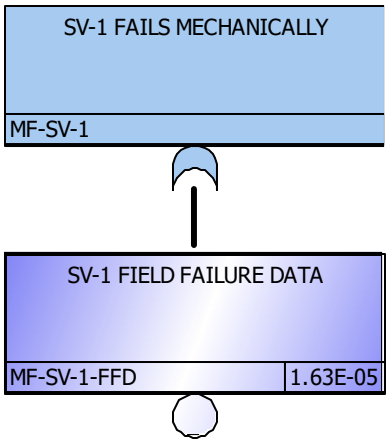


Figure 14: Fault tree for field failure data of solenoid valves.

The fault trees for the fault rates of the solenoid valves, door seals, and the vacuum pump were then used as transfers to each component fault tree that included both human error and mechanical failure, as shown in Figure 15. Fault tree modeling was done for all components.

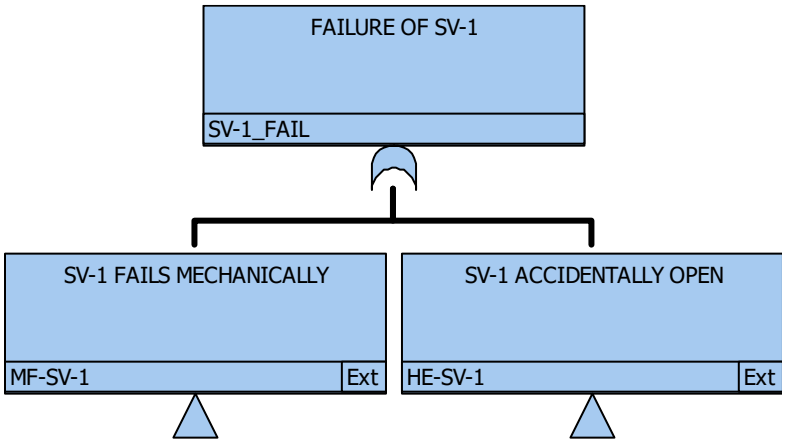


Figure 15: Fault tree for SV-A.

A fault tree for the entire system was then created as shown in Figure 16. The fault tree for the entire system was used to calculate the total probability, the importance measure of choice, and the uncertainty of the system. A fault tree of the system was also made for purely mechanical failure to compare to the failure of the system that included human error.

For each air ingress event, there is an ‘and’ gate where both faults must occur in order for the system to fail.

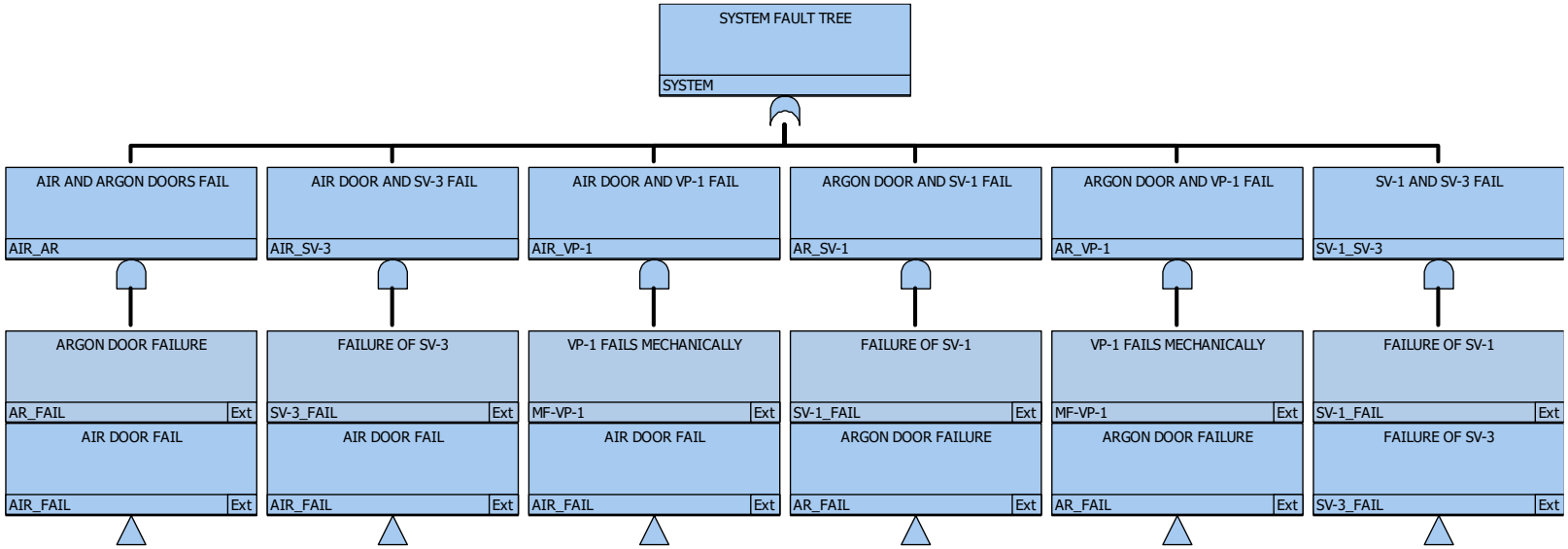


Figure 16: System fault tree for the basic model.

Once all of the models were created for the basic system, the same thing was done with the addition of door interlocks into the system. The failure rate data for the door interlocks is given by Table 8 and was taken from the Point Arguella Field and Gaviota Processing Facility Area Study and Chevron/Texaco Development Plans EIR/EIS (29). Figure 17 updates the simplified air-lock system to include door interlocks.

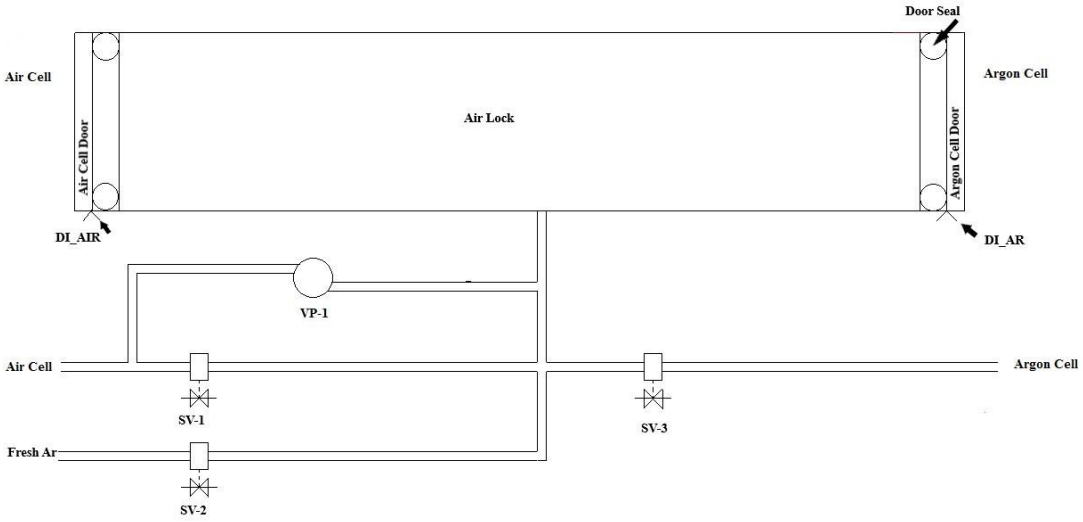


Figure 17: Air-Lock diagram for simplified system with door interlocks.

Table 8: Door MOC Interlock Failure Rate

	Failure Rate	**Distribution**	**Error Factor**
Door MOC Interlocks	1.4E-04/d	LN	10

The only way that the door interlocks could cause an air ingress event is if they failed mechanically and some human error event occurred around the doors. The fault trees for such components are as shown in Figure 18 and Figure 19 an event tree shown in Figure 20.

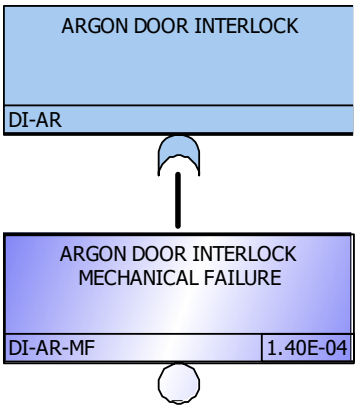


Figure 18: Fault tree for the argon door interlock.

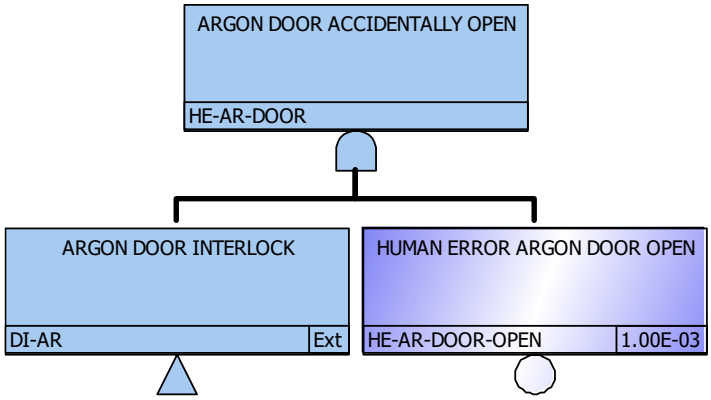


Figure 19: Argon door human error fault tree including door interlocks.

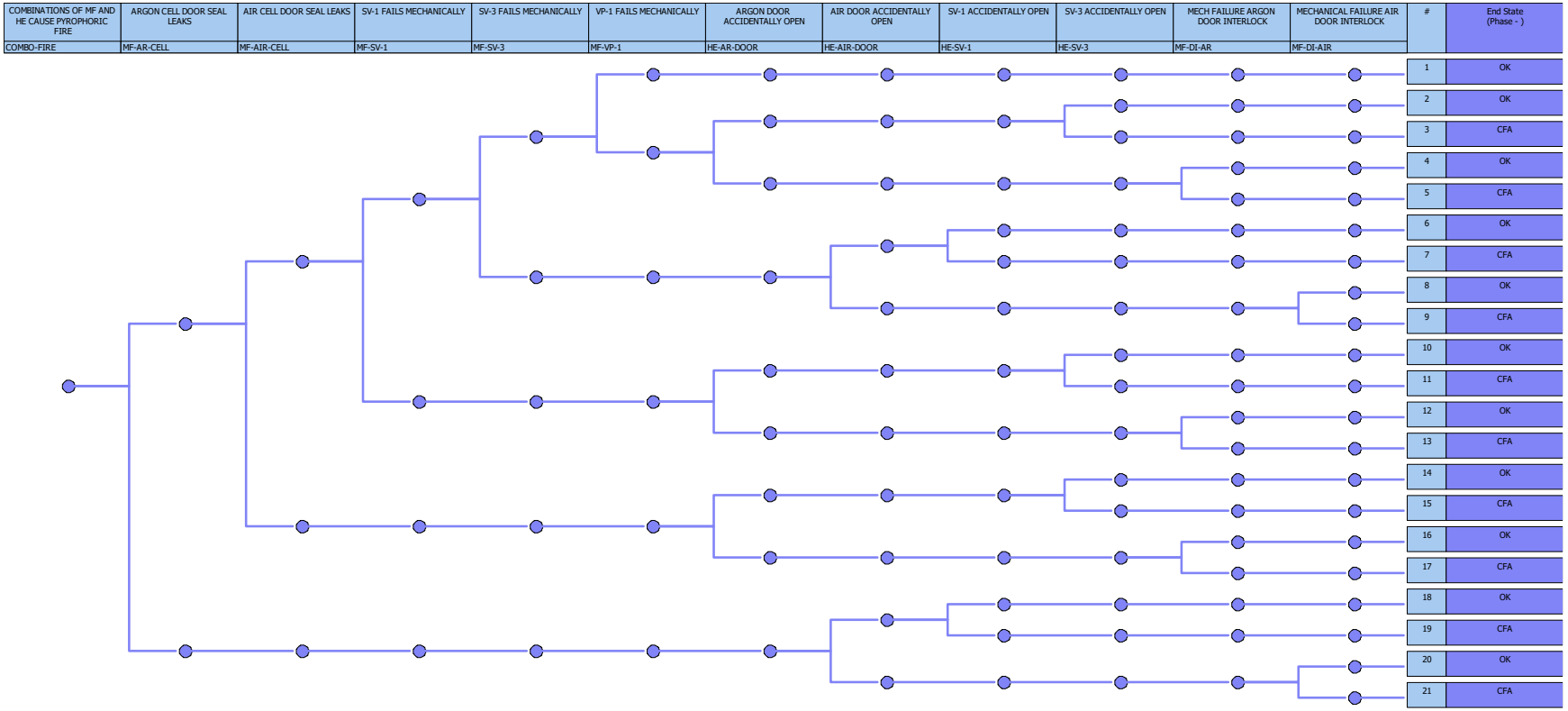


Figure 20: Combination human error and mechanical failure event tree with door interlocks.

As shown, there is an ‘and’ gate between the “transferred in” argon door interlock probability and the human error basic event for opening the argon-side door inadvertently that requires both faults to happen for the component to fail. As with the basic system, importance measures and uncertainty were calculated. It was assumed with the nominal air-lock configuration that the system was not redundant, so common cause failures were not considered.

The next two groups of models centered around an extended air-lock system that contained redundant solenoid valves, shown in Figure 21. One of the greatest benefits of PRA is having the ability to determine the effectiveness of changes or improvements in a system. For the system shown in Figure 21, instead of one solenoid valve failing in combination with another solenoid valve or a door, multiple solenoid valves must fail. It should be noted that SV-F and SV-G have no way of leading to an air ingress event and the extra valve was added for symmetry. Also, the component naming notation changed from numeric to alphabetic for clarity.

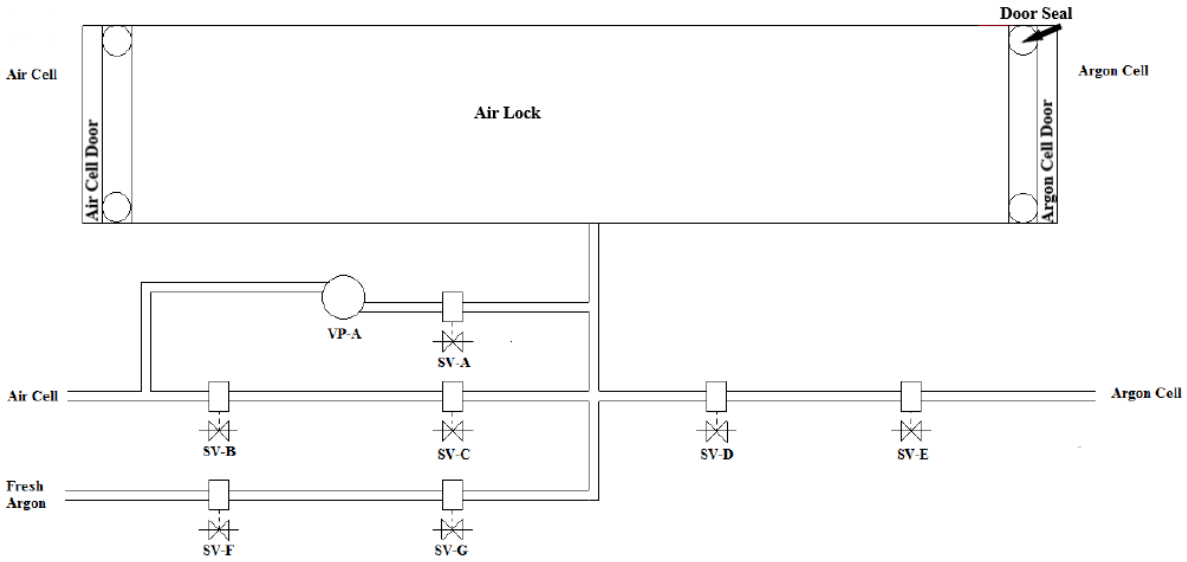


Figure 21: An extended generalized air-lock system.

Figure 22 shows the extended generalized air-lock system with door interlocks.

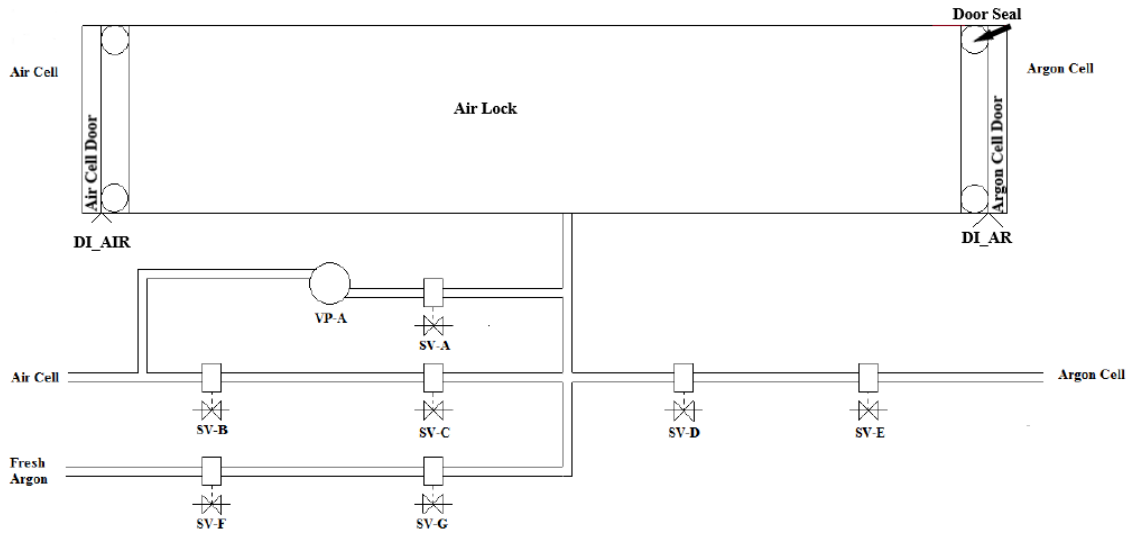


Figure 22: Extended generalized air-lock system with door interlocks.

The extended model in Figure 21 was evaluated for the same failure rate data as the previous model. However, since parts of the configuration are redundant, some common cause failures were added (30). The alpha factor values are shown in Table 9, where CCCG stands for common-cause component group (31).

Table 9: Alpha Factors for CCCG=2

	Mean
α1	9.62E-01
α2	3.53E-02

Inclusion of common cause failures results in similar fault trees for the individual system components, but the fault tree for the entire system is larger since it now must include the common cause failures. To evaluate the common cause failures for the two identical redundant systems, first the original failure probabilities were input, then SV-B and SV-C were input as non-common cause failures (CCFs) and SV-D and SV-E were input as a CCF, then SV-B and SV-C were input as a CCF, but SV-D and SV-E were input as a non-

CCF, then finally, SV-B and SV-C were input as a CCF and SV-D and SV-E were input as a CCF. CCFs can be seen in the fault tree for the extended system design shown in Figure 23.

Risk critical components were found for both the simplified system and the extended system by analyzing the SAPHIRE-calculated cut sets. Engineering judgement must be used in order to define the maintenance interval that is an optimization between the probabilistic risk associated with component failure and the cost associated with maintenance. Since the identification of risk critical components is only dependent on mechanical failure, the systems with a diagnostic human error component and the systems with door interlocks do not produce different results.

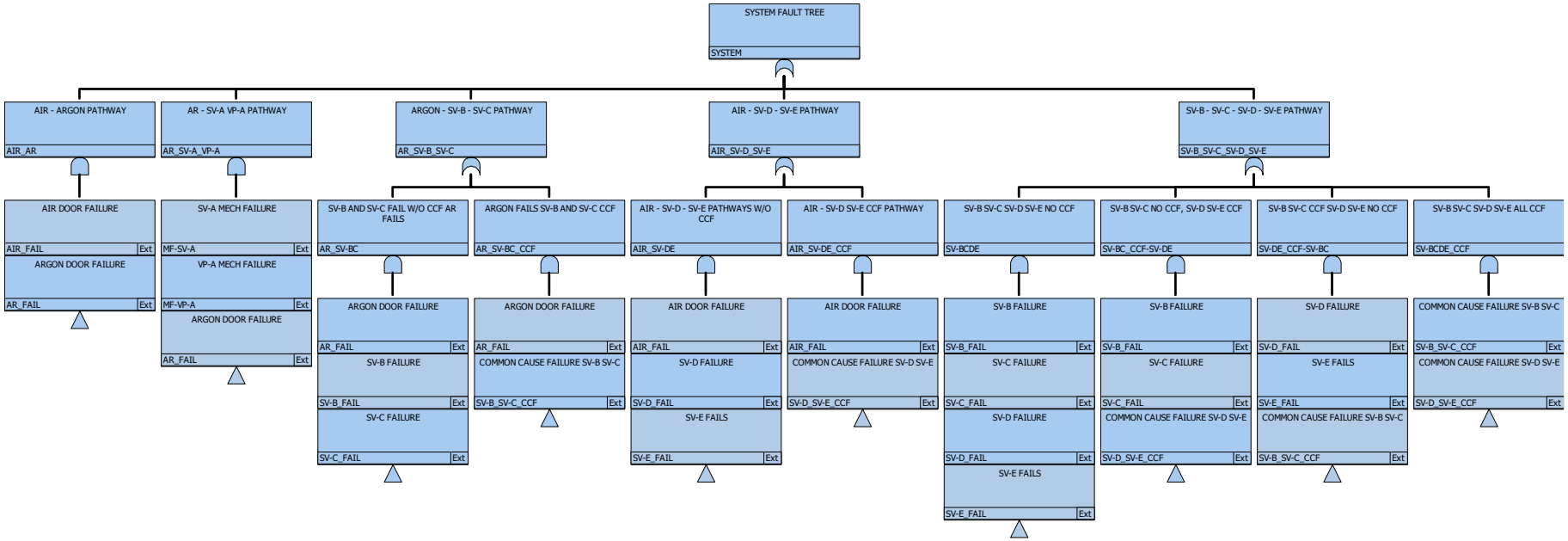


Figure 23: System fault tree for the extended design.

3. Results & Discussion

3.1 Basic Generalized Model – No Door Interlocks

3.1.1 Failure Probability Results

Table 10 reports the failure probability and corresponding standard deviation for a period of one day, one month, and one year, respectively, and refers to the basic system without a diagnosis human error contribution in the SPAR-H model. These data also apply to the original door failure probability. In these PRA models, ‘original’ denotes the IAEA-Tecdoc solenoid valve failure rates, ‘SV_OL’ is in reference to the solenoid valve operated low probability that the field failure data report, the ‘SV_OM’ is in reference to the solenoid valve operated at a median level datum, ‘SV_OH’ refers to the solenoid valve operated at a high level, ‘SV_DOW’ refers to the DOW plant study failure rate, the ‘SV_MAN’ refers to the manufacturers reported failure rate and ‘SV_NRPD’ refers to the NRPD95 source, all seven of which, were reported by the Exida report – “Field Failure Data – The Good, the Bad, and the Ugly”. The Exida report did give a failure rate per hour based on how often the solenoid valve was used, but they did not give any indication on what the threshold was for the difference between operated low and operated medium and operated high. The field failure data given in the Exida report is important, though, because it gives actual reported values for the failure rates of solenoid valves compared to the manufacturers failure rate per hour claim. From the probabilities for each of the different configurations, it is determined that at the lowest, the probability that an air ingress event occurs in one year is 0.82% and at the highest, the probability that an air ingress event occurs in one year is 25.1%.

Table 10: Basic System Failure Probability

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	1.58E-05	1.54E-05	1.02E-03	9.70E-04	9.84E-02	6.51E-02
SV_OL	9.89E-06	1.23E-05	5.39E-05	1.56E-04	3.03E-03	8.66E-03
SV_OM	1.84E-05	3.66E-05	1.70E-03	6.07E-03	1.52E-01	1.14E-01
SV_OH	5.86E-05	3.05E-04	1.79E-02	3.08E-02	6.82E-01	2.51E-01
SV_DOW	9.89E-06	1.23E-05	5.42E-05	1.56E-04	3.05E-03	8.68E-03
SV_MAN	9.79E-06	1.23E-05	4.72E-05	1.51E-04	2.43E-03	8.20E-03
SV_NRPD	1.24E-05	1.57E-05	3.53E-04	1.54E-03	3.37E-02	4.43E-02

It is observed that the failure rate for the one-day interval ranges between 10^{-5} and 10^{-6}. The highest probability over the interval refers to the highest solenoid valve failure rate. The failure rate over the interval for SV_OH was 5.99 times that of SV_MAN, which had the lowest failure rate. The one-month interval produced more of a spread of failure rates which ranged from 10^{-5} up to 10^{-2}. For a one-month interval, SV_OH ends up being 379 times greater than SV_MAN. Similarly, SV_OH was 281 times greater than SV_MAN for the one-year test interval.

Table 11 applies to the same set of failure data with the difference being that a diagnostic human error component was added into the SPAR-H model. The addition of a diagnostic component increased the overall probability of failure for a day from 10^{-5} - 10^{-6} to 10^{-3}. SV_OH is 1.29 times higher than SV_MAN for a one-day interval, while it is only 1.96 times larger for the one-month interval, and 112 times greater for the year-long interval. While SV_MAN is still 112 times less than SV_OH, this is a vast improvement from the prior model that was 281 times greater, which is probably since the human error factors play a much larger role in the total failure probability over a given period. The range of data for a single day interval is much more evenly spread than that of the one-year interval, which ranges between 10^{-3} to 10^{-1}. Meaning that at the lowest, the air ingress

probability over one year is 0.625%, and the at the highest, the air ingress probability for one year is 69.8%.

Table 11: Failures for the Basic System with a Diagnostic Human Error Component

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	1.15E-03	1.44E-03	3.83E-03	3.04E-03	1.16E-01	6.88E-02
SV_OL	1.10E-03	1.47E-03	1.39E-03	1.71E-03	7.18E-03	1.13E-02
SV_OM	1.18E-03	1.52E-03	5.07E-03	7.50E-03	1.73E-01	1.19E-01
SV_OH	1.42E-03	1.79E-03	2.67E-02	3.50E-02	6.98E-01	2.49E-01
SV_DOW	1.10E-03	1.47E-03	1.39E-03	1.71E-03	7.21E-03	1.13E-02
SV_MAN	1.10E-03	1.47E-03	1.36E-03	1.69E-03	6.25E-03	1.07E-02
SV_NRPD	1.12E-03	1.48E-03	2.38E-03	2.98E-03	4.53E-02	4.90E-02

For the model of the general system, the mechanical failure results are a majority of the failure probability. The mechanical failure probability for the system is given in Table 12. For the basic system, the difference in a one-year time interval is not very significant, however, for the one-day interval, the difference is almost a factor of 100. For the generalized system with a diagnostic human error component, the difference is close to a factor of ten for the one-year model, and a factor of 1000 for the one-day model.

Table 12: Mechanical Failure of the Generalized System

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	9.48E-07	1.07E-06	8.37E-04	8.81E-04	9.69E-02	6.41E-02
SV_OL	2.09E-08	7.06E-08	1.88E-05	6.11E-05	2.67E-03	6.22E-03
SV_OM	1.68E-06	5.72E-06	1.47E-03	3.75E-03	1.50E-01	1.11E-01
SV_OH	2.17E-05	7.76E-05	1.72E-02	2.89E-02	6.80E-01	2.48E-01
SV_DOW	2.11E-08	7.09E-08	1.89E-05	6.13E-05	2.70E-03	6.24E-03
SV_MAN	1.66E-08	6.42E-08	1.49E-05	5.55E-05	2.11E-03	5.61E-03
SV_NRPD	2.80E-07	8.41E-07	2.49E-04	6.53E-04	3.28E-02	4.18E-02

Table 13 shows the failure probability over time results for the basic system with the door seal failure rate of 1.48 faults/year. For a one-year interval, this model may range between 59.9% chance of failure to a 98.1% chance of failure. The results from Table 13

are high, however, the failure rate is 1.48 faults/year, so a failure is nearly guaranteed outside of some uncertainty. SV_OH was 2.70 times greater than SV_MAN for the one-day interval, 4.25 times greater for the one-month interval, and 1.64 times greater for the one-year interval.

Table 13: Basic System with Door Seal Failure Rate of 1.48/y

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	6.23E-05	2.00E-05	2.03E-02	2.29E-03	7.66E-01	1.32E-01
SV_OL	4.99E-05	1.63E-05	1.39E-02	1.08E-03	6.03E-01	7.72E-02
SV_OM	6.75E-05	3.34E-05	2.30E-02	6.66E-03	8.11E-01	1.72E-01
SV_OH	1.34E-04	1.59E-04	5.86E-02	3.40E-02	9.81E-01	2.47E-01
SV_DOW	4.99E-05	1.63E-05	1.39E-02	1.08E-03	6.03E-01	7.72E-02
SV_MAN	4.97E-05	1.62E-05	1.38E-02	1.07E-03	5.99E-01	7.61E-02
SV_NRPD	5.55E-05	1.95E-05	1.67E-02	2.32E-03	6.85E-01	1.17E-01

Using the same mechanical failure rate data as immediately prior, Table 14 was formed with the difference being that those failure probabilities per interval included the diagnostic human error approximation component. For the system defined in Table 14, SV_OH was 1.26 times greater than SV_MAN for a one-day interval, 3.38 times greater for a one-month interval, and 1.59 times greater for a one-year interval, which indicates that changes in the human error approximation and the door failure data affect the overall uncertainty of the model. The results given by the basic system with the Bruce B fault rate are again high for a one-year interval, but they are being led by the almost guaranteed failure of the door seals. The lowest probability of failure is approximately 61.8% and the highest probability of failure is 98.2%.

Table 14: Results for the Basic System with a Door Seal Failure Rate of 1.48/yr and a Diagnostic HE Component

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	1.43E-03	1.53E-03	2.95E-02	4.90E-03	7.80E-01	1.34E-01
SV_OL	1.37E-03	1.44E-03	2.18E-02	3.21E-03	6.21E-01	8.34E-04
SV_OM	1.46E-03	1.49E-03	3.27E-02	9.87E-03	8.24E-01	1.76E-01
SV_OH	1.73E-03	1.70E-03	7.31E-02	4.00E-02	9.82E-01	2.43E-01
SV_DOW	1.37E-03	1.44E-03	2.18E-02	3.21E-03	6.21E-01	8.35E-02
SV_MAN	1.37E-03	1.44E-03	2.16E-02	3.19E-03	6.18E-01	8.24E-02
SV_NRPD	1.40E-03	1.46E-03	2.52E-02	4.61E-03	7.02E-01	1.22E-01

Table 15 represents the failure rate data for only the mechanical failure part of the system. It is shown that the Bruce B door failure probability is so high that it dominates the total probability and the probability of the human error components is not significant. When considering the diagnostic human error component, the effect on the probability is only very slightly greater than that of the action-only human error event modeling.

Table 15: Mechanical Failure for Basic System with Bruce B Door Failure Rate

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	2.39E-05	2.53E-06	1.94E-02	2.14E-03	7.64E-01	1.31E-01
SV_OL	1.65E-05	1.15E-06	1.32E-02	9.79E-04	6.01E-01	7.64E-02
SV_OM	2.72E-05	1.36E-05	2.21E-02	7.13E-03	8.10E-01	1.75E-01
SV_OH	7.35E-05	1.61E-04	5.72E-02	3.53E-02	9.80E-01	2.51E-01
SV_DOW	1.65E-05	1.15E-06	1.32E-02	9.79E-04	6.01E-01	7.64E-02
SV_MAN	1.64E-05	1.14E-06	1.31E-02	9.66E-04	5.97E-01	7.54E-02
SV_NRPD	1.98E-05	2.78E-06	1.60E-02	2.16E-03	6.83E-01	1.17E-01

Table 16 uses the door seal failure data of 0.23 faults/year and it does not have a diagnostic human error contribution. SV_OH is 5.04 times greater than SV_MAN for the one-day interval, 46.5 times higher for the one-month interval, and 17.6 times higher for the one-year interval which indicates that the closer the probability is to one-hundred percent chance of failure, the more balanced the difference. For a one-year period, the highest probability indicates a 77.1% chance of failure, while the lowest probability indicates a

4.38% chance of failure. The failure rate data for the door is still fairly high and there is a roughly one in four chance that the seal will fail within a year.

Table 16: Results for Basic System with Door Failure Rate 0.23/yr

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	2.00E-05	1.74E-05	2.19E-03	1.43E-03	2.09E-01	9.57E-02
SV_OL	1.33E-05	1.34E-04	4.96E-04	4.20E-04	4.61E-02	3.28E-02
SV_OM	2.30E-05	2.53E-05	3.16E-03	4.80E-03	2.76E-01	1.38E-01
SV_OH	6.65E-05	1.27E-04	2.21E-02	2.96E-02	7.71E-01	2.53E-01
SV_DOW	1.33E-05	1.34E-05	4.97E-04	4.20E-04	4.62E-02	3.29E-02
SV_MAN	1.32E-05	1.34E-05	4.75E-04	4.09E-04	4.38E-02	3.19E-02
SV_NRPD	1.62E-05	1.56E-05	1.14E-03	1.26E-03	1.14E-01	7.25E-02

Table 17 is the 0.23 door seal faults/year combined with a diagnostic human error component. For a one-day interval, the highest probability is 1.28 times the lowest probability. For a one-month interval, the highest probability is 11.8 times the lowest probability. For a one-year interval, the highest probability is 13.9 times the lowest probability. The highest possibility of failure in a given year is 78.5% and the lowest possibility of failure in a given year is 5.66%.

Table 17: Results for Basic System with Door Failure Rate 0.23/y and Diagnostic HE

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	1.19E-03	1.48E-03	5.89E-03	3.68E-03	2.32E-01	9.73E-02
SV_OL	1.13E-03	1.45E-03	2.73E-03	2.20E-03	5.92E-02	3.79E-02
SV_OM	1.21E-03	1.50E-03	7.41E-03	7.92E-03	3.01E-01	1.44E-01
SV_OH	1.45E-03	1.75E-03	3.17E-02	3.51E-02	7.85E-01	2.52E-01
SV_DOW	1.13E-03	1.45E-03	2.73E-03	2.20E-03	5.93E-02	3.80E-02
SV_MAN	1.13E-03	1.45E-03	2.68E-03	2.18E-03	5.66E-02	3.69E-02
SV_NRPD	1.16E-03	1.46E-03	4.03E-03	3.49E-03	1.33E-01	7.88E-02

Table 18 is the mechanical failure data for the generalized system with the Bruce A door failure data. For both the action-only human error event model and the action and diagnosis human error event model, a one-year interval the majority of the failure is mechanical

failure, while for the one-day interval, the human error accounts for most of the failure probability.

Table 18: Mechanical Error System Failure Results for Bruce A Door Failure Data

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	2.18E-06	1.51E-06	1.92E-03	1.28E-03	2.07E-01	9.26E-02
SV_OL	4.19E-07	4.06E-07	3.71E-04	3.49E-04	4.48E-02	3.16E-02
SV_OM	1.21E-03	1.50E-03	2.83E-03	4.53E-03	2.74E-01	1.34E-01
SV_OH	2.66E-05	8.20E-05	2.12E-02	3.02E-02	7.70E-01	2.49E-01
SV_DOW	4.20E-07	4.07E-07	3.71E-04	3.49E-04	4.48E-02	3.17E-02
SV_MAN	3.99E-07	3.96E-07	3.53E-04	3.40E-04	4.25E-02	3.07E-02
SV_NRPD	1.06E-06	1.34E-06	9.43E-04	1.09E-03	1.12E-01	7.05E-02

3.1.2 Importance Measures – Fussell-Vesely Results

For the purpose of this PRA, the uncertainty and Fussell-Vesely will be evaluated over the one-year time period since the primary concern of this PRA is to evaluate the annual failure possibility of a system. The SAPHRIE generated importance measures for the ‘pathways’ model for the time interval of one-year is shown in Table 19 with a SAPHIRE-produced importance graph shown in Figure 24. The importance graphs can be difficult to read due to the initial jump from 10^{-16} to 10^{-1}. The importance measures from Table 19 show that the solenoid valves, SV-1 and SV-2 failing to shut has the greatest effect on the system as they relate to changes, followed by the mechanical failure of the air and argon doors. It is also noted that all of the human error events have approximately the same point estimate of FV importance which is understandable since all of the probabilities are essentially the same and calculated through the SPAR-H model. The probability of VP-1 leaking is of least importance here, probably because of the combination of the fact that it in itself cannot cause an air ingress event and that it has fewer possible air ingress events when in combination with SV-1 than the rest of the system. The basic model, the

basic model with the diagnostic human error component, the basic model with the Bruce A door failure data, and the basic model with the Bruce A door failure data and a diagnostic human error component all calculate a leak of VP-1 to be the measure of the least importance and SV-1 and SV-2 failing to shut of the greatest importance. Assuming that the solenoid valve field failure data is assumed to be the valve failing to shut, the highest importance and the lowest importance repeats for SV_OM and SV_NRPD. Those importance measures may be found in the appendix.

Table 19: SAPHIRE Generated Importance Model for the Basic System over 1-year

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-DOOR-OPEN	3.24E-3	4.35E-3	4.11E-6	9.92E-4	1.16E-2	1.85E-12	1.65E-1
HE-AR-DOOR-OPEN	3.24E-3	4.41E-3	4.44E-6	1.03E-3	1.18E-2	4.05E-11	9.87E-2
HE-SV-1-NS	3.23E-3	4.35E-3	3.60E-6	1.00E-3	1.13E-2	4.18E-10	8.82E-2
HE-SV-1-OPEN	3.23E-3	4.33E-3	2.55E-6	1.03E-3	1.16E-2	1.56E-13	1.46E-1
HE-SV-3-NS	3.23E-3	4.30E-3	4.84E-6	1.03E-3	1.12E-2	2.98E-11	1.03E-1
HE-SV-3-OPEN	3.23E-3	4.27E-3	3.32E-6	1.00E-3	1.17E-2	3.65E-12	1.16E-1
MF-AIR-CELL-LK	1.47E-1	1.34E-1	4.37E-3	5.12E-2	3.52E-1	3.31E-4	9.26E-1
MF-AR-CELL-LK	1.47E-1	1.35E-1	4.28E-3	5.40E-2	3.50E-1	3.08E-4	9.36E-1
MF-FS-SV-1	8.07E-1	7.96E-1	3.66E-1	8.07E-1	9.45E-1	7.85E-2	9.91E-1
MF-FS-SV-3	8.07E-1	7.95E-1	3.72E-1	8.05E-1	9.44E-1	4.60E-2	9.91E-1
MF-LK-SV-1	4.68E-2	6.04E-2	9.07E-3	3.70E-2	1.22E-1	2.60E-3	5.53E-1
MF-LK-SV-3	4.68E-2	6.08E-2	9.35E-3	3.68E-2	1.23E-1	2.11E-3	5.99E-1
MF-RP-SV-1	6.79E-3	8.82E-3	1.69E-4	2.08E-3	2.05E-2	1.21E-5	4.20E-1
MF-RP-SV-3	6.79E-3	9.02E-3	1.77E-4	2.14E-3	2.07E-2	1.05E-5	7.49E-1
MF-VP-1-LK	8.25E-4	1.05E-3	4.82E-5	4.34E-4	2.42E-3	4.74E-6	2.26E-2

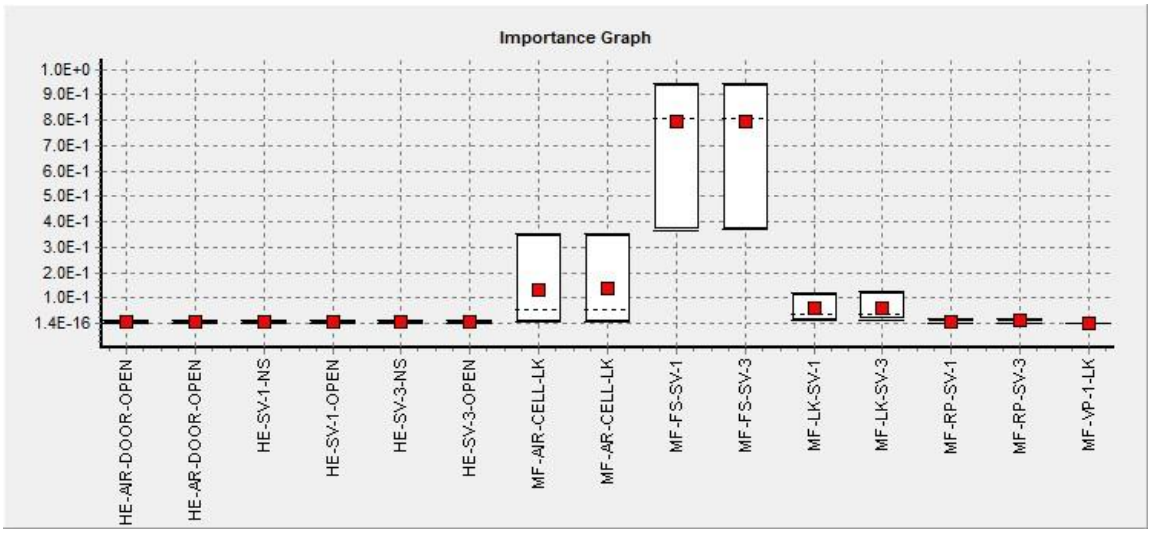


Figure 24: Importance graph for the basic system.

Table 20 and Figure 25 demonstrate the Bruce B door failure data for a year-long interval. The highest importance measure is the door seal mechanical failure rate and the lowest importance is the human error. The same pattern of results is repeated in the SV_OM and SV_NRPD cases.

Table 20: Bruce B Door Failure Results for Pathways System

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-DOOR-OPEN	1.37E-3	2.47E-3	1.88E-6	6.09E-4	6.57E-3	1.23E-12	5.17E-2
HE-AR-DOOR-OPEN	1.37E-3	2.54E-3	2.67E-6	6.09E-4	6.91E-3	2.49E-11	9.34E-2
HE-SV-1-NS	1.36E-3	2.46E-3	2.10E-6	6.03E-4	6.38E-3	6.91E-15	7.75E-2
HE-SV-1-OPEN	1.36E-3	2.50E-3	2.20E-6	6.02E-4	6.63E-3	5.39E-12	5.90E-2
HE-SV-3-NS	1.36E-3	2.46E-3	1.91E-6	5.87E-4	6.47E-3	2.97E-13	7.40E-2
HE-SV-3-OPEN	1.36E-3	2.44E-3	2.32E-6	6.04E-4	6.21E-3	3.27E-13	5.89E-2
MF-AIR-CELL-LK	8.89E-1	5.34E-1	9.94E-2	4.93E-1	8.02E-1	2.04E-3	9.45E-1
MF-AR-CELL-LK	8.89E-1	5.29E-1	9.63E-2	4.89E-1	7.95E-1	5.75E-3	9.59E-1
MF-FS-SV-1	3.28E-1	4.86E-1	1.47E-1	4.13E-1	7.78E-1	5.38E-2	9.74E-1
MF-FS-SV-3	3.28E-1	4.92E-1	1.51E-1	4.21E-1	7.76E-1	4.48E-2	9.81E-1
MF-LK-SV-1	1.97E-2	3.53E-2	5.78E-3	2.16E-2	7.16E-2	1.56E-3	3.76E-1
MF-LK-SV-3	1.97E-2	3.51E-2	5.87E-3	2.12E-2	6.99E-2	2.10E-3	4.38E-1
MF-RP-SV-1	2.87E-3	5.20E-3	9.82E-5	1.25E-3	1.13E-2	6.50E-6	3.39E-1
MF-RP-SV-3	2.87E-3	5.17E-3	1.08E-4	1.26E-3	1.16E-2	8.51E-6	6.07E-1
MF-VP-1-LK	1.77E-3	2.14E-3	3.37E-4	1.32E-3	4.33E-3	5.51E-5	2.07E-2

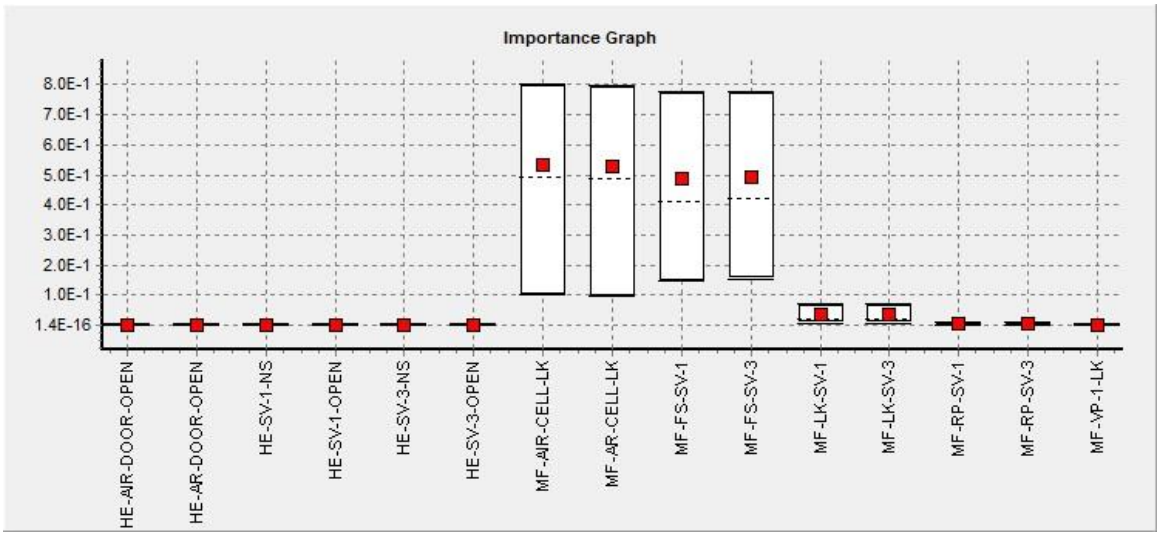


Figure 25: Importance graph for Bruce B door fault rate.

The final group of similar importance measures for the 'pathways' failure rates, SV_OM and SV_NRPD applies to the Bruce A failure rate data with a diagnostic human error component, shown in Table 21 and Figure 26.

Table 21: Pathways Importance Measures with Bruce B Failure and a Diagnostic HE Component

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-DOOR-OPEN	1.51E-2	2.45E-2	1.54E-5	6.26E-3	6.67E-2	2.72E-11	4.04E-1
HE-AR-DOOR-OPEN	1.51E-2	2.48E-2	2.55E-5	6.41E-3	6.76E-2	1.40E-10	4.62E-1
HE-SV-1-NS	1.51E-2	2.41E-2	1.99E-5	6.16E-3	6.54E-2	2.91E-10	3.89E-1
HE-SV-1-OPEN	1.51E-2	2.46E-2	1.72E-5	6.38E-3	6.61E-2	8.82E-11	4.82E-1
HE-SV-3-NS	1.51E-2	2.40E-2	2.07E-5	6.21E-3	6.55E-2	2.56E-12	3.49E-1
HE-SV-3-OPEN	1.51E-2	2.44E-2	1.71E-5	6.31E-3	6.53E-2	1.81E-12	4.02E-1
MF-AIR-CELL-LK	8.82E-1	5.10E-1	8.91E-2	4.66E-1	7.75E-1	1.99E-3	9.38E-1
MF-AR-CELL-LK	8.82E-1	5.08E-1	9.30E-2	4.67E-1	7.73E-1	5.72E-3	9.59E-1
MF-FS-SV-1	3.29E-1	4.64E-1	1.42E-1	3.95E-1	7.34E-1	4.29E-2	9.66E-1
MF-FS-SV-3	3.29E-1	4.66E-1	1.44E-1	3.98E-1	7.32E-1	3.91E-2	9.67E-1
MF-LK-SV-1	1.99E-2	3.32E-2	5.81E-3	2.07E-2	6.65E-2	1.36E-3	3.35E-1
MF-LK-SV-3	1.99E-2	3.34E-2	5.69E-3	2.08E-2	6.62E-2	1.40E-3	4.19E-1
MF-RP-SV-1	2.89E-3	4.89E-3	9.32E-5	1.17E-3	1.10E-2	1.45E-5	3.00E-1
MF-RP-SV-3	2.89E-3	4.91E-3	9.98E-5	1.18E-3	1.09E-2	9.67E-6	5.97E-1
MF-VP-1-LK	1.76E-3	2.01E-3	3.19E-4	1.28E-3	3.98E-3	6.07E-5	1.94E-2

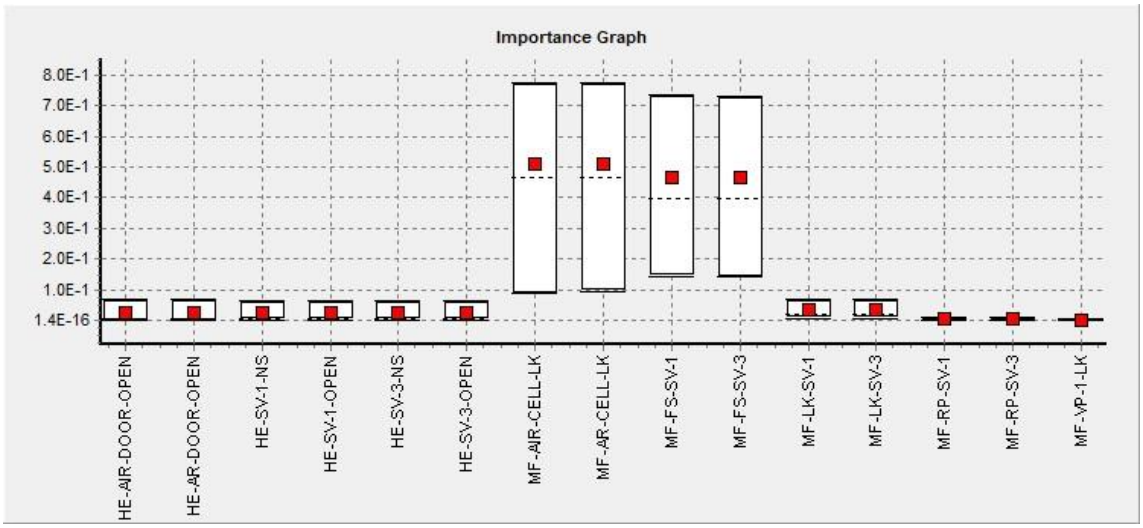


Figure 26: Importance graph for general system with Bruce B fault rate and a diagnostic HE component.

The importance measures for SV_OL are given in Table 22 and Figure 27. The solenoid valve probability here was sufficiently low for the door seal failure probabilities to produce a higher importance. In this case, VP-1 leaking was again the lowest of the mechanical failures, but the human error events had the lowest importance range overall, which was a pattern that was also represented in SV_DOW results that may be found in the appendix. Similar results are represented in the original failure data, the Bruce A failure rate and the Bruce B failure rate.

Table 22: Importance Measures for the Basic System with the SV_OL Configuration

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-DOOR-OPEN	1.82E-2	4.61E-2	2.44E-5	8.74E-3	1.33E-1	3.33E-13	8.03E-1
HE-AR-DOOR-OPEN	1.82E-2	4.64E-2	1.97E-5	8.22E-3	1.34E-1	3.07E-10	7.97E-1
HE-SV-1-NS	1.79E-2	4.38E-2	2.58E-5	8.06E-3	1.25E-1	9.85E-14	6.93E-1
HE-SV-1-OPEN	1.79E-2	4.36E-2	2.41E-5	7.62E-3	1.22E-1	4.54E-11	7.81E-1
HE-SV-3-NS	1.79E-2	4.27E-2	2.37E-5	7.60E-3	1.19E-1	3.12E-12	7.04E-1
HE-SV-3-OPEN	1.79E-2	4.41E-2	2.98E-5	7.78E-3	1.27E-1	7.98E-11	8.27E-1
MF-AIR-CELL-LK	8.27E-1	6.68E-1	1.04E-1	6.48E-1	9.55E-1	5.17E-3	9.98E-1
MF-AR-CELL-LK	8.27E-1	6.65E-1	9.43E-2	6.47E-1	9.55E-1	3.09E-3	9.99E-1
MF-FFD-SV-3	1.06E-1	1.71E-1	2.38E-3	5.71E-2	4.81E-1	1.01E-4	9.73E-1
MF-SV-1-FFD	1.06E-1	1.68E-1	2.50E-3	5.54E-2	4.67E-1	8.40E-5	9.88E-1
MF-VP-1-LK	2.68E-2	6.12E-2	5.92E-3	3.35E-2	1.33E-1	1.22E-3	5.93E-1

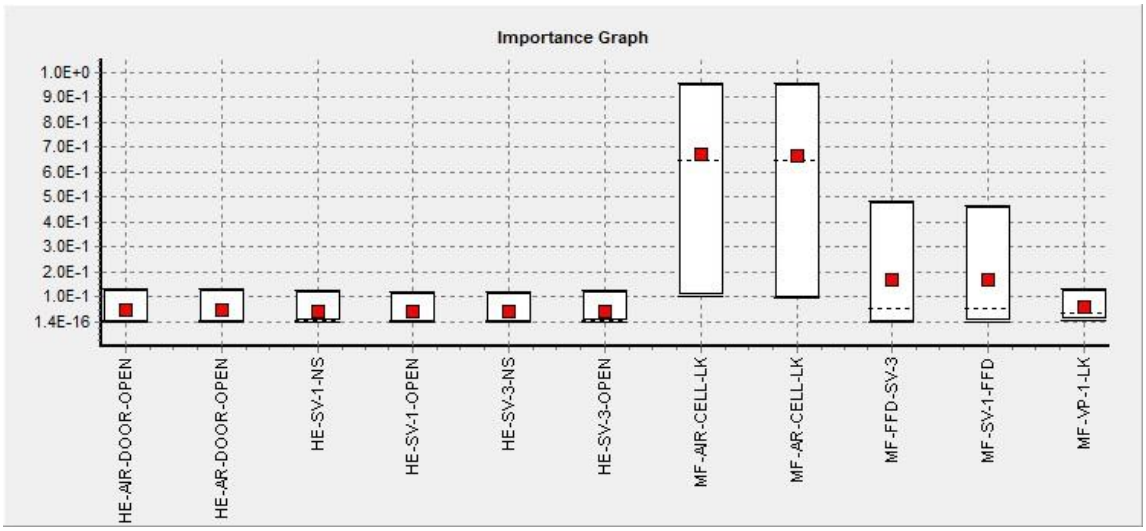


Figure 27: Importance graph for the basic system with SV_OL fault rate.

Table 23 and Figure 28 represent the importance measures for the failure rate given by SV_OL with a diagnostic contribution to human error. The data shows that the VP-1 is of lowest importance to the system and the door failure represents the highest importance to the system. The increased probability of a human error event occurring also increased the level of importance to above that of VP-1, which is a pattern that exists for the original system with diagnostic HE, the Bruce A door failure probability system with a diagnostic human error component, and the Bruce B door failure probability system with a diagnostic human error component.

Table 23: Basic System for SV_OL with a Diagnostic HE Component

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-DOOR-OPEN	1.30E-1	1.65E-1	1.71E-4	5.22E-2	4.65E-1	1.67E-9	9.77E-1
HE-AR-DOOR-OPEN	1.30E-1	1.64E-1	1.49E-4	5.28E-2	4.51E-1	5.29E-13	9.80E-1
HE-SV-1-NS	1.29E-1	1.59E-1	1.35E-4	4.95E-2	4.44E-1	5.15E-12	9.42E-1
HE-SV-1-OPEN	1.29E-1	1.64E-1	1.21E-4	5.20E-2	4.60E-1	5.50E-11	9.80E-1
HE-SV-3-NS	1.29E-1	1.65E-1	1.55E-4	5.06E-2	4.59E-1	2.00E-10	9.24E-1
HE-SV-3-OPEN	1.29E-1	1.59E-1	1.44E-4	4.97E-2	4.43E-1	2.69E-10	9.54E-1
MF-AIR-CELL-LK	5.37E-1	4.10E-1	2.57E-2	2.81E-1	8.22E-1	1.17E-3	9.93E-1
MF-AR-CELL-LK	5.37E-1	4.09E-1	2.54E-2	2.84E-1	8.20E-1	1.58E-3	9.96E-1
MF-FFD-SV-3	6.96E-2	9.37E-2	1.61E-3	2.66E-2	2.54E-1	7.76E-5	9.47E-1
MF-SV-1-FFD	6.96E-2	9.26E-2	1.57E-3	2.69E-2	2.51E-1	8.36E-5	9.71E-1
MF-VP-1-LK	1.37E-2	2.21E-2	2.33E-3	1.14E-2	4.77E-2	2.89E-4	3.68E-1

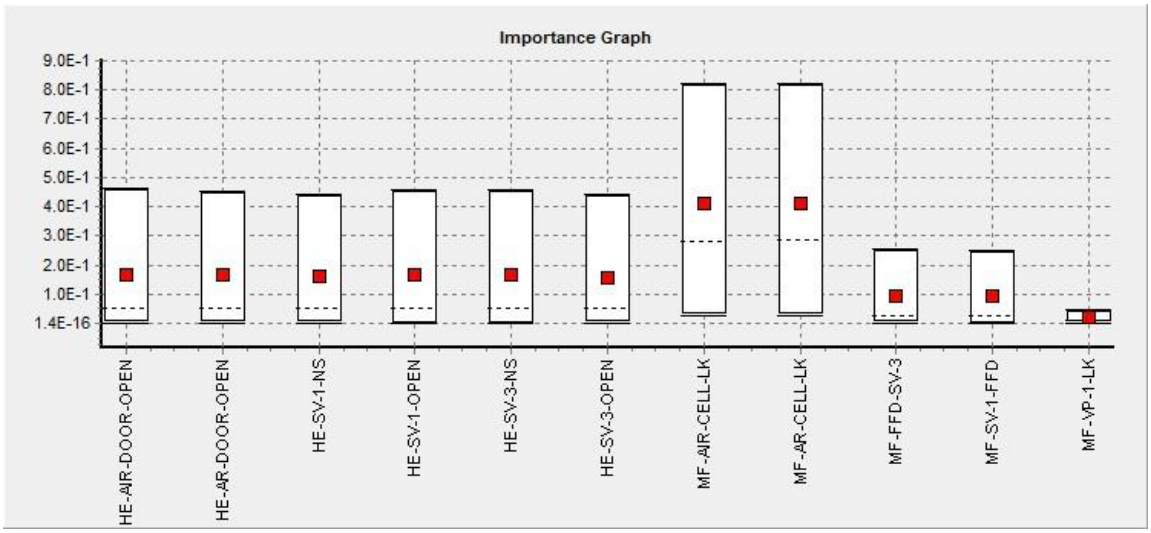


Figure 28: Importance graph for the SV_OL fault rate and a diagnostic HE component.

Table 24 and Figure 31 represent data for the basic system with SV_OH data. The solenoid valve data is so dominant here that even when using the Bruce B door failure rate of 1.48/year, the importance is still greater for the solenoid valve. Similar importance measures happen for all cases including the basic system, the basic system with a diagnostic human error component, the basic system with Bruce A failure rates and Bruce A failure rates plus a diagnostic human error component and the system with the Bruce B failure rates and the Bruce B failure rates and human error system. The component with the highest importance are the solenoid valves, and the component with the least importance is the mechanical failure of the vacuum pump.

Table 24: Importance Measures for Basic System with SV_OH

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-DOOR-OPEN	1.26E-3	3.72E-3	2.09E-6	6.35E-4	8.82E-3	6.00E-15	4.06E-1
HE-AR-DOOR-OPEN	1.26E-3	3.64E-3	1.36E-6	5.86E-4	8.51E-3	2.32E-11	2.54E-1
HE-SV-1-NS	1.26E-3	3.58E-3	2.14E-6	6.18E-4	8.48E-3	4.73E-15	1.40E-1
HE-SV-1-OPEN	1.26E-3	3.56E-3	1.99E-6	5.98E-4	8.31E-3	1.20E-11	2.23E-1
HE-SV-3-NS	1.26E-3	3.51E-3	1.91E-6	5.58E-4	8.25E-3	4.17E-13	2.14E-1
HE-SV-3-OPEN	1.26E-3	3.51E-3	2.48E-6	5.90E-4	8.39E-3	4.81E-12	2.46E-1
MF-AIR-CELL-LK	5.70E-2	1.07E-1	2.20E-3	2.97E-2	2.99E-1	1.66E-4	9.72E-1
MF-AR-CELL-LK	5.70E-2	1.07E-1	1.99E-3	2.97E-2	2.96E-1	1.81E-4	9.74E-1
MF-FFD-SV-3	9.80E-1	9.02E-1	4.13E-1	9.43E-1	9.95E-1	3.10E-2	1.00E+0
MF-SV-1-FFD	9.80E-1	9.02E-1	4.26E-1	9.41E-1	9.95E-1	2.48E-2	1.00E+0
MF-VP-1-LK	1.19E-4	6.75E-4	1.01E-5	1.42E-4	1.53E-3	1.80E-6	7.76E-2

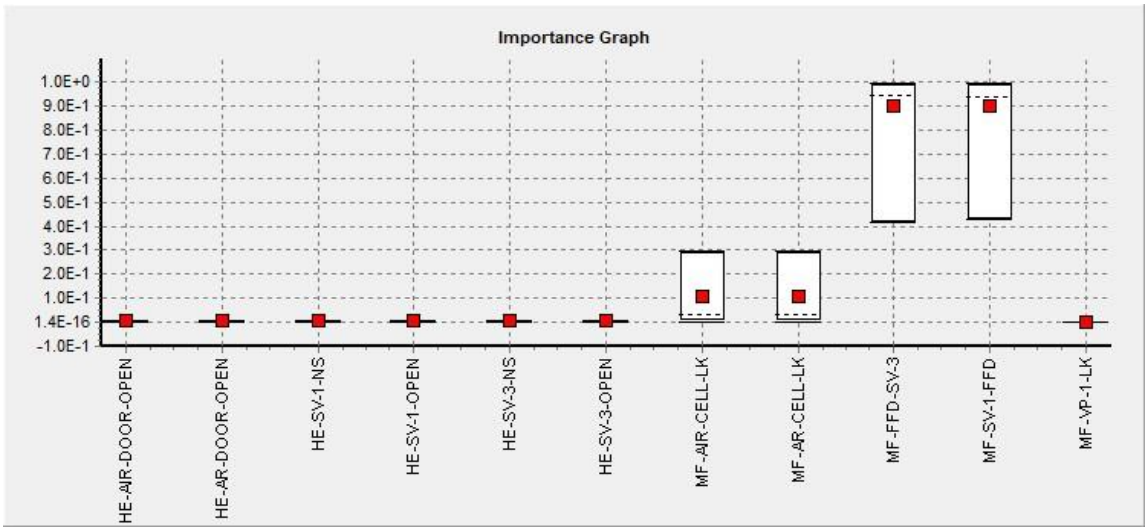


Figure 29: Importance graph for the basic system with SV_OH fault rate.

Similar to the importance measures of SV_OH, the importance measures for SV_MAN are similar for all of the tested models. SV_MAN has the lowest failure rate, which, when modeled, comes out to be even less than the door failure data in any of the situations. The results shown in Table 25 and Figure 30 are true for the basic system, the basic system inclusive of a diagnostic human error contribution, the basic system with Bruce A door failure data, the basic system with Bruce B door failure data, the Bruce A system with a diagnostic human error component and the Bruce B system with a diagnostic human error component.

Table 25: Basic System Importance Measures for SV_MAN

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-DOOR-OPEN	2.03E-2	5.91E-2	2.88E-5	1.07E-2	1.75E-1	8.89E-13	8.01E-1
HE-AR-DOOR-OPEN	2.03E-2	5.97E-2	2.38E-5	9.94E-3	1.81E-1	3.38E-10	8.15E-1
HE-SV-1-NS	1.99E-2	5.53E-2	3.14E-5	9.62E-3	1.64E-1	1.07E-13	7.77E-1
HE-SV-1-OPEN	1.99E-2	5.52E-2	2.84E-5	9.15E-3	1.58E-1	4.60E-11	7.91E-1
HE-SV-3-NS	1.99E-2	5.47E-2	2.76E-5	8.99E-3	1.61E-1	3.17E-12	7.30E-1
HE-SV-3-OPEN	1.99E-2	5.63E-2	3.35E-5	9.50E-3	1.64E-1	8.27E-11	8.50E-1
MF-AIR-CELL-LK	9.20E-1	7.75E-1	2.31E-1	7.92E-1	9.76E-1	2.64E-2	9.99E-1
MF-AR-CELL-LK	9.20E-1	7.72E-1	2.07E-1	7.93E-1	9.76E-1	3.56E-2	9.99E-1
MF-FFD-SV-3	2.97E-3	9.56E-3	5.93E-5	1.48E-3	2.22E-2	2.44E-6	4.91E-1
MF-SV-1-FFD	2.97E-3	9.38E-3	6.14E-5	1.44E-3	2.10E-2	2.03E-6	7.41E-1
MF-VP-1-LK	3.34E-2	9.42E-2	8.84E-3	5.32E-2	2.02E-1	1.23E-3	7.09E-1

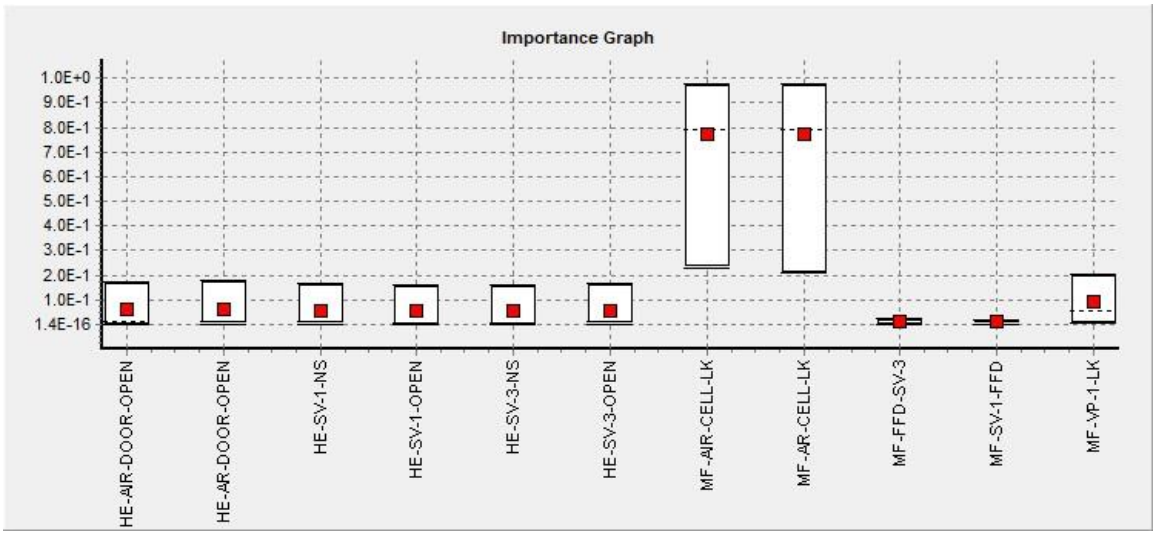


Figure 30: Importance graph for the basic system with SV_MAN fault rate.

3.1.3 Cut Sets and Identification of Risk Critical Components for a Discussion on Risk-Informed Maintenance

The cut sets for the simplified air-lock system with original door fault rate data are given in Table 26 through Table 32. The cut sets are only for the mechanical failures of the system and produce the same results for the inclusion of a diagnostic human error component and for the door interlocks. The door interlocks only affect the human error calculation and can not lead to air ingress events on their own and maintenance does not alter the probability of a human error failure. SV-3 and SV-1 need to be maintained the most for the original fault rates, the SV_OM fault rate, the SV_OH fault rate, and the SV_NRPD fault rate. Air and argon door seals are the highest fault rate probability for SV_OL, SV_DOW, and SV_MAN. Summing to 90% of the total cut set probability, the components that require the most frequent maintenance are the solenoid valves and the door seals. Engineering judgement is largely used to establish at what intervals maintenance needs to be completed. The highest risk components are the same for the Bruce A and Bruce B door fault rate data and the corresponding cut sets can be viewed in

the appendix. For example, if it is decided that maintenance occur at the one-month interval for only the risk-critical components, then the time interval over which the component must run for is reduced to one month, which then produces results for the probability of air ingress that is nearly-identical, if not completely identical to the overall probability if the entire system was run for a month. For example, the original air ingress probability for the basic system with a diagnostic human error component was 1.16E-01/yr with a standard deviation of 6.88E-02 and was 3.83E-03/month with a standard deviation of 3.04E-03. When the interval for maintenance was changed for only the door seals and the solenoid valves, the resultant air ingress probability was 3.83E-03/yr with a standard deviation of 3.04E-03, which is the same overall air ingress probability as the one-month interval for the entire system. The air ingress probability produced a range from 10^{-3} to 10^{-2} per year depending on which solenoid valve fault rate was used. Similarly, the range for the air ingress probability for the basic system with door interlocks and a diagnostic human error component was 10^{-4} to 10^{-2} and the total probability of the system with the original solenoid valve fault rate data was 2.65E-03/yr with a standard deviation of 2.32E-03. The system that had a one-month run time for all component produced an air ingress probability of 2.59E-03/month with a standard deviation of 2.30E-03. The values for the maintained system are not always exactly equivalent as the corresponding system for the one month run time, but are usually similar.

Table 26: Mechanical Failure Cut Sets for the Original System

#	Case	Prob/Freq	Total %	Cut Set
Total		9.69E-2	100	Displaying 20 Cut Sets. (20 Original)
1	C	6.41E-2	66.18	MF-FS-SV-1,MF-FS-SV-3
2	C	1.15E-2	11.86	MF-AR-CELL-LK,MF-FS-SV-1
3	C	1.15E-2	11.86	MF-AIR-CELL-LK,MF-FS-SV-3
4	C	3.67E-3	3.79	MF-FS-SV-3,MF-LK-SV-1
5	C	3.67E-3	3.79	MF-FS-SV-1,MF-LK-SV-3
6	C	2.06E-3	2.12	MF-AIR-CELL-LK,MF-AR-CELL-LK
7	C	6.58E-4	0.68	MF-AR-CELL-LK,MF-LK-SV-1
8	C	6.58E-4	0.68	MF-AIR-CELL-LK,MF-LK-SV-3
9	C	5.32E-4	0.55	MF-FS-SV-3,MF-RP-SV-1
10	C	5.32E-4	0.55	MF-FS-SV-1,MF-RP-SV-3
11	C	2.22E-4	0.23	MF-FS-SV-3,MF-VP-1-LK
12	C	2.10E-4	0.22	MF-LK-SV-1,MF-LK-SV-3
13	C	9.53E-5	0.10	MF-AR-CELL-LK,MF-RP-SV-1
14	C	9.53E-5	0.10	MF-AIR-CELL-LK,MF-RP-SV-3
15	C	3.97E-5	0.04	MF-AR-CELL-LK,MF-VP-1-LK
16	C	3.04E-5	0.03	MF-LK-SV-3,MF-RP-SV-1
17	C	3.04E-5	0.03	MF-LK-SV-1,MF-RP-SV-3
18	C	1.27E-5	0.01	MF-LK-SV-3,MF-VP-1-LK
19	C	4.41E-6	< 0.01	MF-RP-SV-1,MF-RP-SV-3
20	C	1.84E-6	< 0.01	MF-RP-SV-3,MF-VP-1-LK

Table 27:Mechanical Failure Cut Sets for the Original System with SV_OL

#	Case	Prob/Freq	Total %	Cut Set
Total		2.67E-3	100	Displaying 6 Cut Sets. (6 Original)
1	C	2.06E-3	76.94	MF-AIR-CELL-LK,MF-AR-CELL-LK
2	C	2.69E-4	10.06	MF-AR-CELL-LK,MF-SV-1-FFD
3	C	2.69E-4	10.06	MF-AIR-CELL-LK,MF-FFD-SV-3
4	C	3.97E-5	1.49	MF-AR-CELL-LK,MF-VP-1-LK
5	C	3.52E-5	1.31	MF-FFD-SV-3,MF-SV-1-FFD
6	C	5.19E-6	0.19	MF-FFD-SV-3,MF-VP-1-LK

Table 28: Mechanical Failure Cut Sets for the Original System with SV_OM

#	Case	Prob/Freq	Total %	Cut Set
Total		1.50E-1	100	Displaying 6 Cut Sets. (6 Original)
1	C	1.21E-1	80.33	MF-FFD-SV-3,MF-SV-1-FFD
2	C	1.58E-2	10.49	MF-AR-CELL-LK,MF-SV-1-FFD
3	C	1.58E-2	10.49	MF-AIR-CELL-LK,MF-FFD-SV-3
4	C	2.06E-3	1.37	MF-AIR-CELL-LK,MF-AR-CELL-LK
5	C	3.04E-4	0.20	MF-FFD-SV-3,MF-VP-1-LK
6	C	3.97E-5	0.03	MF-AR-CELL-LK,MF-VP-1-LK

Table 29: Mechanical Failure Cut Sets for the Original System with SV_OH

#	Case	Prob/Freq	Total %	Cut Set
Total		6.80E-1	100	Displaying 6 Cut Sets. (6 Original)
1	C	6.55E-1	96.21	MF-FFD-SV-3,MF-SV-1-FFD
2	C	3.67E-2	5.39	MF-AR-CELL-LK,MF-SV-1-FFD
3	C	3.67E-2	5.39	MF-AIR-CELL-LK,MF-FFD-SV-3
4	C	2.06E-3	0.30	MF-AIR-CELL-LK,MF-AR-CELL-LK
5	C	7.08E-4	0.10	MF-FFD-SV-3,MF-VP-1-LK
6	C	3.97E-5	< 0.01	MF-AR-CELL-LK,MF-VP-1-LK

Table 30: Mechanical Failure Cut Sets for the Original System with SV_DOW

#	Case	Prob/Freq	Total %	Cut Set
Total		2.70E-3	100	Displaying 6 Cut Sets. (6 Original)
1	C	2.06E-3	76.35	MF-AIR-CELL-LK,MF-AR-CELL-LK
2	C	2.78E-4	10.32	MF-AR-CELL-LK,MF-SV-1-FFD
3	C	2.78E-4	10.32	MF-AIR-CELL-LK,MF-FFD-SV-3
4	C	3.97E-5	1.47	MF-AR-CELL-LK,MF-VP-1-LK
5	C	3.76E-5	1.39	MF-FFD-SV-3,MF-SV-1-FFD
6	C	5.37E-6	0.20	MF-FFD-SV-3,MF-VP-1-LK

Table 31: Mechanical Failure Cut Sets for the Original System with SV_MAN

#	Case	Prob/Freq	Total %	Cut Set
Total		2.11E-3	100	Displaying 6 Cut Sets. (6 Original)
1	C	2.06E-3	97.48	MF-AIR-CELL-LK,MF-AR-CELL-LK
2	C	3.97E-5	1.88	MF-AR-CELL-LK,MF-VP-1-LK
3	C	6.76E-6	0.32	MF-AR-CELL-LK,MF-SV-1-FFD
4	C	6.76E-6	0.32	MF-AIR-CELL-LK,MF-FFD-SV-3
5	C	1.30E-7	< 0.01	MF-FFD-SV-3,MF-VP-1-LK
6	C	2.22E-8	< 0.01	MF-FFD-SV-3,MF-SV-1-FFD

Table 32: Mechanical Failure Cut Sets for the Original System with SV_NRPD

#	Case	Prob/Freq	Total %	Cut Set
Total		3.28E-2	100	Displaying 6 Cut Sets. (6 Original)
1	C	1.85E-2	56.55	MF-FFD-SV-3,MF-SV-1-FFD
2	C	6.17E-3	18.85	MF-AR-CELL-LK,MF-SV-1-FFD
3	C	6.17E-3	18.85	MF-AIR-CELL-LK,MF-FFD-SV-3
4	C	2.06E-3	6.28	MF-AIR-CELL-LK,MF-AR-CELL-LK
5	C	1.19E-4	0.36	MF-FFD-SV-3,MF-VP-1-LK
6	C	3.97E-5	0.12	MF-AR-CELL-LK,MF-VP-1-LK

3.1.4 Uncertainty Discussion

Calculation of the uncertainty used a Monte Carlo uncertainty method with 8000 samples and a random number seed of 50. The PDF for the uncertainty for the basic system over a period of one year, as produced by SAPHIRE is given in Figure 31.

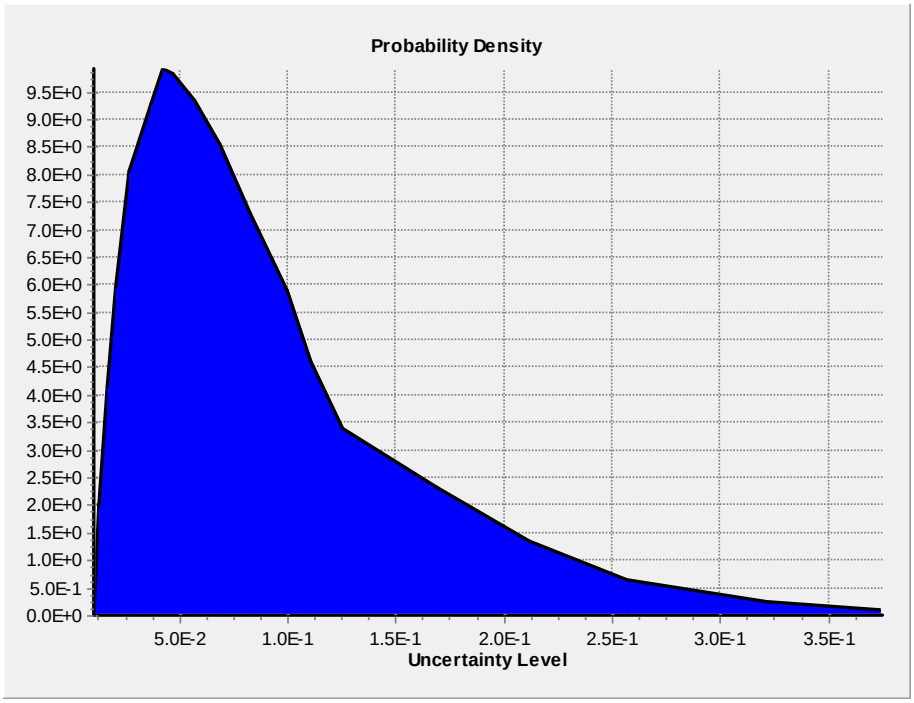


Figure 31: PDF of the basic system over 1 year.

The top-heavy nature of the PDF distribution is indicative of the log-normal uncertainty distributions that was applied to all of the model components. The cumulative distribution function is given by Figure 32. The CDF reaches its maximum very quickly.

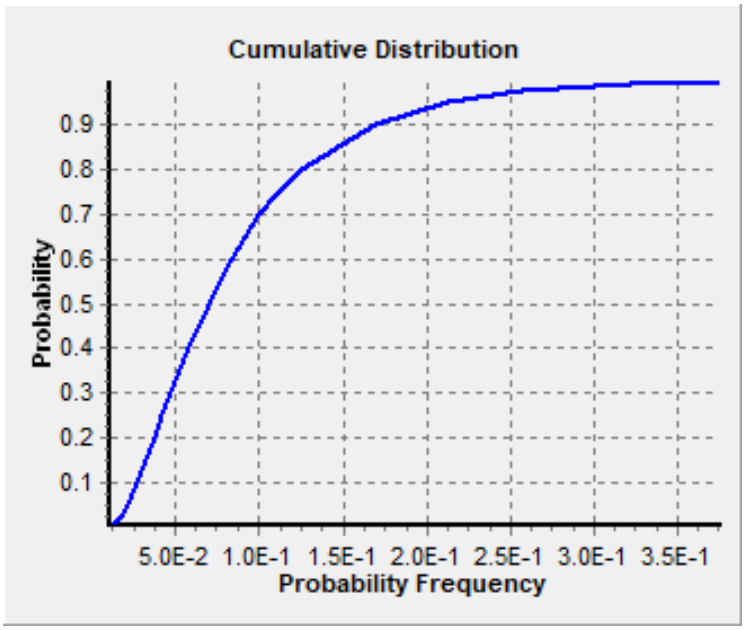


Figure 32 CDF for the generalized system using the 'pathways' model.

Overall, the spread of failure rates is somewhat concerning. When considering a testing failure of a one-year period, an upper limit that is 281 times the lower limit doesn't give very much information as it relates to the overall failure probability of the system. As certain probabilities increase, such as the human error failure rate, the spread in the value decreases, but that does not necessarily that those probabilities are the correct ones. The absolute lowest range contains an upper limit that is only 1.59 times greater than the lower limit, however, this applies to a door interlock failure probability that is almost guaranteed to occur over the interval.

3.2 Basic Generalized System with Door Interlocks

3.2.1 Failure Probability Results

The inclusion of door interlock probability an effect on the total air ingress probability of reducing the overall fault rate by approximately half. The door interlocks provide an improvement to the human error ingress event probability for a door. For the year-long interval, using the original data, the probability of human error for the doors is down to 4.98E-05/yr from 1E-03/yr. Table 33 shows the overall failure probability for a one-day, one-month, and one-year event, along with the corresponding standard deviations. For the one-day interval, the results for the highest failure rate, SV_OH, is 9.78 times the lowest, SV_MAN, for the one-month interval, the SV_OH results are 513 times the SV_MAN results, and for the one-year interval, the SV_OH results are 291 times the SV_MAN results, which parallels the results from the basic system without the door interlocks. For the scenario in Table 33, there is between a 0.234% and a 68.1% chance of failure.

Table 33: Failure Results for Basic System w/ Door Interlocks

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	8.84E-06	9.94E-06	9.55E-04	9.10E-04	9.79E-02	6.37E-02
SV_OL	4.60E-06	7.62E-06	4.03E-05	1.08E-04	2.92E-03	7.59E-03
SV_OM	1.09E-05	1.88E-05	1.62E-03	5.15E-03	1.51E-01	1.12E-01
SV_OH	4.43E-05	1.62E-04	1.77E-02	3.00E-02	6.81E-01	2.51E-01
SV_DOW	4.60E-06	7.62E-06	4.05E-05	1.08E-04	2.94E-03	7.61E-03
SV_MAN	4.53E-06	7.59E-06	3.45E-05	1.03E-04	2.34E-03	7.16E-03
SV_NRPD	6.39E-06	9.19E-06	3.16E-04	1.02E-03	3.34E-02	4.28E-02

When adding the diagnostic human error component into this system, the failure probabilities increased, shown in Table 34. The SV_OH results are 1.45 times the SV_MAN results for the one-day period, 34.8 times the SV_MAN results for the one-month period, and 147 times the SV_MAN results for the one-year period. The values for the generalized system with door interlocks parallel those from the generalized system without any door interlocks in that they are the same order of magnitude and that the results here were a decrease from the results given with an action-only human error event. To put it another way, at the lowest, there's between a 0.47% and 69.2% chance of failure.

Table 34: Failure Results for the Basic System with Door Interlocks and Diagnostic HE Component

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	5.28E-04	9.06E-04	2.59E-03	2.30E-03	1.10E-01	6.75E-02
SV_OL	4.90E-04	8.54E-04	6.94E-04	1.04E-03	5.52E-03	8.70E-03
SV_OM	5.43E-04	8.91E-04	3.63E-03	6.09E-03	1.65E-01	1.15E-01
SV_OH	7.10E-04	1.07E-03	2.33E-02	3.28E-02	6.92E-01	2.49E-01
SV_DOW	4.90E-04	8.54E-04	6.95E-04	1.04E-03	5.55E-03	8.72E-03
SV_MAN	4.90E-04	8.54E-04	6.69E-04	1.02E-03	4.70E-03	8.19E-03
SV_NRPD	5.08E-04	8.65E-04	1.43E-03	2.00E-03	4.10E-02	4.54E-02

Human error for the generalized system with door interlocks has a measurable effect on the overall failure probability of the system shown in Table 35. The results from Table 35 apply to both the action-only human error data and the action plus diagnostic

human error event. The difference for the system with a diagnostic human error event is very substantial for the one-day event and somewhat significant for the one-year event. For the system with the action only event, the difference is almost a factor of 10 for the one-day interval, and is not very significant for the one-year interval.

Table 35: Mechanical Failure Results for the Basic System with Door Interlocks

	1 DAY	**STDEV**	**1 MONTH**	**STDEV**	**1 YEAR**	**STDEV**
ORIGINAL	9.48E-07	1.07E-06	8.37E-04	8.81E-04	9.69E-02	6.41E-02
SV_OL	2.09E-08	7.06E-08	1.88E-05	6.11E-05	2.67E-03	6.22E-03
SV_OM	1.68E-06	5.72E-06	1.47E-03	3.75E-03	1.50E-01	1.11E-01
SV_OH	2.17E-05	7.76E-05	1.72E-02	2.89E-02	6.80E-01	2.48E-01
SV_DOW	2.11E-08	7.09E-08	1.89E-05	6.13E-05	2.70E-03	6.24E-03
SV_MAN	1.66E-08	6.42E-08	1.49E-05	5.55E-05	2.11E-03	5.61E-03
SV_NRPD	2.80E-07	8.41E-07	2.49E-04	6.53E-04	3.28E-02	4.18E-02

When the Bruce B failure data for the door replaced the La Crosse BWR door failure data, the failure probability results are understandably raised to very large probabilities since the doors are almost guaranteed to fail within a year, where the results are given in Table 36. The results for SV_OH for the one-day interval were 3.06 times the results for SV_MAN, 4.27 times for the one-month interval, and 1.64 times the SV_MAN results for the one-year interval. Using the configuration of the basic system with door interlocks and Bruce B fault rate data indicates a range for the chance of failure that is between 59.9% and 98.1%.

Table 36: Failure Results for the Basic System with Door Interlocks and Bruce B Failure Data

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	4.75E-05	1.28E-05	2.00E-02	2.31E-03	7.65E-01	1.34E-01
SV_OL	3.68E-05	1.01E-05	1.37E-02	1.09E-03	6.02E-01	7.94E-02
SV_OM	5.21E-05	2.02E-05	2.27E-02	6.26E-03	8.11E-01	1.77E-01
SV_OH	1.12E-04	1.13E-04	5.81E-02	3.37E-02	9.81E-01	2.50E-01
SV_DOW	3.68E-05	1.01E-05	1.37E-02	1.09E-03	6.02E-01	7.94E-02
SV_MAN	3.66E-05	1.01E-05	1.36E-02	1.07E-03	5.99E-01	7.83E-02
SV_NRPD	4.16E-05	1.20E-05	1.65E-02	2.16E-03	6.84E-01	1.21E-01

The results for using the Bruce B failure data in combination with a diagnosis human error contribution are shown in Table 37. The range of values indicates a chance of failure in a year to be between 61.1% and 98.2%, which are very similar to the results gained from the action-only human error event. The highest failure probability was 1.38 times the lowest for the one-day interval, 3.64 times the lowest for the one-month interval, and 1.61 times the lowest for the one-year interval which are also very close to the values reported for the same group of models for the basic system. This is the lowest difference between the two models, but it is forced by the failure probability being incredibly high. For such a high door failure probability, the effect from the human error is not very significant. in Table 38 also demonstrates similar results when referring to the effect that only mechanical failure has on the system. Since there is not a difference in the mechanical failure probability between the model that has the diagnostic human error and the model that does not, the values for Table 38 apply to both model groups.

Table 37: Basic System with Door Interlocks, Diagnostic HE, and Bruce B Door Failure Data

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	7.23E-04	8.61E-04	2.59E-02	3.97E-03	7.75E-01	1.34E-01
SV_OL	6.79E-04	8.61E-04	1.87E-02	2.46E-03	6.15E-01	8.21E-02
SV_OM	7.41E-04	8.93E-04	2.89E-02	8.36E-03	8.20E-01	1.77E-01
SV_OH	9.34E-04	1.06E-03	6.77E-02	3.67E-02	9.82E-01	2.46E-01
SV_DOW	6.79E-04	8.61E-04	1.87E-02	2.46E-03	6.15E-01	8.22E-02
SV_MAN	6.78E-04	8.61E-04	1.86E-02	2.44E-03	6.11E-01	8.11E-02
SV_NRPD	6.99E-04	8.70E-04	2.19E-02	3.68E-03	6.96E-01	1.22E-01

Table 38: Mechanical Failure Results for the Basic System with Door Interlocks and Bruce B Door Failure Rate

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	2.39E-05	2.53E-06	1.94E-02	2.14E-03	7.64E-01	1.31E-01
SV_OL	1.65E-05	1.15E-06	1.32E-02	9.79E-04	6.01E-01	7.64E-02
SV_OM	2.72E-05	1.36E-05	2.21E-02	7.13E-03	8.10E-01	1.75E-01
SV_OH	7.35E-05	1.61E-04	5.72E-02	3.53E-02	9.80E-01	2.51E-01
SV_DOW	1.65E-05	1.15E-05	1.32E-02	9.79E-04	6.01E-01	7.64E-02
SV_MAN	1.64E-05	1.14E-06	1.31E-02	9.66E-04	5.97E-01	7.54E-02
SV_NRPD	1.98E-05	2.78E-06	1.60E-02	2.16E-03	6.83E-01	1.17E-01

The results for the generalized system with door interlocks that utilizes the Bruce A door failure rate are given in Table 39. For the one-day interval, the highest failure probability is 7.40 times the lowest, for the one-month interval, the highest failure probability is 50.3 times the lowest, and for the one-year interval, the highest failure probability is 17.8 times the lowest, which is a significant reduction from the first group of models with door interlocks, but it is again being forced by the relatively high failure probability of the airlock door seals. The range of the possibility of failure is between 4.34% and 77.1%.

Table 39: Failure Results for the Generalized System with Door Interlocks and Bruce A Failure Data

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	1.21E-05	1.11E-05	2.10E-03	1.36E-03	2.09E-01	9.30E-02
SV_OL	7.01E-06	7.48E-06	4.53E-04	3.84E-04	2.58E-02	3.20E-02
SV_OM	1.44E-05	2.13E-05	3.04E-03	4.94E-03	2.76E-01	1.40E-01
SV_OH	5.12E-05	1.24E-04	2.18E-02	3.21E-02	7.71E-01	2.53E-01
SV_DOW	7.01E-06	7.49E-06	4.54E-04	3.84E-04	4.58E-02	3.20E-02
SV_MAN	6.92E-06	7.44E-06	4.33E-04	3.74E-04	4.34E-02	3.10E-02
SV_NRPD	9.19E-06	1.01E-05	1.07E-03	1.25E-03	1.13E-01	7.30E-02

The Bruce A door fault rate with a diagnostic human error component is given in Table 40. The highest failure probability from the results given by Table 40 is 1.44 times the lowest for the one-day interval, 16.8 times the lowest for the one-month interval and 15.0 times the lowest for the one-year time interval, which is still a fairly large spread in results, but it is an improvement from the 291 times difference. The range of percent chance of failures is 5.19% to 78.0%.

Table 40: Generalized System with Door Interlocks and Bruce A Door Failure

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	5.51E-04	8.68E-04	4.33E-03	2.82E-03	2.24E-01	9.79E-02
SV_OL	5.13E-04	8.24E-04	1.70E-03	1.43E-03	5.45E-02	3.44E-02
SV_OM	5.66E-04	8.63E-04	5.65E-03	6.44E-03	2.92E-01	1.40E-01
SV_OH	7.37E-04	1.05E-03	2.80E-02	3.32E-02	7.80E-01	2.51E-01
SV_DOW	5.13E-04	8.24E-04	1.70E-03	1.43E-03	5.46E-02	3.44E-02
SV_MAN	5.12E-04	8.23E-04	1.67E-03	1.41E-03	5.19E-02	3.36E-02
SV_NRPD	5.30E-04	8.36E-04	2.78E-03	2.45E-03	1.26E-01	7.38E-02

Table 41 represents the mechanical failure for the sequence of fault rates given by Table 39 and Table 40. The human error probability has about a factor of ten difference between the basic system without a diagnostic human error component and approximately a factor of 100 for the inclusion of the diagnostic component as a part of the human error event.

Table 41: Generalized System with Door Interlocks, Bruce A Failure, and Diagnostic HE

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	2.18E-06	1.51E-06	1.92E-03	1.28E-03	2.07E-01	9.26E-02
SV_OL	4.19E-07	4.06E-07	3.71E-04	3.49E-04	4.48E-02	3.16E-02
SV_OM	3.24E-06	6.64E-06	2.83E-03	4.53E-03	2.74E-01	1.34E-01
SV_OH	2.66E-05	8.20E-05	2.12E-02	3.02E-02	7.70E-01	2.49E-01
SV_DOW	4.20E-07	4.07E-07	3.71E-04	3.49E-04	4.48E-02	3.17E-02
SV_MAN	3.99E-07	3.96E-07	3.53E-04	3.40E-04	4.25E-02	3.07E-02
SV_NRPD	1.06E-06	1.34E-06	9.43E-04	1.09E-03	1.12E-01	7.05E-02

3.2.2 Fussell-Vesely

The original system with the IAEA solenoid valve fault rates and the system with SV_OM behave in the same way, so only one table will be referred to here and the rest may be found in the appendix. The basic system with door interlocks, the basic system with Bruce A door fault, and the basic system with Bruce A door fault and a diagnostic human error component all have the solenoid valves with the highest importance and the door interlocks plus the human error for the doors have the lowest importance and are reported in Table 42 and Figure 33. All of the values in this section are being reported for the one-year interval.

Table 42: Importance Results Generalized System for the Original System and Door Interlocks

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	1.62E-4	2.06E-4	4.42E-8	1.47E-5	4.26E-4	0.00E+0	3.05E-2
DI-AR-MF	1.62E-4	1.96E-4	2.77E-8	1.48E-5	4.36E-4	1.87E-13	1.70E-2
HE-AIR-DOOR-OPEN	1.62E-4	2.06E-4	4.42E-8	1.47E-5	4.26E-4	0.00E+0	3.05E-2
HE-AR-DOOR-OPEN	1.62E-4	1.96E-4	2.77E-8	1.48E-5	4.36E-4	1.87E-13	1.70E-2
HE-SV-1-NS	3.24E-3	4.33E-3	3.27E-6	1.04E-3	1.16E-2	1.54E-13	1.04E-1
HE-SV-1-OPEN	3.24E-3	4.37E-3	4.09E-6	9.87E-4	1.18E-2	2.14E-11	1.14E-1
HE-SV-3-NS	3.24E-3	4.37E-3	3.11E-6	1.03E-3	1.17E-2	9.08E-12	1.16E-1
HE-SV-3-OPEN	3.24E-3	4.27E-3	3.68E-6	1.04E-3	1.16E-2	9.94E-11	1.32E-1
MF-AIR-CELL-LK	1.47E-1	1.30E-1	3.86E-3	5.09E-2	3.44E-1	2.91E-4	9.38E-1
MF-AR-CELL-LK	1.47E-1	1.32E-1	3.98E-3	5.13E-2	3.44E-1	1.29E-4	9.03E-1
MF-FS-SV-1	8.09E-1	8.04E-1	3.91E-1	8.14E-1	9.48E-1	4.73E-2	9.91E-1
MF-FS-SV-3	8.09E-1	8.02E-1	3.76E-1	8.13E-1	9.48E-1	8.34E-2	9.92E-1
MF-LK-SV-1	4.69E-2	6.10E-2	9.11E-3	3.67E-2	1.26E-1	2.15E-3	6.64E-1
MF-LK-SV-3	4.69E-2	6.03E-2	8.93E-3	3.68E-2	1.24E-1	2.18E-3	5.62E-1
MF-RP-SV-1	6.81E-3	8.48E-3	1.73E-4	2.10E-3	2.04E-2	1.30E-5	3.73E-1
MF-RP-SV-3	6.81E-3	9.01E-3	1.67E-4	2.13E-3	2.04E-2	1.50E-5	4.29E-1
MF-VP-1-LK	8.12E-4	1.00E-3	4.04E-5	3.93E-4	2.35E-3	2.47E-6	3.00E-2

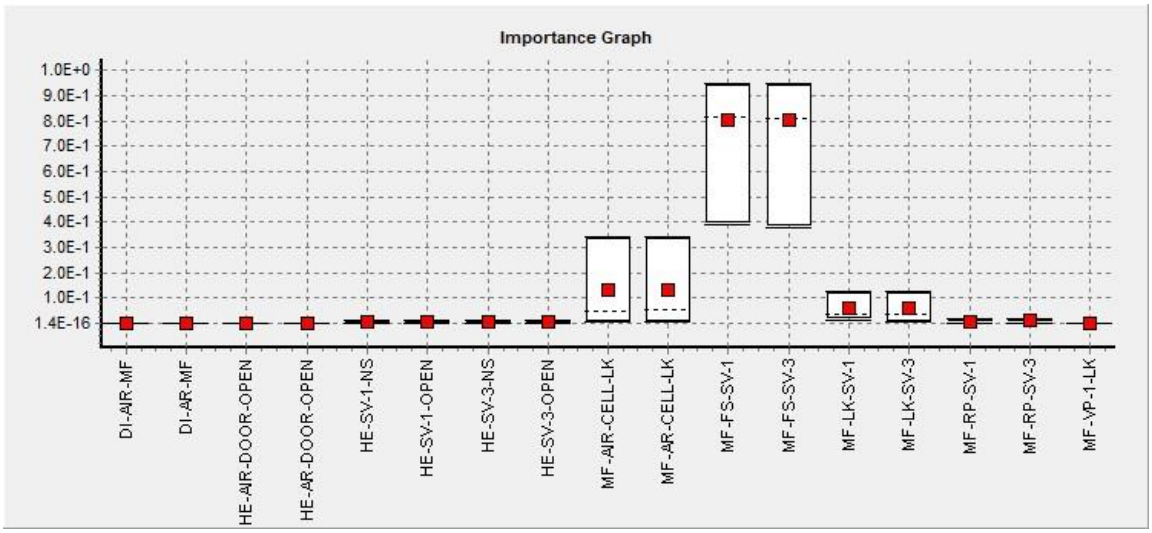


Figure 33: Importance graph for generalized system with door interlocks.

For the generalized system with door interlocks and a diagnostic human error component, the solenoid valves are of the highest importance, and the vacuum pump failure is the least importance, which is shown in Table 43 and Figure 34.

Table 43: Importance Measures for Pathways Fault Rates and a Diagnostic HE

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	1.69E-3	1.90E-3	3.67E-7	1.47E-4	4.10E-3	1.96E-12	1.53E-1
DI-AR-MF	1.69E-3	1.89E-3	2.20E-7	1.39E-4	4.49E-3	6.25E-11	1.38E-1
HE-AIR-DOOR-OPEN	1.69E-3	1.90E-3	3.67E-7	1.47E-4	4.10E-3	1.96E-12	1.53E-1
HE-AR-DOOR-OPEN	1.69E-3	1.89E-3	2.20E-7	1.39E-4	4.49E-3	6.25E-11	1.38E-1
HE-SV-1-NS	3.38E-2	4.09E-2	3.21E-5	1.04E-2	1.13E-1	4.16E-13	6.65E-1
HE-SV-1-OPEN	3.38E-2	4.11E-2	2.82E-5	1.05E-2	1.11E-1	4.16E-10	5.59E-1
HE-SV-3-NS	3.38E-2	4.06E-2	2.97E-5	1.06E-2	1.12E-1	3.62E-9	5.87E-1
HE-SV-3-OPEN	3.38E-2	4.08E-2	3.26E-5	1.06E-2	1.14E-1	1.20E-10	6.01E-1
MF-AIR-CELL-LK	1.39E-1	1.26E-1	3.89E-3	4.95E-2	3.25E-1	3.26E-4	8.96E-1
MF-AR-CELL-LK	1.39E-1	1.25E-1	4.10E-3	4.79E-2	3.27E-1	3.11E-4	9.13E-1
MF-FS-SV-1	7.64E-1	7.44E-1	3.47E-1	7.40E-1	9.17E-1	7.50E-2	9.91E-1
MF-FS-SV-3	7.64E-1	7.45E-1	3.50E-1	7.42E-1	9.19E-1	6.61E-2	9.86E-1
MF-LK-SV-1	4.45E-2	5.63E-2	8.84E-3	3.50E-2	1.14E-1	3.01E-3	5.98E-1
MF-LK-SV-3	4.45E-2	5.65E-2	8.92E-3	3.45E-2	1.13E-1	2.00E-3	5.98E-1
MF-RP-SV-1	6.45E-3	7.83E-3	1.58E-4	1.93E-3	1.87E-2	1.78E-5	3.45E-1
MF-RP-SV-3	6.45E-3	8.01E-3	1.58E-4	1.96E-3	1.90E-2	1.46E-5	5.50E-1
MF-VP-1-LK	7.31E-4	8.85E-4	3.67E-5	3.50E-4	2.04E-3	2.23E-6	1.82E-2

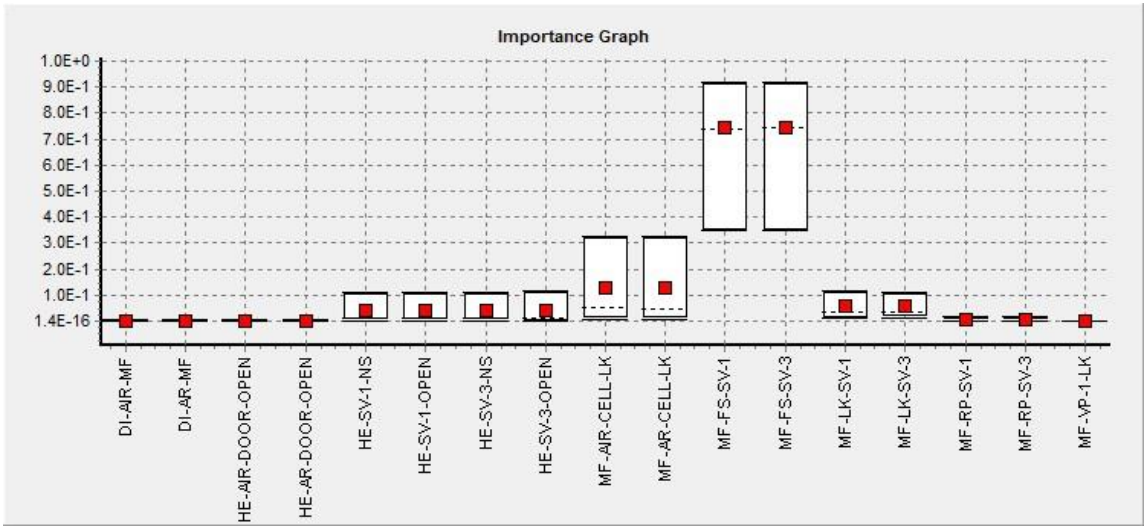


Figure 34: Importance graph for basic system with door interlocks and a diagnostic HE event.

For the system with the highest door fault rate, Bruce B, the mechanical failure of the door is of the greatest importance and the human error of the door plus mechanical failure of door interlocks is of the least importance, shown in Table 44 and Figure 35.

Table 44: Pathways Data w/ Bruce B Fault Rate and Door Interlock

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	6.80E-5	1.09E-4	2.07E-8	8.63E-6	2.32E-4	4.07E-13	9.53E-3
DI-AR-MF	6.80E-5	1.11E-4	2.17E-8	8.97E-6	2.40E-4	1.59E-13	1.25E-2
HE-AIR-DOOR-OPEN	6.80E-5	1.09E-4	2.07E-8	8.63E-6	2.32E-4	4.07E-13	9.53E-3
HE-AR-DOOR-OPEN	6.80E-5	1.11E-4	2.17E-8	8.97E-6	2.40E-4	1.59E-13	1.25E-2
HE-SV-1-NS	1.36E-3	2.46E-3	2.10E-6	5.88E-4	6.52E-3	2.06E-11	1.08E-1
HE-SV-1-OPEN	1.36E-3	2.43E-3	2.23E-6	5.80E-4	6.57E-3	5.78E-11	5.74E-2
HE-SV-3-NS	1.36E-3	2.42E-3	2.24E-6	6.10E-4	6.47E-3	6.94E-13	5.32E-2
HE-SV-3-OPEN	1.36E-3	2.42E-3	1.89E-6	5.86E-4	6.25E-3	6.53E-15	9.56E-2
MF-AIR-CELL-LK	8.89E-1	5.28E-1	9.19E-2	4.87E-1	7.94E-1	9.04E-3	9.56E-1
MF-AR-CELL-LK	8.89E-1	5.28E-1	9.86E-2	4.88E-1	7.95E-1	8.37E-3	9.57E-1
MF-FS-SV-1	3.28E-1	4.95E-1	1.46E-1	4.23E-1	7.79E-1	4.17E-2	9.71E-1
MF-FS-SV-3	3.28E-1	4.95E-1	1.42E-1	4.25E-1	7.77E-1	3.34E-2	9.86E-1
MF-LK-SV-1	1.97E-2	3.53E-2	5.74E-3	2.11E-2	7.17E-2	1.48E-3	3.22E-1
MF-LK-SV-3	1.97E-2	3.52E-2	5.90E-3	2.14E-2	7.15E-2	1.52E-3	3.43E-1
MF-RP-SV-1	2.86E-3	5.00E-3	1.11E-4	1.20E-3	1.14E-2	1.13E-5	2.61E-1
MF-RP-SV-3	2.86E-3	5.10E-3	1.10E-4	1.22E-3	1.15E-2	1.10E-5	2.59E-1
MF-VP-1-LK	1.77E-3	2.14E-3	3.42E-4	1.31E-3	4.25E-3	6.25E-5	2.31E-2

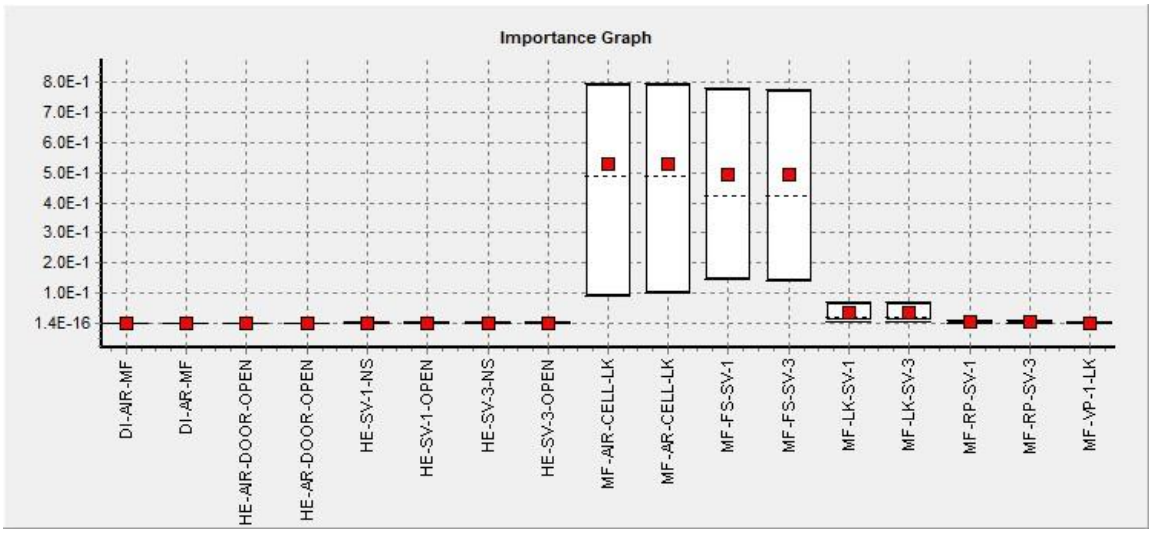


Figure 35: Importance graph for the general system with door interlocks and Bruce B fault rate.

The SV_OL and the SV_DOW fault rates produce a highest importance for the mechanical failure of the door and a lowest importance for the mechanical failure of the door plus the human error of the door. Table 45 is the SV_OL model for the generalized system with door interlocks and Figure 36 is the corresponding importance graph.

Table 45:FV Results for SV_OL Fault Rate for Generalized System with Door Interlocks

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	9.24E-4	2.31E-3	2.54E-7	1.36E-4	4.82E-3	2.96E-12	1.61E-1
DI-AR-MF	9.24E-4	2.53E-3	2.76E-7	1.24E-4	4.94E-3	6.01E-13	3.36E-1
HE-AIR-DOOR-OPEN	9.24E-4	2.31E-3	2.54E-7	1.36E-4	4.82E-3	2.96E-12	1.61E-1
HE-AR-DOOR-OPEN	9.24E-4	2.53E-3	2.76E-7	1.24E-4	4.94E-3	6.01E-13	3.36E-1
HE-SV-1-NS	1.82E-2	4.76E-2	1.78E-5	8.22E-3	1.34E-1	1.21E-12	7.95E-1
HE-SV-1-OPEN	1.82E-2	4.62E-2	2.35E-5	7.79E-3	1.32E-1	4.56E-11	7.46E-1
HE-SV-3-NS	1.82E-2	4.70E-2	2.57E-5	8.27E-3	1.35E-1	9.68E-13	7.71E-1
HE-SV-3-OPEN	1.82E-2	4.67E-2	2.73E-5	8.33E-3	1.32E-1	2.48E-11	7.41E-1
MF-AIR-CELL-LK	8.41E-1	6.94E-1	1.08E-1	6.91E-1	9.64E-1	8.75E-4	9.98E-1
MF-AR-CELL-LK	8.41E-1	6.94E-1	1.13E-1	6.87E-1	9.62E-1	3.79E-4	9.98E-1
MF-SV-1-FFD	1.08E-1	1.78E-1	2.60E-3	5.92E-2	4.99E-1	1.62E-4	9.87E-1
MF-SV-3-FFD	1.08E-1	1.78E-1	2.80E-3	5.88E-2	5.04E-1	1.66E-4	9.96E-1
MF-VP-1-LK	2.72E-2	6.42E-2	5.86E-3	3.50E-2	1.41E-1	6.21E-4	8.24E-1

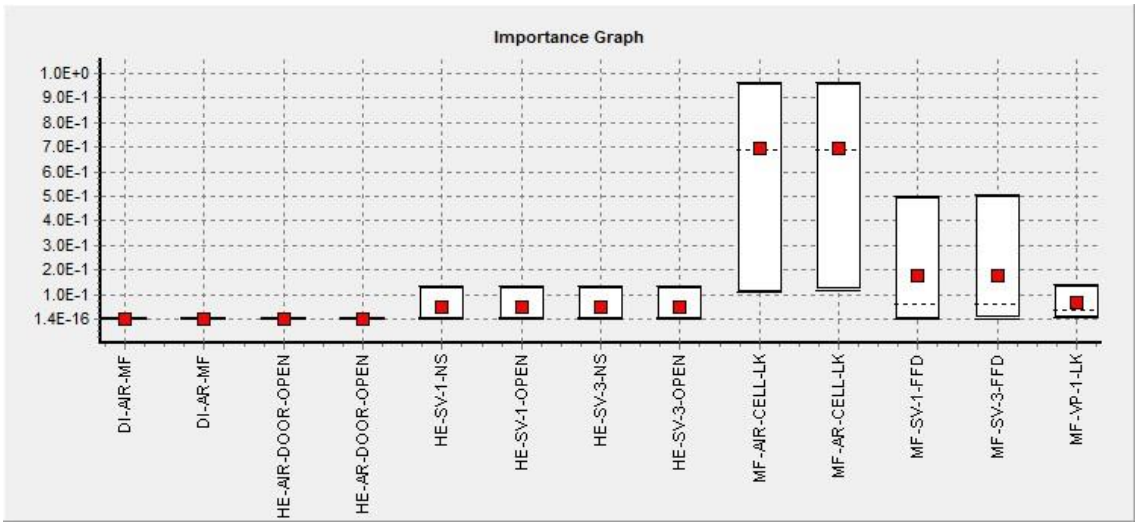


Figure 36: Importance graph for SV_OL fault rate for the basic system with door interlocks

The SV_OH model results were not repeated by another model, but for the basic system with door interlocks, the basic system with door interlocks and Bruce A fault data, the basic system with door interlocks and the Bruce B fault data, and the basic system with door interlocks, Bruce B failure data, and a diagnostic human error event, the fault rate of the least importance belongs to the door interlock failure and the door human error, and the fault rate of the greatest importance belongs to the mechanical failure of the solenoid valves, demonstrated by Table 46 and Figure 37, which shows the importance measures for the basic system with door interlocks for the SV_OH failure rate.

Table 46: FV Results for Generalized System w/ Door Interlocks for SV_OH Fault Rate

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	6.27E-5	1.51E-4	2.13E-8	9.28E-6	3.15E-4	8.92E-13	1.34E-2
DI-AR-MF	6.27E-5	1.69E-4	1.97E-8	8.70E-6	3.00E-4	5.76E-14	4.65E-2
HE-AIR-DOOR-OPEN	6.27E-5	1.51E-4	2.13E-8	9.28E-6	3.15E-4	8.92E-13	1.34E-2
HE-AR-DOOR-OPEN	6.27E-5	1.69E-4	1.97E-8	8.70E-6	3.00E-4	5.76E-14	4.65E-2
HE-SV-1-NS	1.26E-3	3.69E-3	1.47E-6	6.21E-4	8.81E-3	8.02E-14	2.19E-1
HE-SV-1-OPEN	1.26E-3	3.60E-3	1.63E-6	5.79E-4	8.44E-3	8.49E-12	2.47E-1
HE-SV-3-NS	1.26E-3	3.54E-3	1.97E-6	5.97E-4	8.44E-3	2.63E-13	1.73E-1
HE-SV-3-OPEN	1.26E-3	3.56E-3	2.38E-6	5.92E-4	8.27E-3	1.05E-12	1.53E-1
MF-AIR-CELL-LK	5.70E-2	1.08E-1	2.03E-3	2.95E-2	3.03E-1	1.20E-4	9.70E-1
MF-AR-CELL-LK	5.70E-2	1.04E-1	2.11E-3	2.90E-2	2.91E-1	1.04E-4	9.56E-1
MF-SV-1-FFD	9.80E-1	9.04E-1	4.36E-1	9.46E-1	9.96E-1	4.37E-2	1.00E+0
MF-SV-3-FFD	9.80E-1	9.07E-1	4.44E-1	9.46E-1	9.96E-1	4.44E-2	1.00E+0
MF-VP-1-LK	1.17E-4	6.72E-4	8.86E-6	1.31E-4	1.51E-3	6.64E-7	4.78E-2

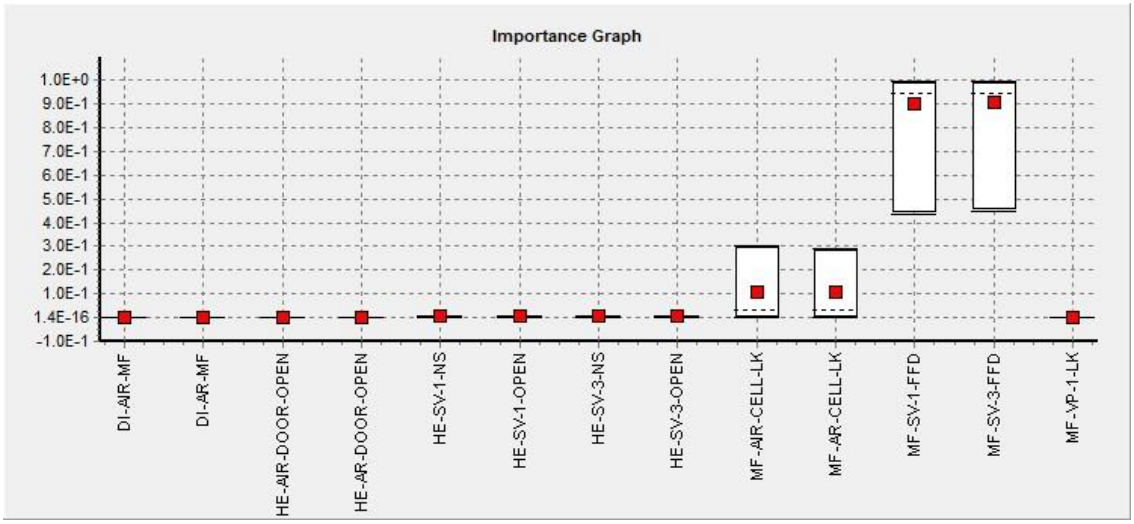


Figure 37: Importance graph for generalized system w/ door interlocks and SV_OH fault rate.

For the SV_OH fault rate, the general model with the diagnostic human error component and the generalized model with the Bruce A failure data and human error, the highest importance applies to the mechanical failure of the solenoid valves and the lowest importance applies to the mechanical failure of the vacuum pump. One example of this behavior is in Table 47 and Figure 38, which gives the SV_OH results for the basic system inclusive of door interlocks and a diagnostic human error component over a one-year period.

Table 47: FV Results for SV_OH Fault Rate, Diagnostic HE, and Door Interlocks

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	6.95E-4	1.58E-3	2.04E-7	8.96E-5	3.25E-3	1.57E-13	1.59E-1
DI-AR-MF	6.95E-4	1.48E-3	1.84E-7	9.41E-5	2.86E-3	1.94E-12	2.85E-1
HE-AIR-DOOR-OPEN	6.95E-4	1.58E-3	2.04E-7	8.96E-5	3.25E-3	1.57E-13	1.59E-1
HE-AR-DOOR-OPEN	6.95E-4	1.48E-3	1.84E-7	9.41E-5	2.86E-3	1.94E-12	2.85E-1
HE-SV-1-NS	1.39E-2	3.20E-2	1.72E-5	6.20E-3	8.42E-2	3.17E-13	8.53E-1
HE-SV-1-OPEN	1.39E-2	3.23E-2	1.77E-5	6.25E-3	8.23E-2	7.86E-13	7.85E-1
HE-SV-3-NS	1.39E-2	3.28E-2	2.04E-5	6.25E-3	8.71E-2	1.50E-10	6.53E-1
HE-SV-3-OPEN	1.39E-2	3.20E-2	1.60E-5	6.19E-3	8.35E-2	3.51E-11	7.13E-1
MF-AIR-CELL-LK	5.73E-2	9.67E-2	2.01E-3	2.69E-2	2.65E-1	5.72E-5	9.58E-1
MF-AR-CELL-LK	5.73E-2	9.90E-2	2.12E-3	2.81E-2	2.69E-1	1.84E-4	9.68E-1
MF-SV-1-FFD	9.72E-1	8.66E-1	3.65E-1	9.04E-1	9.90E-1	3.18E-2	1.00E+0
MF-SV-3-FFD	9.72E-1	8.64E-1	3.62E-1	9.01E-1	9.90E-1	3.57E-2	1.00E+0
MF-VP-1-LK	1.16E-4	5.36E-4	9.26E-6	1.24E-4	1.20E-3	3.39E-7	3.59E-2

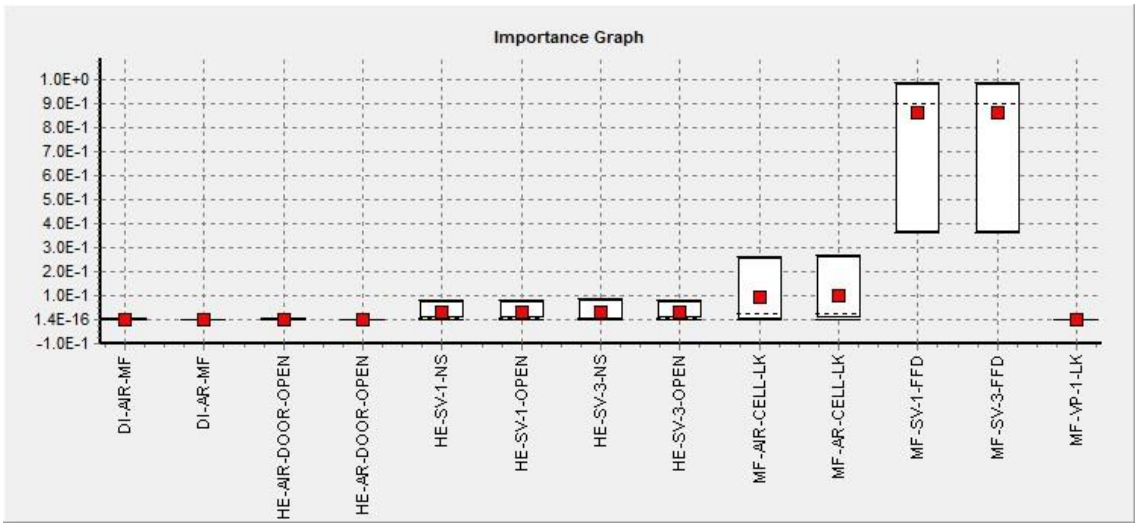


Figure 38: Importance graph for the basic system with SV_OM with diagnostic HE component and door interlocks

For the SV_MAN solenoid valve fault rate, the generalized system, the Bruce A fault rate, and the Bruce B fault rate system, the component of greatest importance is the mechanical failure of the door and the components of least importance are the door interlocks with human error diagnostic capabilities, which is shown in Table 48 and Figure 39 for the basic system with door interlocks.

Table 48: FV for Generalized System, SV_MAN Fault Rate, and Door Interlocks

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	1.03E-3	3.13E-3	2.97E-7	1.66E-4	6.46E-3	2.88E-12	1.92E-1
DI-AR-MF	1.03E-3	3.43E-3	3.36E-7	1.55E-4	6.74E-3	6.47E-13	5.57E-1
HE-AIR-DOOR-OPEN	1.03E-3	3.13E-3	2.97E-7	1.66E-4	6.46E-3	2.88E-12	1.92E-1
HE-AR-DOOR-OPEN	1.03E-3	3.43E-3	3.36E-7	1.55E-4	6.74E-3	6.47E-13	5.57E-1
HE-SV-1-NS	2.03E-2	6.15E-2	2.19E-5	9.95E-3	1.76E-1	1.32E-12	8.42E-1
HE-SV-1-OPEN	2.03E-2	5.97E-2	2.82E-5	9.32E-3	1.72E-1	4.60E-11	8.18E-1
HE-SV-3-NS	2.03E-2	6.03E-2	3.26E-5	1.00E-2	1.77E-1	9.76E-13	9.07E-1
HE-SV-3-OPEN	2.03E-2	6.06E-2	3.32E-5	1.02E-2	1.77E-1	2.69E-11	7.81E-1
MF-AIR-CELL-LK	9.38E-1	8.14E-1	2.53E-1	8.45E-1	9.83E-1	2.13E-2	9.99E-1
MF-AR-CELL-LK	9.38E-1	8.15E-1	2.70E-1	8.44E-1	9.82E-1	1.14E-2	9.99E-1
MF-SV-1-FFD	3.03E-3	1.07E-2	6.44E-5	1.54E-3	2.37E-2	4.01E-6	6.73E-1
MF-SV-3-FFD	3.03E-3	1.00E-2	6.79E-5	1.53E-3	2.40E-2	4.16E-6	8.70E-1
MF-VP-1-LK	3.40E-2	1.02E-1	9.01E-3	5.65E-2	2.21E-1	9.75E-4	8.81E-1

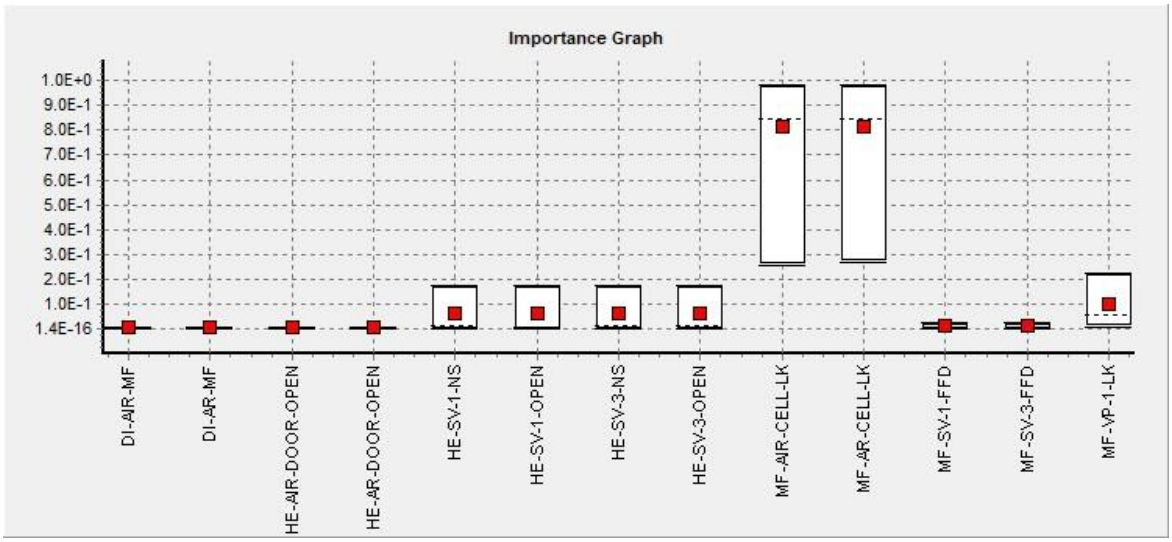


Figure 39: Importance graph for basic system with door interlocks, HE diagnostic event, and SV_MAN fault rate.

The generalized system with a human error component, the Bruce A system with a human error component and the Bruce B system with a human error component all have the same pattern for the SV_MAN results. The component of highest importance is the mechanical failure of the door, but the component of the lowest importance is the mechanical failure of the solenoid valve, which is demonstrated by the results for the SV_MAN results for the generalized system with a diagnostic human error component and is shown in Table 49 and Figure 40.

Table 49: FV for Generalized System w/ Diagnostic HE and SV_MAN Fault Rate

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
DI-AIR-MF	8.03E-3	1.54E-2	1.94E-6	9.43E-4	3.55E-2	3.72E-12	7.02E-1
DI-AR-MF	8.03E-3	1.40E-2	1.69E-6	9.11E-4	3.20E-2	2.63E-11	8.65E-1
HE-AIR-DOOR-OPEN	8.03E-3	1.54E-2	1.94E-6	9.43E-4	3.55E-2	3.72E-12	7.02E-1
HE-AR-DOOR-OPEN	8.03E-3	1.40E-2	1.69E-6	9.11E-4	3.20E-2	2.63E-11	8.65E-1
HE-SV-1-NS	1.59E-1	2.14E-1	2.10E-4	7.28E-2	5.91E-1	6.33E-12	9.85E-1
HE-SV-1-OPEN	1.59E-1	2.19E-1	2.15E-4	7.31E-2	6.07E-1	2.06E-11	9.84E-1
HE-SV-3-NS	1.59E-1	2.17E-1	2.27E-4	7.30E-2	5.90E-1	7.84E-9	9.83E-1
HE-SV-3-OPEN	1.59E-1	2.16E-1	1.98E-4	7.40E-2	5.98E-1	2.33E-10	9.92E-1
MF-AIR-CELL-LK	6.64E-1	5.30E-1	4.32E-2	4.29E-1	9.21E-1	2.49E-3	9.99E-1
MF-AR-CELL-LK	6.64E-1	5.31E-1	4.24E-2	4.36E-1	9.24E-1	1.82E-3	9.99E-1
MF-SV-1-FFD	2.15E-3	4.99E-3	4.99E-5	8.76E-4	1.16E-2	2.72E-6	2.64E-1
MF-SV-3-FFD	2.15E-3	5.31E-3	4.88E-5	8.55E-4	1.17E-2	3.30E-6	4.97E-1
MF-VP-1-LK	1.71E-2	3.35E-2	2.56E-3	1.52E-2	7.44E-2	7.88E-5	6.21E-1

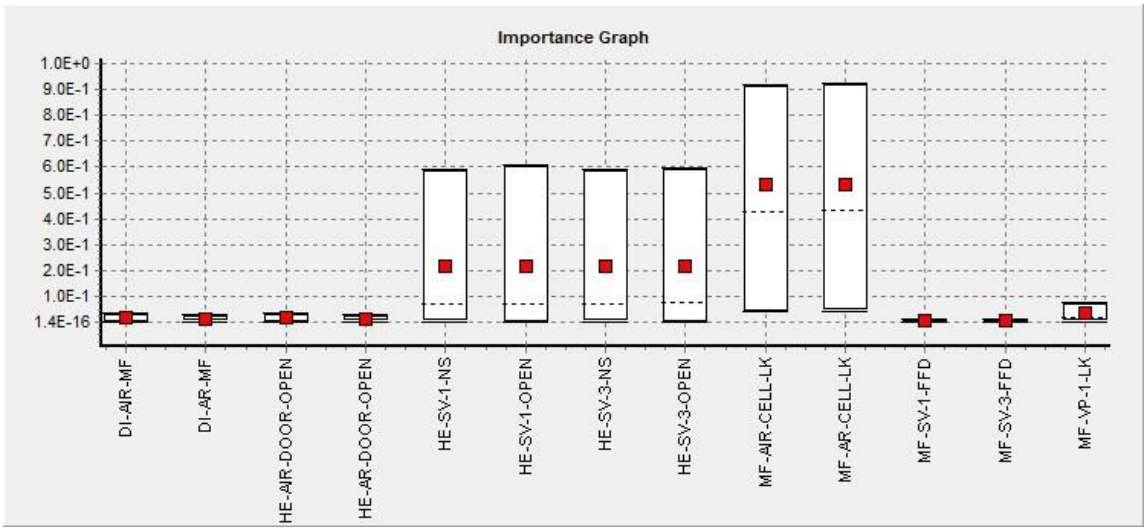


Figure 40: Importance graph for the basic system w/ door interlocks, SV_MAN fault rate, and a diagnostic HE event.

For the SV_NRPD fault rate, the generalized system with door interlocks, the generalized system with door interlocks and Bruce A fault rates, the generalized system with the Bruce A fault rate and a diagnostic human error component, the generalized system with the Bruce B fault rate, and the generalized system with the Bruce B fault rate and a diagnostic human error component all have the door interlocks and human error of the door as the lowest importance and the solenoid valves were of the highest importance, shown in Table 50 and Figure 41 which use the generalized system with door interlocks and the initial fault rate data.

Table 50: FV Generalized System w/ Door Interlocks for SV_NRPD

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	2.75E-4	7.12E-4	8.75E-8	3.89E-5	1.48E-3	2.81E-12	5.27E-2
DI-AR-MF	2.75E-4	7.82E-4	7.51E-8	3.62E-5	1.45E-3	2.17E-13	2.37E-1
HE-AIR-DOOR-OPEN	2.75E-4	7.12E-4	8.75E-8	3.89E-5	1.48E-3	2.81E-12	5.27E-2
HE-AR-DOOR-OPEN	2.75E-4	7.82E-4	7.51E-8	3.62E-5	1.45E-3	2.17E-13	2.37E-1
HE-SV-1-NS	5.49E-3	1.63E-2	5.93E-6	2.52E-3	4.25E-2	3.83E-13	4.99E-1
HE-SV-1-OPEN	5.49E-3	1.58E-2	6.40E-6	2.36E-3	4.15E-2	3.67E-11	5.39E-1
HE-SV-3-NS	5.49E-3	1.59E-2	8.19E-6	2.43E-3	4.24E-2	7.91E-13	5.18E-1
HE-SV-3-OPEN	5.49E-3	1.58E-2	9.05E-6	2.51E-3	4.08E-2	7.99E-12	4.50E-1
MF-AIR-CELL-LK	2.50E-1	3.24E-1	8.25E-3	1.65E-1	7.77E-1	1.80E-4	9.93E-1
MF-AR-CELL-LK	2.50E-1	3.21E-1	8.51E-3	1.65E-1	7.67E-1	1.04E-4	9.93E-1
MF-SV-1-FFD	7.44E-1	6.41E-1	6.25E-2	6.13E-1	9.59E-1	4.01E-3	9.99E-1
MF-SV-3-FFD	7.44E-1	6.44E-1	6.57E-2	6.15E-1	9.60E-1	4.08E-3	9.99E-1
MF-VP-1-LK	2.38E-3	9.55E-3	1.35E-4	2.80E-3	2.37E-2	8.68E-6	3.10E-1

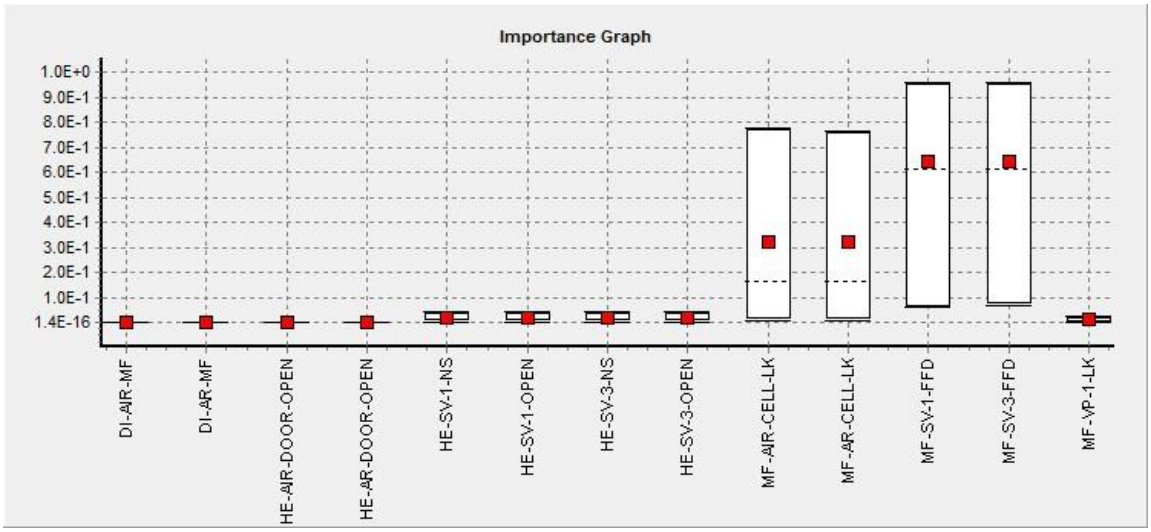


Figure 41: Importance measures for SV_NRPD fault rate for basic system with door interlocks.

For the SV_NRPD fault rate and the generalized system with door interlocks, initial failure rate data, and a diagnostic human error component, the highest importance component was the mechanical failure of the solenoid valves and the lowest importance was the mechanical failure of the vacuum pump. Table 51 and Figure 42 display results for the SV_NRPD fault rate and a diagnostic human error component. Notice in the graph that the human error is substantially larger than the previous model.

Table 51: Generalized System with Door Interlocks for SV_NRPD Fault Rate and Diagnostic Human Error

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
DI-AIR-MF	2.73E-3	5.61E-3	7.68E-7	3.23E-4	1.24E-2	1.97E-13	4.31E-1
DI-AR-MF	2.73E-3	5.12E-3	5.94E-7	3.26E-4	1.09E-2	7.38E-12	6.22E-1
HE-AIR-DOOR-OPEN	2.73E-3	5.61E-3	7.68E-7	3.23E-4	1.24E-2	1.97E-13	4.31E-1
HE-AR-DOOR-OPEN	2.73E-3	5.12E-3	5.94E-7	3.26E-4	1.09E-2	7.38E-12	6.22E-1
HE-SV-1-NS	5.46E-2	9.72E-2	5.95E-5	2.32E-2	2.80E-1	6.67E-13	9.55E-1
HE-SV-1-OPEN	5.46E-2	9.79E-2	6.89E-5	2.31E-2	2.81E-1	2.30E-12	9.37E-1
HE-SV-3-NS	5.46E-2	9.94E-2	7.72E-5	2.32E-2	2.91E-1	4.96E-10	9.12E-1
HE-SV-3-OPEN	5.46E-2	9.80E-2	6.26E-5	2.29E-2	2.83E-1	1.38E-10	9.05E-1
MF-AIR-CELL-LK	2.26E-1	2.57E-1	7.43E-3	1.18E-1	6.47E-1	1.93E-4	9.88E-1
MF-AR-CELL-LK	2.26E-1	2.61E-1	7.49E-3	1.22E-1	6.56E-1	1.83E-4	9.91E-1
MF-SV-1-FFD	6.72E-1	5.45E-1	4.81E-2	4.62E-1	9.12E-1	2.81E-3	9.96E-1
MF-SV-3-FFD	6.72E-1	5.39E-1	4.67E-2	4.58E-1	9.13E-1	3.24E-3	9.97E-1
MF-VP-1-LK	1.96E-3	5.38E-3	1.21E-4	1.83E-3	1.30E-2	4.40E-6	2.15E-1

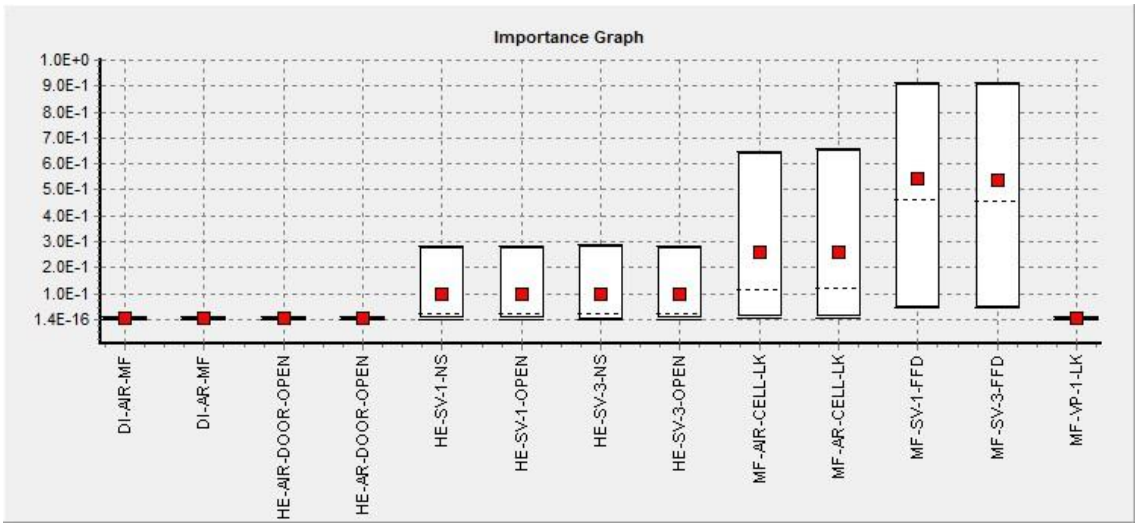


Figure 42: Importance graph for the basic system with door interlocks, SV_NRPD fault rate, and diagnosis HE event.

The SV_MAN fault rate is so low that it pushes the importance of the component to the lowest, which is the only time where the solenoid valve is of the lowest importance and is notable since, for the original solenoid valve data, SV_OM, SV_OH, and SV_NRPD, the solenoid valves had the greatest importance. SV_OL and SV_DOW are the only two where, for all of the permutations of the data, there was the same order of importance.

3.2.3 Uncertainty Discussion

As mentioned in the prior section for the configuration without door interlocks, there is a significant spread in the failure probabilities that results in difficulty determining the actual accuracy of the results. Even when the spread is somewhat mitigated, some probabilities are somewhat questionable and possibly overly conservative, as with the Bruce B door fault rate.

Again, the PDF and CDF are shown in Figure 43 and Figure 44 for a one-year interval, but with the original failure data for the generalized system with a door interlock

modification. The models with the door interlocks are nearly identical to the generalized system without door interlocks.

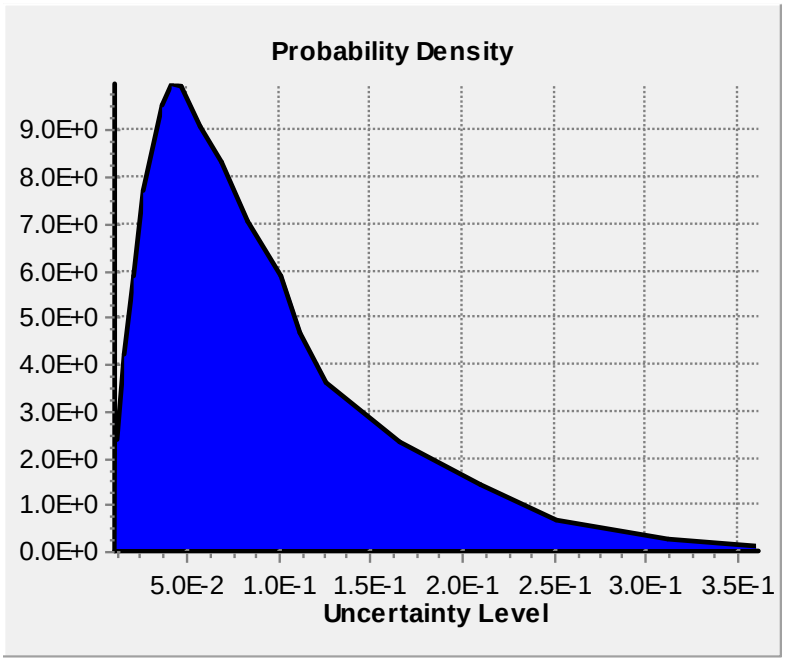


Figure 43: PDF distribution for the generalized system with door interlocks.

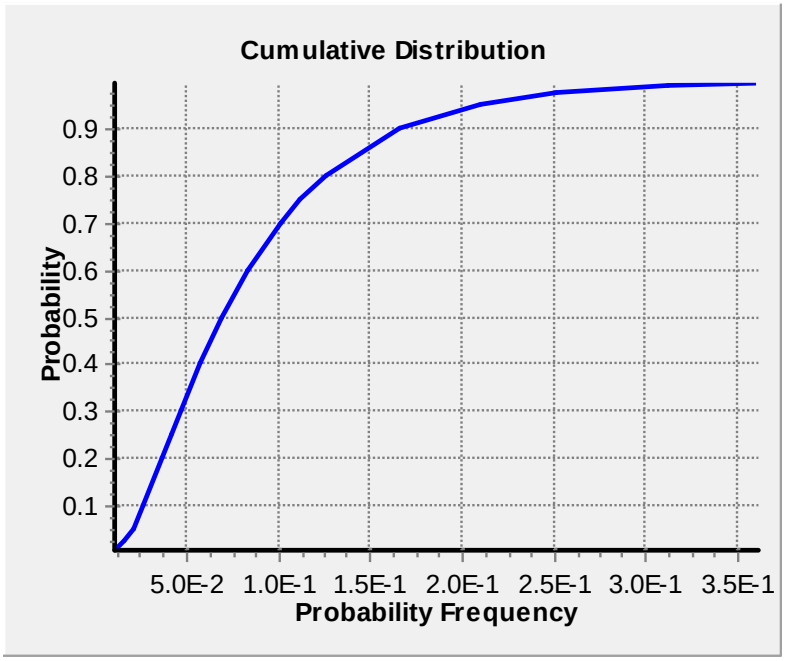


Figure 44: CDF distribution for the generalized system with door interlocks

3.3 Extended System

3.3.1 Failure Probability Results

The probabilistic improvement in adding extra solenoid valves into the system is approximately a factor of ten for the one-day interval, then it reduces to just short of a factor of ten to the one-year interval. For the original fault rate data, the results for SV_OH over the one-day interval was 1.07 times the SV_MAN results, 19.8 times the results for a one-month interval, and 217 times the SV_MAN results for the one-year interval, which is somewhat different from the original generalized system in that the difference between SV_OH and SV_MAN is reduced. For the one-year interval, the range of the chance of an air ingress event is between 0.215% and 46.6%. The results for the one-day, one-month, and one-year and the corresponding standard deviation is given in Table 52.

Table 52: Failure Results for the Extended System

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	1.35E-06	2.99E-06	4.07E-05	7.74E-05	1.66E-02	1.51E-02
SV_OL	1.34E-06	3.12E-06	2.35E-05	6.84E-05	2.16E-03	5.91E-03
SV_OM	1.36E-06	3.13E-06	3.80E-05	1.05E-04	2.81E-02	2.19E-02
SV_OH	1.43E-06	3.20E-06	4.64E-04	8.86E-04	4.66E-01	1.17E-01
SV_DOW	1.34E-06	3.12E-06	2.35E-05	6.84E-05	2.16E-03	5.91E-03
SV_MAN	1.34E-06	2.95E-06	2.34E-05	6.84E-05	2.15E-03	5.90E-03
SV_NRPD	1.35E-06	3.12E-06	2.53E-05	7.09E-05	4.23E-03	8.03E-03

When adding in a diagnostic human error component, SV_OH becomes 1.04 times larger for the one-day interval, 5.87 times larger for the one-month interval, and 154 times larger for the one-year interval, which is, again, a reduction in value for the one-month interval as compared to the generalized system. The highest chance of an air ingress event over a one-year interval, from the results reported in Table 53, is 46.6% and the lowest chance is

0.215%. It should also be noted that the results here are only slightly higher than the previous data.

Table 53: Failure Results for Extended System w/ Diagnostic HE Event

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	1.36E-04	3.74E-04	3.19E-04	5.33E-04	2.24E-02	1.87E-02
SV_OL	1.35E-04	3.06E-04	2.35E-04	4.49E-04	3.27E-03	6.89E-03
SV_OM	1.37E-04	3.07E-04	3.25E-04	5.31E-04	3.66E-02	2.45E-02
SV_OH	1.41E-04	3.10E-04	1.38E-03	1.83E-03	4.99E-01	1.21E-01
SV_DOW	1.35E-04	3.06E-04	2.35E-04	4.49E-04	3.27E-03	6.89E-03
SV_MAN	1.35E-04	3.06E-04	2.35E-04	4.49E-04	3.23E-03	6.87E-03
SV_NRPD	1.36E-04	3.06E-04	2.55E-04	4.63E-04	6.54E-03	9.55E-03

The overall contribution of human error for the extended system that is inclusive of a diagnostic human error component is dominant. For the original mode over one day, the difference is a factor of 100 and for the extended system with a diagnostic human error event included, a factor of 10,000. The results for Table 53 are more in line with the presumed behavior that for a fuel cycle facility, the human errors will dominate. However, for the one-year interval, the human error accounts for significantly more. Table 54 represents the mechanical failure rates for the extended system without any modifications.

Table 54: Mechanical Failure Results for Extended System

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	2.44E-08	8.07E-08	2.78E-05	7.52E-05	1.61E-02	1.56E-02
SV_OL	2.42E-08	5.84E-08	1.47E-05	4.67E-05	2.06E-03	4.94E-03
SV_OM	2.46E-08	5.89E-08	2.53E-05	7.23E-05	2.73E-02	2.11E-02
SV_OH	3.09E-08	7.35E-08	4.01E-04	9.06E-04	4.63E-01	1.18E-01
SV_DOW	2.42E-08	5.84E-08	1.47E-05	4.67E-05	2.06E-03	4.94E-03
SV_MAN	2.42E-08	7.19E-08	1.47E-05	4.67E-05	2.06E-03	4.94E-03
SV_NRPD	2.42E-08	5.85E-08	1.58E-05	4.80E-05	4.03E-03	6.74E-03

For the Bruce B fault rate and the extended system, the chance that an air ingress event occurs is between 60.4% and 95.1%. The SV_OH results, shown in Table 55, are 1.03

times the SV_MAN results for the one-day interval, 1.37 times the SV_MAN results for the one-month interval, and 1.57 times the SV_MAN results for the one-year interval. Compared to the original system configuration, the extended system only improves the system a very small amount.

Table 55: Extended System with Bruce B Fault Rate

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	2.58E-05	5.06E-06	1.37E-02	1.04E-03	6.49E-01	8.97E-02
SV_OL	2.58E-05	5.26E-06	1.34E-02	1.03E-03	5.97E-01	7.74E-02
SV_OM	2.59E-05	5.27E-06	1.37E-02	1.09E-03	6.74E-01	9.86E-02
SV_OH	2.62E-05	5.34E-06	1.74E-02	2.55E-03	9.44E-01	1.82E-01
SV_DOW	2.58E-05	5.26E-06	1.34E-02	1.03E-03	5.97E-01	7.74E-02
SV_MAN	2.58E-05	5.26E-06	1.34E-02	1.03E-03	5.97E-01	7.74E-02
SV_NRPD	2.58E-05	5.26E-06	1.34E-02	1.03E-03	6.09E-01	8.05E-02

When a diagnostic human error component was added to the models, the failure probability was increased from the prior system by a factor of 10 for the one-day interval, and then only slightly for the one-month and one-year intervals, as represented in Table 56. The results for the SV_OH fault rate is 1.03 times the results for SV_MAN for the one-day interval, 1.37 times SV_MAN results for the one-month interval, and 1.57 times the SV_MAN results for the one-year interval. From the results reported in Table 56, the highest chance that the system fails is 95.1% and the lowest chance is 60.4%.

Table 56: Extended System with Bruce B Fault Rate and Diagnostic HE Comp

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	2.43E-04	3.67E-04	1.65E-02	1.73E-03	6.62E-01	9.23E-02
SV_OL	2.42E-04	3.65E-04	1.59E-02	1.65E-03	6.04E-01	7.69E-02
SV_OM	2.44E-04	3.66E-04	1.65E-02	1.80E-03	6.89E-01	1.00E-01
SV_OH	2.49E-04	3.70E-04	2.17E-02	3.80E-03	9.51E-01	1.84E-01
SV_DOW	2.42E-04	3.65E-04	1.59E-02	1.65E-03	6.04E-01	7.69E-02
SV_MAN	2.42E-04	3.65E-04	1.58E-02	1.65E-03	6.04E-01	7.69E-02
SV_NRPD	2.43E-04	3.65E-04	1.60E-02	1.68E-03	6.19E-01	8.08E-02

The results for the mechanical failure of the Bruce B fault rate for the system indicate that mechanical failures almost completely dominate the failure probability for the original system with an action only human error event model, and are a majority of the probability for the original system with the action plus diagnostic human error event model, which are shown in Table 57.

Table 57: Mechanical Failure Results for Extended System with Bruce B Fault Rate

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	1.66E-05	1.18E-06	1.35E-02	1.01E-03	6.48E-01	8.99E-02
SV_OL	1.66E-05	1.16E-06	1.31E-02	9.71E-04	5.97E-01	7.52E-02
SV_OM	1.66E-05	1.16E-06	1.34E-02	1.04E-03	6.73E-01	9.70E-02
SV_OH	1.68E-05	1.20E-06	1.70E-02	2.44E-03	9.44E-01	1.80E-01
SV_DOW	1.66E-05	1.16E-06	1.31E-02	9.71E-04	5.97E-01	7.52E-02
SV_MAN	1.66E-05	1.17E-06	1.31E-02	9.71E-04	5.97E-01	7.52E-02
SV_NRPD	1.66E-05	1.16E-06	1.32E-02	9.76E-04	6.08E-01	7.87E-02

The Bruce A fault rate data for the extended system produced the results in Table 58. The highest chance of failure for a year is about 59.3% and the lowest chance of failure over a year is 4.26%. The results for SV_OH are 1.05 times those of SV_MAN for one day, 3.40 times the results for SV_MAN for one month, and 13.9 times the results for SV_MAN for one year. When comparing the results of the extended configuration with Bruce A door seal fault rate to the original configuration with Bruce A door seal fault rate, there are only very slight improvements.

Table 58: Results for Extended Pathways with Bruce A Fault Rate

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	2.78E-06	3.71E-06	4.54E-04	3.77E-04	8.13E-02	4.42E-01
SV_OL	2.76E-06	3.89E-06	3.91E-04	3.62E-04	4.26E-02	3.12E-02
SV_OM	2.78E-06	3.90E-06	4.45E-04	3.98E-04	1.04E-01	4.97E-02
SV_OH	2.89E-06	3.97E-06	1.33E-03	1.30E-03	5.93E-01	1.42E-01
SV_DOW	2.76E-06	3.89E-06	3.91E-04	3.62E-04	4.26E-02	3.12E-02
SV_MAN	2.76E-06	3.88E-06	3.91E-04	3.61E-04	4.26E-02	3.12E-02
SV_NRPD	2.77E-06	3.89E-06	3.89E-04	3.65E-04	5.03E-02	3.38E-02

The results for the extended system configuration that utilized the Bruce A fault rate and included the diagnosis portion of the human error model are given in Table 59. The highest chance of failure over a year, from the results reported in Table 59, is 62.3% and the lowest chance of failure over a year is 4.69%. The SV_OH results are 1.04 times SV_MAN for one day, 2.95 times SV_MAN for one month, and 13.3 times SV_MAN for one year. The overall failure probability was again, only lowered slightly compared to the previous models.

Table 59: Extended Pathways for Bruce A Fault Rate and Diagnostic HE

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	1.48E-04	3.30E-04	1.07E-03	8.99E-04	9.30E-02	4.80E-02
SV_OL	1.47E-04	3.40E-04	9.16E-04	8.28E-04	4.70E-02	3.19E-02
SV_OM	1.49E-04	3.41E-04	1.09E-03	9.41E-04	1.19E-01	5.37E-02
SV_OH	1.53E-04	3.44E-04	2.70E-03	2.41E-03	6.23E-01	1.51E-01
SV_DOW	1.47E-04	3.40E-04	9.16E-04	8.28E-04	4.70E-02	3.19E-02
SV_MAN	1.47E-04	3.40E-04	9.14E-04	8.28E-04	4.69E-02	3.18E-02
SV_NRPD	1.48E-04	3.40E-04	9.54E-04	8.48E-04	5.73E-02	3.53E-02

The results for the mechanical failure indicate that a majority of the overall failure probability for a one-year interval belong to mechanical failure events and may be seen in Table 60.

Table 60: Mechanical Failure of Ext. System with Bruce A Fault Rate and Diagnostic HE Comp

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	4.34E-07	4.18E-07	4.08E-04	3.70E-04	8.02E-02	4.46E-02
SV_OL	4.33E-07	3.96E-07	3.52E-04	3.32E-04	4.22E-02	3.00E-02
SV_OM	4.35E-07	3.97E-07	3.98E-04	3.61E-04	1.02E-01	4.75E-02
SV_OH	4.61E-07	4.12E-07	1.22E-03	1.20E-03	5.90E-01	1.41E-01
SV_DOW	4.33E-07	3.96E-07	3.52E-04	3.32E-04	4.22E-02	3.00E-02
SV_MAN	4.33E-07	3.88E-07	3.52E-04	3.32E-04	4.22E-02	3.00E-02
SV_NRPD	4.34E-07	3.96E-07	3.57E-04	3.34E-04	4.97E-02	3.24E-02

3.3.2 Fussell-Vesely

The configuration of the extended pathways system that utilized original failure data and the configuration that utilized the original failure data and included a diagnostic human error event, had mechanical error of SV_A as the component of the lowest importance, and the mechanical failure of SV_B, SV_C, SV_D, and SV_E as the components of the greatest importance, whose data appear in Table 61 and Figure 45. SV_A is located by VP_A in the extended system, which was often the lowest-calculated importance measure for the original configuration.

Table 61: FV for Extended System and Original Fault Rate

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	7.79E-3	1.33E-2	9.69E-6	2.89E-3	3.51E-2	1.61E-12	3.61E-1
HE-AR-OP	7.80E-3	1.36E-2	9.80E-6	2.78E-3	3.59E-2	2.79E-11	4.30E-1
HE-SV-B-LO	2.12E-3	2.97E-3	1.87E-6	6.65E-4	7.98E-3	1.03E-12	8.37E-2
HE-SV-B-OP	2.12E-3	2.99E-3	2.44E-6	6.50E-4	7.93E-3	9.57E-10	7.96E-2
HE-SV-C-LO	2.12E-3	2.95E-3	2.23E-6	6.22E-4	7.97E-3	1.47E-10	7.84E-2
HE-SV-C-OP	2.12E-3	2.89E-3	2.15E-6	6.18E-4	7.91E-3	2.29E-11	8.42E-2
HE-SV-D-LO	2.12E-3	3.01E-3	2.08E-6	6.74E-4	7.94E-3	6.81E-12	1.09E-1
HE-SV-D-OP	2.12E-3	2.88E-3	2.60E-6	6.32E-4	7.68E-3	9.28E-14	9.82E-2
HE-SV-E-LO	2.12E-3	3.02E-3	2.63E-6	6.46E-4	8.13E-3	5.16E-11	7.22E-2
HE-SV-E-OP	2.12E-3	2.90E-3	2.30E-6	6.51E-4	7.87E-3	4.29E-13	7.09E-2
MF-AIR-LK	3.53E-1	2.99E-1	1.38E-2	1.70E-1	6.86E-1	7.82E-4	9.87E-1
MF-AR-LK	3.53E-1	3.03E-1	1.41E-2	1.75E-1	6.85E-1	4.99E-4	9.82E-1
MF-SV-A-FS	6.20E-4	9.39E-4	1.48E-5	2.43E-4	2.23E-3	8.91E-7	5.70E-2
MF-SV-A-LK	3.55E-5	5.86E-5	7.69E-7	1.42E-5	1.36E-4	6.59E-8	9.72E-3
MF-SV-A-RP	5.14E-6	8.16E-6	2.41E-8	8.52E-7	1.68E-5	6.56E-10	1.60E-3
MF-SV-B-FS	5.35E-1	5.70E-1	1.09E-1	5.43E-1	8.24E-1	9.39E-3	9.41E-1
MF-SV-B-LK	3.07E-2	4.20E-2	4.74E-3	2.41E-2	8.77E-2	5.00E-4	4.71E-1
MF-SV-B-RP	4.45E-3	6.12E-3	1.02E-4	1.36E-3	1.44E-2	3.68E-6	3.10E-1
MF-SV-C-FS	5.35E-1	5.70E-1	1.10E-1	5.42E-1	8.24E-1	8.25E-3	9.50E-1
MF-SV-C-LK	3.07E-2	4.19E-2	4.38E-3	2.39E-2	8.78E-2	3.10E-4	4.85E-1
MF-SV-C-RP	4.45E-3	6.05E-3	9.23E-5	1.43E-3	1.38E-2	7.61E-6	2.63E-1

Name	Point Est.	Mean	5th	50th	95th	Min	Max
MF-SV-D-FS	5.35E-1	5.69E-1	1.06E-1	5.43E-1	8.25E-1	9.50E-3	9.43E-1
MF-SV-D-LK	3.07E-2	4.13E-2	4.46E-3	2.37E-2	8.83E-2	5.44E-4	4.46E-1
MF-SV-D-RP	4.45E-3	5.71E-3	1.03E-4	1.33E-3	1.30E-2	2.24E-6	4.18E-1
MF-SV-E-FS	5.35E-1	5.68E-1	1.04E-1	5.41E-1	8.22E-1	1.50E-2	9.52E-1
MF-SV-E-LK	3.07E-2	4.17E-2	4.64E-3	2.39E-2	8.71E-2	4.96E-4	3.66E-1
MF-SV-E-RP	4.45E-3	6.39E-3	1.01E-4	1.35E-3	1.40E-2	2.40E-6	7.29E-1
MF-VP-A-LK	6.61E-4	1.01E-3	1.67E-5	2.67E-4	2.38E-3	1.01E-6	6.68E-2
SV-B-C_CCF	6.96E-2	6.52E-2	1.48E-2	5.64E-2	1.04E-1	1.79E-3	2.17E-1
SV-D-E_CCF	6.96E-2	6.46E-2	1.46E-2	5.51E-2	1.03E-1	2.02E-3	2.33E-1

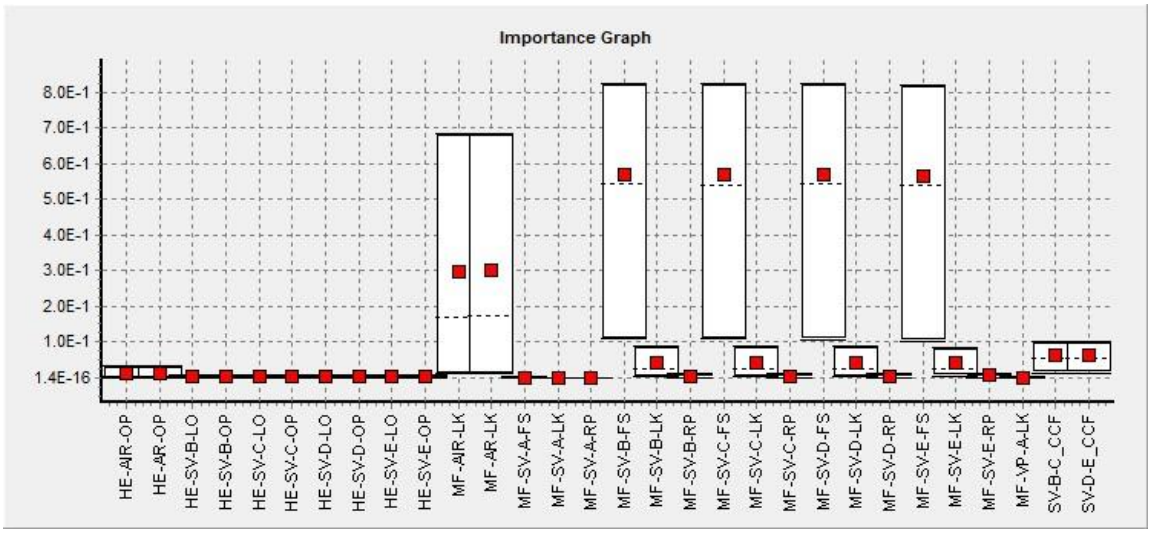


Figure 45: Importance graph for the extended system.

The configuration for this original system but different door fault rates, both including and not including a diagnostic human error event, calculated mechanical failure of the doors as the most important and mechanical failure of the SV_A as the lowest importance, which is shown in Table 62 and Figure 46.

Table 62: FV for Extended System w/ Bruce B Fault Rate

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	1.32E-3	4.01E-3	3.00E-6	8.44E-4	1.03E-2	3.60E-10	3.06E-1
HE-AR-OP	1.32E-3	4.16E-3	3.84E-6	9.56E-4	1.08E-2	8.21E-13	1.06E-1
HE-SV-B-LO	3.59E-4	1.02E-3	6.01E-7	1.92E-4	2.65E-3	1.86E-12	5.46E-2
HE-SV-B-OP	3.59E-4	9.93E-4	7.08E-7	1.95E-4	2.57E-3	4.69E-13	3.91E-2
HE-SV-C-LO	3.59E-4	9.86E-4	4.96E-7	1.83E-4	2.59E-3	4.50E-14	3.02E-2
HE-SV-C-OP	3.59E-4	9.69E-4	6.99E-7	1.82E-4	2.49E-3	7.69E-12	6.06E-2
HE-SV-D-LO	3.59E-4	9.90E-4	6.64E-7	1.88E-4	2.64E-3	1.20E-13	3.93E-2
HE-SV-D-OP	3.59E-4	9.93E-4	6.77E-7	1.98E-4	2.61E-3	6.81E-12	4.38E-2
HE-SV-E-LO	3.59E-4	9.75E-4	7.92E-7	2.00E-4	2.49E-3	1.62E-11	2.82E-2
HE-SV-E-OP	3.59E-4	9.42E-4	6.02E-7	1.98E-4	2.56E-3	9.08E-12	2.68E-2
MF-AIR-LK	9.59E-1	7.58E-1	2.48E-1	7.70E-1	9.44E-1	2.96E-2	9.94E-1
MF-AR-LK	9.59E-1	7.65E-1	2.69E-1	7.82E-1	9.42E-1	3.14E-2	9.91E-1
MF-SV-A-FS	2.64E-4	6.54E-4	3.92E-5	2.61E-4	1.44E-3	5.13E-6	2.20E-2
MF-SV-A-LK	1.51E-5	3.99E-5	2.10E-6	1.47E-5	8.97E-5	1.46E-7	2.77E-3
MF-SV-A-RP	2.19E-6	5.58E-6	4.84E-8	8.82E-7	1.11E-5	9.99E-10	1.14E-3
MF-SV-B-FS	9.00E-2	2.15E-1	2.60E-2	1.29E-1	4.65E-1	4.05E-3	8.61E-1
MF-SV-B-LK	5.19E-3	1.45E-2	1.36E-3	7.02E-3	3.11E-2	2.64E-4	2.60E-1
MF-SV-B-RP	7.53E-4	2.21E-3	2.77E-5	4.30E-4	4.78E-3	1.13E-6	1.36E-1
MF-SV-C-FS	9.00E-2	2.16E-1	2.63E-2	1.30E-1	4.69E-1	2.95E-3	9.06E-1
MF-SV-C-LK	5.19E-3	1.41E-2	1.25E-3	6.81E-3	3.07E-2	3.06E-4	3.57E-1
MF-SV-C-RP	7.53E-4	2.00E-3	2.94E-5	3.97E-4	4.47E-3	2.35E-6	1.73E-1

Name	Point Est.	Mean	5th	50th	95th	Min	Max
MF-SV-D-FS	9.00E-2	2.09E-1	2.70E-2	1.26E-1	4.51E-1	5.64E-3	8.99E-1
MF-SV-D-LK	5.19E-3	1.43E-2	1.35E-3	6.81E-3	3.10E-2	2.67E-4	3.17E-1
MF-SV-D-RP	7.53E-4	2.09E-3	2.63E-5	4.07E-4	4.85E-3	1.62E-6	1.65E-1
MF-SV-E-FS	9.00E-2	2.10E-1	2.67E-2	1.27E-1	4.56E-1	3.50E-3	8.93E-1
MF-SV-E-LK	5.19E-3	1.39E-2	1.29E-3	6.73E-3	3.08E-2	3.00E-4	2.79E-1
MF-SV-E-RP	7.53E-4	2.05E-3	2.96E-5	4.05E-4	4.54E-3	1.62E-6	3.90E-1
MF-VP-A-LK	2.82E-4	7.00E-4	4.50E-5	2.85E-4	1.53E-3	6.11E-6	2.30E-2
SV-B-C_CCF	1.18E-2	2.23E-2	4.58E-3	1.47E-2	4.41E-2	1.68E-3	1.29E-1
SV-D-E_CCF	1.18E-2	2.18E-2	4.83E-3	1.45E-2	4.28E-2	1.60E-3	1.41E-1

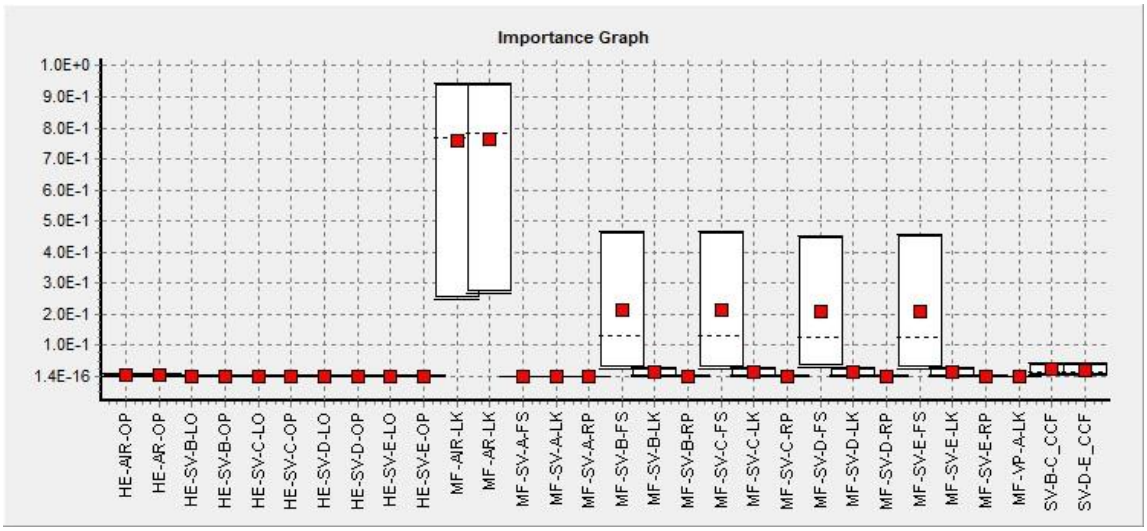


Figure 46: Importance graph for Bruce B fault rate for the extended system.

For the SV_OL, SV_DOW, and SV_MAN, all of the models produced the same result with the highest importance being the mechanical door failure probability and the lowest importance being the mechanical failure of SV-A and VP-A. As mentioned before, SV_A and VP_A are located next to each other and relate to a previously, often-occurring lowest

importance. One reason why only SV-A is the lowest for the original failure is because the failure rate gets broken up between SV-A rupturing, the lowest, SV-A failing to shut, and SV-A leaking. An example of SV_A and VP_A having the lowest importance is given in Table 63 and Figure 42.

Table 63: FV for Extended Pathways with SV_OL Fault Rate

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	2.15E-2	7.65E-2	3.23E-5	1.14E-2	2.31E-1	2.58E-10	9.57E-1
HE-AR-OP	2.15E-2	8.03E-2	3.87E-5	1.26E-2	2.39E-1	6.86E-11	9.63E-1
HE-SV-B-LO	1.71E-4	8.12E-4	1.02E-7	4.72E-5	1.55E-3	0.00E+0	1.57E-1
HE-SV-B-OP	1.71E-4	8.27E-4	1.27E-7	4.82E-5	1.62E-3	0.00E+0	2.30E-1
HE-SV-C-LO	1.71E-4	8.99E-4	1.39E-7	4.69E-5	1.61E-3	0.00E+0	2.10E-1
HE-SV-C-OP	1.71E-4	8.21E-4	1.27E-7	5.01E-5	1.65E-3	2.70E-11	1.30E-1
HE-SV-D-LO	1.71E-4	8.55E-4	1.21E-7	4.60E-5	1.62E-3	5.42E-13	1.12E-1
HE-SV-D-OP	1.71E-4	7.70E-4	1.59E-7	4.91E-5	1.61E-3	1.58E-12	8.61E-2
HE-SV-E-LO	1.71E-4	8.35E-4	9.62E-8	4.54E-5	1.60E-3	8.67E-13	3.27E-1
HE-SV-E-OP	1.71E-4	8.38E-4	1.20E-7	4.75E-5	1.70E-3	6.08E-13	1.60E-1
MF-AIR-LK	9.76E-1	9.15E-1	4.73E-1	9.57E-1	9.98E-1	2.94E-2	1.00E+0
MF-AR-LK	9.77E-1	9.12E-1	4.50E-1	9.52E-1	9.98E-1	2.97E-2	1.00E+0
MF-SV-A-FFD	1.12E-4	5.36E-4	1.61E-6	4.90E-5	1.00E-3	9.07E-8	1.17E-1
MF-SV-B-FFD	1.01E-3	4.29E-3	8.41E-6	3.28E-4	8.31E-3	2.32E-7	3.90E-1
MF-SV-C-FFD	1.01E-3	4.21E-3	8.20E-6	3.36E-4	7.76E-3	1.29E-7	3.65E-1
MF-SV-D-FFD	1.01E-3	4.64E-3	7.66E-6	3.29E-4	8.42E-3	1.19E-7	7.29E-1
MF-SV-E-FFD	1.01E-3	4.59E-3	8.16E-6	3.25E-4	8.37E-3	1.61E-7	7.32E-1
MF-VP-A-LK	1.12E-4	5.36E-4	1.61E-6	4.90E-5	1.00E-3	9.07E-8	1.17E-1
SV-B-C_CCF	6.08E-4	2.06E-3	5.29E-5	5.83E-4	4.56E-3	5.41E-6	1.25E-1
SV-D-E_CCF	6.08E-4	1.97E-3	5.41E-5	5.96E-4	4.61E-3	6.62E-6	7.56E-2

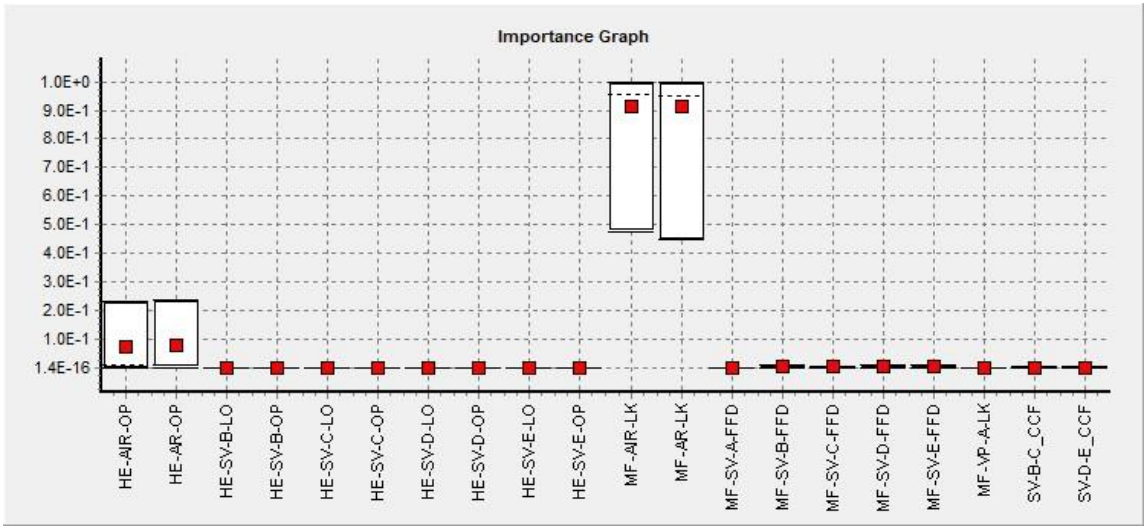


Figure 47: Importance graph for the extended system using SV_OL

For all SV_OM models, all SV_NRPD models, and the Bruce B models, both inclusive and non-inclusive of a diagnostic human error event for the SV_OH data, the highest calculated importance measure applied to the mechanical door failure and the lowest belonged to the common cause failures of the solenoid valve. An example of the highest importance belonging to door failure and the lowest importance belonging to CCF is given by the extended pathways model for door interlocks using SV_OM and is shown in Table 64 and Figure 48.

Table 64: FV for the Extended System with SV_OM Fault Rate

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	5.99E-3	2.72E-2	1.13E-5	3.81E-3	7.15E-2	5.29E-11	8.19E-1
HE-AR-OP	6.00E-3	2.83E-2	1.40E-5	3.98E-3	7.73E-2	6.12E-11	7.57E-1
HE-SV-B-LO	2.09E-3	4.18E-3	1.31E-6	5.50E-4	1.07E-2	6.13E-15	1.79E-1
HE-SV-B-OP	2.09E-3	4.35E-3	1.74E-6	5.58E-4	1.03E-2	2.82E-12	4.16E-1
HE-SV-C-LO	2.09E-3	4.51E-3	1.76E-6	5.78E-4	1.08E-2	2.36E-12	2.12E-1
HE-SV-C-OP	2.09E-3	4.49E-3	1.56E-6	5.98E-4	1.09E-2	7.75E-10	3.24E-1
HE-SV-D-LO	2.09E-3	4.30E-3	1.66E-6	5.38E-4	1.06E-2	7.36E-12	4.00E-1
HE-SV-D-OP	2.09E-3	4.29E-3	2.31E-6	5.73E-4	1.06E-2	4.86E-11	2.82E-1
HE-SV-E-LO	2.09E-3	4.19E-3	1.37E-6	5.27E-4	1.05E-2	2.93E-11	2.22E-1
HE-SV-E-OP	2.09E-3	4.34E-3	1.59E-6	5.60E-4	1.07E-2	3.74E-11	2.70E-1
MF-AIR-LK	2.71E-1	4.60E-1	1.55E-2	3.10E-1	9.12E-1	4.05E-4	9.99E-1
MF-AR-LK	2.72E-1	4.64E-1	1.46E-2	3.16E-1	9.17E-1	6.90E-4	9.99E-1
MF-SV-A-FFD	5.02E-4	3.03E-3	7.45E-6	3.44E-4	7.05E-3	6.93E-8	3.76E-1
MF-SV-B-FFD	7.24E-1	5.02E-1	1.40E-2	3.77E-1	9.28E-1	3.62E-4	9.97E-1
MF-SV-C-FFD	7.24E-1	5.01E-1	1.39E-2	3.76E-1	9.26E-1	2.83E-4	9.96E-1
MF-SV-D-FFD	7.24E-1	5.00E-1	1.30E-2	3.72E-1	9.31E-1	4.19E-4	9.98E-1
MF-SV-E-FFD	7.24E-1	5.00E-1	1.27E-2	3.73E-1	9.31E-1	6.67E-4	9.98E-1
MF-VP-A-LK	5.02E-4	3.03E-3	7.45E-6	3.44E-4	7.05E-3	6.93E-8	3.76E-1
SV-B-C_CCF	1.69E-4	5.62E-4	2.49E-5	1.99E-4	1.32E-3	3.92E-6	2.40E-2
SV-D-E_CCF	1.69E-4	5.64E-4	2.53E-5	1.99E-4	1.30E-3	5.93E-6	2.86E-2

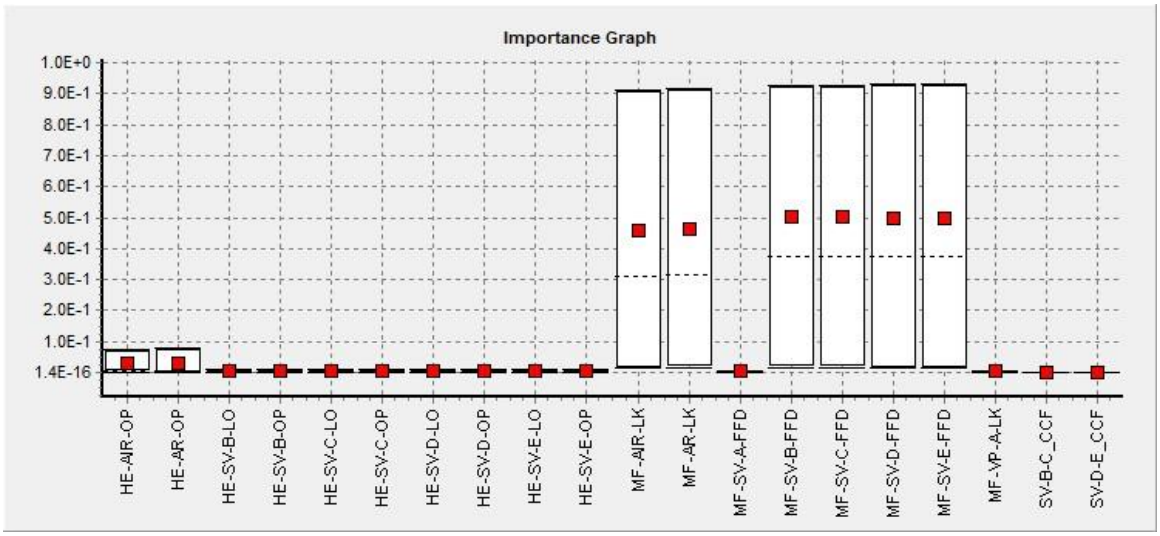


Figure 48: Importance graph for the extended system with SV_OM fault rate.

Finally, for the SV_OH fault rate and the otherwise original failure data, the otherwise original failure data including a diagnostic human error event, and the Bruce A fault rate, inclusive and non-inclusive of a diagnosis event, the lowest importance belongs to the common cause failure probabilities and the highest importance belongs to SV-B, SV-C, SV-D, and SV-E mechanical failure rates. The solenoid valve failure rate is sufficiently large enough that even the door failure rate cannot overtake them in importance. An example of such may be found in Table 65.

Table 65: FV for Extended Pathways with SV_OH Fault Rate

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	1.51E-3	8.67E-3	3.57E-6	1.14E-3	2.04E-2	1.33E-11	4.47E-1
HE-AR-OP	1.51E-3	9.05E-3	4.54E-6	1.20E-3	2.30E-2	2.72E-11	4.46E-1
HE-SV-B-LO	1.22E-3	2.77E-3	1.26E-6	4.70E-4	6.71E-3	2.85E-15	1.16E-1
HE-SV-B-OP	1.22E-3	2.88E-3	1.71E-6	4.84E-4	6.65E-3	3.00E-12	2.69E-1
HE-SV-C-LO	1.22E-3	2.92E-3	1.73E-6	4.90E-4	6.85E-3	2.07E-12	2.37E-1
HE-SV-C-OP	1.22E-3	2.92E-3	1.38E-6	5.01E-4	6.98E-3	1.36E-9	3.14E-1
HE-SV-D-LO	1.22E-3	2.87E-3	1.59E-6	4.57E-4	6.74E-3	5.14E-12	2.08E-1
HE-SV-D-OP	1.22E-3	2.88E-3	2.05E-6	4.92E-4	6.56E-3	5.87E-11	2.10E-1
HE-SV-E-LO	1.22E-3	2.80E-3	1.30E-6	4.56E-4	6.92E-3	1.29E-11	1.59E-1
HE-SV-E-OP	1.22E-3	2.83E-3	1.51E-6	4.76E-4	6.83E-3	3.50E-11	1.43E-1
MF-AIR-LK	6.84E-2	2.03E-1	3.77E-3	6.75E-2	5.78E-1	1.99E-4	9.92E-1
MF-AR-LK	6.84E-2	2.05E-1	3.78E-3	6.72E-2	5.91E-1	2.33E-4	9.92E-1
MF-SV-A-FFD	7.05E-5	8.25E-4	1.99E-6	7.79E-5	1.74E-3	2.77E-8	1.32E-1
MF-SV-B-FFD	9.60E-1	7.90E-1	1.41E-1	8.34E-1	9.85E-1	4.35E-3	9.99E-1
MF-SV-C-FFD	9.60E-1	7.90E-1	1.41E-1	8.35E-1	9.85E-1	4.05E-3	9.99E-1
MF-SV-D-FFD	9.60E-1	7.87E-1	1.35E-1	8.37E-1	9.86E-1	5.64E-3	1.00E+0
MF-SV-E-FFD	9.60E-1	7.87E-1	1.35E-1	8.37E-1	9.86E-1	7.74E-3	9.99E-1
MF-VP-A-LK	7.05E-5	8.25E-4	1.99E-6	7.79E-5	1.74E-3	2.77E-8	1.32E-1
SV-B-C_CCF	4.26E-5	1.64E-4	1.03E-5	5.57E-5	3.88E-4	2.48E-6	5.73E-3
SV-D-E_CCF	4.26E-5	1.70E-4	1.07E-5	5.59E-5	3.80E-4	3.81E-6	1.27E-2

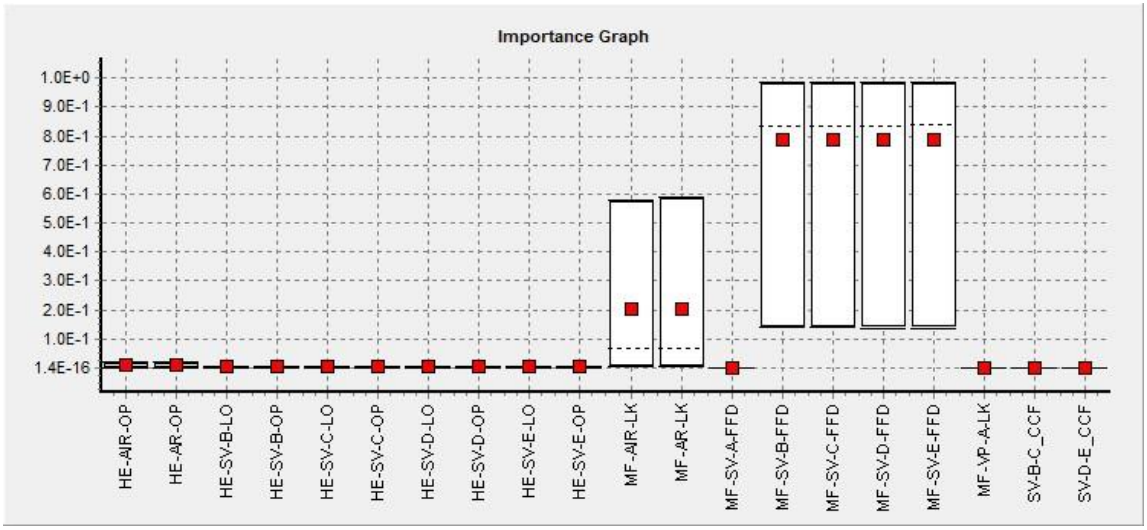


Figure 49: Importance graph for the extended system with SV_OH fault rate.

One notable difference between the extended configuration versus the original configuration, is that, in the case of the extended configuration, for all importance calculations except for part of the SV_OH failure data, the door failure is consistently the highest, while the lowest alternates between SV-A and VP-A and the common cause failures.

3.3.3 Cut Sets and Identification of Risk Critical Components for a Discussion on Risk-Informed Maintenance

The risk critical components were identified from the cut sets given in Table 66 – Table 72 to be SV-B, SV-C, SV-D, and SV-E mechanical failure and argon cell and air cell door seal failure. Regular maintenance is recommended primarily for the solenoid valve and the air-lock doors. Again, engineering judgement must be used to determine the maintenance interval, meaning that based on judgement, the maintenance interval may be one month or one quarter, etc. If the maintenance interval for the risk critical components was set at a one-month interval, the probability of the extended system with a diagnostic human error component would become 4.08E-05/year with a standard deviation of 7.74E-05, which is

a comparable result to the one-month test interval calculated at 4.07E-05/month with a standard deviation of 7.04E-05. The range of the extended system is 10^{-4} to 10^{-3} per year. A one-month test interval of risk critical components also produced a failure probability for the extended system with door interlocks of 5.50E-05/year with a standard deviation of 9.88E-05. The one-month interval for the same system produced a probability of 4.77E-05/month and a standard deviation of 9.88E-05. See the appendix for the cut sets for the updated door fault rates. The range of the extended system is 10^{-5} to 10^{-4} per year.

Table 66: Mechanical Failure Cut Sets for Extended System

#	Case	Prob/Freq	Total %	Cut Set
Total		1.61E-2	100	Displaying 124 Cut Sets. (124 Original)
1	C	4.11E-3	25.61	MF-SV-B-FS,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-FS
2	C	2.91E-3	18.12	MF-AIR-LK,MF-SV-D-FS,MF-SV-E-FS
3	C	2.91E-3	18.12	MF-AR-LK,MF-SV-B-FS,MF-SV-C-FS
4	C	2.06E-3	12.82	MF-AIR-LK,MF-AR-LK
5	C	5.73E-4	3.57	MF-SV-B-FS,MF-SV-C-FS,SV-D-E_CCF
6	C	5.73E-4	3.57	MF-SV-D-FS,MF-SV-E-FS,SV-B-C_CCF
7	C	4.06E-4	2.53	MF-AIR-LK,SV-D-E_CCF
8	C	4.06E-4	2.53	MF-AR-LK,SV-B-C_CCF
9	C	2.35E-4	1.47	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-FS
10	C	2.35E-4	1.47	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-FS
11	C	2.35E-4	1.47	MF-SV-B-FS,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-LK
12	C	2.35E-4	1.47	MF-SV-B-FS,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-FS
13	C	1.67E-4	1.04	MF-AIR-LK,MF-SV-D-FS,MF-SV-E-LK
14	C	1.67E-4	1.04	MF-AIR-LK,MF-SV-D-LK,MF-SV-E-FS
15	C	1.67E-4	1.04	MF-AR-LK,MF-SV-B-FS,MF-SV-C-LK
16	C	1.67E-4	1.04	MF-AR-LK,MF-SV-B-LK,MF-SV-C-FS
17	C	7.99E-5	0.50	SV-B-C_CCF,SV-D-E_CCF
18	C	3.41E-5	0.21	MF-SV-B-FS,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-RP

#	Case	Prob/Freq	Total %	Cut Set
19	C	3.41E-5	0.21	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-FS
20	C	3.41E-5	0.21	MF-SV-B-FS,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-FS
21	C	3.41E-5	0.21	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-FS
22	C	3.28E-5	0.20	MF-SV-B-LK,MF-SV-C-FS,SV-D-E_CCF
23	C	3.28E-5	0.20	MF-SV-B-FS,MF-SV-C-LK,SV-D-E_CCF
24	C	3.28E-5	0.20	MF-SV-D-LK,MF-SV-E-FS,SV-B-C_CCF
25	C	3.28E-5	0.20	MF-SV-D-FS,MF-SV-E-LK,SV-B-C_CCF
26	C	2.41E-5	0.15	MF-AIR-LK,MF-SV-D-FS,MF-SV-E-RP
27	C	2.41E-5	0.15	MF-AIR-LK,MF-SV-D-RP,MF-SV-E-FS
28	C	2.41E-5	0.15	MF-AR-LK,MF-SV-B-FS,MF-SV-C-RP
29	C	2.41E-5	0.15	MF-AR-LK,MF-SV-B-RP,MF-SV-C-FS
30	C	1.35E-5	0.08	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-FS
31	C	1.35E-5	0.08	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-LK
32	C	1.35E-5	0.08	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-FS
33	C	1.35E-5	0.08	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-FS
34	C	1.35E-5	0.08	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-LK
35	C	1.35E-5	0.08	MF-SV-B-FS,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-LK
36	C	1.01E-5	0.06	MF-AR-LK,MF-SV-A-FS,MF-VP-A-LK
37	C	9.53E-6	0.06	MF-AIR-LK,MF-SV-D-LK,MF-SV-E-LK
38	C	9.53E-6	0.06	MF-AR-LK,MF-SV-B-LK,MF-SV-C-LK
39	C	4.75E-6	0.03	MF-SV-B-RP,MF-SV-C-FS,SV-D-E_CCF
40	C	4.75E-6	0.03	MF-SV-B-FS,MF-SV-C-RP,SV-D-E_CCF
41	C	4.75E-6	0.03	MF-SV-D-RP,MF-SV-E-FS,SV-B-C_CCF
42	C	4.75E-6	0.03	MF-SV-D-FS,MF-SV-E-RP,SV-B-C_CCF
43	C	1.95E-6	0.01	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-RP
44	C	1.95E-6	0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-FS
45	C	1.95E-6	0.01	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-FS
46	C	1.95E-6	0.01	MF-SV-B-FS,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-RP

#	Case	Prob/Freq	Total %	Cut Set
47	C	1.95E-6	0.01	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-RP
48	C	1.95E-6	0.01	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-FS
49	C	1.95E-6	0.01	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-LK
50	C	1.95E-6	0.01	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-FS
51	C	1.95E-6	0.01	MF-SV-B-FS,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-LK
52	C	1.95E-6	0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-FS
53	C	1.95E-6	0.01	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-LK
54	C	1.95E-6	0.01	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-FS
55	C	1.88E-6	0.01	MF-SV-B-LK,MF-SV-C-LK,SV-D-E_CCF
56	C	1.88E-6	0.01	MF-SV-D-LK,MF-SV-E-LK,SV-B-C_CCF
57	C	1.38E-6	< 0.01	MF-AIR-LK,MF-SV-D-LK,MF-SV-E-RP
58	C	1.38E-6	< 0.01	MF-AIR-LK,MF-SV-D-RP,MF-SV-E-LK
59	C	1.38E-6	< 0.01	MF-AR-LK,MF-SV-B-LK,MF-SV-C-RP
60	C	1.38E-6	< 0.01	MF-AR-LK,MF-SV-B-RP,MF-SV-C-LK
61	C	7.71E-7	< 0.01	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-FS
62	C	7.71E-7	< 0.01	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-LK
63	C	7.71E-7	< 0.01	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-LK
64	C	7.71E-7	< 0.01	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-LK
65	C	5.76E-7	< 0.01	MF-AR-LK,MF-SV-A-LK,MF-VP-A-LK
66	C	2.83E-7	< 0.01	MF-SV-B-FS,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-RP
67	C	2.83E-7	< 0.01	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-RP
68	C	2.83E-7	< 0.01	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-FS
69	C	2.83E-7	< 0.01	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-RP
70	C	2.83E-7	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-FS
71	C	2.83E-7	< 0.01	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-FS

#	Case	Prob/Freq	Total %	Cut Set
72	C	2.72E-7	< 0.01	MF-SV-B-RP,MF-SV-C-LK,SV-D-E_CCF
73	C	2.72E-7	< 0.01	MF-SV-B-LK,MF-SV-C-RP,SV-D-E_CCF
74	C	2.72E-7	< 0.01	MF-SV-D-RP,MF-SV-E-LK,SV-B-C_CCF
75	C	2.72E-7	< 0.01	MF-SV-D-LK,MF-SV-E-RP,SV-B-C_CCF
76	C	2.00E-7	< 0.01	MF-AIR-LK,MF-SV-D-RP,MF-SV-E-RP
77	C	2.00E-7	< 0.01	MF-AR-LK,MF-SV-B-RP,MF-SV-C-RP
78	C	1.12E-7	< 0.01	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-RP
79	C	1.12E-7	< 0.01	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-RP
80	C	1.12E-7	< 0.01	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-FS
81	C	1.12E-7	< 0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-LK
82	C	1.12E-7	< 0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-FS
83	C	1.12E-7	< 0.01	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-LK
84	C	1.12E-7	< 0.01	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-RP
85	C	1.12E-7	< 0.01	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-LK
86	C	1.12E-7	< 0.01	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-LK
87	C	1.12E-7	< 0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-FS
88	C	1.12E-7	< 0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-LK
89	C	1.12E-7	< 0.01	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-LK
90	C	8.34E-8	< 0.01	MF-AR-LK,MF-SV-A-RP,MF-VP-A-LK
91	C	4.41E-8	< 0.01	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-LK
92	C	3.94E-8	< 0.01	MF-SV-B-RP,MF-SV-C-RP,SV-D-E_CCF
93	C	3.94E-8	< 0.01	MF-SV-D-RP,MF-SV-E-RP,SV-B-C_CCF
94	C	1.62E-8	< 0.01	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-RP
95	C	1.62E-8	< 0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-RP
96	C	1.62E-8	< 0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-FS

#	Case	Prob/Freq	Total %	Cut Set
97	C	1.62E-8	< 0.01	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-RP
98	C	1.62E-8	< 0.01	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-RP
99	C	1.62E-8	< 0.01	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-LK
100	C	1.62E-8	< 0.01	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-RP
101	C	1.62E-8	< 0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-RP
102	C	1.62E-8	< 0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-FS
103	C	1.62E-8	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-LK
104	C	1.62E-8	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-FS
105	C	1.62E-8	< 0.01	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-LK
106	C	6.39E-9	< 0.01	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-RP
107	C	6.39E-9	< 0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-LK
108	C	6.39E-9	< 0.01	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-LK
109	C	6.39E-9	< 0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-LK
110	C	2.35E-9	< 0.01	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-RP
111	C	2.35E-9	< 0.01	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-RP
112	C	2.35E-9	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-RP
113	C	2.35E-9	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-FS
114	C	9.27E-10	< 0.01	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-RP
115	C	9.27E-10	< 0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-RP
116	C	9.27E-10	< 0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-LK
117	C	9.27E-10	< 0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-RP
118	C	9.27E-10	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-LK

#	Case	Prob/Freq	Total %	Cut Set
119	C	9.27E-10	< 0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-LK
120	C	1.34E-10	< 0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-RP
121	C	1.34E-10	< 0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-RP
122	C	1.34E-10	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-RP
123	C	1.34E-10	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-LK
124	C	1.95E-11	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-RP

Table 67: Mechanical Failure Cut Sets for Extended System with SV_OL

#	Case	Prob/Freq	Total %	Cut Set
Total		2.06E-3	100	Displaying 10 Cut Sets. (10 Original)
1	C	2.06E-3	99.71	MF-AIR-LK,MF-AR-LK
2	C	1.60E-6	0.08	MF-AIR-LK,MF-SV-D-FFD,MF-SV-E-FFD
3	C	1.60E-6	0.08	MF-AR-LK,MF-SV-B-FFD,MF-SV-C-FFD
4	C	1.28E-6	0.06	MF-AIR-LK,SV-D-E_CCF
5	C	1.28E-6	0.06	MF-AR-LK,SV-B-C_CCF
6	C	2.36E-7	0.01	MF-AR-LK,MF-SV-A-FFD,MF-VP-A-LK
7	C	1.24E-9	< 0.01	MF-SV-B-FFD,MF-SV-C-FFD,MF-SV-D-FFD,MF-SV-E-FFD
8	C	9.93E-10	< 0.01	MF-SV-B-FFD,MF-SV-C-FFD,SV-D-E_CCF
9	C	9.93E-10	< 0.01	MF-SV-D-FFD,MF-SV-E-FFD,SV-B-C_CCF
10	C	7.97E-10	< 0.01	SV-B-C_CCF,SV-D-E_CCF

Table 68: Mechanical Failure Cut Sets for the Extended System with SV_OM

#	Case	Prob/Freq	Total %	Cut Set
Total		2.73E-2	100	Displaying 10 Cut Sets. (10 Original)
1	C	1.45E-2	53.23	MF-SV-B-FFD,MF-SV-C-FFD,MF-SV-D-FFD,MF-SV-E-FFD
2	C	5.47E-3	20.02	MF-AIR-LK,MF-SV-D-FFD,MF-SV-E-FFD
3	C	5.47E-3	20.02	MF-AR-LK,MF-SV-B-FFD,MF-SV-C-FFD
4	C	2.06E-3	7.53	MF-AIR-LK,MF-AR-LK
5	C	1.38E-5	0.05	MF-AR-LK,MF-SV-A-FFD,MF-VP-A-LK
6	C	3.40E-6	0.01	MF-SV-B-FFD,MF-SV-C-FFD,SV-D-E_CCF
7	C	3.40E-6	0.01	MF-SV-D-FFD,MF-SV-E-FFD,SV-B-C_CCF
8	C	1.28E-6	< 0.01	MF-AIR-LK,SV-D-E_CCF
9	C	1.28E-6	< 0.01	MF-AR-LK,SV-B-C_CCF
10	C	7.97E-10	< 0.01	SV-B-C_CCF,SV-D-E_CCF

Table 69: Mechanical Failure Cut Sets for the Extended System with SV_OH

#	Case	Prob/Freq	Total %	Cut Set
Total		4.63E-1	100	Displaying 10 Cut Sets. (10 Original)
1	C	4.28E-1	92.53	MF-SV-B-FFD,MF-SV-C-FFD,MF-SV-D-FFD,MF-SV-E-FFD
2	C	2.97E-2	6.41	MF-AIR-LK,MF-SV-D-FFD,MF-SV-E-FFD
3	C	2.97E-2	6.41	MF-AR-LK,MF-SV-B-FFD,MF-SV-C-FFD
4	C	2.06E-3	0.44	MF-AIR-LK,MF-AR-LK
5	C	3.21E-5	< 0.01	MF-AR-LK,MF-SV-A-FFD,MF-VP-A-LK
6	C	1.85E-5	< 0.01	MF-SV-B-FFD,MF-SV-C-FFD,SV-D-E_CCF
7	C	1.85E-5	< 0.01	MF-SV-D-FFD,MF-SV-E-FFD,SV-B-C_CCF
8	C	1.28E-6	< 0.01	MF-AIR-LK,SV-D-E_CCF
9	C	1.28E-6	< 0.01	MF-AR-LK,SV-B-C_CCF
10	C	7.97E-10	< 0.01	SV-B-C_CCF,SV-D-E_CCF

Table 70: Mechanical Failure Cut Sets for Extended System with SV_DOW

#	Case	Prob/Freq	Total %	Cut Set
Total		2.06E-3	100	Displaying 10 Cut Sets. (10 Original)
1	C	2.06E-3	99.70	MF-AIR-LK,MF-AR-LK
2	C	1.71E-6	0.08	MF-AIR-LK,MF-SV-D-FFD,MF-SV-E-FFD
3	C	1.71E-6	0.08	MF-AR-LK,MF-SV-B-FFD,MF-SV-C-FFD
4	C	1.28E-6	0.06	MF-AIR-LK,SV-D-E_CCF
5	C	1.28E-6	0.06	MF-AR-LK,SV-B-C_CCF
6	C	2.44E-7	0.01	MF-AR-LK,MF-SV-A-FFD,MF-VP-A-LK
7	C	1.41E-9	< 0.01	MF-SV-B-FFD,MF-SV-C-FFD,MF-SV-D-FFD,MF-SV-E-FFD
8	C	1.06E-9	< 0.01	MF-SV-B-FFD,MF-SV-C-FFD,SV-D-E_CCF
9	C	1.06E-9	< 0.01	MF-SV-D-FFD,MF-SV-E-FFD,SV-B-C_CCF
10	C	7.97E-10	< 0.01	SV-B-C_CCF,SV-D-E_CCF

Table 71: Mechanical Failure Cut Sets for the Extended System with SV_MAN

#	Case	Prob/Freq	Total %	Cut Set
Total		2.06E-3	100	Displaying 9 Cut Sets. (9 Original)
1	C	2.06E-3	99.88	MF-AIR-LK,MF-AR-LK
2	C	1.28E-6	0.06	MF-AIR-LK,SV-D-E_CCF
3	C	1.28E-6	0.06	MF-AR-LK,SV-B-C_CCF
4	C	5.92E-9	< 0.01	MF-AR-LK,MF-SV-A-FFD,MF-VP-A-LK
5	C	1.01E-9	< 0.01	MF-AIR-LK,MF-SV-D-FFD,MF-SV-E-FFD
6	C	1.01E-9	< 0.01	MF-AR-LK,MF-SV-B-FFD,MF-SV-C-FFD
7	C	7.97E-10	< 0.01	SV-B-C_CCF,SV-D-E_CCF
8	C	6.26E-13	< 0.01	MF-SV-B-FFD,MF-SV-C-FFD,SV-D-E_CCF
9	C	6.26E-13	< 0.01	MF-SV-D-FFD,MF-SV-E-FFD,SV-B-C_CCF

Table 72: Mechanical Failure Cut Sets for the Extended System with SV_NRPD

#	Case	Prob/Freq	Total %	Cut Set
Total		4.03E-3	100	Displaying 10 Cut Sets. (10 Original)
1	C	2.06E-3	51.03	MF-AIR-LK,MF-AR-LK
2	C	8.22E-4	20.37	MF-AIR-LK,MF-SV-D-FFD,MF-SV-E-FFD
3	C	8.22E-4	20.37	MF-AR-LK,MF-SV-B-FFD,MF-SV-C-FFD
4	C	3.28E-4	8.13	MF-SV-B-FFD,MF-SV-C-FFD,MF-SV-D-FFD,MF-SV-E-FFD
5	C	5.35E-6	0.13	MF-AR-LK,MF-SV-A-FFD,MF-VP-A-LK
6	C	1.28E-6	0.03	MF-AIR-LK,SV-D-E_CCF
7	C	1.28E-6	0.03	MF-AR-LK,SV-B-C_CCF
8	C	5.11E-7	0.01	MF-SV-B-FFD,MF-SV-C-FFD,SV-D-E_CCF
9	C	5.11E-7	0.01	MF-SV-D-FFD,MF-SV-E-FFD,SV-B-C_CCF
10	C	7.97E-10	< 0.01	SV-B-C_CCF,SV-D-E_CCF

3.3.4 Uncertainty Discussion

The addition of the extra solenoid valves did very minimal improvement to the overall uncertainty of the system. However, short of finding new and more extensive failure rates, the difference between the systems would not be significant.

For the models, a PDF and a CDF are given for the original failure rates. The CDF shows a steeper incline in the plot as compared to the original configuration, the probability frequency is also over a much lower range. A plot of the CDF is shown in Figure 50. The PDF is also a much narrower area with a peak at 8.0E+1, compared to the 9.5E+0 that was for the original configuration. The PDF is shown in Figure 51.

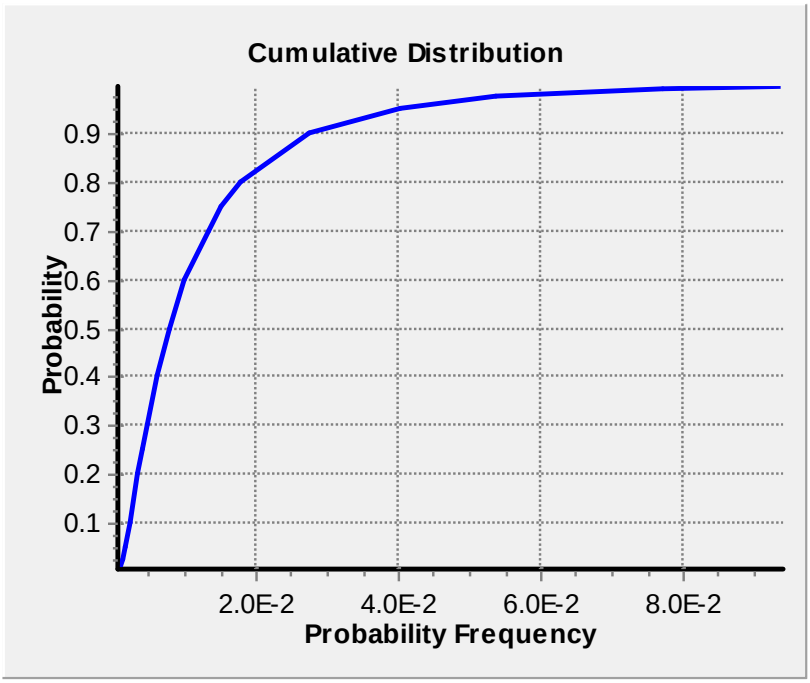


Figure 50: CDF for extended system and original failure rates.

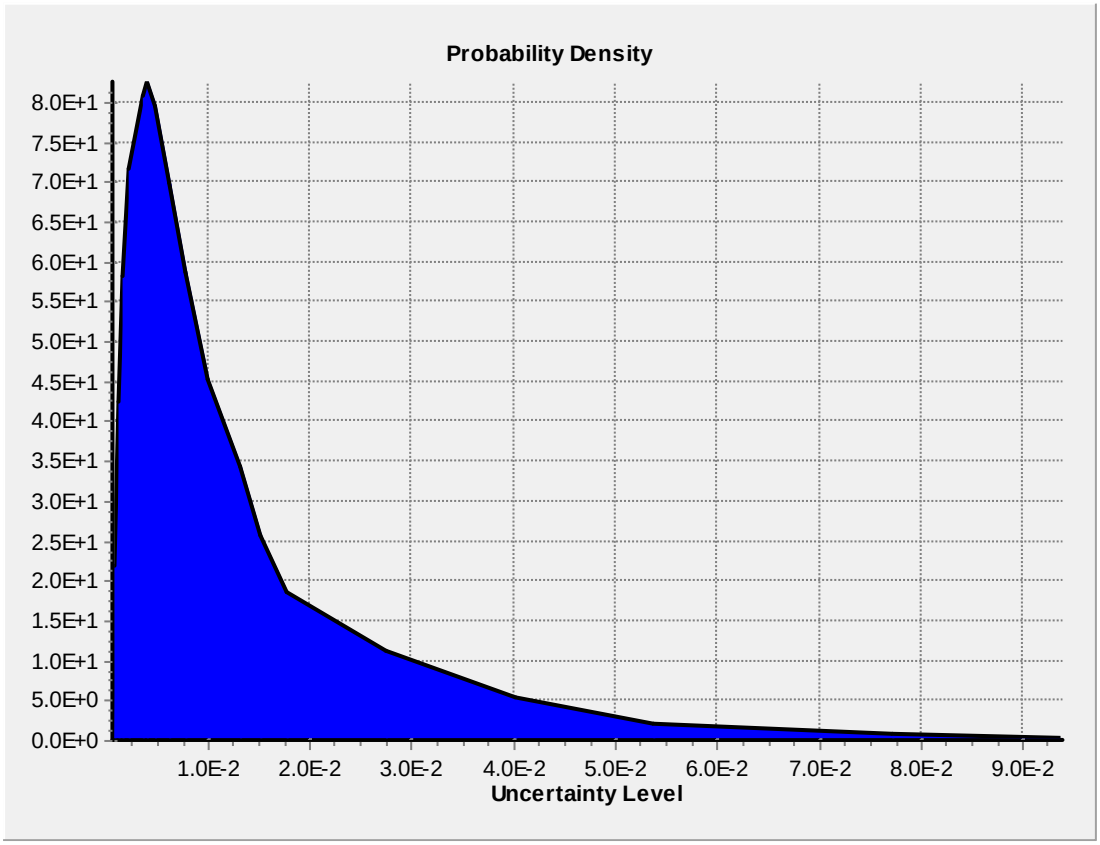


Figure 51: PDF for extended system with original failure rates.

3.4 Extended Pathways with Door Interlocks

3.4.1 System Failure Probability Results

The extended system configuration with door interlocks produces SV_OH results that are 1.54 times the SV_MAN results for a one-day interval, 28.5 times the SV_MAN results for the one-month interval, and 225 times the SV_MAN results for the one-year interval. At its highest, the chance of failure is approximately 46.5% and the lowest is 0.207%. The overall air ingress probability for the extended system with door interlocks is given by Table 73. Compared to the original system, the extended system produces results which indicate an initial probabilistic improvement for a one-day interval, but only slight probabilistic improvement over a one-year interval.

Table 73: Failure Rate Results for the Extended System with Door Interlocks

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	2.68E-08	8.10E-08	2.90E-05	7.51E-05	1.63E-02	1.59E-02
SV_OL	2.55E-08	1.22E-07	1.48E-05	9.25E-05	2.07E-03	7.64E-03
SV_OM	2.74E-08	1.27E-07	2.67E-05	1.08E-04	2.78E-02	2.33E-02
SV_OH	3.93E-08	1.62E-07	4.22E-04	1.09E-03	4.65E-01	1.19E-01
SV_DOW	2.55E-08	1.22E-07	1.48E-05	9.25E-05	2.07E-03	7.64E-03
SV_MAN	2.55E-08	7.35E-08	1.48E-05	9.25E-05	2.07E-03	7.64E-03
SV_NRPD	2.60E-08	1.23E-07	1.63E-05	9.39E-05	4.11E-03	9.00E-03

The results when including a diagnostic human error component to the system are shown in Table 74. Overall, the chance of failure for a one-year interval is approximately 49.1% and the lowest is approximately 0.216%. The results for an SV_OH fault rate are 1.80 times the SV_MAN results for one-day, 35.8 times the SV_MAN results for one month, and 227 times the SV_MAN results for one year. For the one-year interval, the improvement is not very significant. Both the one-day and one-month intervals show improvement, the one-

day by a factor of 1000 and a one month by a factor of 10 to a factor of 100, with the exception of the SV_OH results.

Table 74: Extended System w/ Door Interlocks and Diagnostic HE Component

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	4.61E-07	1.17E-06	4.77E-05	9.17E-05	1.94E-02	1.72E-02
SV_OL	4.12E-07	9.58E-07	1.93E-05	7.00E-05	2.18E-03	6.33E-03
SV_OM	4.81E-07	1.08E-06	5.00E-05	1.21E-04	3.28E-02	2.41E-02
SV_OH	7.41E-07	1.65E-06	6.84E-04	1.17E-03	4.91E-01	1.24E-01
SV_DOW	4.12E-07	9.58E-07	1.93E-05	7.00E-05	2.18E-03	6.33E-03
SV_MAN	4.11E-07	1.02E-06	1.91E-05	6.97E-05	2.16E-03	6.31E-03
SV_NRPD	4.34E-07	9.95E-07	2.53E-05	7.94E-05	4.96E-03	8.47E-03

The mechanical failure contribution to the system is given in Table 75. Mechanical failures comprise a strong majority of the fault rate for the system with an action-only human error event, and are a factor of 10 less than the overall fault rate for the system with an action plus diagnostic human error event for a one-day interval, and an insignificant effect for a one-year interval.

Table 75: Mechanical Failure for Extended System with Door Interlock

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	1.66E-05	1.18E-06	1.35E-02	1.01E-03	6.48E-01	8.99E-02
SV_OL	1.66E-05	1.16E-06	1.31E-02	9.71E-04	5.97E-01	7.52E-02
SV_OM	1.66E-05	1.16E-06	1.34E-02	1.04E-03	6.73E-01	9.70E-02
SV_OH	1.68E-05	1.20E-06	1.70E-02	2.44E-03	9.44E-01	1.80E-01
SV_DOW	1.66E-05	1.16E-06	1.31E-02	9.71E-04	5.97E-01	7.52E-02
SV_MAN	1.66E-05	1.17E-06	1.31E-02	9.71E-04	5.97E-01	7.52E-02
SV_NRPD	1.66E-05	1.16E-06	1.32E-02	9.76E-04	6.08E-01	7.87E-02

The door fault rates of 1.48/yr produce the results given in Table 76. The results for the highest failure rate are 1.02 times the lowest for one day, 1.31 times the lowest for one month, and the highest failure probability was 1.02 times the lowest for the one-day interval, 1.31 times the lowest for the one-month interval, and 1.58 times the lowest for the

one-year interval. The highest chance of failure over one year for the results reported in Table 76 is 94.4% and the lowest chance is 59.7%. The overall air ingress probability improvement between the extended system with the Bruce B door seal fault rate compared with the original configuration with the Bruce B door seal fault rate is relatively insignificant since the door fault rate is so high.

Table 76: Failure Results for Extended System with Door Interlocks and Bruce B Fault Rate

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	1.67E-05	1.23E-06	1.35E-02	1.05E-03	6.48E-01	9.20E-02
SV_OL	1.66E-05	1.19E-06	1.31E-02	9.91E-04	5.97E-01	7.68E-02
SV_OM	1.67E-05	1.19E-06	1.34E-02	1.05E-03	6.74E-01	9.77E-02
SV_OH	1.70E-05	1.24E-06	1.72E-02	2.41E-03	9.44E-01	1.80E-01
SV_DOW	1.66E-05	1.19E-06	1.31E-02	9.91E-04	5.97E-01	7.68E-02
SV_MAN	1.66E-05	1.19E-06	1.31E-02	9.91E-04	5.97E-01	7.68E-02
SV_NRPD	1.67E-05	1.19E-06	1.32E-02	9.97E-04	6.08E-01	7.99E-02

With a diagnostic HE component, the highest failure rate is 1.10 times the lowest over one day, 1.41 times the lowest over one month, and 1.59 times the lowest over one year. The chance of failure for a one-year interval ranges between 59.7% and 94.9%, which is demonstrated by the results in Table 77. Again, when compared to the original configuration, the improvement in the probability of air ingress is minimal.

Table 77: Failure Results for the Extended System with Door Interlocks, Bruce B Fault Rate, and Diagnostic HE Comp

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	2.11E-05	2.68E-06	1.38E-02	1.09E-03	6.55E-01	9.34E-02
SV_OL	2.08E-05	2.53E-06	1.32E-02	9.97E-04	5.97E-01	7.66E-02
SV_OM	2.13E-05	2.72E-06	1.39E-02	1.11E-03	6.83E-01	9.97E-02
SV_OH	2.29E-05	3.70E-06	1.86E-02	3.12E-03	9.49E-01	1.83E-01
SV_DOW	2.08E-05	2.53E-06	1.32E-02	9.97E-04	5.97E-01	7.66E-02
SV_MAN	2.08E-05	2.53E-06	1.32E-02	9.97E-04	5.97E-01	7.65E-02
SV_NRPD	2.10E-05	2.58E-06	1.34E-02	1.02E-03	6.12E-01	8.05E-02

Table 78 is the contribution that mechanical failure has to the model of the extended system with door interlocks and the Bruce B door seal fault rate and the corresponding system with a diagnostic human error contribution. For both models, the contribution of the mechanical failure events is the majority of the probability, and for the system with an action-only human error event, the human error is essentially insignificant.

Table 78: Mechanical Failure for Extended System with Door Interlocks and Bruce B Fault Rate

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	1.66E-05	1.18E-06	1.35E-02	1.01E-03	6.48E-01	8.99E-02
SV_OL	1.66E-05	1.16E-06	1.31E-02	9.71E-04	5.97E-01	7.52E-02
SV_OM	1.66E-05	1.16E-06	1.34E-02	1.04E-03	6.73E-01	9.70E-02
SV_OH	1.68E-05	1.20E-06	1.70E-02	2.44E-03	9.44E-01	1.80E-01
SV_DOW	1.66E-05	1.16E-06	1.31E-02	9.71E-04	5.97E-01	7.52E-02
SV_MAN	1.66E-05	1.17E-06	1.31E-02	9.71E-04	5.97E-01	7.52E-02
SV_NRPD	1.66E-05	1.16E-06	1.32E-02	9.76E-04	6.08E-01	7.87E-02

Finally, for the Bruce A fault rate and an action-only human error component, the results were computed and are shown in Table 79. The highest reported failure rate for one day 1.12 times the lowest, for one month, 3.58 times the lowest, and for one year, 14 times the lowest. The chance of an air ingress event ranges from a 4.22% to 59.2%. Compared to the original system with door interlocks, a vast improvement is seen in the one-day interval, a respectable improvement for the one-month interval, and a somewhat insignificant improvement for the one-year interval.

Table 79: Failure Results for Extended Pathways with Bruce A Fault Rate and Door Interlocks

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	4.44E-07	4.05E-07	4.12E-04	3.57E-04	8.08E-02	4.36E-02
SV_OL	4.39E-07	4.00E-07	3.52E-04	3.33E-04	4.23E-02	3.02E-02
SV_OM	4.47E-07	4.03E-07	4.04E-04	3.70E-04	1.03E-01	4.93E-02
SV_OH	4.91E-07	4.37E-07	1.26E-03	1.44E-03	5.92E-01	1.42E-01
SV_DOW	4.39E-07	4.00E-07	3.52E-04	3.33E-04	4.23E-02	3.02E-02
SV_MAN	4.39E-07	4.12E-07	3.52E-04	3.33E-04	4.22E-02	3.02E-02
SV_NRPD	4.41E-07	4.01E-07	3.59E-04	3.36E-04	4.99E-02	3.29E-02

An addition of a diagnostic human error component results in failure probabilities displayed in Table 80 resulted in an upper chance of failure at 61.6% and a lower chance of failure at 4.26%. Also, the highest failure rate for one day is 1.42 times the lowest, for one month, is 4.54 times the lowest, and for one year is 14.5 times the lowest. In comparison with the original system configuration, the one-day interval is a significant improvement probability, while the one-month interval produces a reasonable improvement, and the one-year interval produces almost no improvement.

Table 80: Failure Probability for Extended System with Door Interlocks, Bruce A Fault Rate, and Diagnostic HE Comp

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	1.40E-06	1.64E-06	4.76E-04	3.94E-04	8.72E-02	4.61E-02
SV_OL	1.31E-06	1.40E-06	3.73E-04	3.51E-04	4.28E-02	3.11E-02
SV_OM	1.43E-06	1.51E-06	4.84E-04	4.37E-04	1.12E-01	5.30E-02
SV_OH	1.86E-06	2.06E-06	1.69E-03	1.82E-03	6.16E-01	1.49E-01
SV_DOW	1.31E-06	1.40E-06	3.73E-04	3.51E-04	4.28E-02	3.11E-02
SV_MAN	1.31E-06	1.57E-06	3.72E-04	3.51E-04	4.26E-02	3.10E-02
SV_NRPD	1.35E-06	1.43E-06	3.98E-04	3.65E-04	5.27E-02	3.48E-02

The contribution of the mechanical failure for the extended system with door interlocks, inclusion of a diagnostic human error component and the Bruce A door seal fault rate is

shown in Table 81. Again, mechanical failure is largely dominant in both models, but more so in the model with an action only human error diagnosis.

Table 81: Mech. Failure of Ext. System with DI, Diagnoses HE Comp, and Bruce A Fault Rate

	1 DAY	STDEV	1 MONTH	STDEV	1 YEAR	STDEV
ORIGINAL	4.34E-07	4.18E-07	4.08E-04	3.70E-04	8.02E-02	4.46E-02
SV_OL	4.33E-07	3.96E-07	3.52E-04	3.32E-04	4.22E-02	3.00E-02
SV_OM	4.35E-07	3.97E-07	3.98E-04	3.61E-04	1.02E-01	4.75E-02
SV_OH	4.61E-07	4.12E-07	1.22E-03	1.20E-03	5.90E-01	1.41E-01
SV_DOW	4.33E-07	3.96E-07	3.52E-04	3.32E-04	4.22E-02	3.00E-02
SV_MAN	4.33E-07	3.88E-07	3.52E-04	3.32E-04	4.22E-02	3.00E-02
SV_NRPD	4.34E-07	3.96E-07	3.57E-04	3.34E-04	4.97E-02	3.24E-02

3.4.2 Fussell-Vesely

There are only four unique patterns for the Fussell-Vesely importance results for the extended system configuration with door interlocks. The original failure rate data, inclusive and non-inclusive of a diagnostic human error component, indicated that SV-A rupture was the lowest importance and the mechanical failure of SV-B, SV-C, SV-D, and SV-E was the highest importance and the results are given in Table 82 and the corresponding importance graph is given in Figure 52.

Table 82: FV Results for Extended Pathways DI System

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	3.91E-4	6.43E-4	1.11E-7	3.96E-5	1.33E-3	9.15E-13	9.00E-2
DI-AR	3.92E-4	6.29E-4	9.27E-8	4.09E-5	1.35E-3	2.10E-11	6.20E-2
HE-AIR-OP	3.91E-4	6.43E-4	1.11E-7	3.96E-5	1.33E-3	9.15E-13	9.00E-2
HE-AR-OP	3.92E-4	6.29E-4	9.27E-8	4.09E-5	1.35E-3	2.10E-11	6.20E-2
HE-SV-B-LO	2.13E-3	3.09E-3	1.78E-6	6.43E-4	8.20E-3	1.06E-9	9.68E-2
HE-SV-B-OP	2.13E-3	3.00E-3	2.34E-6	6.61E-4	7.87E-3	0.00E+0	6.59E-2

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-SV-C-LO	2.13E-3	3.04E-3	2.48E-6	6.45E-4	8.17E-3	0.00E+0	7.68E-2
HE-SV-C-OP	2.13E-3	3.07E-3	2.03E-6	6.61E-4	8.29E-3	1.15E-11	8.85E-2
HE-SV-D-LO	2.13E-3	3.05E-3	2.40E-6	6.55E-4	8.43E-3	6.83E-12	8.17E-2
HE-SV-D-OP	2.13E-3	3.01E-3	1.66E-6	6.38E-4	8.25E-3	1.18E-12	7.26E-2
HE-SV-E-LO	2.13E-3	2.98E-3	2.42E-6	6.59E-4	8.34E-3	1.92E-13	9.83E-2
HE-SV-E-OP	2.13E-3	3.03E-3	2.42E-6	6.54E-4	8.04E-3	4.96E-10	7.90E-2
MF-AIR-LK	3.55E-1	3.02E-1	1.50E-2	1.70E-1	6.91E-1	8.86E-4	9.87E-1
MF-AR-LK	3.56E-1	3.06E-1	1.49E-2	1.71E-1	6.99E-1	6.81E-4	9.71E-1
MF-SV-A-FS	6.16E-4	8.85E-4	1.28E-5	2.27E-4	2.21E-3	2.62E-7	3.39E-2
MF-SV-A-LK	3.53E-5	5.51E-5	6.70E-7	1.26E-5	1.34E-4	1.04E-8	2.09E-3
MF-SV-A-RP	5.11E-6	8.01E-6	2.25E-8	7.88E-7	1.66E-5	1.27E-9	1.89E-3
MF-SV-B-FS	5.39E-1	5.78E-1	1.06E-1	5.54E-1	8.33E-1	9.38E-3	9.43E-1
MF-SV-B-LK	3.09E-2	4.29E-2	4.53E-3	2.46E-2	9.06E-2	6.03E-4	4.74E-1
MF-SV-B-RP	4.48E-3	6.18E-3	9.53E-5	1.36E-3	1.44E-2	4.80E-6	4.65E-1
MF-SV-C-FS	5.39E-1	5.79E-1	1.08E-1	5.56E-1	8.31E-1	9.43E-3	9.42E-1
MF-SV-C-LK	3.09E-2	4.23E-2	4.64E-3	2.43E-2	8.78E-2	4.24E-4	5.13E-1
MF-SV-C-RP	4.48E-3	5.91E-3	9.26E-5	1.35E-3	1.43E-2	2.22E-6	3.56E-1
MF-SV-D-FS	5.39E-1	5.76E-1	1.04E-1	5.52E-1	8.28E-1	1.88E-2	9.55E-1
MF-SV-D-LK	3.09E-2	4.20E-2	4.56E-3	2.45E-2	8.65E-2	7.72E-4	4.31E-1
MF-SV-D-RP	4.48E-3	6.04E-3	9.41E-5	1.41E-3	1.41E-2	3.74E-6	2.81E-1
MF-SV-E-FS	5.39E-1	5.75E-1	1.05E-1	5.48E-1	8.31E-1	1.96E-2	9.41E-1
MF-SV-E-LK	3.09E-2	4.28E-2	4.54E-3	2.39E-2	9.09E-2	4.91E-4	4.67E-1

Name	Point Est.	Mean	5th	50th	95th	Min	Max
MF-SV-E-RP	4.48E-3	6.13E-3	1.04E-4	1.36E-3	1.40E-2	1.05E-5	3.87E-1
MF-VP-A-LK	6.57E-4	9.48E-4	1.43E-5	2.49E-4	2.35E-3	2.74E-7	3.49E-2
SV-B-C_CCF	7.01E-2	6.58E-2	1.51E-2	5.62E-2	1.05E-1	2.29E-3	2.47E-1
SV-D-E_CCF	7.01E-2	6.58E-2	1.52E-2	5.60E-2	1.05E-1	3.32E-3	2.38E-1

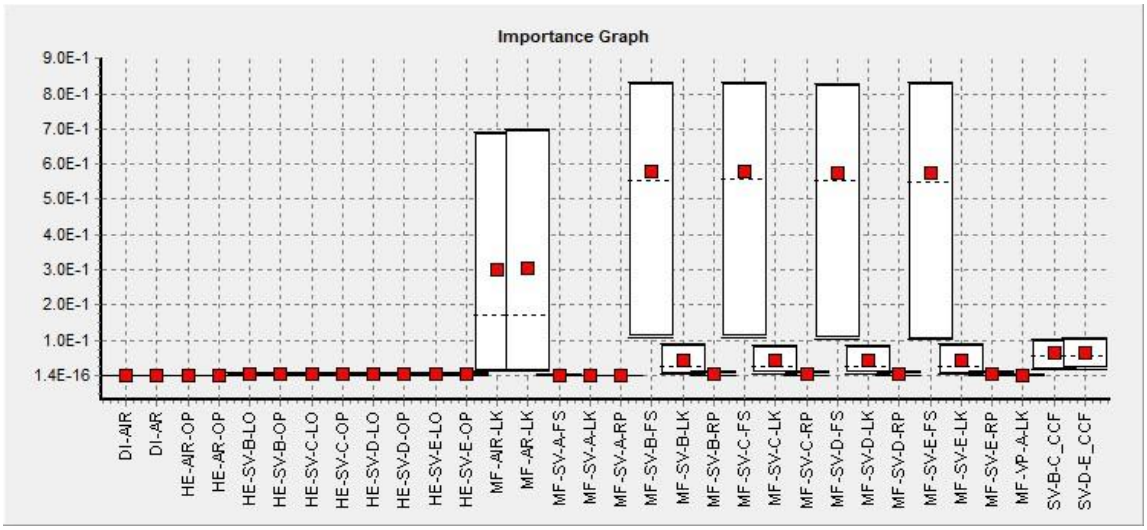


Figure 52: Importance graph for extended pathways with door interlock

The original solenoid valve fault rate with the different door fault rates, inclusive and non-inclusive of a diagnostic human error component produce results where mechanical failure of the door is the highest importance and the mechanical failure of SV-A via rupture is the lowest importance, shown in Table 83 and Figure 53.

Table 83: FV Results for Original Valve Fault Data with Human Error Event and Bruce B Door Fault

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	6.57E-5	1.75E-4	3.37E-8	1.32E-5	3.89E-4	1.71E-11	1.77E-2
DI-AR	6.57E-5	2.08E-4	3.37E-8	1.31E-5	4.11E-4	8.61E-12	9.41E-2
HE-AIR-OP	6.57E-5	1.75E-4	3.37E-8	1.32E-5	3.89E-4	1.71E-11	1.77E-2
HE-AR-OP	6.57E-5	2.08E-4	3.37E-8	1.31E-5	4.11E-4	8.61E-12	9.41E-2
HE-SV-B-LO	3.59E-4	1.02E-3	7.30E-7	1.93E-4	2.54E-3	1.00E-14	5.06E-2
HE-SV-B-OP	3.59E-4	1.00E-3	5.75E-7	1.97E-4	2.62E-3	1.18E-15	3.41E-2
HE-SV-C-LO	3.59E-4	9.90E-4	6.85E-7	1.94E-4	2.48E-3	3.80E-11	4.58E-2
HE-SV-C-OP	3.59E-4	1.00E-3	6.56E-7	1.98E-4	2.62E-3	4.47E-12	3.41E-2
HE-SV-D-LO	3.59E-4	9.93E-4	7.07E-7	1.91E-4	2.61E-3	5.87E-11	3.32E-2
HE-SV-D-OP	3.59E-4	9.63E-4	8.08E-7	1.86E-4	2.45E-3	1.50E-13	3.66E-2
HE-SV-E-LO	3.59E-4	9.57E-4	6.34E-7	1.89E-4	2.45E-3	9.40E-13	5.07E-2
HE-SV-E-OP	3.59E-4	9.85E-4	6.18E-7	1.86E-4	2.52E-3	3.39E-11	4.05E-2
MF-AIR-LK	9.59E-1	7.64E-1	2.61E-1	7.80E-1	9.47E-1	2.76E-2	9.89E-1
MF-AR-LK	9.59E-1	7.63E-1	2.68E-1	7.79E-1	9.43E-1	2.70E-2	9.92E-1
MF-SV-A-FS	2.64E-4	6.73E-4	3.82E-5	2.64E-4	1.47E-3	1.66E-6	2.50E-2
MF-SV-A-LK	1.51E-5	3.99E-5	2.18E-6	1.48E-5	9.07E-5	2.19E-7	1.26E-3
MF-SV-A-RP	2.19E-6	5.87E-6	4.82E-8	8.77E-7	1.24E-5	2.31E-9	2.05E-3
MF-SV-B-FS	9.00E-2	2.13E-1	2.53E-2	1.27E-1	4.68E-1	5.83E-3	8.97E-1
MF-SV-B-LK	5.19E-3	1.43E-2	1.35E-3	6.87E-3	3.16E-2	2.97E-4	3.28E-1
MF-SV-B-RP	7.53E-4	2.02E-3	2.76E-5	4.25E-4	4.59E-3	1.24E-6	2.23E-1
MF-SV-C-FS	9.00E-2	2.13E-1	2.53E-2	1.26E-1	4.70E-1	5.18E-3	8.90E-1

Name	Point Est.	Mean	5th	50th	95th	Min	Max
MF-SV-C-LK	5.19E-3	1.43E-2	1.31E-3	6.82E-3	3.18E-2	2.76E-4	2.85E-1
MF-SV-C-RP	7.53E-4	2.02E-3	2.75E-5	4.00E-4	4.76E-3	1.35E-6	1.19E-1
MF-SV-D-FS	9.00E-2	2.14E-1	2.76E-2	1.30E-1	4.67E-1	5.07E-3	8.96E-1
MF-SV-D-LK	5.19E-3	1.46E-2	1.28E-3	6.97E-3	3.15E-2	3.41E-4	2.98E-1
MF-SV-D-RP	7.53E-4	2.04E-3	2.84E-5	4.03E-4	4.65E-3	2.08E-6	1.31E-1
MF-SV-E-FS	9.00E-2	2.14E-1	2.75E-2	1.29E-1	4.67E-1	3.13E-3	8.97E-1
MF-SV-E-LK	5.19E-3	1.45E-2	1.41E-3	7.06E-3	3.19E-2	1.20E-4	2.61E-1
MF-SV-E-RP	7.53E-4	2.19E-3	3.03E-5	4.31E-4	4.78E-3	9.58E-7	4.97E-1
MF-VP-A-LK	2.81E-4	7.19E-4	4.43E-5	2.88E-4	1.56E-3	2.95E-6	2.57E-2
SV-B-C_CCF	1.18E-2	2.22E-2	4.55E-3	1.43E-2	4.53E-2	2.09E-3	1.34E-1
SV-D-E_CCF	1.18E-2	2.22E-2	4.79E-3	1.46E-2	4.40E-2	1.47E-3	1.37E-1

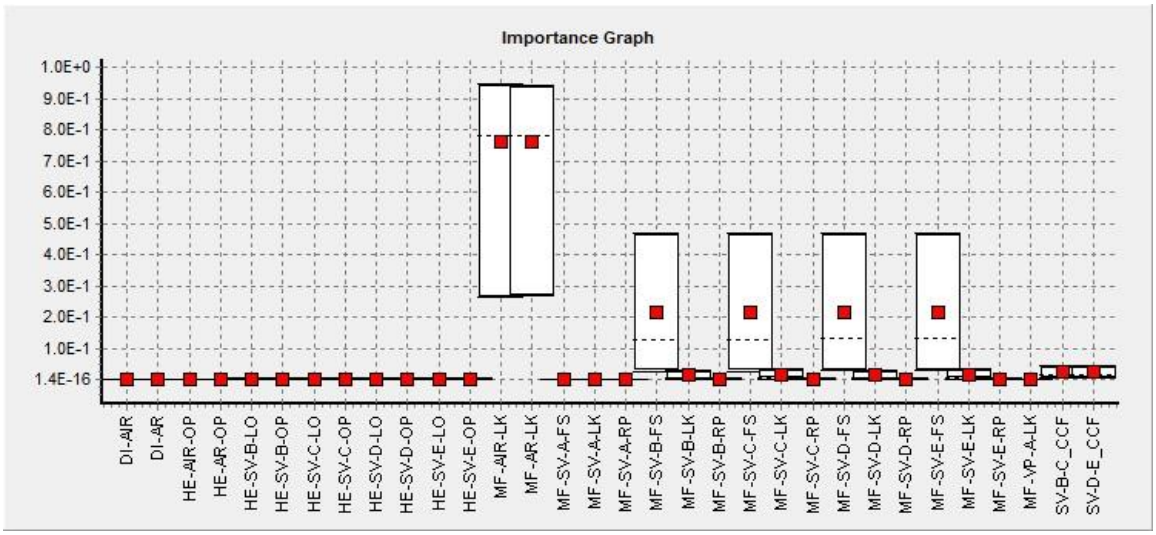


Figure 53: Importance graph for Bruce B fault rate and extended pathways with door interlocks.

The SV_DOW, SV_MAN, and SV_OL models all produce the same pattern for importance measures. The highest importance belongs to the mechanical failure of the door and the

lowest importance belongs to the mechanical failure of VP-A and SV-A, which is shown in Table 84 and Figure 54.

Table 84: FV for SV_OL for Extended System with Door Interlocks

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	1.09E-3	5.22E-3	4.97E-7	1.79E-4	9.12E-3	0.00E+0	7.58E-1
DI-AR	1.09E-3	5.60E-3	4.41E-7	1.97E-4	9.61E-3	2.49E-12	7.61E-1
HE-AIR-OP	1.09E-3	5.22E-3	4.97E-7	1.79E-4	9.12E-3	0.00E+0	7.58E-1
HE-AR-OP	1.09E-3	5.60E-3	4.41E-7	1.97E-4	9.61E-3	2.49E-12	7.61E-1
HE-SV-B-LO	1.74E-4	1.10E-3	1.33E-7	5.20E-5	2.04E-3	3.50E-14	1.52E-1
HE-SV-B-OP	1.74E-4	1.09E-3	1.39E-7	4.91E-5	1.86E-3	4.97E-12	4.17E-1
HE-SV-C-LO	1.74E-4	1.06E-3	1.24E-7	4.64E-5	1.86E-3	2.08E-13	2.26E-1
HE-SV-C-OP	1.74E-4	1.06E-3	1.16E-7	4.99E-5	1.84E-3	1.37E-11	1.07E-1
HE-SV-D-LO	1.74E-4	1.01E-3	1.23E-7	5.15E-5	1.84E-3	0.00E+0	1.82E-1
HE-SV-D-OP	1.74E-4	1.09E-3	1.46E-7	5.52E-5	1.91E-3	9.19E-13	5.20E-1
HE-SV-E-LO	1.74E-4	1.03E-3	1.13E-7	5.08E-5	1.95E-3	3.59E-13	1.96E-1
HE-SV-E-OP	1.74E-4	1.03E-3	1.66E-7	5.38E-5	1.93E-3	4.13E-12	1.36E-1
MF-AIR-LK	9.97E-1	9.84E-1	8.86E-1	9.94E-1	9.99E-1	9.22E-2	1.00E+0
MF-AR-LK	9.97E-1	9.84E-1	8.91E-1	9.94E-1	9.99E-1	1.97E-1	1.00E+0
MF-SV-A-FFD	1.14E-4	6.43E-4	1.53E-6	5.18E-5	1.20E-3	4.37E-8	8.31E-2
MF-SV-B-FFD	1.03E-3	5.73E-3	7.72E-6	3.30E-4	9.93E-3	1.09E-7	5.62E-1
MF-SV-C-FFD	1.03E-3	5.80E-3	8.01E-6	3.39E-4	9.77E-3	3.33E-7	8.88E-1
MF-SV-D-FFD	1.03E-3	5.39E-3	8.78E-6	3.55E-4	1.08E-2	3.73E-7	6.17E-1
MF-SV-E-FFD	1.03E-3	5.42E-3	9.40E-6	3.39E-4	9.79E-3	4.33E-7	6.47E-1
MF-VP-A-LK	1.14E-4	6.43E-4	1.53E-6	5.18E-5	1.20E-3	4.37E-8	8.31E-2
SV-B-C_CCF	6.20E-4	2.51E-3	4.88E-5	6.07E-4	5.90E-3	7.98E-6	1.84E-1
SV-D-E_CCF	6.20E-4	2.64E-3	5.15E-5	6.26E-4	5.96E-3	3.86E-6	3.57E-1

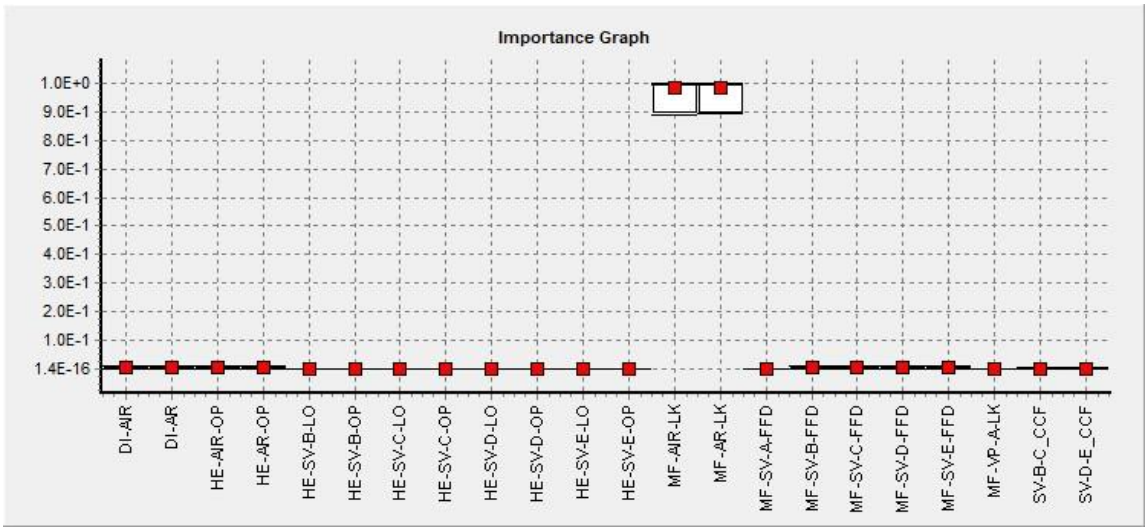


Figure 54: Importance graph for SV_OL for the extended system with door interlocks.

For SV_OM models with the original system and the original system with human error have SV-B, SV-C, SV-D, and SV-E with the highest importance the common cause failures with the lowest importance. SV_OH fault rate models with the otherwise original data, both with and without human error, and the Bruce B door failure data both with and without human error, shown in Table 85 and Figure 55.

Table 85: FV for SV_OM for Extended System with Door Interlocks

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	3.00E-4	1.44E-3	1.71E-7	5.76E-5	2.37E-3	3.48E-13	4.91E-1
DI-AR	3.01E-4	1.59E-3	1.44E-7	6.46E-5	2.77E-3	8.00E-13	2.36E-1
HE-AIR-OP	3.00E-4	1.44E-3	1.71E-7	5.76E-5	2.37E-3	3.48E-13	4.91E-1
HE-AR-OP	3.01E-4	1.59E-3	1.44E-7	6.46E-5	2.77E-3	8.00E-13	2.36E-1
HE-SV-B-LO	2.10E-3	4.69E-3	1.77E-6	5.73E-4	1.13E-2	2.56E-13	3.15E-1
HE-SV-B-OP	2.10E-3	4.58E-3	1.76E-6	5.77E-4	1.13E-2	1.16E-11	2.35E-1
HE-SV-C-LO	2.10E-3	4.54E-3	1.49E-6	5.39E-4	1.09E-2	1.70E-11	3.31E-1
HE-SV-C-OP	2.10E-3	4.55E-3	1.59E-6	5.41E-4	1.08E-2	2.66E-10	4.42E-1
HE-SV-D-LO	2.10E-3	4.43E-3	1.71E-6	5.69E-4	1.09E-2	0.00E+0	4.61E-1
HE-SV-D-OP	2.10E-3	4.53E-3	2.16E-6	5.70E-4	1.11E-2	1.11E-11	3.69E-1
HE-SV-E-LO	2.10E-3	4.64E-3	1.58E-6	5.86E-4	1.14E-2	1.09E-11	2.21E-1
HE-SV-E-OP	2.10E-3	4.66E-3	2.26E-6	5.90E-4	1.13E-2	6.67E-11	2.39E-1
MF-AIR-LK	2.73E-1	4.79E-1	1.43E-2	3.24E-1	9.36E-1	3.21E-4	9.99E-1
MF-AR-LK	2.73E-1	4.77E-1	1.57E-2	3.27E-1	9.31E-1	1.71E-3	9.99E-1
MF-SV-A-FFD	4.97E-4	3.40E-3	5.01E-6	3.36E-4	7.34E-3	5.38E-8	2.67E-1
MF-SV-B-FFD	7.28E-1	5.07E-1	1.39E-2	3.84E-1	9.35E-1	2.44E-4	9.99E-1
MF-SV-C-FFD	7.28E-1	5.08E-1	1.38E-2	3.85E-1	9.35E-1	3.88E-4	9.99E-1
MF-SV-D-FFD	7.28E-1	5.13E-1	1.44E-2	3.93E-1	9.40E-1	8.95E-4	9.98E-1
MF-SV-E-FFD	7.28E-1	5.13E-1	1.52E-2	3.90E-1	9.40E-1	8.50E-4	9.98E-1
MF-VP-A-LK	4.97E-4	3.40E-3	5.01E-6	3.36E-4	7.34E-3	5.38E-8	2.67E-1
SV-B-C_CCF	1.70E-4	6.13E-4	2.53E-5	2.04E-4	1.41E-3	5.84E-6	3.25E-2
SV-D-E_CCF	1.70E-4	6.50E-4	2.50E-5	2.04E-4	1.50E-3	2.20E-6	6.69E-2

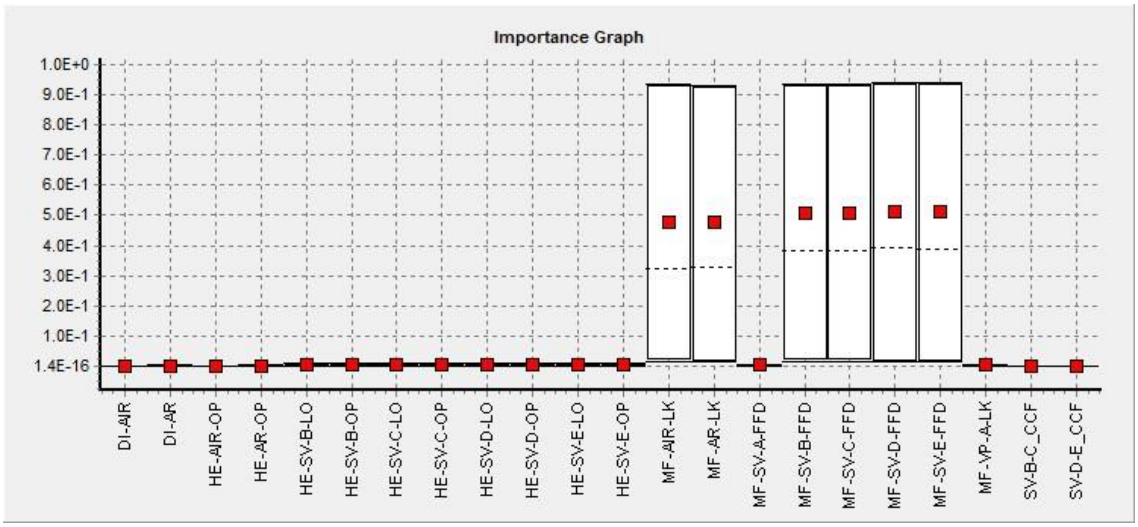


Figure 55: Importance graph for SV_OM fault rate with original system plus door interlocks.

Similarly, for all of the SV_NRPD results, and the SV_OH results with the Bruce B fault rate, inclusive and not of a diagnostic human error event, and the SV_OM results with the Bruce A and Bruce B fault rates, both inclusive and not of the human error events, the measure of the highest importance was the door fault rate, and the measure with the least importance was the common cause failures. See Table 86 and Figure 56.

Table 86: FV Results for SV_NRPD fault rate for Extended System with Door Interlocks

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	7.77E-4	2.82E-3	3.22E-7	1.17E-4	4.99E-3	8.10E-13	6.73E-1
DI-AR	7.79E-4	3.14E-3	3.12E-7	1.29E-4	5.60E-3	1.95E-12	5.51E-1
HE-AIR-OP	7.77E-4	2.82E-3	3.22E-7	1.17E-4	4.99E-3	8.10E-13	6.73E-1
HE-AR-OP	7.79E-4	3.14E-3	3.12E-7	1.29E-4	5.60E-3	1.95E-12	5.51E-1
HE-SV-B-LO	2.13E-3	4.77E-3	1.19E-6	4.24E-4	1.14E-2	1.32E-13	3.66E-1
HE-SV-B-OP	2.13E-3	4.70E-3	1.16E-6	4.32E-4	1.14E-2	2.74E-11	3.78E-1
HE-SV-C-LO	2.13E-3	4.75E-3	9.74E-7	3.88E-4	1.09E-2	6.13E-12	4.70E-1
HE-SV-C-OP	2.13E-3	4.63E-3	9.78E-7	3.95E-4	1.06E-2	2.36E-10	2.99E-1
HE-SV-D-LO	2.13E-3	4.54E-3	1.12E-6	4.28E-4	1.11E-2	0.00E+0	5.05E-1
HE-SV-D-OP	2.13E-3	4.60E-3	1.36E-6	4.30E-4	1.11E-2	5.04E-12	6.06E-1
HE-SV-E-LO	2.13E-3	4.75E-3	9.03E-7	4.25E-4	1.14E-2	4.07E-12	3.20E-1
HE-SV-E-OP	2.13E-3	4.93E-3	1.52E-6	4.39E-4	1.16E-2	3.12E-11	3.71E-1
MF-AIR-LK	7.07E-1	7.25E-1	6.29E-2	7.51E-1	9.88E-1	8.52E-4	1.00E+0
MF-AR-LK	7.09E-1	7.25E-1	6.99E-2	7.55E-1	9.88E-1	3.64E-3	1.00E+0
MF-SV-A-FFD	1.30E-3	4.55E-3	1.12E-5	4.95E-4	1.00E-2	1.88E-7	4.06E-1
MF-SV-B-FFD	2.87E-1	2.57E-1	1.80E-3	8.27E-2	7.29E-1	3.62E-5	9.95E-1
MF-SV-C-FFD	2.87E-1	2.57E-1	1.91E-3	8.25E-2	7.31E-1	7.07E-5	9.98E-1
MF-SV-D-FFD	2.87E-1	2.62E-1	1.94E-3	8.46E-2	7.48E-1	1.18E-4	9.94E-1
MF-SV-E-FFD	2.87E-1	2.61E-1	2.14E-3	8.38E-2	7.48E-1	1.03E-4	9.95E-1
MF-VP-A-LK	1.30E-3	4.55E-3	1.12E-5	4.95E-4	1.00E-2	1.88E-7	4.06E-1
SV-B-C_CCF	4.40E-4	1.24E-3	4.21E-5	4.10E-4	2.88E-3	7.98E-6	5.02E-2
SV-D-E_CCF	4.40E-4	1.32E-3	4.42E-5	4.06E-4	3.03E-3	3.02E-6	9.81E-2

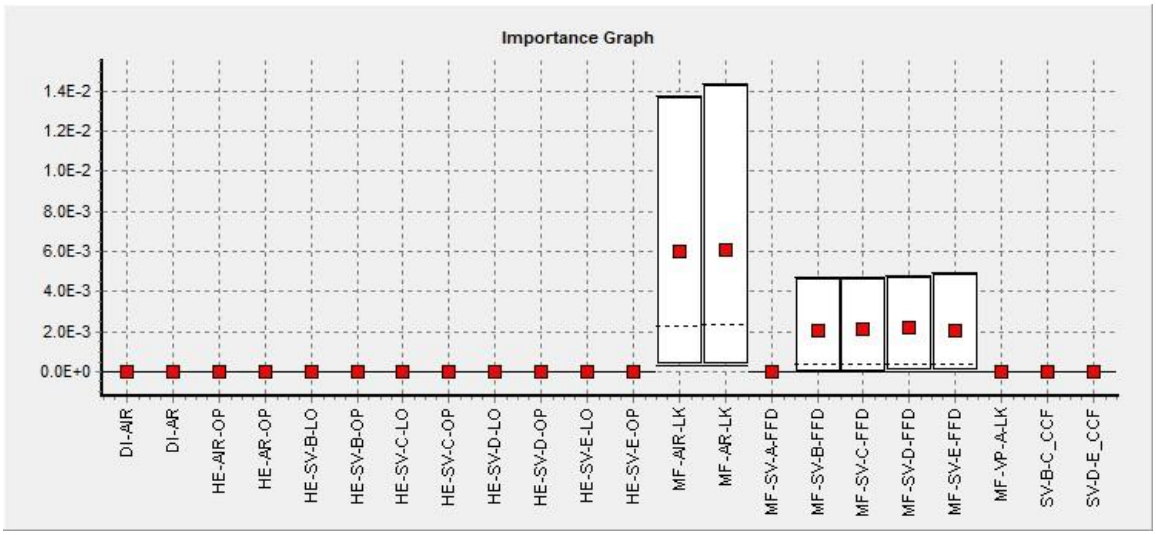


Figure 56: Importance graph for SV_NRPD for extended system with door interlocks.

The importance measures group themselves into much more distinct and succinct patterns of the highest vs the lowest importance as compared to the original configuration with the door interlocks.

3.4.3 Uncertainty Discussion

The spread in the results for the extended system with door interlocks is no different than the spread for the previous results for the extended system without door interlocks. The only way to theoretically pinpoint the exact failure probability would be to have an infinite number of component fault rate data.

For the generalized system over one year, the CDF and PDF are given in Figure 57 and Figure 58. The CDF and PDF for the extended system with door interlocks are almost identical to the distributions without any interlocks.

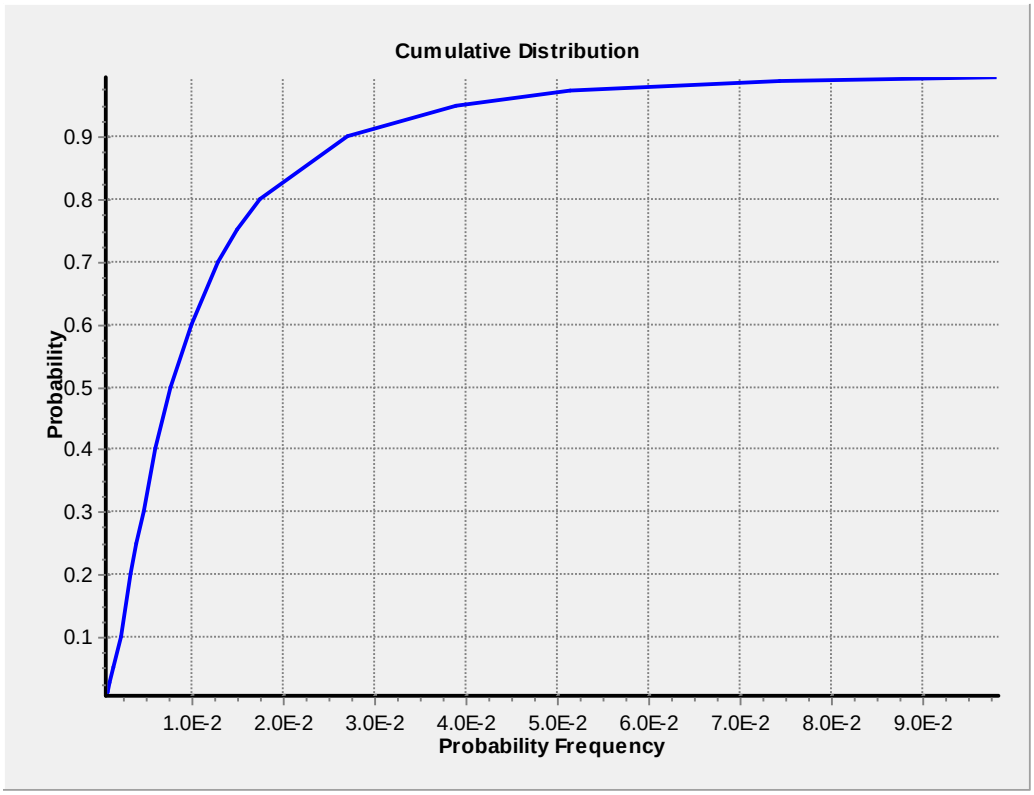


Figure 57: CDF for generalized system with door interlocks.

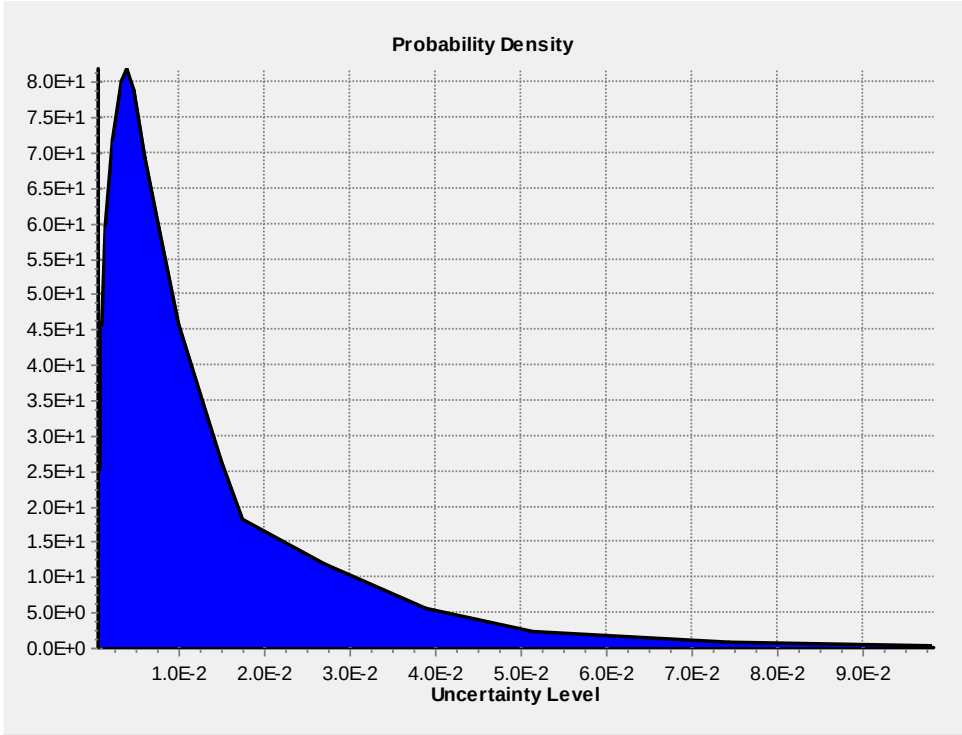


Figure 58: PDF for generalized system with door interlocks.

4. Conclusions

The one-year air ingress event probability is far too high to be advisably safe for continuous use, however if there was an appropriate testing interval involved, this would significantly reduce the probability. Engineering judgement may help reduce the probability given the cut sets. If the percentage of time for maintenance is chosen to be one-month, and the detrimental effects that frequent testing could have on a system are ignored, then the risk could be reduced significantly. Ideally, further research would be done to optimize the operational period with maintenance, such as using four state Markov models which calculate the probabilities for a component in four states (operational, down for maintenance, degraded, and failed) (32). PRA typically only calculates whether a component is failed or operational and does not acknowledge the degraded state. The results gained from Markov models may be plotted to find the optimization between the unavailability from maintenance and the probabilistic risk. Markov models require significantly more data along with a sensitivity analysis to produce adequate results and may use results from a PRA but are not generally a part of PRA.

A summary of the results for the system with original fault rate data and a diagnostic human error component is given in Table 87. The door interlocks did contribute some to the reduction of total air ingress probability, but making the solenoid valves redundant did the most, reducing the probability by roughly a factor of 10. The inclusion of the diagnostic human error component was selected here because it is likely that an operator will have to make some diagnosis before acting on an event. If the extended system with door interlocks is considered, the probability of air ingress after maintaining the risk-critical components

ranges between 10^{-5} to 10^{-4} per year. Further studies should be done relating to the effect of frequent maintenance on this system.

Table 87: Summary Results for the Original Fault Rate Data Using IAEA-Tecdoc-478 Fault Rate with a diagnostic HE Component

	Prob. for 1 year	**Unc. (st.dev)**
Simplified	1.16E-01	6.88E-02
Simplified + DI	1.10E-01	6.75E-02
Extended Model	2.24E-02	1.87E-02
Extended Model + DI	1.94E-02	1.72E-02
Extended Model + RCC Maintenance	3.19E-04	5.33E-04
Extended Model + DI + RCC Maintenance	5.50E-05	9.88E-05

The utilization of the Bruce B door seal fault rate of 1.48 per year produces dangerously high probabilities, no matter the model. It is not recommended that doors with such a high fault rate be used. The reliance on the SV_OH fault rate may also be a bit erroneous since the valves will most likely not be operated at high rates. The valves will be opened to let argon into the system and then returned to their normally shut resting state. Compared to the other solenoid valve component fault rate, the SV_OH data produces results that are consistently ten times every other failure rate, which is more indicative that the SV_OH fault rate is more of an outlier.

The FV importance measures produced much more consistent results with the extended system than with the original configuration, which is another indication that the SV_OH fault rate is unreasonably high, since the SV_OH fault rate has been shown to even overtake the Bruce B door fault rate.

The overall uncertainty of all of the models that were tested is dominated by the intense range of fault rate data for the same components, which makes producing a reasonably accurate PRA model somewhat difficult. The best way to combat the

uncertainty would be to calculate the results using many more fault rates for each component.

Bibliography

1. Bartel, Reynold. *WASH-1400: The Reactor Safety Study - The Introduction of Risk Assessment to the Regulation of Nuclear Reactors.* s.l. : U.S. NRC, 2016.

2. U.S. NRC. *NUREG-2150: A Proposed Risk Management Regulatory Framework.* 2012.

3. US NRC. *Draft Regulatory Basis for Licensing and Regulating Reprocessing Facilities.* s.l. : US NRC, 2011. ML112081702.

4. U.S. NRC. Probabilistiv Risk Assessment. *NRC.gov.* [Online] 2016. https://www.nrc.gov/about-nrc/regulatory/risk-informed/pra.html.

5. Calley, Michael. *PRA Basics for Regulatory Application.* [Powerpoint Presentation]

6. Kececioglu, D. Reliability Engineering Handbook. New Jersey : Prentice Hall, 1991.

7. Erickson II, Clifton A. Event Tree Analysis. *Hazard Analysis Techniques for System Savety.* s.l. : John Wiley & Sons, Inc, 2005.

8. Vesely, W. E., et al. *Fault Tree Handbook.* s.l. : U. S. NRC, 1981. NUREG-0492.

9. Further Concepts in Probability. *wyzant.com.* [Online] wyzant. https://www.wyzant.com/resources/lessons/math/statistics_and_probability/probability/further_concepts_in_probability.

10. INL. nrc.gov. *Module N: Importance Measures.* [Online] https://www.nrc.gov/docs/ML1216/ML12160A479.pdf.

11. Rausand, Marvin. Risk Assessment - Common Cause Failures. *NTNU - Trondheim.* [Online] http://frigg.ivt.ntnu.no/ross/risk/slides/ccf.pdf.

12. Downer, John. *When Failure is an Option: Redundancy, Reliability and Regulation in Complex Technical Systems.* Centre for Analysis of Risk and Regulation. s.l. : ESRC, 2009.

13. Redundant Systems Basic Concepts . *ni.com.* [Online] National Instruments, January 11, 2008. [Cited: 10 20, 2017.] http://www.ni.com/white-paper/6874/en/.

14. U.S. NRC. *NUREG/CRE--5695 - A Process for Risk-Focused Maintenance.* 1991.

15. Drouin, M., et al. *Guidance on the Treatment of Uncertainties Associated with PRAs in Risk-Informed Decision Making.* s.l. : U.S. NRC, 2009. NUREG-1855.

16. Pishro-nik, Hossein. Probability Density Function (PDF). *Introduction to Probability, Statistics, and Random Processes.* [Online] Creative Commons Atribution-Non Commercial - NoDerivs 3.0 Unported License . https://www.probabilitycourse.com/chapter4/4_1_1_pdf.php.

17. MathWave. Distribution Fitting - Using Distribution Graphs. *MathWave - Data Analysis and Simulation.* [Online] MathWave Technologies. http://www.mathwave.com/articles/distribution-fitting-graphs.html.

18. *OVERVIEW OF THE SAPHIRE PROBABILISTIC RISK ANALYSIS SOFTWARE* . Smith, Curtis L., et al. s.l. : INL, October 2016, Vols. INL/CON-16-39539.

19. Idaho National Lab . SAPHIRE Version 8 Users Guide .

20. Atwood, Corwin L. *Constrained Noninformative Priors.* Idaho Falls : Idaho National Engineering Laboratory, 1994. INEL-94/0074.

21. World Nuclear Association. Processing of Used Nuclear Fuel. *world-nuclear.org.* [Online] 2016. http://www.world-nuclear.org/information-library/nuclear-fuel-cycle/fuel-recycling/processing-of-used-nuclear-fuel.aspx.

22. *Fast Reactor Spent Fuel Processing: Experience and Criticality Safety.* Pope, Chad. s.l. : INL, May 2007, Vols. INL/CON-07-12106.

23. *Transient Response and Radiation Dose Estimates for Breaches to a Spent Fuel Processing Facility.* Solbrig, Charles W., Pope, Chad and Andrus, Jason. 275, s.l. : Elsevier, 2014, Nuclear Engineering and Design.

24. IAEA. *IAEA-TECDOC-478: Component Reliability Data for use in Probabilistic Safety Assessment* . s.l. : IAEA, 1988.

25. U.S. NRC. *Integrated Plant Safety Assessment: Systematic Evaluation Program La Crosse Boiling Water Reactor.* s.l. : U.S. NRC, 1983.

26. Goble, William M. and Siebert, Joseph F. *Field Failure Data - The Good, the Bad, and the Ugly.* s.l. : Exida, 2008.

27. Berlo, C. Van and Leidner, J. *Aging of Elastomers in CANDU Pressure Boundary Service.* s.l. : Atomic Energy Control Board, 1987.

28. INL; U.S. NRC. *NUREG/CR-6883 The SPAR-H Human Reliability Analysis Method.* 2005.

29. Arthur D. Little Inc. . *Point Arguella Field and Gaviota Processing Facility Area Study and Chevron/Texaco Development Plans EIR/EIS.* 1984.

30. U.S. Nuclear Refulatory Commission. CCF Parameter Estimations 2015. [Online] October 2016. http://nrcoe.inel.gov/resultsdb/publicdocs/CCF/ccfparamest2015.pdf.

31. Kelly, Dana and Smith, Curtis. *Bayesian Inference for Probabilistic Risk Assessment: A Practitioner's Guidebook.* s.l. : Springer, 2011.

32. U.S. NRC. *NUREG/CR-6002 - Risk-Based Maintenance Modeling.* 1995.

33. —. *NUREG/CR--5695: A Process for Risk-Focused Maintenance.* 1991.

Appendix

Appendix A – Event Trees

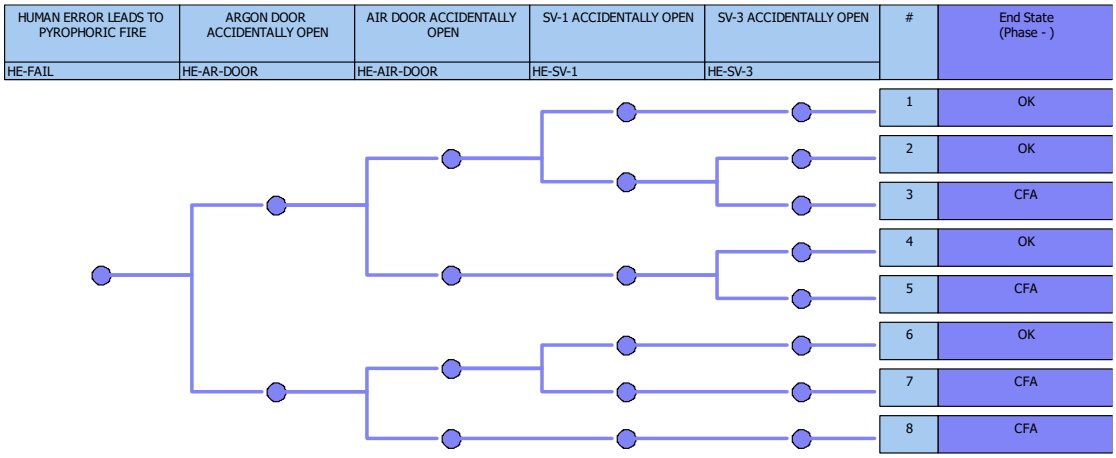


Figure 59: HE event tree for the basic system.

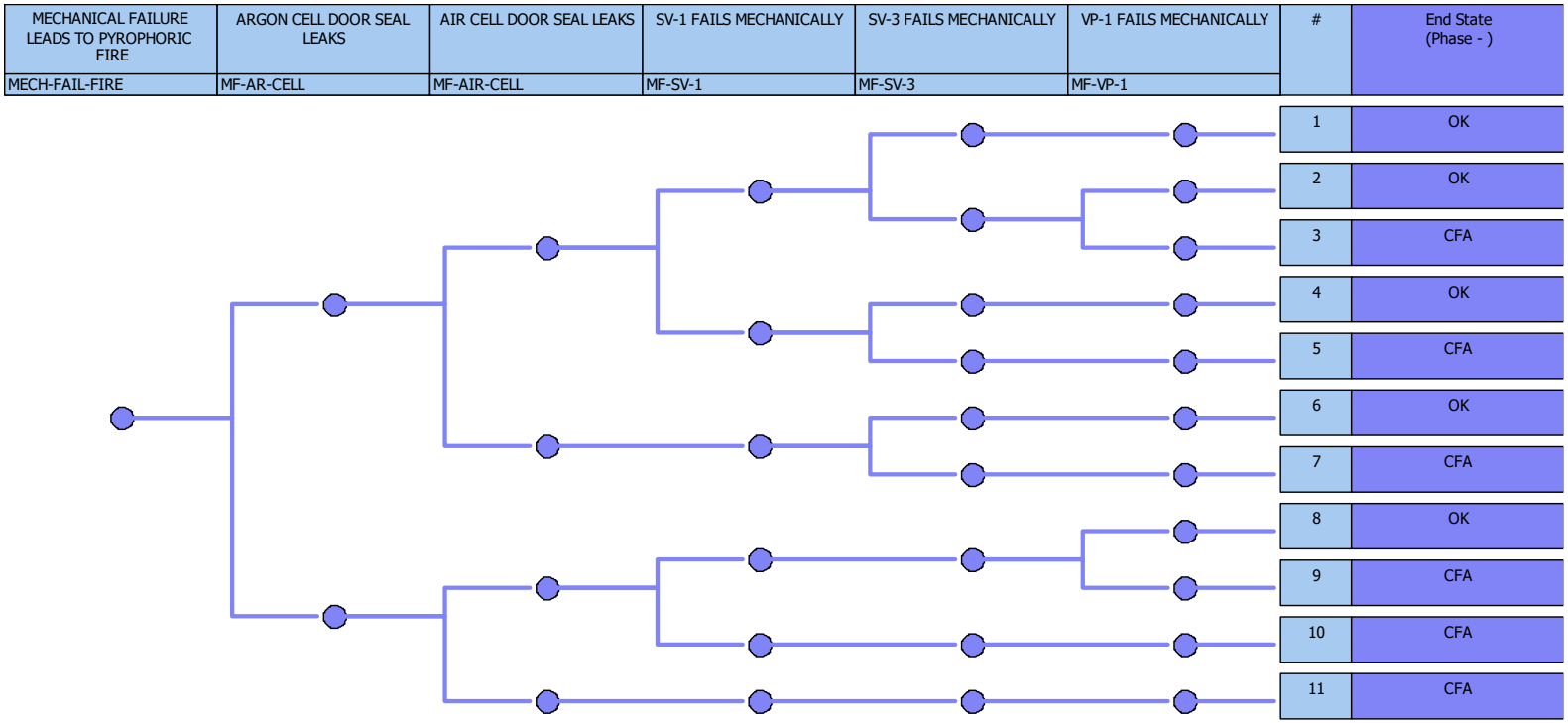


Figure 60: MF event tree for the basic system.

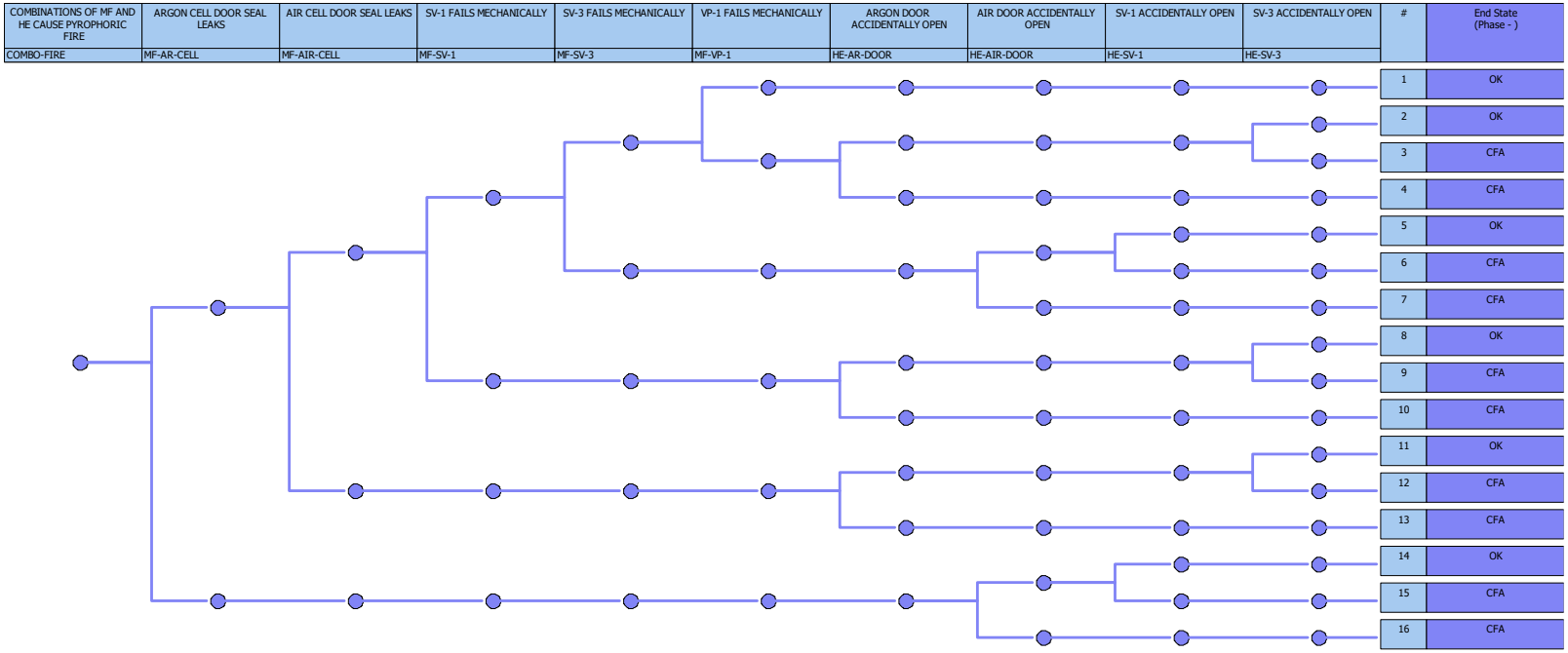


Figure 61: Generalized system combination event tree.

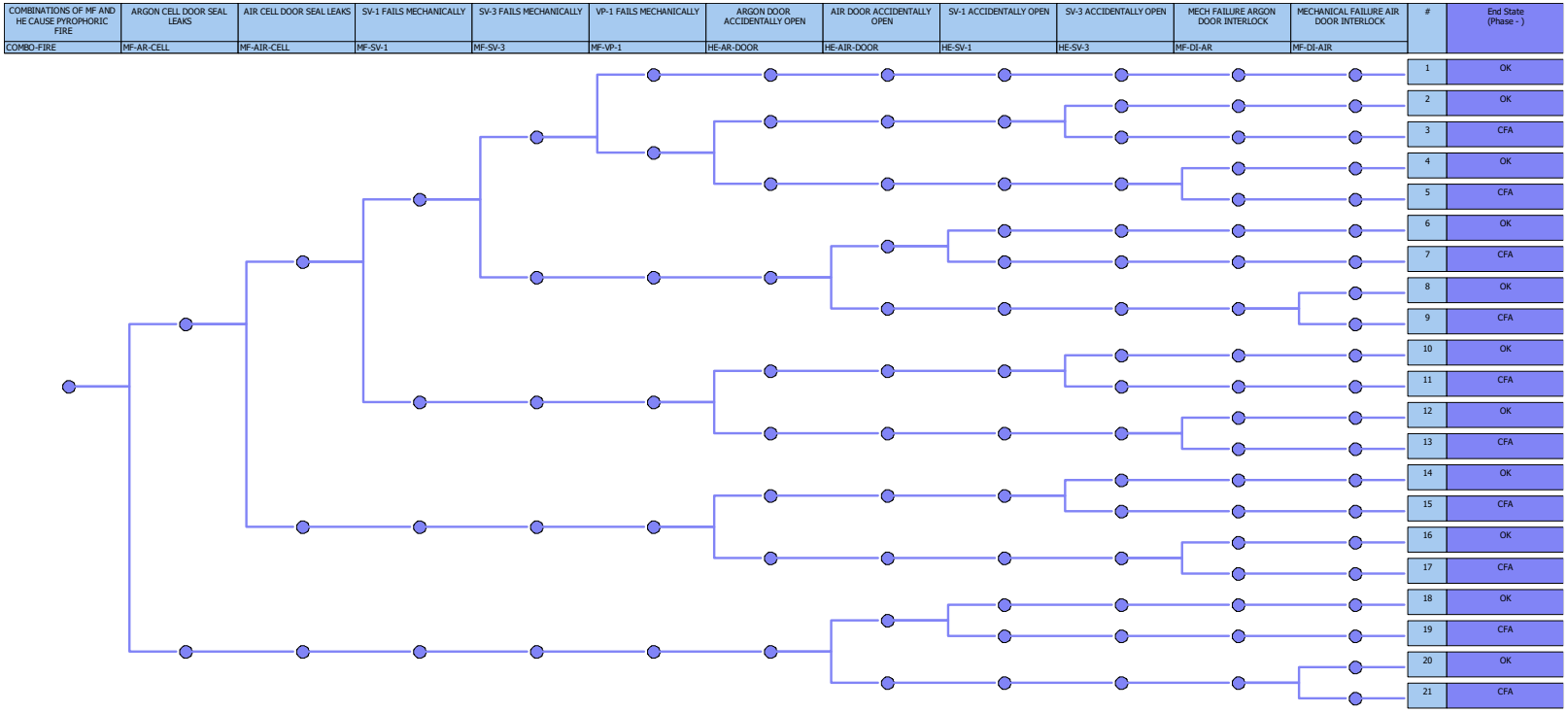


Figure 62: Combination errors event tree for basic system and door interlocks.

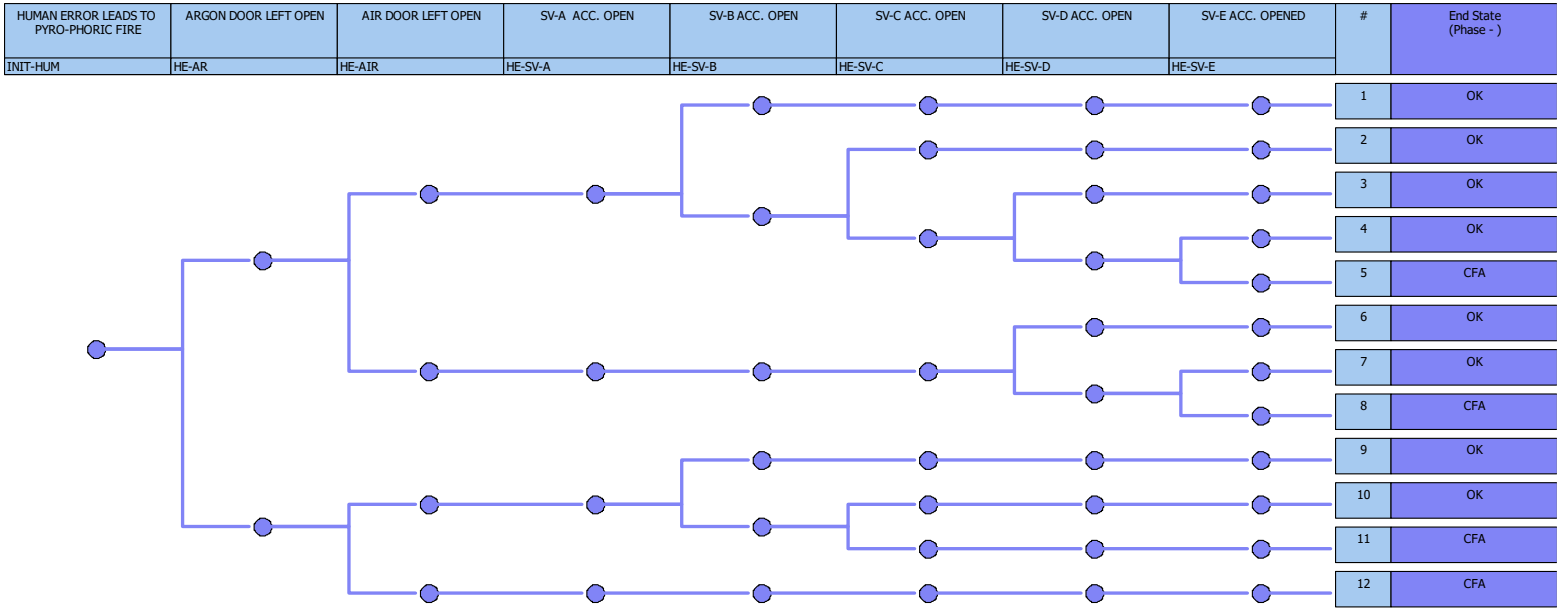


Figure 63: Human error ET for extended system.

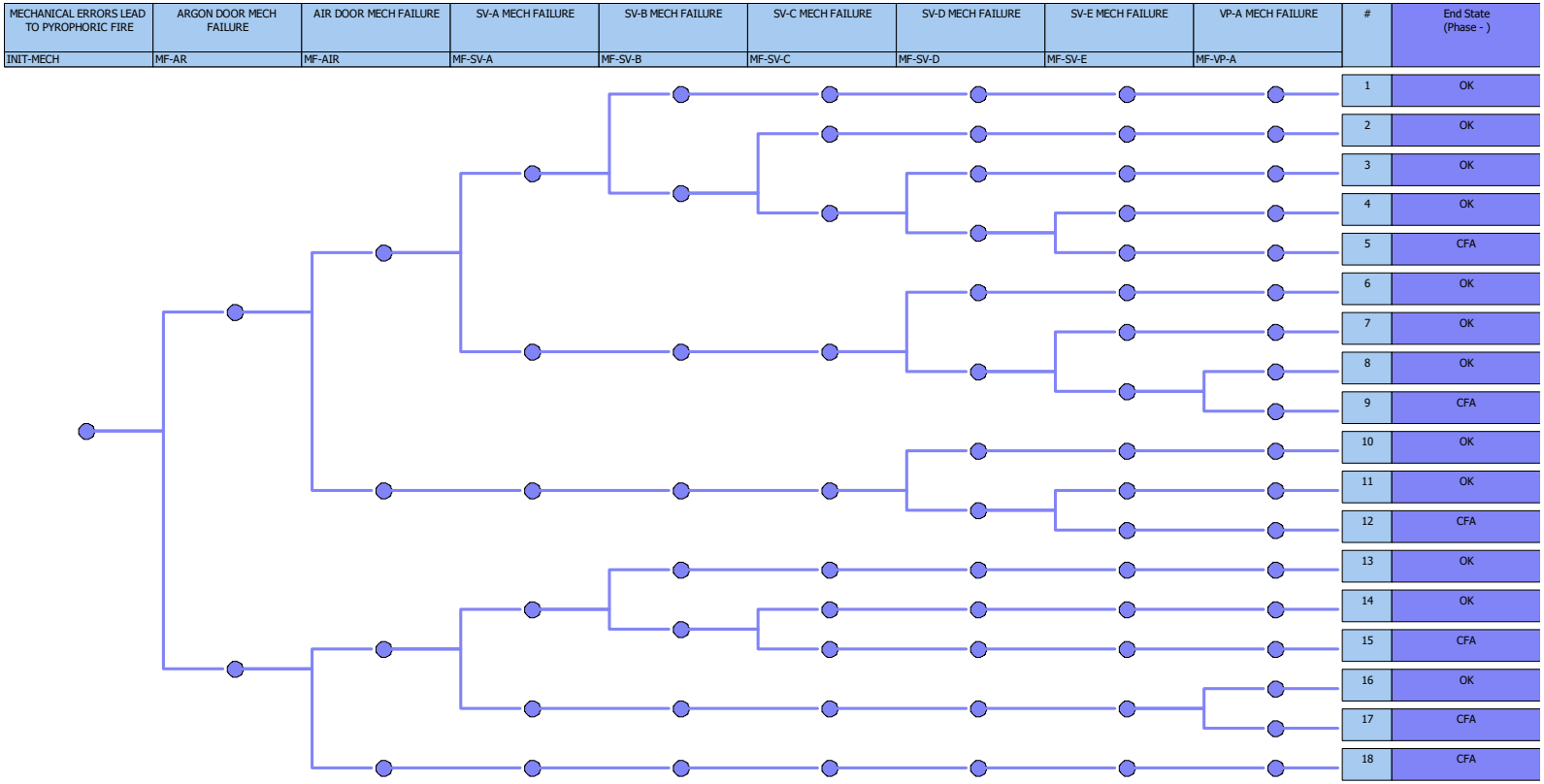


Figure 64: MF ET for extended system.

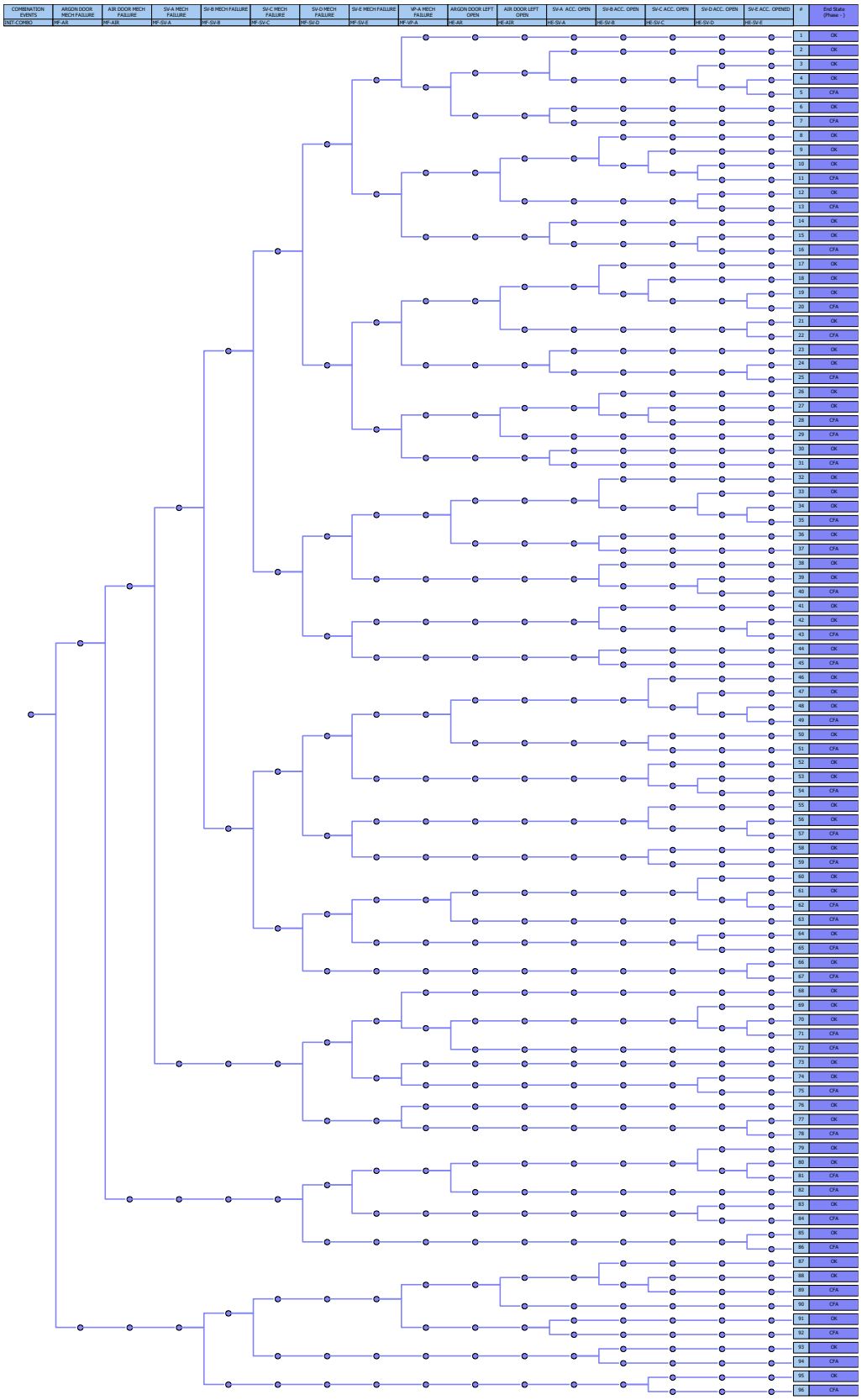


Figure 65: Combinations ET for extended system.

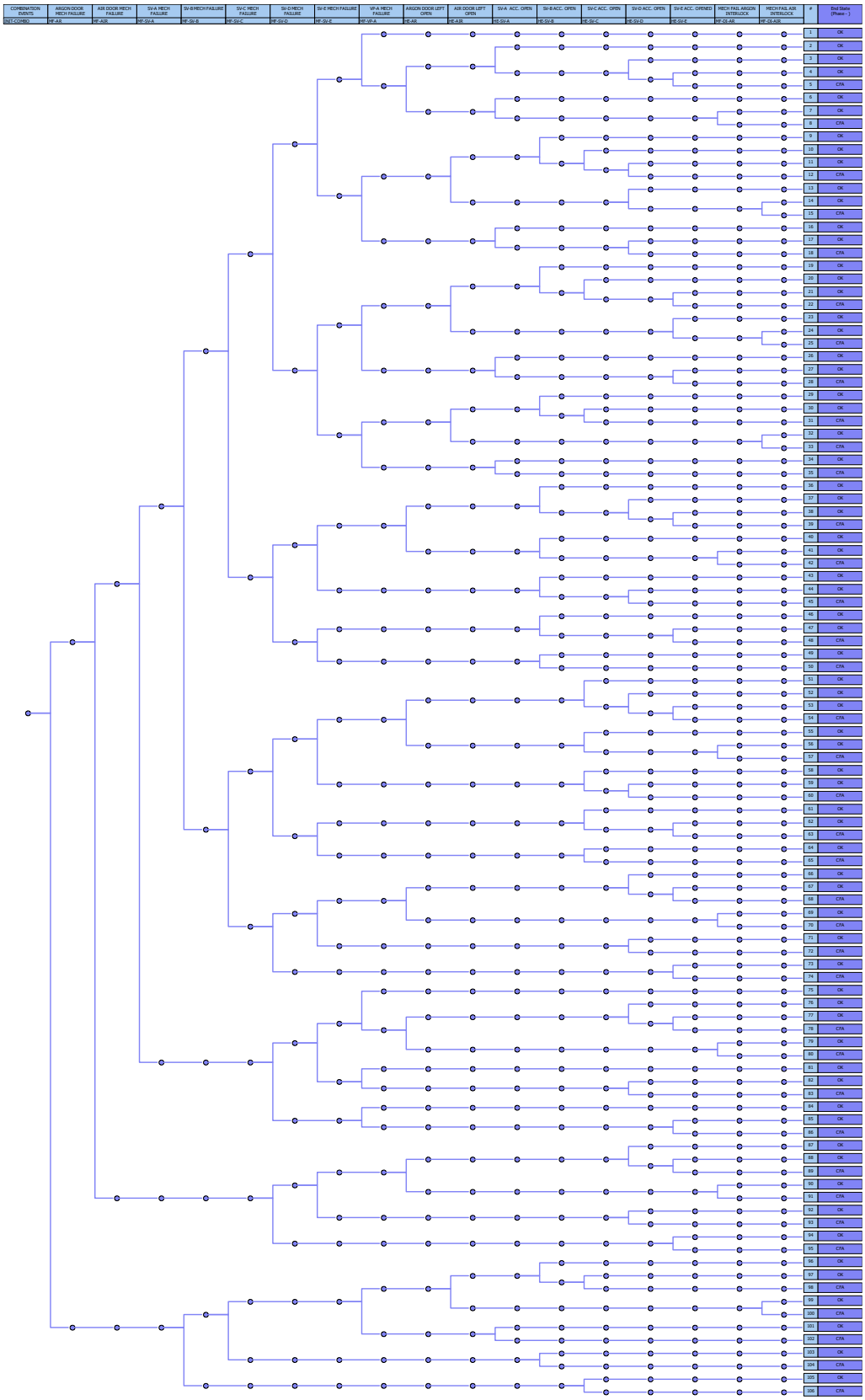


Figure 66: Combinations ET for extended system with door interlocks.

Appendix B – Fault Trees

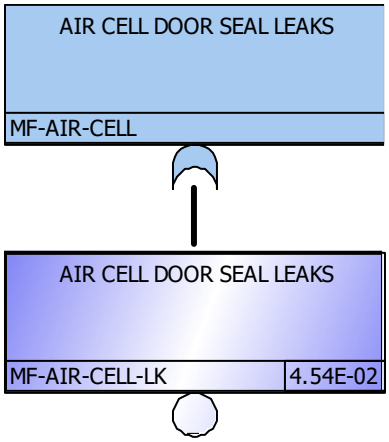


Figure 67: Air MF fault tree.

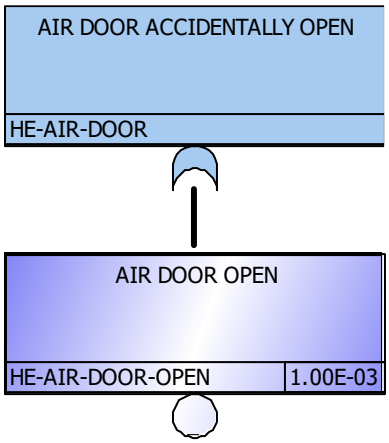


Figure 68: Air HE fault tree.

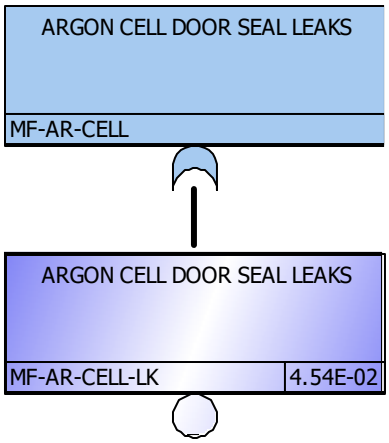


Figure 69: Ar MF fault tree.

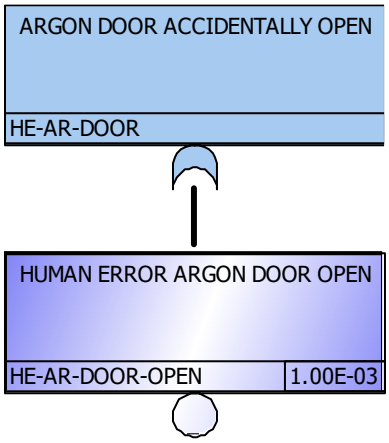


Figure 70: Ar door HE fault tree.

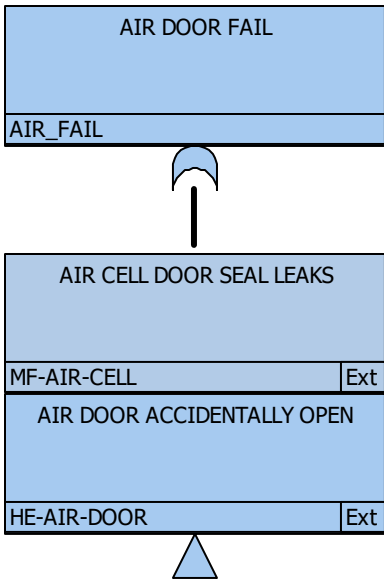


Figure 71: Air door fault tree.

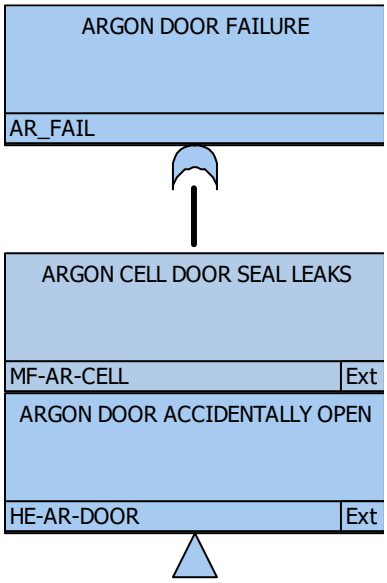


Figure 72: Argon door fault tree.

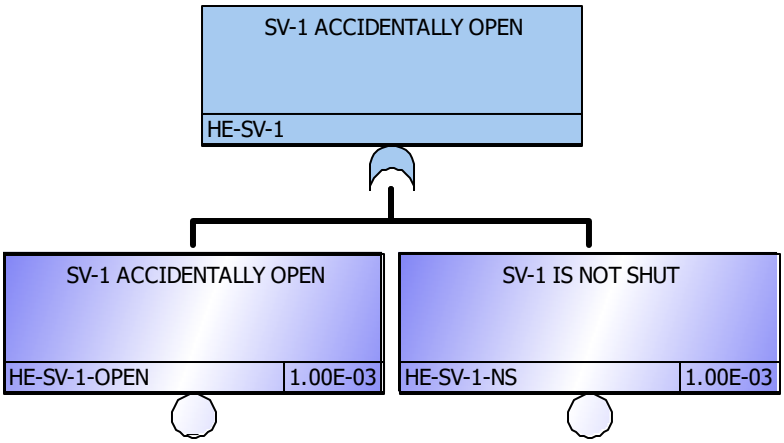


Figure 73: SV-1 HE fault tree.

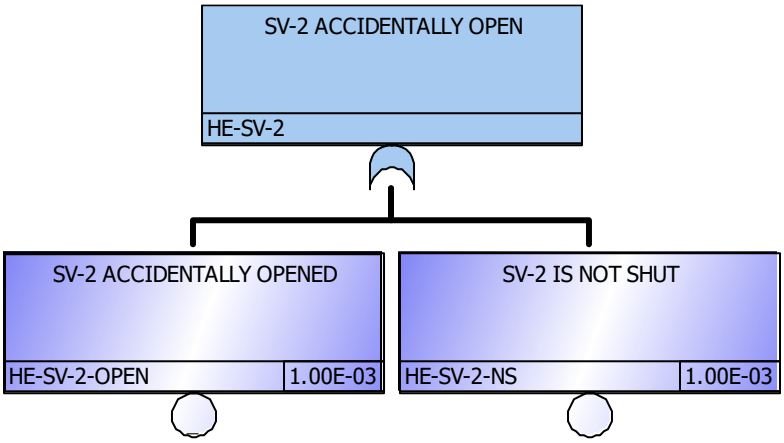


Figure 74: SV-2 HE fault tree.

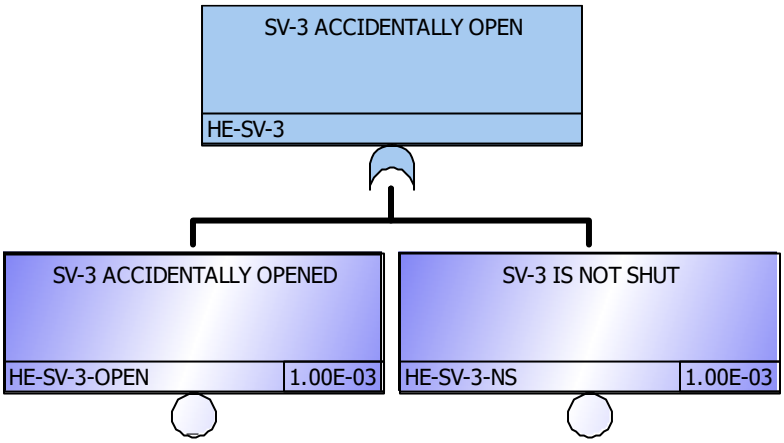


Figure 75: SV-3 HE fault tree

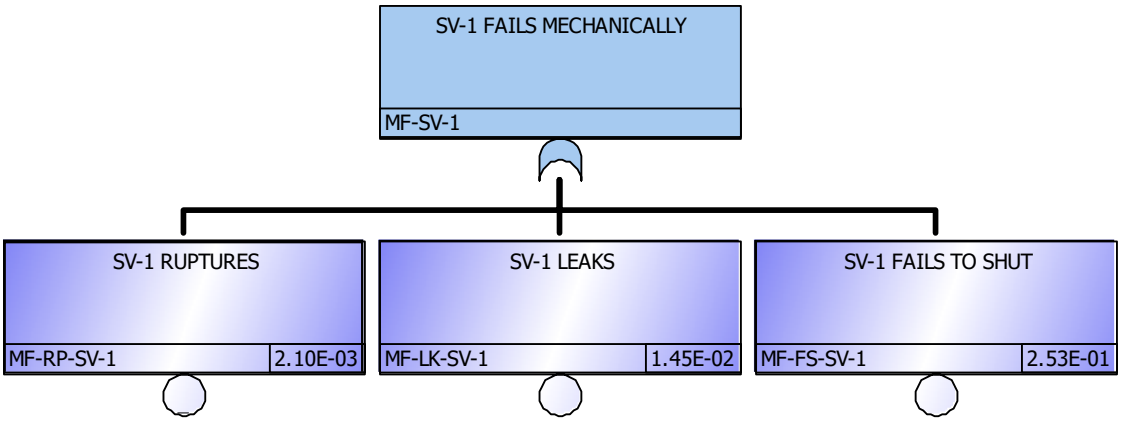


Figure 76: SV-1 MF fault tree.

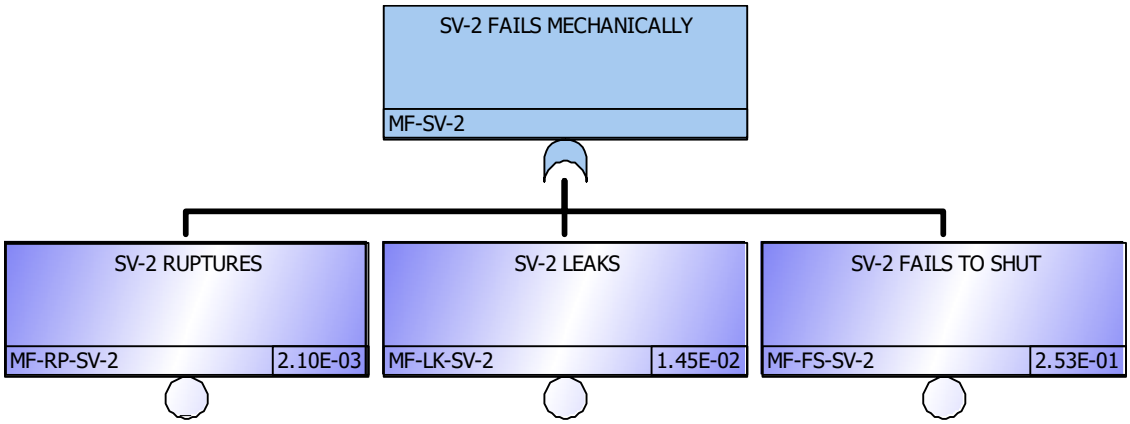


Figure 77: SV-2 MF fault tree

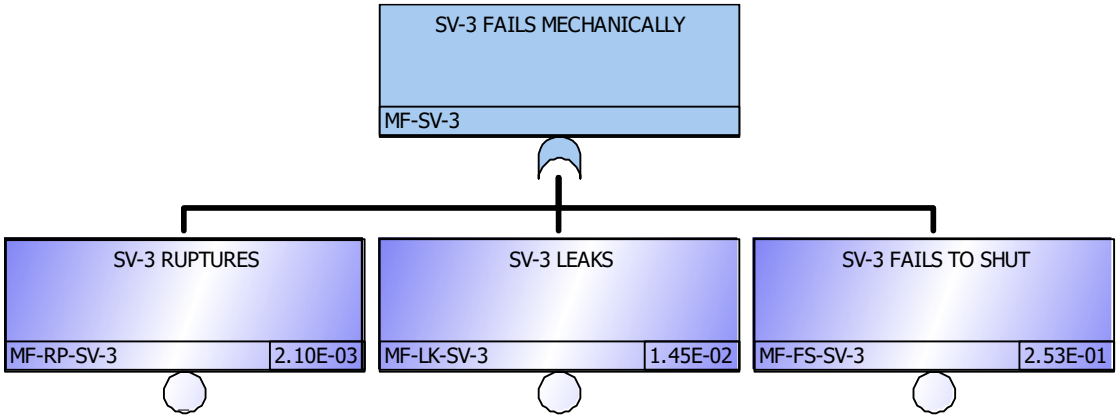


Figure 78: SV-3 MF fault tree.

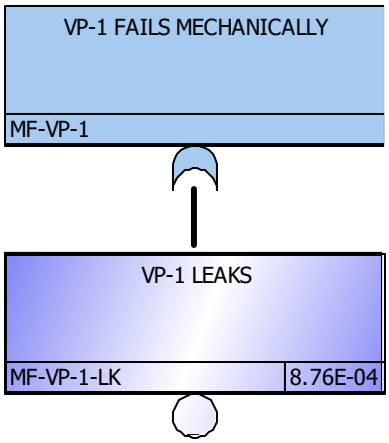


Figure 79: VP-1 MF fault tree.

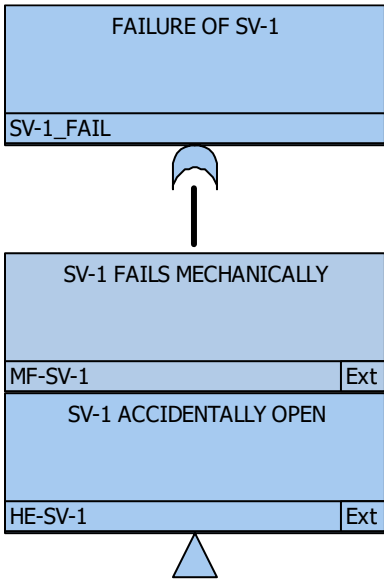


Figure 80: SV-1 fault tree.

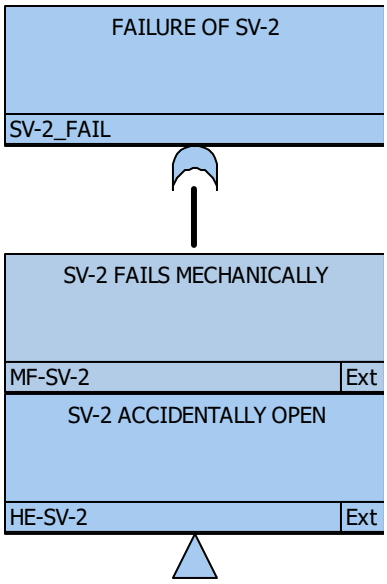


Figure 81: SV-2 fault tree.

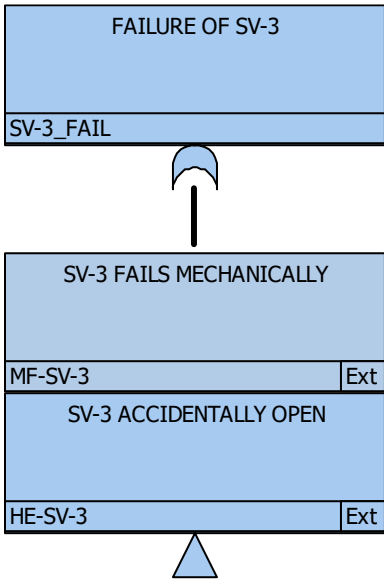


Figure 82: SV-3 fault tree.

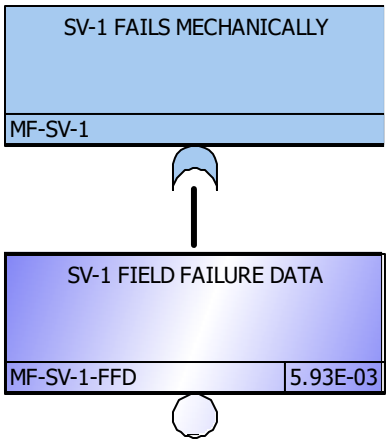


Figure 83: MF SV-1 FT for FFD.

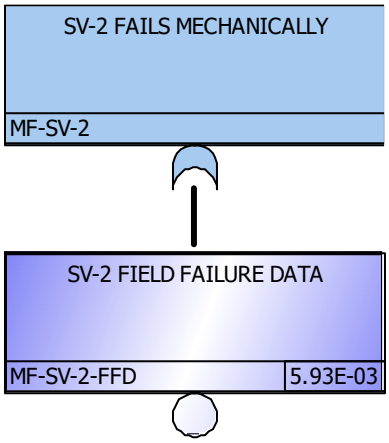


Figure 84: MF SV-2 FT for field failure data.

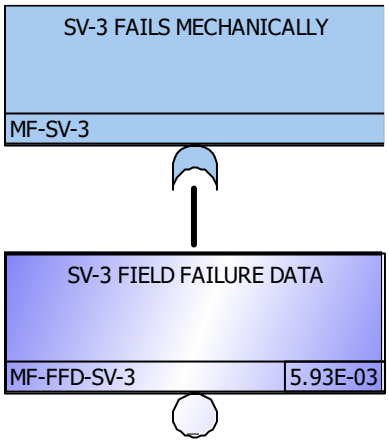


Figure 85: MF SV-3 FT for FFD

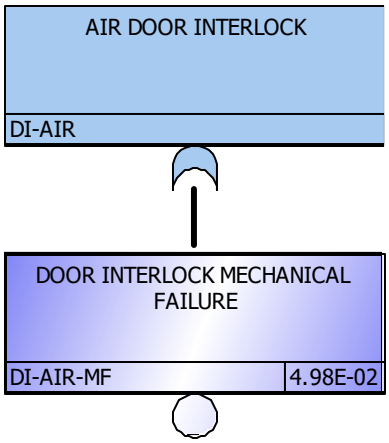


Figure 86: Air door interlock fault tree.

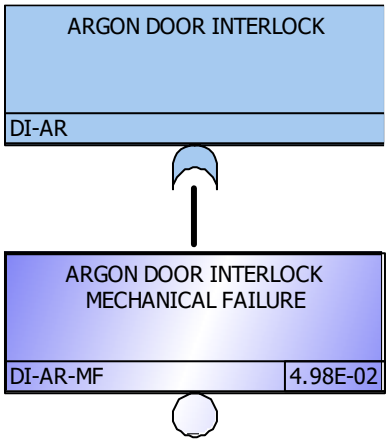


Figure 87: Ar door interlock fault tree.

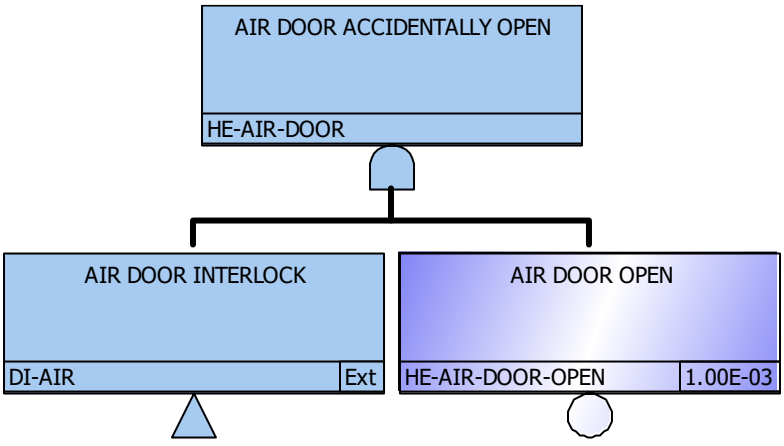


Figure 88: HE Air door FT w/door interlocks.

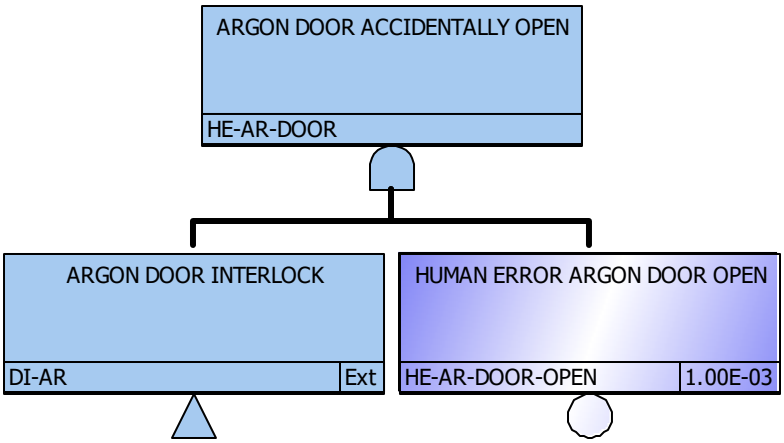


Figure 89: HE argon door FT w/ door interlocks.

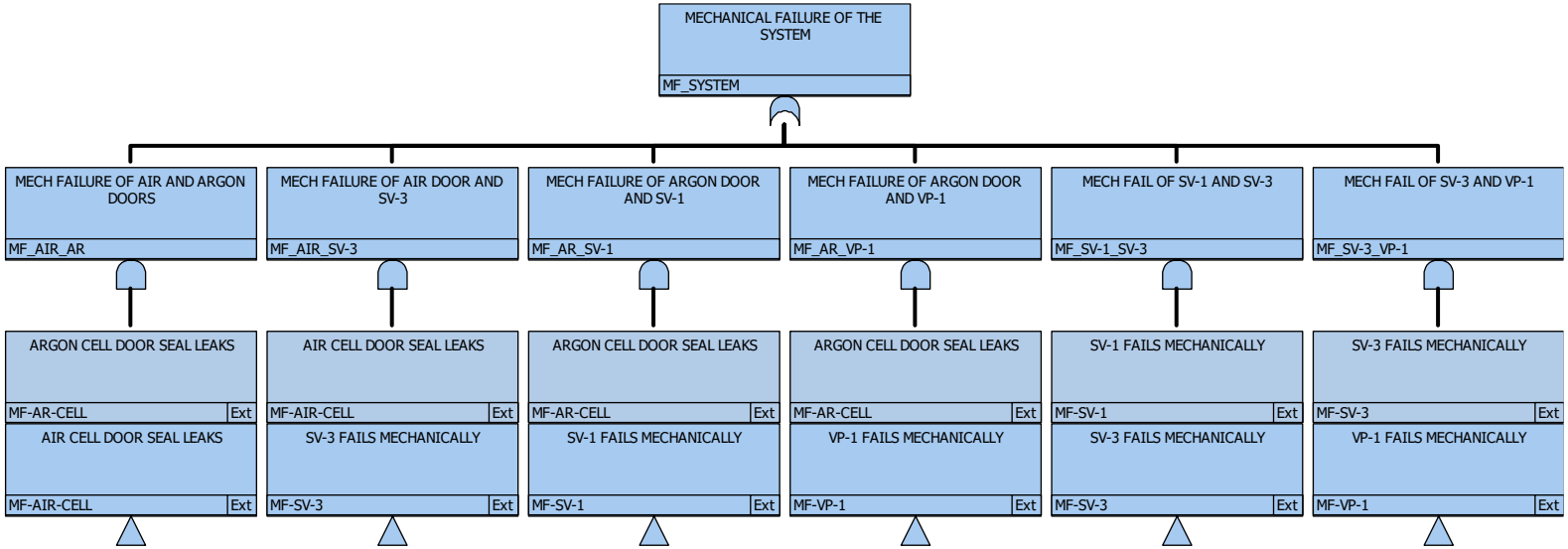


Figure 90: FT for mechanical failure of generalized system.

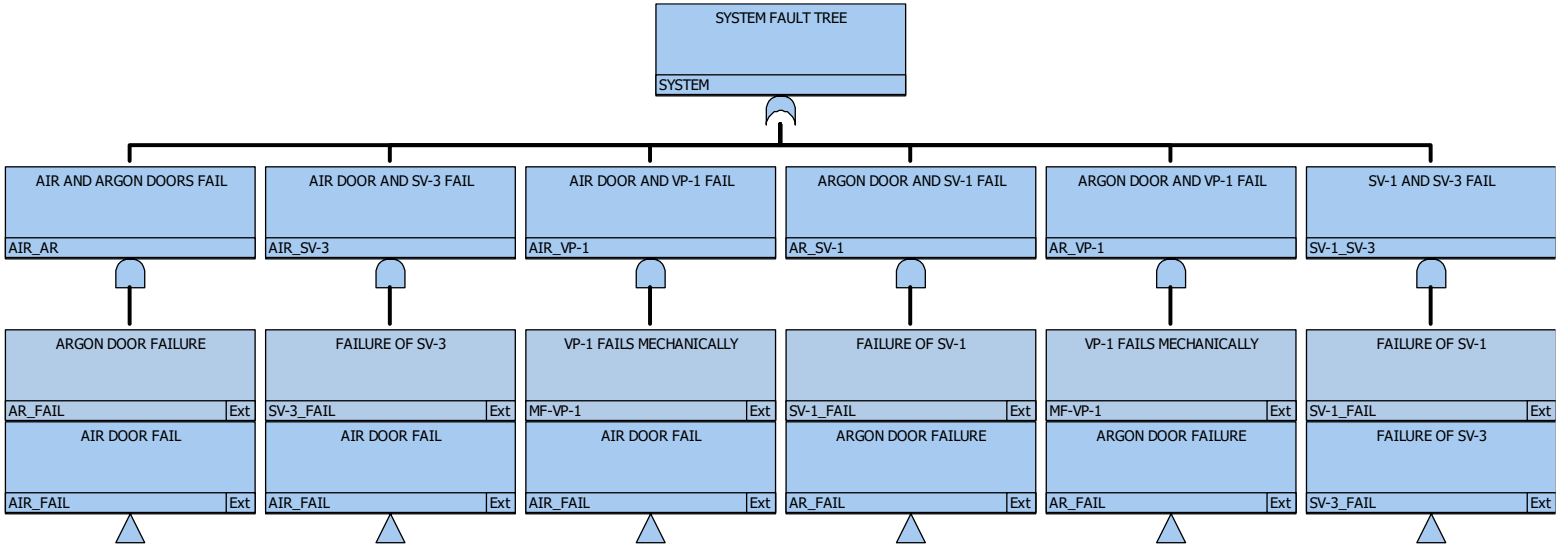


Figure 91: System fault tree for generalized system.

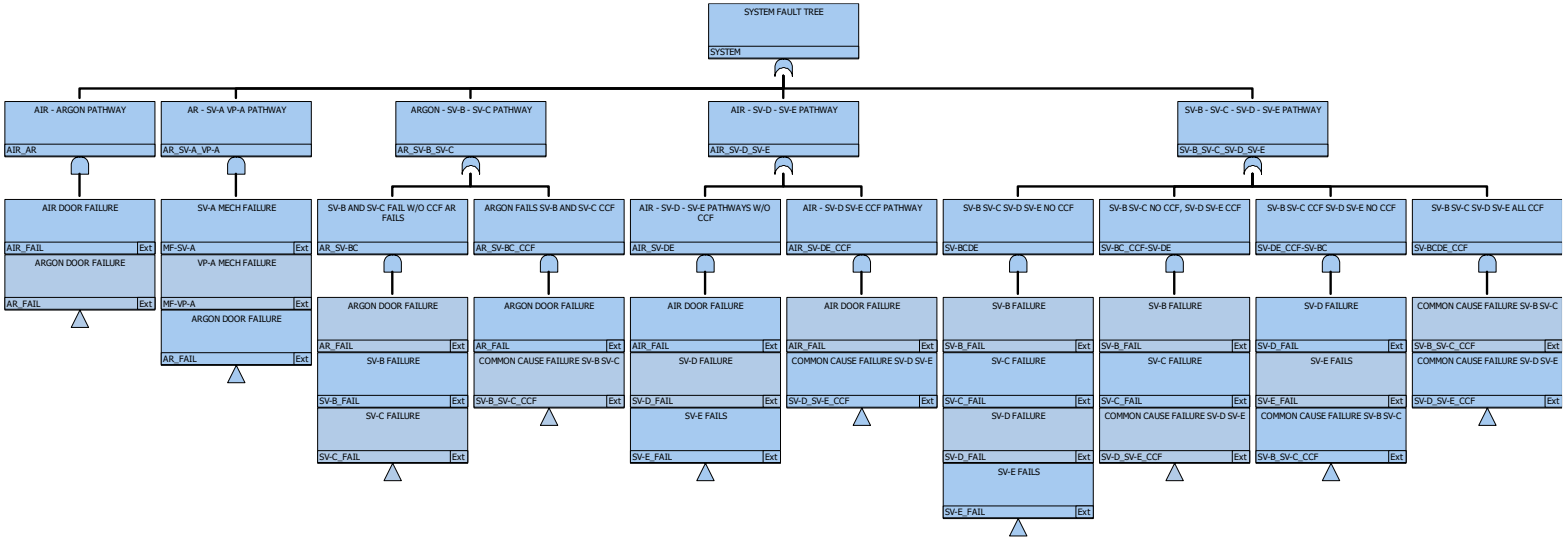


Figure 92: Extended system fault tree.

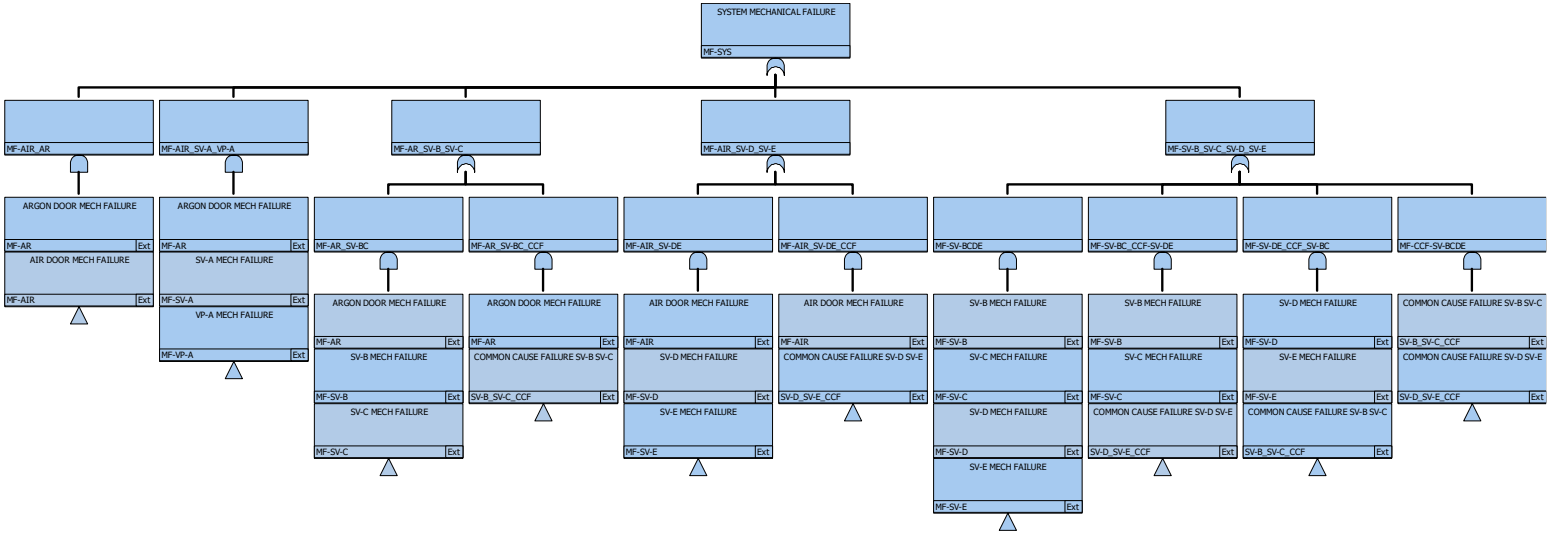


Figure 93: Extended system fault tree for MF only.

Appendix C – Fussel-Vesely Results

Table 88: Basic System FV

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-DOOR-OPEN	3.24E-3	4.35E-3	4.11E-6	9.92E-4	1.16E-2	1.85E-12	1.65E-1
HE-AR-DOOR-OPEN	3.24E-3	4.41E-3	4.44E-6	1.03E-3	1.18E-2	4.05E-11	9.87E-2
HE-SV-1-NS	3.23E-3	4.35E-3	3.60E-6	1.00E-3	1.13E-2	4.18E-10	8.82E-2
HE-SV-1-OPEN	3.23E-3	4.33E-3	2.55E-6	1.03E-3	1.16E-2	1.56E-13	1.46E-1
HE-SV-3-NS	3.23E-3	4.30E-3	4.84E-6	1.03E-3	1.12E-2	2.98E-11	1.03E-1
HE-SV-3-OPEN	3.23E-3	4.27E-3	3.32E-6	1.00E-3	1.17E-2	3.65E-12	1.16E-1
MF-AIR-CELL-LK	1.47E-1	1.34E-1	4.37E-3	5.12E-2	3.52E-1	3.31E-4	9.26E-1
MF-AR-CELL-LK	1.47E-1	1.35E-1	4.28E-3	5.40E-2	3.50E-1	3.08E-4	9.36E-1
MF-FS-SV-1	8.07E-1	7.96E-1	3.66E-1	8.07E-1	9.45E-1	7.85E-2	9.91E-1
MF-FS-SV-3	8.07E-1	7.95E-1	3.72E-1	8.05E-1	9.44E-1	4.60E-2	9.91E-1
MF-LK-SV-1	4.68E-2	6.04E-2	9.07E-3	3.70E-2	1.22E-1	2.60E-3	5.53E-1
MF-LK-SV-3	4.68E-2	6.08E-2	9.35E-3	3.68E-2	1.23E-1	2.11E-3	5.99E-1
MF-RP-SV-1	6.79E-3	8.82E-3	1.69E-4	2.08E-3	2.05E-2	1.21E-5	4.20E-1
MF-RP-SV-3	6.79E-3	9.02E-3	1.77E-4	2.14E-3	2.07E-2	1.05E-5	7.49E-1
MF-VP-1-LK	8.25E-4	1.05E-3	4.82E-5	4.34E-4	2.42E-3	4.74E-6	2.26E-2

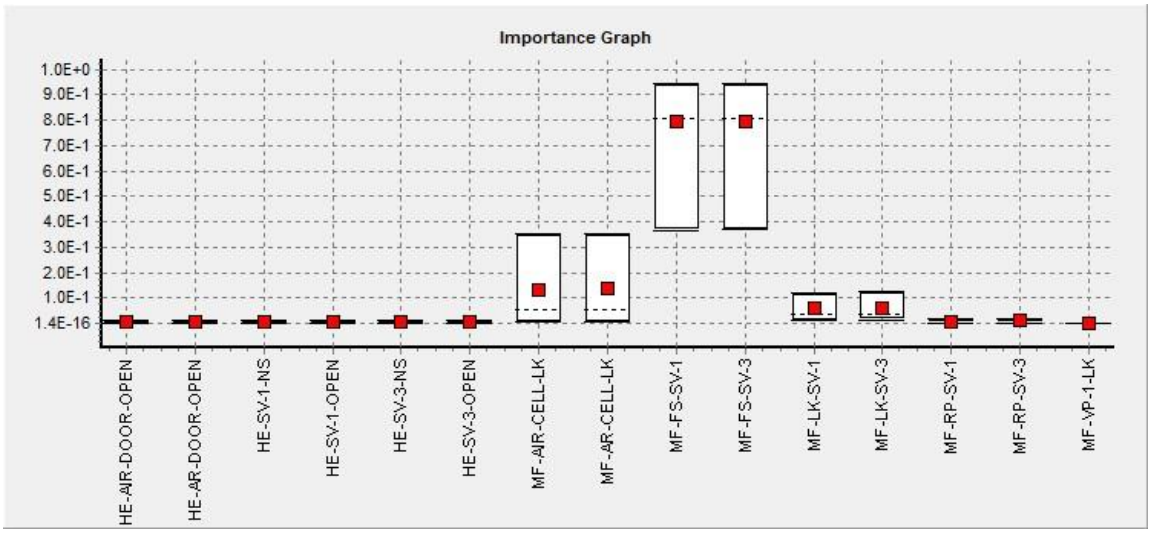


Figure 94: Importance graph for FV results for basic system.

Table 89: FV Original System SV_OL

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-DOOR-OPEN	1.82E-2	4.61E-2	2.44E-5	8.74E-3	1.33E-1	3.33E-13	8.03E-1
HE-AR-DOOR-OPEN	1.82E-2	4.64E-2	1.97E-5	8.22E-3	1.34E-1	3.07E-10	7.97E-1
HE-SV-1-NS	1.79E-2	4.38E-2	2.58E-5	8.06E-3	1.25E-1	9.85E-14	6.93E-1
HE-SV-1-OPEN	1.79E-2	4.36E-2	2.41E-5	7.62E-3	1.22E-1	4.54E-11	7.81E-1
HE-SV-3-NS	1.79E-2	4.27E-2	2.37E-5	7.60E-3	1.19E-1	3.12E-12	7.04E-1
HE-SV-3-OPEN	1.79E-2	4.41E-2	2.98E-5	7.78E-3	1.27E-1	7.98E-11	8.27E-1
MF-AIR-CELL-LK	8.27E-1	6.68E-1	1.04E-1	6.48E-1	9.55E-1	5.17E-3	9.98E-1
MF-AR-CELL-LK	8.27E-1	6.65E-1	9.43E-2	6.47E-1	9.55E-1	3.09E-3	9.99E-1
MF-FFD-SV-3	1.06E-1	1.71E-1	2.38E-3	5.71E-2	4.81E-1	1.01E-4	9.73E-1
MF-SV-1-FFD	1.06E-1	1.68E-1	2.50E-3	5.54E-2	4.67E-1	8.40E-5	9.88E-1
MF-VP-1-LK	2.68E-2	6.12E-2	5.92E-3	3.35E-2	1.33E-1	1.22E-3	5.93E-1

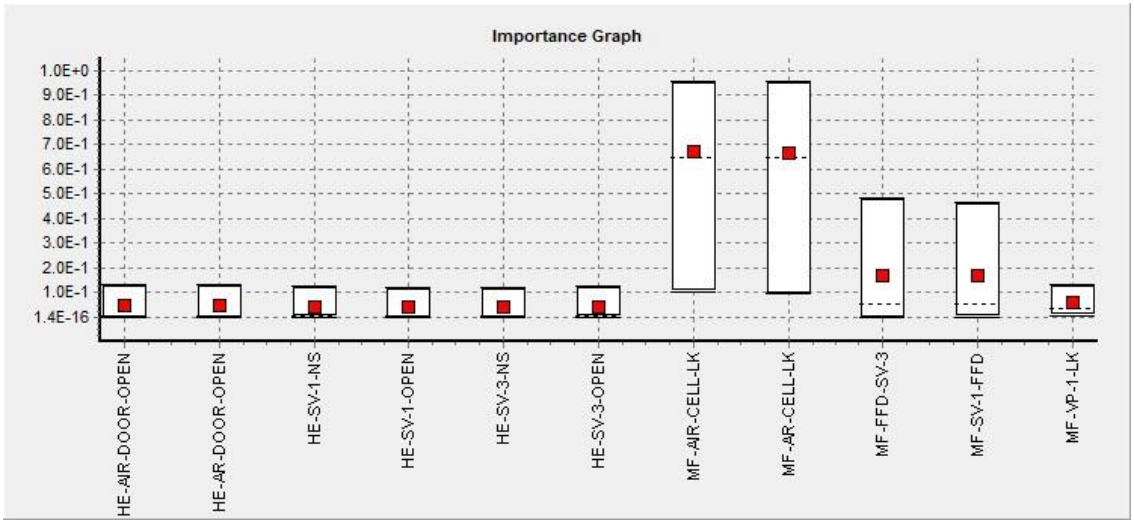


Figure 95: Importance graph for FV results for basic system w/SV_OL.

Table 90: FV for Original System SV_OM

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-DOOR-OPEN	2.61E-3	8.74E-3	4.15E-6	1.35E-3	2.26E-2	8.81E-15	6.56E-1
HE-AR-DOOR-OPEN	2.61E-3	8.65E-3	2.90E-6	1.27E-3	2.14E-2	5.49E-11	4.26E-1
HE-SV-1-NS	2.60E-3	8.54E-3	4.29E-6	1.31E-3	2.15E-2	7.35E-15	3.04E-1
HE-SV-1-OPEN	2.60E-3	8.38E-3	3.75E-6	1.24E-3	2.13E-2	2.19E-11	3.84E-1
HE-SV-3-NS	2.60E-3	8.30E-3	3.55E-6	1.17E-3	2.06E-2	1.08E-12	4.08E-1
HE-SV-3-OPEN	2.60E-3	8.29E-3	4.63E-6	1.26E-3	2.15E-2	1.45E-11	3.50E-1
MF-AIR-CELL-LK	1.18E-1	2.04E-1	4.21E-3	7.23E-2	5.69E-1	1.95E-4	9.87E-1
MF-AR-CELL-LK	1.18E-1	2.03E-1	3.87E-3	7.08E-2	5.63E-1	2.96E-4	9.89E-1
MF-FFD-SV-3	8.91E-1	7.78E-1	1.52E-1	8.13E-1	9.82E-1	8.13E-3	1.00E+0
MF-SV-1-FFD	8.91E-1	7.77E-1	1.59E-1	8.08E-1	9.82E-1	6.49E-3	1.00E+0
MF-VP-1-LK	5.34E-4	3.15E-3	3.83E-5	7.34E-4	7.78E-3	4.11E-6	1.27E-1

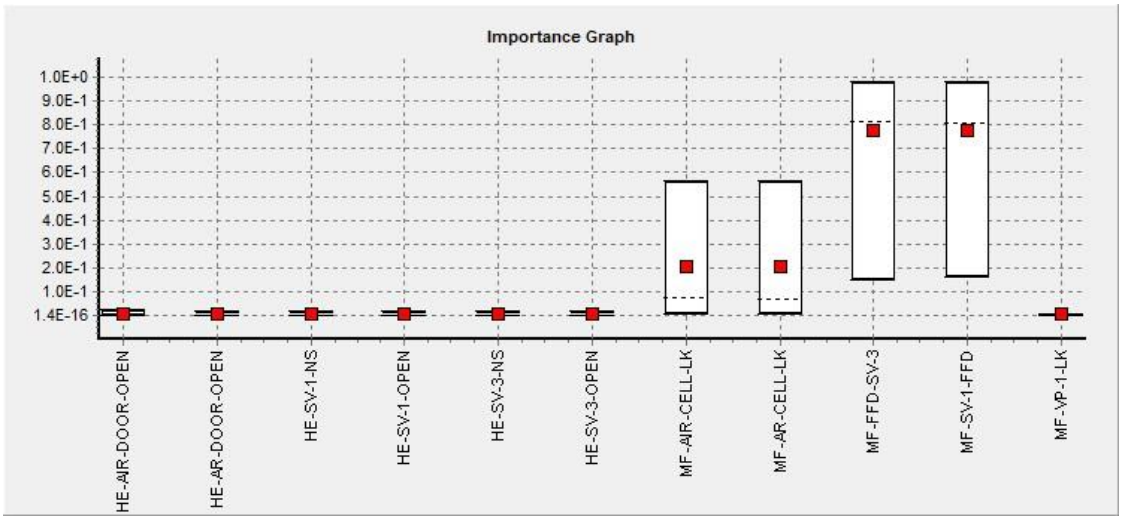


Figure 96: Importance graph for FV results for basic system w/ SV_OM.

Table 91: FV for Basic System SV_OH

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-DOOR-OPEN	1.26E-3	3.72E-3	2.09E-6	6.35E-4	8.82E-3	6.00E-15	4.06E-1
HE-AR-DOOR-OPEN	1.26E-3	3.64E-3	1.36E-6	5.86E-4	8.51E-3	2.32E-11	2.54E-1
HE-SV-1-NS	1.26E-3	3.58E-3	2.14E-6	6.18E-4	8.48E-3	4.73E-15	1.40E-1
HE-SV-1-OPEN	1.26E-3	3.56E-3	1.99E-6	5.98E-4	8.31E-3	1.20E-11	2.23E-1
HE-SV-3-NS	1.26E-3	3.51E-3	1.91E-6	5.58E-4	8.25E-3	4.17E-13	2.14E-1
HE-SV-3-OPEN	1.26E-3	3.51E-3	2.48E-6	5.90E-4	8.39E-3	4.81E-12	2.46E-1
MF-AIR-CELL-LK	5.70E-2	1.07E-1	2.20E-3	2.97E-2	2.99E-1	1.66E-4	9.72E-1
MF-AR-CELL-LK	5.70E-2	1.07E-1	1.99E-3	2.97E-2	2.96E-1	1.81E-4	9.74E-1
MF-FFD-SV-3	9.80E-1	9.02E-1	4.13E-1	9.43E-1	9.95E-1	3.10E-2	1.00E+0
MF-SV-1-FFD	9.80E-1	9.02E-1	4.26E-1	9.41E-1	9.95E-1	2.48E-2	1.00E+0
MF-VP-1-LK	1.19E-4	6.75E-4	1.01E-5	1.42E-4	1.53E-3	1.80E-6	7.76E-2

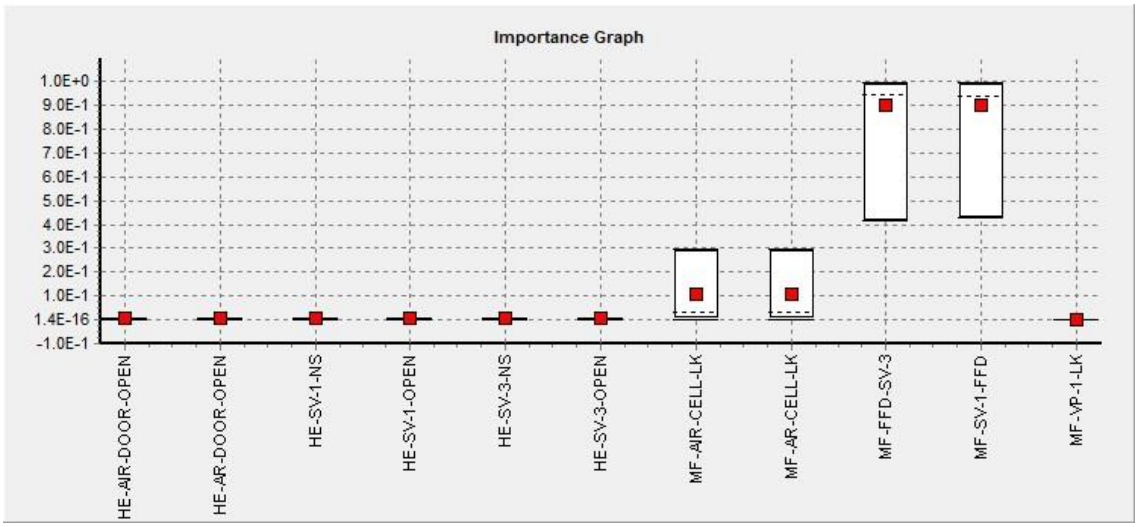


Figure 97: Importance graph for FV results for basic system for SV_OH.

Table 92: FV for Basic System w/ SV_DOW

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-DOOR-OPEN	1.82E-2	4.58E-2	2.43E-5	8.69E-3	1.32E-1	3.21E-13	8.03E-1
HE-AR-DOOR-OPEN	1.82E-2	4.62E-2	1.97E-5	8.14E-3	1.33E-1	3.06E-10	7.96E-1
HE-SV-1-NS	1.79E-2	4.36E-2	2.56E-5	8.02E-3	1.24E-1	9.64E-14	6.90E-1
HE-SV-1-OPEN	1.79E-2	4.33E-2	2.40E-5	7.59E-3	1.21E-1	4.54E-11	7.81E-1
HE-SV-3-NS	1.79E-2	4.25E-2	2.35E-5	7.57E-3	1.18E-1	3.08E-12	7.03E-1
HE-SV-3-OPEN	1.79E-2	4.38E-2	2.98E-5	7.75E-3	1.26E-1	7.96E-11	8.26E-1
MF-AIR-CELL-LK	8.24E-1	6.66E-1	1.02E-1	6.44E-1	9.55E-1	5.01E-3	9.98E-1
MF-AR-CELL-LK	8.24E-1	6.63E-1	9.29E-2	6.44E-1	9.54E-1	2.99E-3	9.99E-1
MF-FFD-SV-3	1.10E-1	1.75E-1	2.47E-3	5.89E-2	4.89E-1	1.04E-4	9.74E-1
MF-SV-1-FFD	1.10E-1	1.72E-1	2.59E-3	5.72E-2	4.75E-1	8.69E-5	9.88E-1
MF-VP-1-LK	2.66E-2	6.06E-2	5.82E-3	3.31E-2	1.32E-1	1.22E-3	5.93E-1

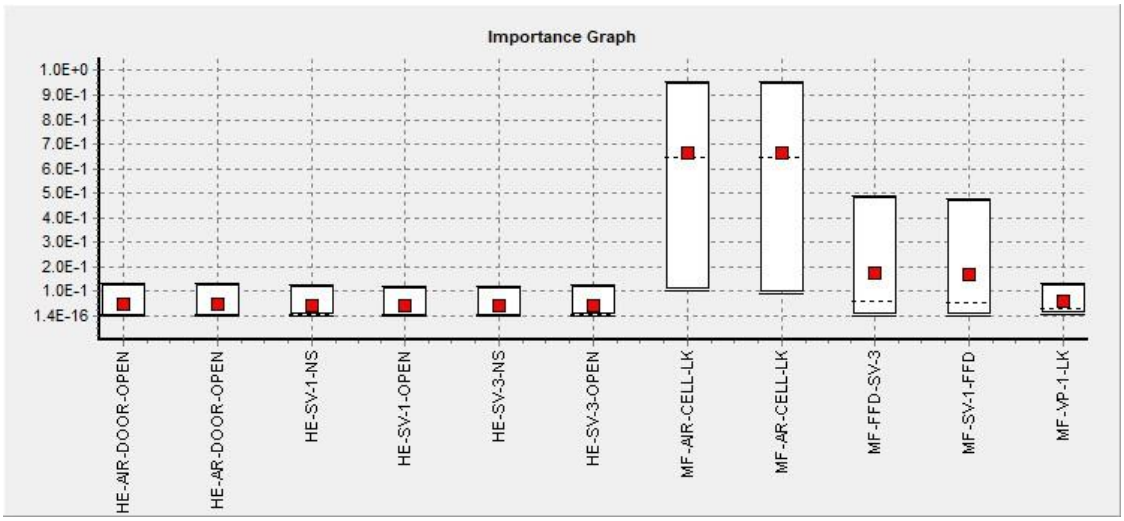


Figure 98: Importance graph for FV results for basic system w/ SV_DOW.

Table 93: FV for Basic System with SV_MAN

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-DOOR-OPEN	2.03E-2	5.91E-2	2.88E-5	1.07E-2	1.75E-1	8.89E-13	8.01E-1
HE-AR-DOOR-OPEN	2.03E-2	5.97E-2	2.38E-5	9.94E-3	1.81E-1	3.38E-10	8.15E-1
HE-SV-1-NS	1.99E-2	5.53E-2	3.14E-5	9.62E-3	1.64E-1	1.07E-13	7.77E-1
HE-SV-1-OPEN	1.99E-2	5.52E-2	2.84E-5	9.15E-3	1.58E-1	4.60E-11	7.91E-1
HE-SV-3-NS	1.99E-2	5.47E-2	2.76E-5	8.99E-3	1.61E-1	3.17E-12	7.30E-1
HE-SV-3-OPEN	1.99E-2	5.63E-2	3.35E-5	9.50E-3	1.64E-1	8.27E-11	8.50E-1
MF-AIR-CELL-LK	9.20E-1	7.75E-1	2.31E-1	7.92E-1	9.76E-1	2.64E-2	9.99E-1
MF-AR-CELL-LK	9.20E-1	7.72E-1	2.07E-1	7.93E-1	9.76E-1	3.56E-2	9.99E-1
MF-FFD-SV-3	2.97E-3	9.56E-3	5.93E-5	1.48E-3	2.22E-2	2.44E-6	4.91E-1
MF-SV-1-FFD	2.97E-3	9.38E-3	6.14E-5	1.44E-3	2.10E-2	2.03E-6	7.41E-1
MF-VP-1-LK	3.34E-2	9.42E-2	8.84E-3	5.32E-2	2.02E-1	1.23E-3	7.09E-1

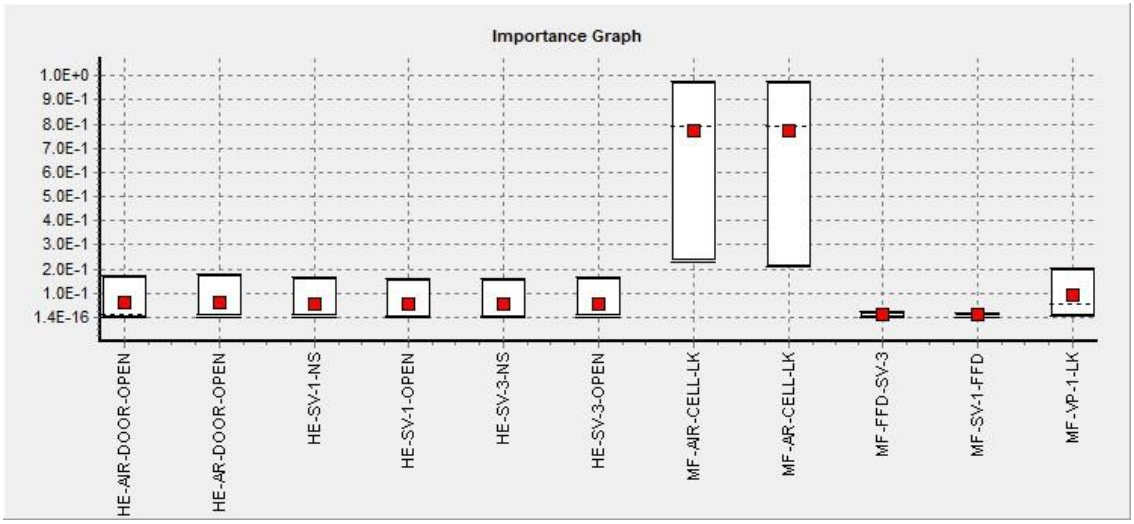


Figure 99: Importance graph for FV results for basic system for SV_MAN.

Table 94: FV for Basic System with SV_NRPD

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-DOOR-OPEN	5.49E-3	1.59E-2	8.12E-6	2.63E-3	4.32E-2	1.90E-14	7.60E-1
HE-AR-DOOR-OPEN	5.49E-3	1.59E-2	5.69E-6	2.42E-3	4.24E-2	1.16E-10	5.97E-1
HE-SV-1-NS	5.47E-3	1.56E-2	7.63E-6	2.47E-3	4.02E-2	1.53E-14	4.50E-1
HE-SV-1-OPEN	5.47E-3	1.53E-2	7.17E-6	2.38E-3	4.08E-2	3.24E-11	5.86E-1
HE-SV-3-NS	5.47E-3	1.51E-2	6.80E-6	2.25E-3	3.89E-2	1.89E-12	5.67E-1
HE-SV-3-OPEN	5.47E-3	1.52E-2	9.05E-6	2.35E-3	4.10E-2	3.14E-11	5.42E-1
MF-AIR-CELL-LK	2.49E-1	3.19E-1	8.27E-3	1.61E-1	7.63E-1	3.45E-4	9.91E-1
MF-AR-CELL-LK	2.49E-1	3.17E-1	7.94E-3	1.59E-1	7.60E-1	4.26E-4	9.93E-1
MF-FFD-SV-3	7.40E-1	6.36E-1	5.76E-2	6.03E-1	9.56E-1	2.76E-3	9.97E-1
MF-SV-1-FFD	7.40E-1	6.33E-1	6.01E-2	5.94E-1	9.54E-1	2.22E-3	9.98E-1
MF-VP-1-LK	2.41E-3	9.27E-3	1.63E-4	2.92E-3	2.25E-2	1.59E-5	2.90E-1

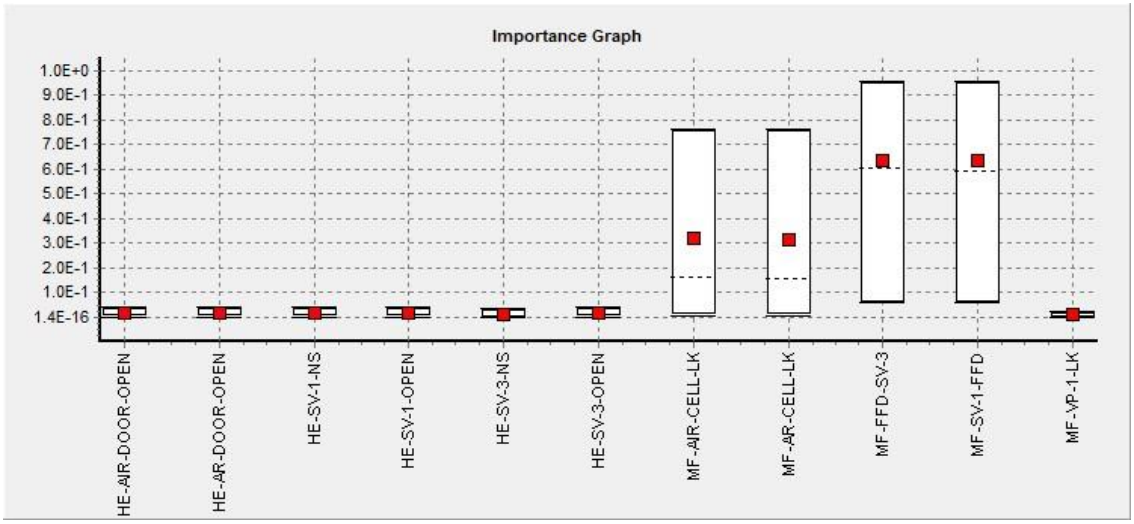


Figure 100: Importance graph for FV results for basic system for SV_NRPD.

Table 95: FV Results for Basic System w/Diagnostic HE Component

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-DOOR-OPEN	3.30E-2	3.85E-2	2.77E-5	9.96E-3	1.05E-1	1.19E-11	4.64E-1
HE-AR-DOOR-OPEN	3.30E-2	4.01E-2	3.17E-5	1.04E-2	1.10E-1	2.90E-14	5.11E-1
HE-SV-1-NS	3.29E-2	3.75E-2	3.03E-5	9.70E-3	1.02E-1	5.74E-11	5.51E-1
HE-SV-1-OPEN	3.29E-2	3.92E-2	1.92E-5	9.69E-3	1.09E-1	5.92E-10	6.23E-1
HE-SV-3-NS	3.29E-2	3.85E-2	3.53E-5	1.02E-2	1.05E-1	5.94E-9	6.77E-1
HE-SV-3-OPEN	3.29E-2	3.86E-2	3.11E-5	9.95E-3	1.07E-1	1.69E-11	7.08E-1
MF-AIR-CELL-LK	1.36E-1	1.20E-1	3.70E-3	4.64E-2	3.13E-1	3.27E-4	9.10E-1
MF-AR-CELL-LK	1.36E-1	1.19E-1	3.89E-3	4.55E-2	3.06E-1	2.34E-4	8.79E-1
MF-FS-SV-1	7.43E-1	7.22E-1	3.30E-1	7.12E-1	9.04E-1	7.10E-2	9.89E-1
MF-FS-SV-3	7.43E-1	7.24E-1	3.24E-1	7.18E-1	9.04E-1	9.10E-2	9.82E-1
MF-LK-SV-1	4.33E-2	5.48E-2	8.59E-3	3.41E-2	1.11E-1	2.42E-3	4.52E-1
MF-LK-SV-3	4.33E-2	5.38E-2	8.85E-3	3.36E-2	1.08E-1	2.06E-3	6.03E-1
MF-RP-SV-1	6.29E-3	8.17E-3	1.58E-4	1.90E-3	1.85E-2	1.24E-5	3.91E-1
MF-RP-SV-3	6.29E-3	7.36E-3	1.51E-4	1.91E-3	1.70E-2	2.22E-5	4.23E-1
MF-VP-1-LK	8.49E-4	1.05E-3	7.29E-5	4.90E-4	2.33E-3	6.34E-6	1.75E-2

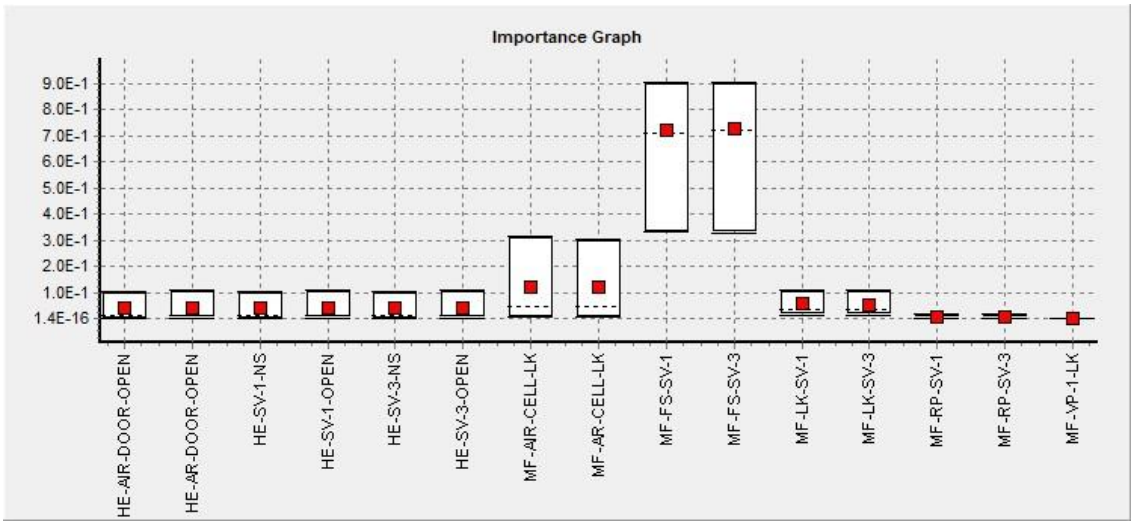


Figure 101: FV importance graph for basic system w/ diagnostic HE component.

Table 96: FV Results for Basic System w/Diagnostic HE Component & SV_OL

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-DOOR-OPEN	1.30E-1	1.65E-1	1.71E-4	5.22E-2	4.65E-1	1.67E-9	9.77E-1
HE-AR-DOOR-OPEN	1.30E-1	1.64E-1	1.49E-4	5.28E-2	4.51E-1	5.29E-13	9.80E-1
HE-SV-1-NS	1.29E-1	1.59E-1	1.35E-4	4.95E-2	4.44E-1	5.15E-12	9.42E-1
HE-SV-1-OPEN	1.29E-1	1.64E-1	1.21E-4	5.20E-2	4.60E-1	5.50E-11	9.80E-1
HE-SV-3-NS	1.29E-1	1.65E-1	1.55E-4	5.06E-2	4.59E-1	2.00E-10	9.24E-1
HE-SV-3-OPEN	1.29E-1	1.59E-1	1.44E-4	4.97E-2	4.43E-1	2.69E-10	9.54E-1
MF-AIR-CELL-LK	5.37E-1	4.10E-1	2.57E-2	2.81E-1	8.22E-1	1.17E-3	9.93E-1
MF-AR-CELL-LK	5.37E-1	4.09E-1	2.54E-2	2.84E-1	8.20E-1	1.58E-3	9.96E-1
MF-FFD-SV-3	6.96E-2	9.37E-2	1.61E-3	2.66E-2	2.54E-1	7.76E-5	9.47E-1
MF-SV-1-FFD	6.96E-2	9.26E-2	1.57E-3	2.69E-2	2.51E-1	8.36E-5	9.71E-1
MF-VP-1-LK	1.37E-2	2.21E-2	2.33E-3	1.14E-2	4.77E-2	2.89E-4	3.68E-1

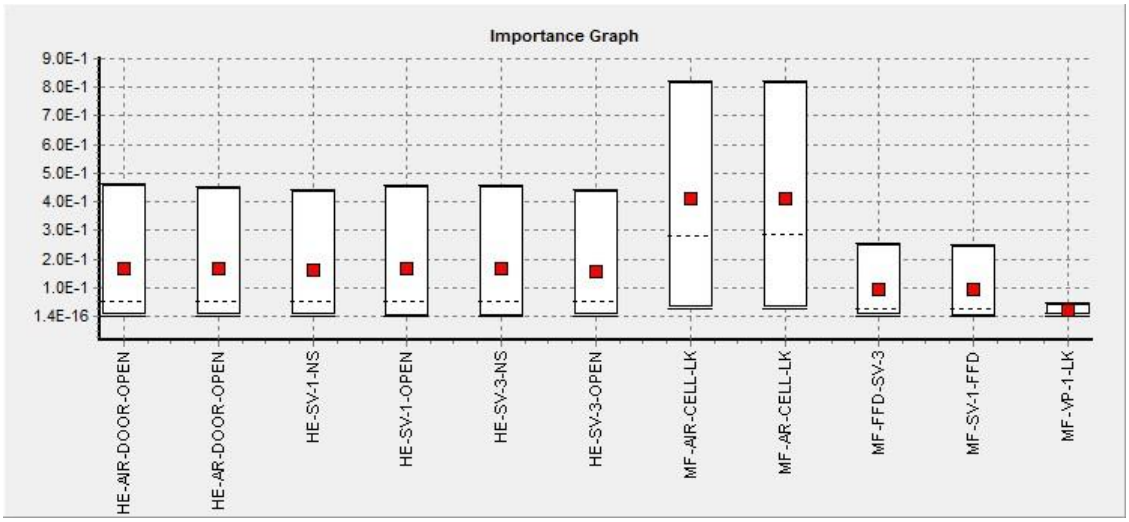


Figure 102: FV importance graph for basic system w/ diagnostic HE component & SV_OL.

Table 97 FV Results for Basic System w/Diagnostic HE Component & SV_OM

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-DOOR-OPEN	2.72E-2	5.94E-2	4.27E-5	1.22E-2	1.67E-1	4.36E-10	9.36E-1
HE-AR-DOOR-OPEN	2.72E-2	5.89E-2	3.28E-5	1.23E-2	1.63E-1	1.08E-13	8.94E-1
HE-SV-1-NS	2.71E-2	5.70E-2	3.41E-5	1.18E-2	1.61E-1	9.17E-13	7.86E-1
HE-SV-1-OPEN	2.71E-2	5.83E-2	2.86E-5	1.26E-2	1.62E-1	2.14E-11	7.87E-1
HE-SV-3-NS	2.71E-2	5.92E-2	3.43E-5	1.23E-2	1.69E-1	5.50E-11	8.40E-1
HE-SV-3-OPEN	2.71E-2	5.62E-2	3.20E-5	1.19E-2	1.58E-1	1.95E-10	8.53E-1
MF-AIR-CELL-LK	1.12E-1	1.66E-1	3.75E-3	5.88E-2	4.52E-1	1.92E-4	9.67E-1
MF-AR-CELL-LK	1.12E-1	1.66E-1	3.64E-3	5.88E-2	4.54E-1	2.87E-4	9.73E-1
MF-FFD-SV-3	8.36E-1	6.74E-1	1.07E-1	6.61E-1	9.50E-1	5.62E-3	9.99E-1
MF-SV-1-FFD	8.36E-1	6.74E-1	1.02E-1	6.62E-1	9.49E-1	6.26E-3	9.99E-1
MF-VP-1-LK	5.72E-4	2.35E-3	5.72E-5	7.53E-4	5.72E-3	5.75E-6	1.03E-1

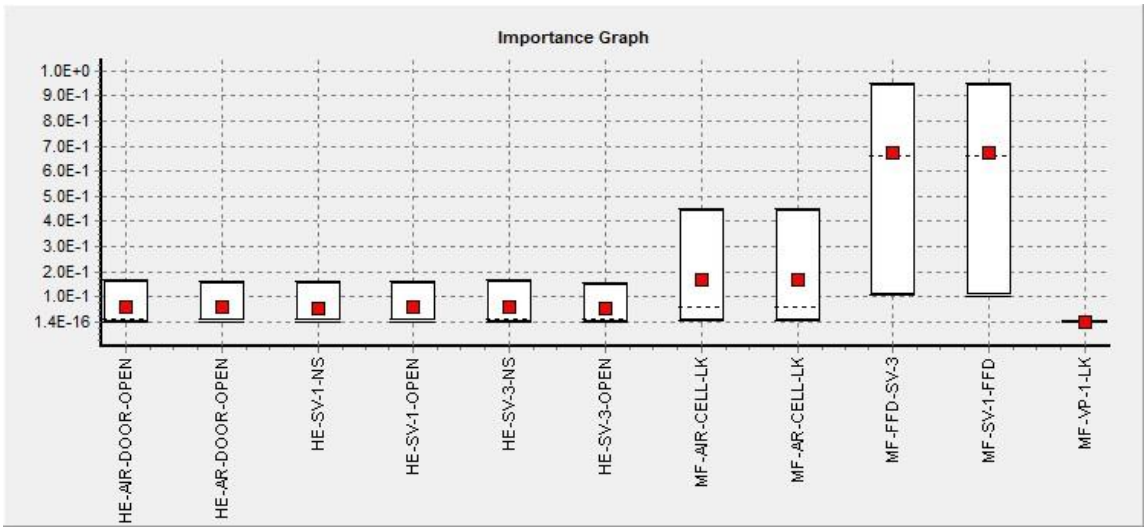


Figure 103: FV importance graph for basic system w/ diagnostic HE component & SV_OM.

Table 98:FV Results for Basic System w/Diagnostic HE Component & SV_OH

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-DOOR-OPEN	1.40E-2	3.15E-2	2.18E-5	6.17E-3	8.25E-2	4.18E-10	8.36E-1
HE-AR-DOOR-OPEN	1.40E-2	3.12E-2	1.87E-5	6.23E-3	8.18E-2	4.15E-14	7.55E-1
HE-SV-1-NS	1.40E-2	3.02E-2	1.80E-5	5.94E-3	8.06E-2	4.17E-13	7.07E-1
HE-SV-1-OPEN	1.40E-2	3.11E-2	1.46E-5	6.41E-3	8.17E-2	8.97E-12	7.11E-1
HE-SV-3-NS	1.40E-2	3.13E-2	1.84E-5	6.20E-3	8.21E-2	2.73E-11	6.54E-1
HE-SV-3-OPEN	1.40E-2	2.97E-2	1.85E-5	6.00E-3	7.77E-2	1.09E-10	6.55E-1
MF-AIR-CELL-LK	5.75E-2	9.62E-2	2.02E-3	2.75E-2	2.64E-1	1.20E-4	9.44E-1
MF-AR-CELL-LK	5.75E-2	9.62E-2	1.99E-3	2.78E-2	2.59E-1	1.55E-4	9.84E-1
MF-FFD-SV-3	9.68E-1	8.47E-1	3.21E-1	8.82E-1	9.87E-1	2.17E-2	1.00E+0
MF-SV-1-FFD	9.68E-1	8.46E-1	3.11E-1	8.83E-1	9.86E-1	2.40E-2	1.00E+0
MF-VP-1-LK	1.41E-4	6.27E-4	1.76E-5	1.80E-4	1.49E-3	1.78E-6	6.60E-2

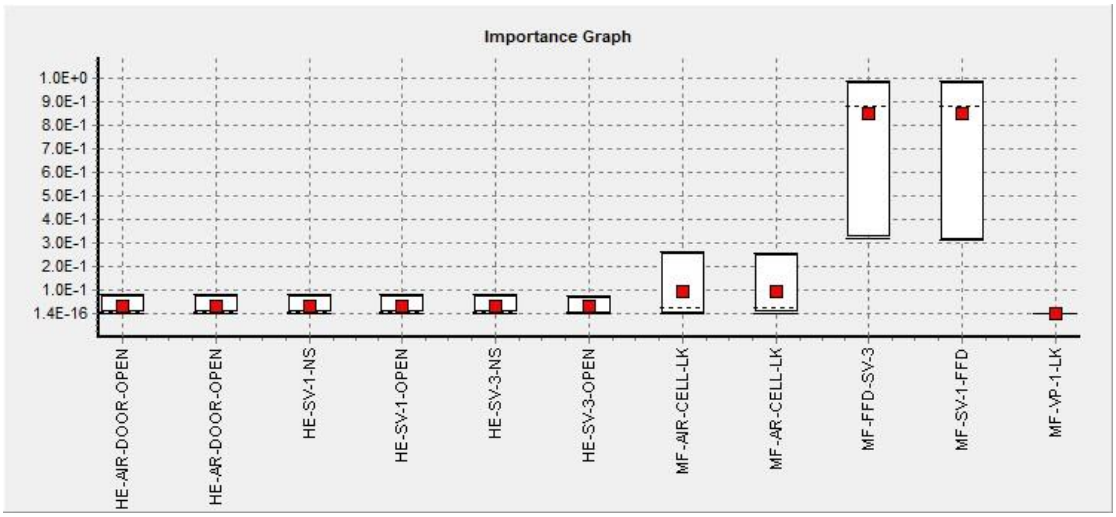


Figure 104: FV importance graph for basic system w/ diagnostic HE component & SV_OH.

Table 99: FV Results for Basic System w/Diagnostic HE Component and SV_DOW

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-DOOR-OPEN	1.30E-1	1.64E-1	1.70E-4	5.20E-2	4.64E-1	1.66E-9	9.76E-1
HE-AR-DOOR-OPEN	1.30E-1	1.63E-1	1.49E-4	5.27E-2	4.50E-1	5.26E-13	9.80E-1
HE-SV-1-NS	1.29E-1	1.59E-1	1.35E-4	4.94E-2	4.43E-1	5.16E-12	9.41E-1
HE-SV-1-OPEN	1.29E-1	1.64E-1	1.21E-4	5.20E-2	4.59E-1	5.50E-11	9.80E-1
HE-SV-3-NS	1.29E-1	1.65E-1	1.54E-4	5.02E-2	4.58E-1	2.00E-10	9.24E-1
HE-SV-3-OPEN	1.29E-1	1.58E-1	1.41E-4	4.96E-2	4.42E-1	2.69E-10	9.54E-1
MF-AIR-CELL-LK	5.36E-1	4.09E-1	2.57E-2	2.81E-1	8.22E-1	1.17E-3	9.93E-1
MF-AR-CELL-LK	5.36E-1	4.08E-1	2.51E-2	2.83E-1	8.19E-1	1.58E-3	9.96E-1
MF-FFD-SV-3	7.18E-2	9.60E-2	1.66E-3	2.75E-2	2.60E-1	8.03E-5	9.49E-1
MF-SV-1-FFD	7.18E-2	9.49E-2	1.62E-3	2.78E-2	2.57E-1	8.64E-5	9.72E-1
MF-VP-1-LK	1.37E-2	2.20E-2	2.31E-3	1.13E-2	4.73E-2	2.83E-4	3.63E-1

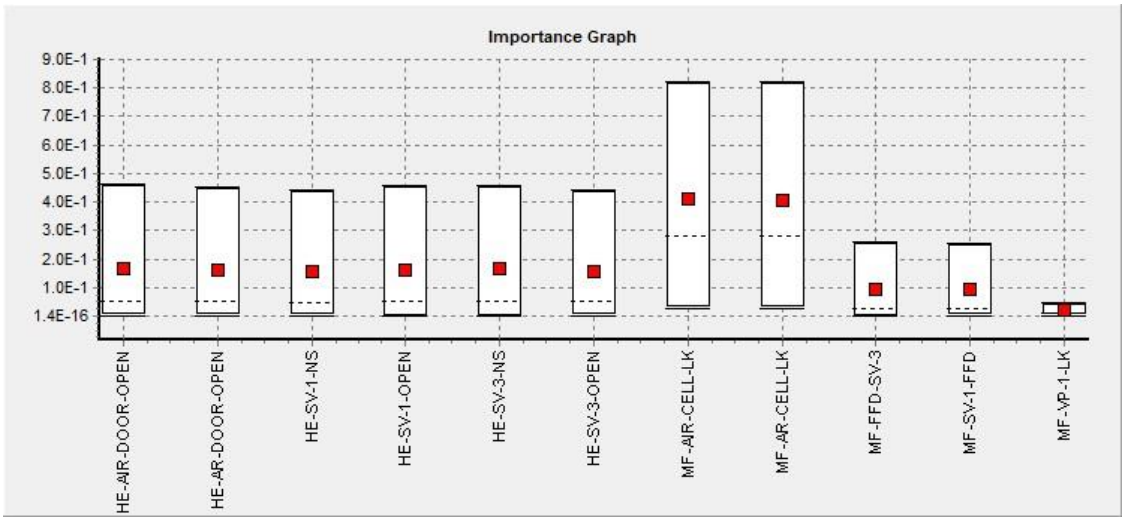


Figure 105: FV importance graph for basic system w/ diagnostic HE component for SV_DOW.

Table 100: FV Results for Basic System w/Diagnostic HE Component and SV_MAN

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-DOOR-OPEN	1.40E-1	1.81E-1	1.94E-4	5.81E-2	5.08E-1	1.83E-9	9.77E-1
HE-AR-DOOR-OPEN	1.40E-1	1.81E-1	1.78E-4	5.96E-2	5.02E-1	5.71E-13	9.81E-1
HE-SV-1-NS	1.38E-1	1.75E-1	1.56E-4	5.55E-2	4.87E-1	5.57E-12	9.75E-1
HE-SV-1-OPEN	1.38E-1	1.81E-1	1.30E-4	5.72E-2	5.11E-1	5.63E-11	9.83E-1
HE-SV-3-NS	1.38E-1	1.82E-1	1.82E-4	5.65E-2	5.04E-1	2.09E-10	9.74E-1
HE-SV-3-OPEN	1.38E-1	1.75E-1	1.61E-4	5.47E-2	4.91E-1	2.70E-10	9.78E-1
MF-AIR-CELL-LK	5.76E-1	4.46E-1	2.97E-2	3.22E-1	8.62E-1	1.18E-3	9.97E-1
MF-AR-CELL-LK	5.76E-1	4.46E-1	2.97E-2	3.23E-1	8.58E-1	1.67E-3	9.99E-1
MF-FFD-SV-3	1.87E-3	3.88E-3	4.00E-5	6.83E-4	8.49E-3	1.94E-6	3.07E-1
MF-SV-1-FFD	1.87E-3	3.85E-3	3.92E-5	6.88E-4	8.34E-3	2.07E-6	5.40E-1
MF-VP-1-LK	1.58E-2	2.81E-2	2.87E-3	1.40E-2	6.13E-2	3.39E-4	5.71E-1

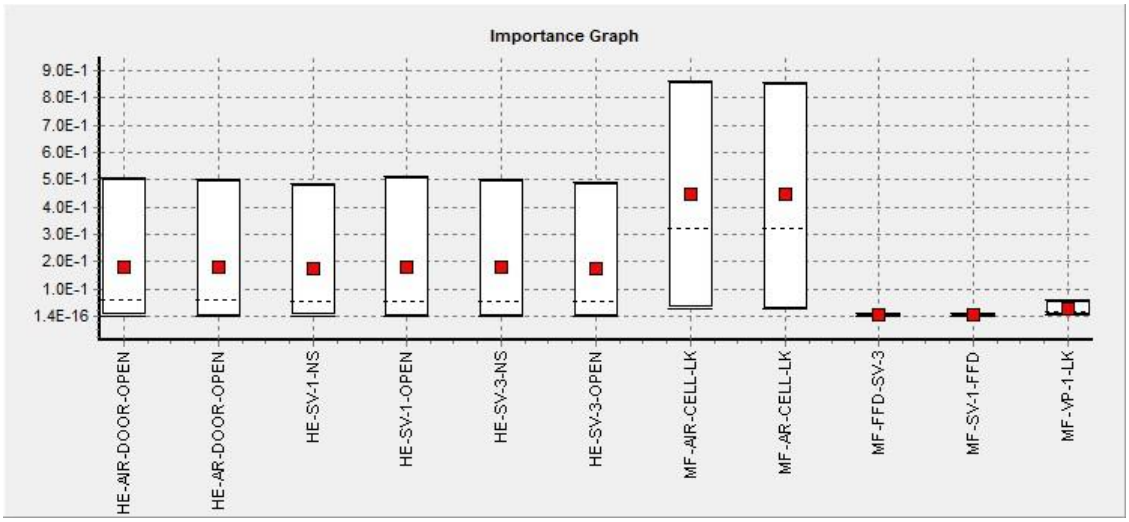


Figure 106: FV importance graph for basic system w/ diagnostic HE component & SV_MAN.

Table 101: FV Results for Basic System w/Diagnostic HE Component and SV_NRPD

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-DOOR-OPEN	5.23E-2	8.99E-2	6.79E-5	2.14E-2	2.53E-1	6.40E-10	9.63E-1
HE-AR-DOOR-OPEN	5.23E-2	8.90E-2	5.55E-5	2.15E-2	2.49E-1	2.20E-13	9.50E-1
HE-SV-1-NS	5.21E-2	8.64E-2	5.92E-5	2.06E-2	2.49E-1	1.88E-12	8.27E-1
HE-SV-1-OPEN	5.21E-2	8.82E-2	4.64E-5	2.17E-2	2.50E-1	3.56E-11	9.04E-1
HE-SV-3-NS	5.21E-2	8.96E-2	6.02E-5	2.10E-2	2.58E-1	9.88E-11	8.96E-1
HE-SV-3-OPEN	5.21E-2	8.54E-2	5.36E-5	2.07E-2	2.47E-1	2.40E-10	9.17E-1
MF-AIR-CELL-LK	2.15E-1	2.39E-1	6.99E-3	1.09E-1	5.98E-1	3.35E-4	9.80E-1
MF-AR-CELL-LK	2.15E-1	2.39E-1	6.83E-3	1.09E-1	6.05E-1	5.07E-4	9.83E-1
MF-FFD-SV-3	6.40E-1	5.01E-1	3.90E-2	4.03E-1	8.84E-1	1.92E-3	9.97E-1
MF-SV-1-FFD	6.40E-1	5.01E-1	3.74E-2	4.05E-1	8.82E-1	2.14E-3	9.94E-1
MF-VP-1-LK	2.18E-3	5.68E-3	2.00E-4	2.27E-3	1.33E-2	1.05E-5	1.28E-1

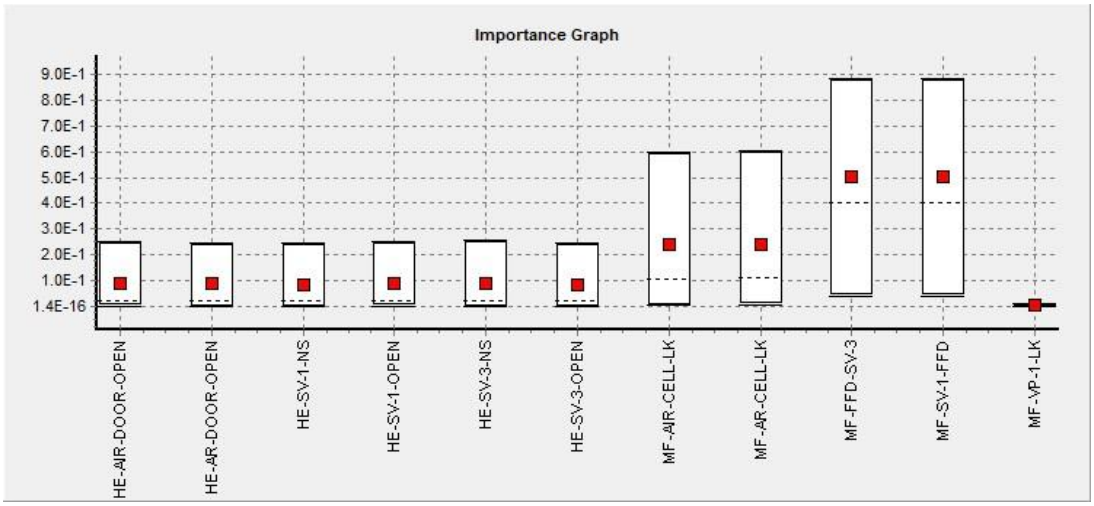


Figure 107: FV importance graph for basic system w/ diagnostic HE component & SV_NRPD.

Table 102: FV Results for Basic System w/ Bruce B Fault Rate

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-DOOR-OPEN	1.37E-3	2.47E-3	1.88E-6	6.09E-4	6.57E-3	1.23E-12	5.17E-2
HE-AR-DOOR-OPEN	1.37E-3	2.54E-3	2.67E-6	6.09E-4	6.91E-3	2.49E-11	9.34E-2
HE-SV-1-NS	1.36E-3	2.46E-3	2.10E-6	6.03E-4	6.38E-3	6.91E-15	7.75E-2
HE-SV-1-OPEN	1.36E-3	2.50E-3	2.20E-6	6.02E-4	6.63E-3	5.39E-12	5.90E-2
HE-SV-3-NS	1.36E-3	2.46E-3	1.91E-6	5.87E-4	6.47E-3	2.97E-13	7.40E-2
HE-SV-3-OPEN	1.36E-3	2.44E-3	2.32E-6	6.04E-4	6.21E-3	3.27E-13	5.89E-2
MF-AIR-CELL-LK	8.89E-1	5.34E-1	9.94E-2	4.93E-1	8.02E-1	2.04E-3	9.45E-1
MF-AR-CELL-LK	8.89E-1	5.29E-1	9.63E-2	4.89E-1	7.95E-1	5.75E-3	9.59E-1
MF-FS-SV-1	3.28E-1	4.86E-1	1.47E-1	4.13E-1	7.78E-1	5.38E-2	9.74E-1
MF-FS-SV-3	3.28E-1	4.92E-1	1.51E-1	4.21E-1	7.76E-1	4.48E-2	9.81E-1
MF-LK-SV-1	1.97E-2	3.53E-2	5.78E-3	2.16E-2	7.16E-2	1.56E-3	3.76E-1
MF-LK-SV-3	1.97E-2	3.51E-2	5.87E-3	2.12E-2	6.99E-2	2.10E-3	4.38E-1
MF-RP-SV-1	2.87E-3	5.20E-3	9.82E-5	1.25E-3	1.13E-2	6.50E-6	3.39E-1
MF-RP-SV-3	2.87E-3	5.17E-3	1.08E-4	1.26E-3	1.16E-2	8.51E-6	6.07E-1
MF-VP-1-LK	1.77E-3	2.14E-3	3.37E-4	1.32E-3	4.33E-3	5.51E-5	2.07E-2

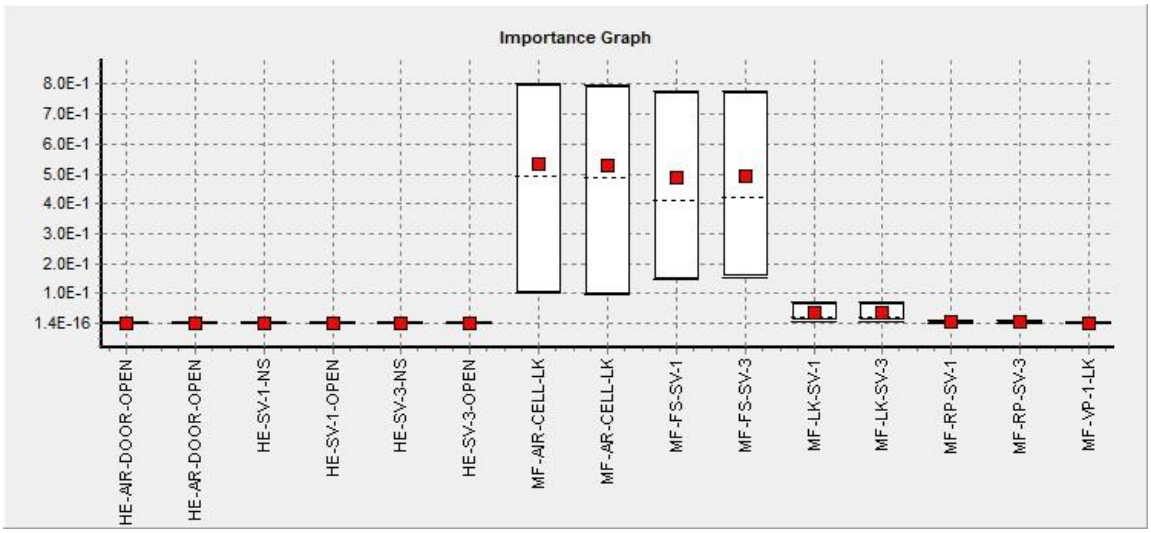


Figure 108: Importance graph of FV results for basic system w/ Bruce B fault rate.

Table 103: FV Results for Basic System w/ Bruce B Fault Rate & SV_OL

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-DOOR-OPEN	1.30E-3	6.07E-3	3.55E-6	1.11E-3	1.55E-2	5.67E-14	2.81E-1
HE-AR-DOOR-OPEN	1.30E-3	6.30E-3	3.25E-6	1.13E-3	1.56E-2	8.00E-10	3.05E-1
HE-SV-1-NS	1.30E-3	6.37E-3	3.93E-6	1.10E-3	1.60E-2	4.53E-11	3.33E-1
HE-SV-1-OPEN	1.30E-3	6.26E-3	3.67E-6	1.10E-3	1.54E-2	1.24E-10	3.66E-1
HE-SV-3-NS	1.30E-3	6.41E-3	3.19E-6	1.08E-3	1.55E-2	9.51E-13	4.17E-1
HE-SV-3-OPEN	1.30E-3	6.18E-3	3.90E-6	1.08E-3	1.49E-2	1.47E-13	2.73E-1
MF-AIR-CELL-LK	9.95E-1	9.46E-1	7.05E-1	9.66E-1	9.93E-1	9.45E-2	9.99E-1
MF-AR-CELL-LK	9.95E-1	9.47E-1	7.17E-1	9.66E-1	9.93E-1	9.78E-2	9.99E-1
MF-FFD-SV-3	7.69E-3	3.12E-2	4.95E-4	6.73E-3	7.63E-2	4.63E-5	8.91E-1
MF-SV-1-FFD	7.69E-3	3.23E-2	4.84E-4	6.31E-3	7.68E-2	4.78E-5	9.07E-1
MF-VP-1-LK	2.25E-3	1.05E-2	1.23E-3	5.19E-3	2.27E-2	2.36E-4	2.87E-1

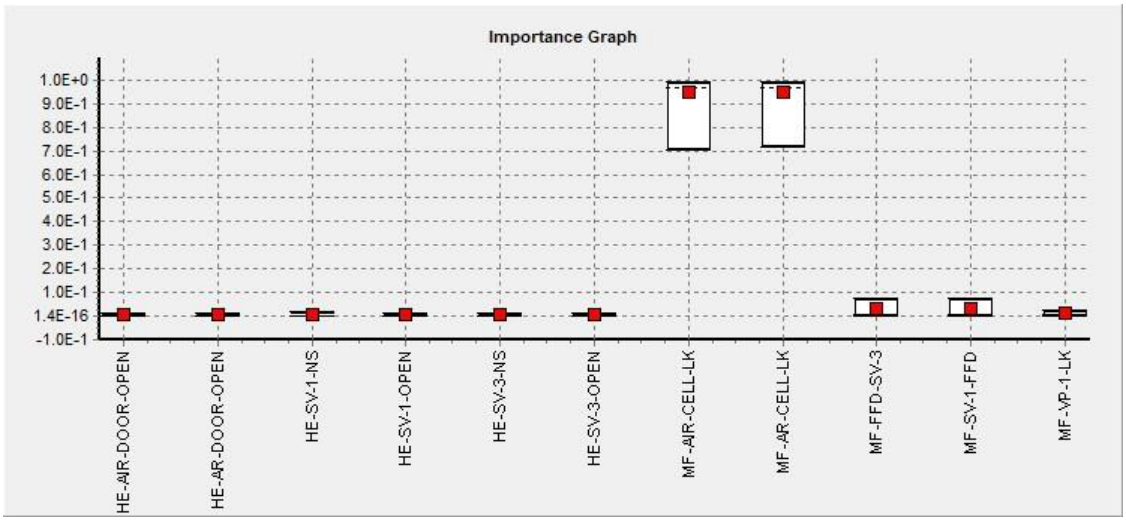


Figure 109: Importance graph of FV results for basic system w/ Bruce B fault rate and SV_OL.

Table 104: FV Results for Basic System w/ Bruce B Fault Rate and SV_OM

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-DOOR-OPEN	2.27E-4	4.55E-4	1.24E-4	3.90E-4	7.22E-4	5.02E-6	1.35E-3
HE-AR-DOOR-OPEN	2.27E-4	4.56E-4	1.26E-4	3.91E-4	7.17E-4	5.03E-6	1.28E-3
HE-SV-1-NS	2.27E-4	4.55E-4	1.23E-4	3.90E-4	7.22E-4	5.02E-6	1.34E-3
HE-SV-1-OPEN	2.27E-4	4.55E-4	1.23E-4	3.90E-4	7.22E-4	5.02E-6	1.34E-3
HE-SV-3-NS	2.27E-4	4.55E-4	1.25E-4	3.90E-4	7.16E-4	5.04E-6	1.28E-3
HE-SV-3-OPEN	2.27E-4	4.55E-4	1.25E-4	3.90E-4	7.16E-4	5.02E-6	1.28E-3
MF-AIR-CELL-LK	1.99E+0	1.42E+0	3.32E-1	1.16E+0	2.33E+0	2.33E-2	3.62E+0
MF-AR-CELL-LK	1.99E+0	1.42E+0	3.37E-1	1.17E+0	2.32E+0	1.84E-2	3.62E+0
MF-FFD-SV-3	2.63E-1	3.94E-1	9.82E-2	3.45E-1	6.17E-1	1.43E-2	1.01E+0
MF-SV-1-FFD	2.63E-1	3.94E-1	9.56E-2	3.44E-1	6.20E-1	3.34E-2	1.05E+0
MF-VP-1-LK	1.18E-4	2.31E-4	7.06E-5	2.12E-4	3.35E-4	1.24E-6	4.04E-4

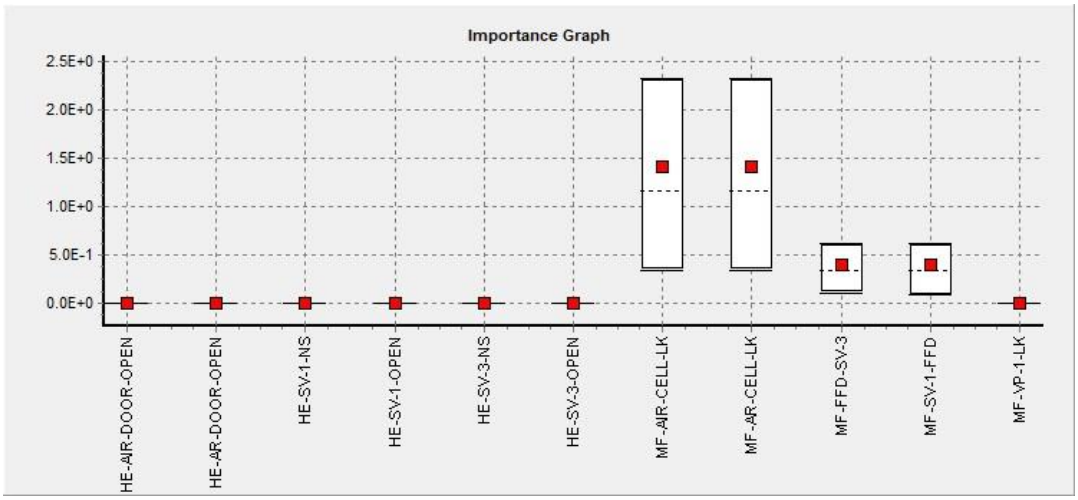


Figure 110: Importance graph of FV results for basic system w/ Bruce B fault rate and SV_OM.

Table 105: FV Results for Basic System w/ Bruce B Fault Rate and SV_OH

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-DOOR-OPEN	1.62E-3	2.06E-3	1.71E-6	4.72E-4	5.31E-3	8.82E-15	8.44E-2
HE-AR-DOOR-OPEN	1.62E-3	2.01E-3	1.49E-6	4.64E-4	5.32E-3	1.29E-10	6.21E-2
HE-SV-1-NS	1.62E-3	2.11E-3	1.58E-6	4.60E-4	5.43E-3	4.53E-11	8.24E-2
HE-SV-1-OPEN	1.62E-3	2.07E-3	1.61E-6	4.74E-4	5.36E-3	9.23E-11	1.00E-1
HE-SV-3-NS	1.62E-3	2.04E-3	1.63E-6	4.65E-4	5.22E-3	1.86E-13	1.20E-1
HE-SV-3-OPEN	1.62E-3	1.99E-3	1.58E-6	4.49E-4	5.15E-3	1.53E-13	6.90E-2
MF-AIR-CELL-LK	8.66E-1	4.51E-1	5.26E-2	3.65E-1	8.01E-1	2.04E-3	9.91E-1
MF-AR-CELL-LK	8.66E-1	4.45E-1	5.40E-2	3.58E-1	7.97E-1	3.30E-3	9.92E-1
MF-FFD-SV-3	8.88E-1	6.79E-1	1.29E-1	6.66E-1	9.53E-1	1.45E-2	1.00E+0
MF-SV-1-FFD	8.88E-1	6.73E-1	1.26E-1	6.54E-1	9.54E-1	1.52E-2	1.00E+0
MF-VP-1-LK	1.38E-3	1.38E-3	1.30E-4	7.05E-4	2.90E-3	2.83E-5	6.94E-2

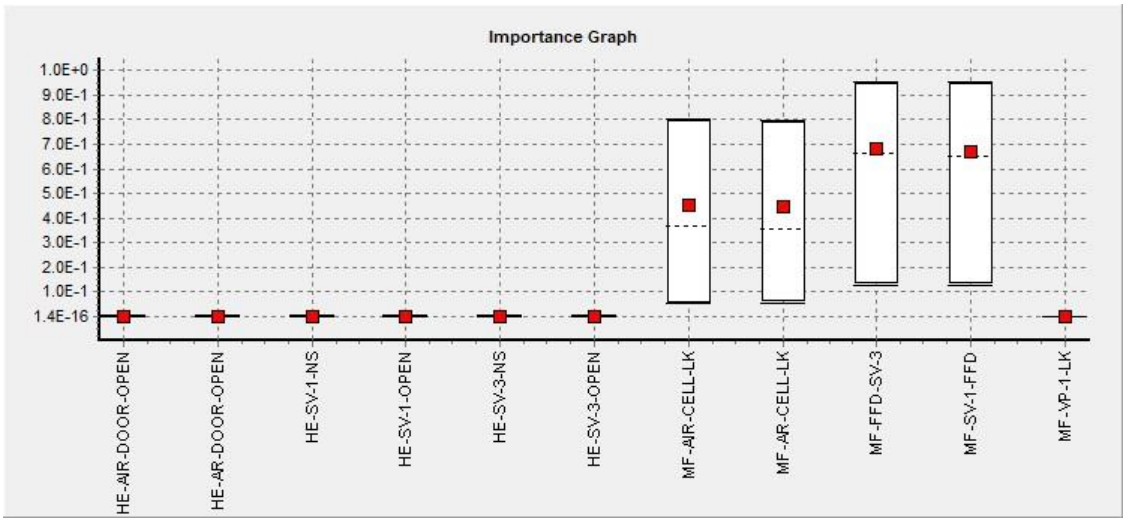


Figure 111: Importance graph of FV results for basic system w/ Bruce B fault rate and SV_OH.

Table 106: FV Results for Basic System w/ Bruce B Fault Rate and SV_DOW

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-DOOR-OPEN	1.30E-3	6.06E-3	3.55E-6	1.11E-3	1.55E-2	5.67E-14	2.80E-1
HE-AR-DOOR-OPEN	1.30E-3	6.29E-3	3.24E-6	1.12E-3	1.56E-2	8.00E-10	3.02E-1
HE-SV-1-NS	1.30E-3	6.36E-3	3.93E-6	1.10E-3	1.60E-2	4.53E-11	3.32E-1
HE-SV-1-OPEN	1.30E-3	6.25E-3	3.66E-6	1.10E-3	1.54E-2	1.24E-10	3.64E-1
HE-SV-3-NS	1.30E-3	6.39E-3	3.19E-6	1.08E-3	1.54E-2	9.48E-13	4.14E-1
HE-SV-3-OPEN	1.30E-3	6.16E-3	3.89E-6	1.08E-3	1.49E-2	1.47E-13	2.73E-1
MF-AIR-CELL-LK	9.95E-1	9.46E-1	7.02E-1	9.66E-1	9.93E-1	9.23E-2	9.99E-1
MF-AR-CELL-LK	9.95E-1	9.46E-1	7.12E-1	9.65E-1	9.93E-1	9.52E-2	9.99E-1
MF-FFD-SV-3	7.95E-3	3.21E-2	5.12E-4	6.96E-3	7.87E-2	4.79E-5	8.94E-1
MF-SV-1-FFD	7.95E-3	3.32E-2	5.00E-4	6.52E-3	7.92E-2	4.94E-5	9.09E-1
MF-VP-1-LK	2.25E-3	1.05E-2	1.23E-3	5.16E-3	2.26E-2	2.36E-4	2.86E-1

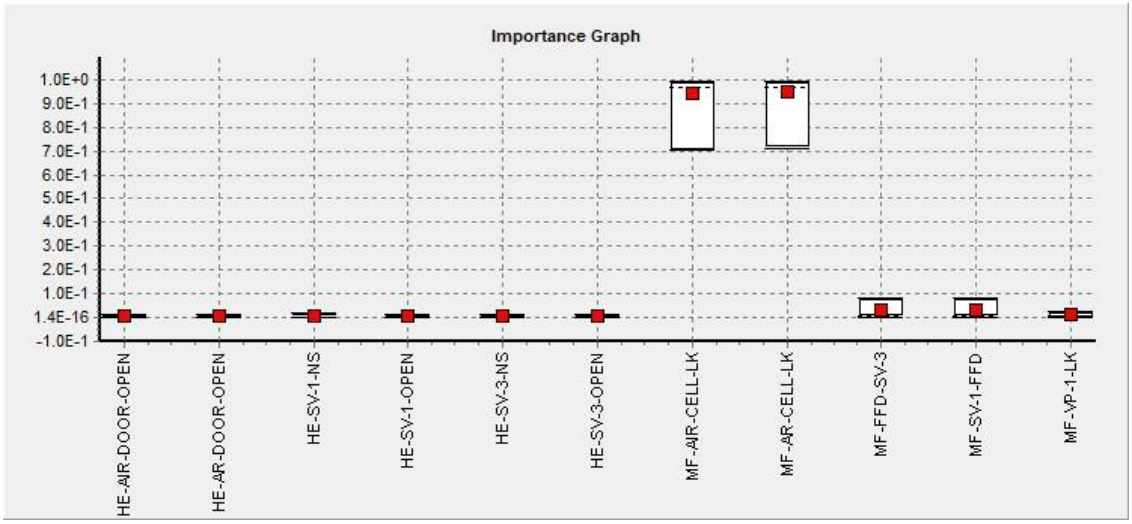


Figure 112: Importance graph of FV results for basic system w/ Bruce B fault rate and SV_DOW.

Table 107: FV Results for Basic System w/ Bruce B Fault Rate and SV_MAN

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-DOOR-OPEN	1.30E-3	6.51E-3	3.57E-6	1.15E-3	1.62E-2	5.88E-14	4.20E-1
HE-AR-DOOR-OPEN	1.30E-3	6.70E-3	3.32E-6	1.16E-3	1.62E-2	7.99E-10	4.40E-1
HE-SV-1-NS	1.29E-3	6.87E-3	3.97E-6	1.13E-3	1.70E-2	4.51E-11	3.54E-1
HE-SV-1-OPEN	1.29E-3	6.71E-3	3.66E-6	1.12E-3	1.62E-2	1.24E-10	4.24E-1
HE-SV-3-NS	1.29E-3	6.84E-3	3.22E-6	1.10E-3	1.61E-2	1.04E-12	5.52E-1
HE-SV-3-OPEN	1.29E-3	6.58E-3	3.94E-6	1.10E-3	1.56E-2	1.47E-13	3.42E-1
MF-AIR-CELL-LK	9.98E-1	9.74E-1	8.66E-1	9.83E-1	9.96E-1	3.01E-1	1.00E+0
MF-AR-CELL-LK	9.98E-1	9.74E-1	8.65E-1	9.83E-1	9.96E-1	2.16E-1	1.00E+0
MF-FFD-SV-3	1.93E-4	1.01E-3	1.24E-5	1.69E-4	2.07E-3	1.16E-6	1.70E-1
MF-SV-1-FFD	1.93E-4	1.12E-3	1.21E-5	1.59E-4	2.08E-3	1.20E-6	2.25E-1
MF-VP-1-LK	2.26E-3	1.16E-2	1.26E-3	5.50E-3	2.52E-2	2.36E-4	3.07E-1

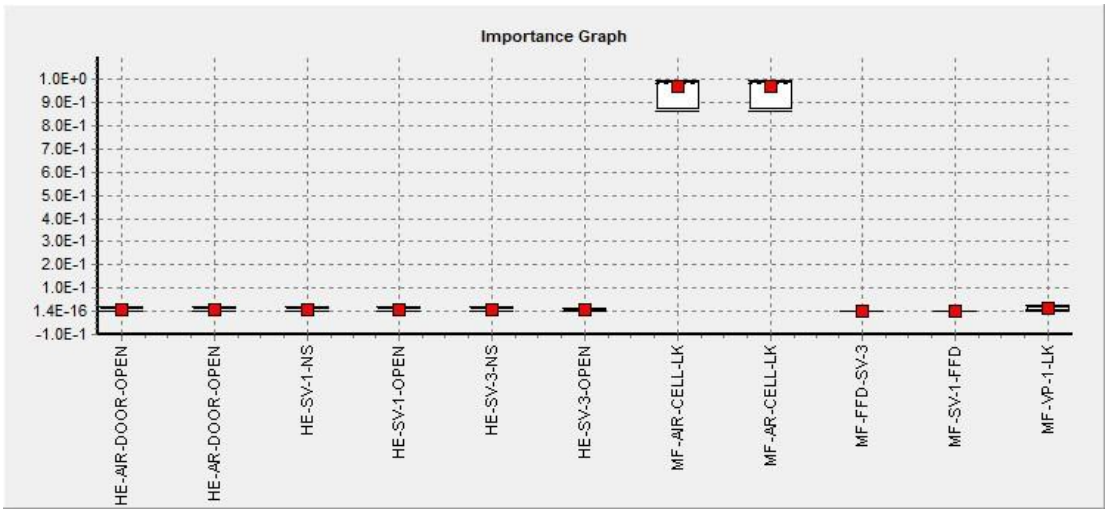


Figure 113: Importance graph of FV results for basic system w/ Bruce B fault rate and SV_MAN.

Table 108: FV Results for Basic System w/ Bruce B Fault Rate and SV_NRPD

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-DOOR-OPEN	1.33E-3	4.05E-3	2.88E-6	8.46E-4	1.02E-2	3.24E-14	1.64E-1
HE-AR-DOOR-OPEN	1.33E-3	4.11E-3	2.58E-6	8.26E-4	1.06E-2	6.07E-10	2.10E-1
HE-SV-1-NS	1.33E-3	4.18E-3	2.79E-6	8.13E-4	1.06E-2	4.73E-11	1.92E-1
HE-SV-1-OPEN	1.33E-3	4.11E-3	2.69E-6	8.17E-4	1.02E-2	1.20E-10	1.80E-1
HE-SV-3-NS	1.33E-3	4.14E-3	2.58E-6	8.04E-4	1.03E-2	3.62E-13	2.67E-1
HE-SV-3-OPEN	1.33E-3	4.04E-3	2.70E-6	8.05E-4	1.00E-2	1.52E-13	1.75E-1
MF-AIR-CELL-LK	9.34E-1	7.36E-1	1.56E-1	7.50E-1	9.64E-1	6.37E-3	9.96E-1
MF-AR-CELL-LK	9.34E-1	7.33E-1	1.66E-1	7.44E-1	9.64E-1	1.43E-2	9.97E-1
MF-FFD-SV-3	1.78E-1	2.76E-1	1.23E-2	1.44E-1	6.57E-1	1.18E-3	9.91E-1
MF-SV-1-FFD	1.78E-1	2.73E-1	1.21E-2	1.36E-1	6.58E-1	1.22E-3	9.89E-1
MF-VP-1-LK	1.98E-3	5.19E-3	6.02E-4	2.77E-3	1.07E-2	1.13E-4	1.69E-1

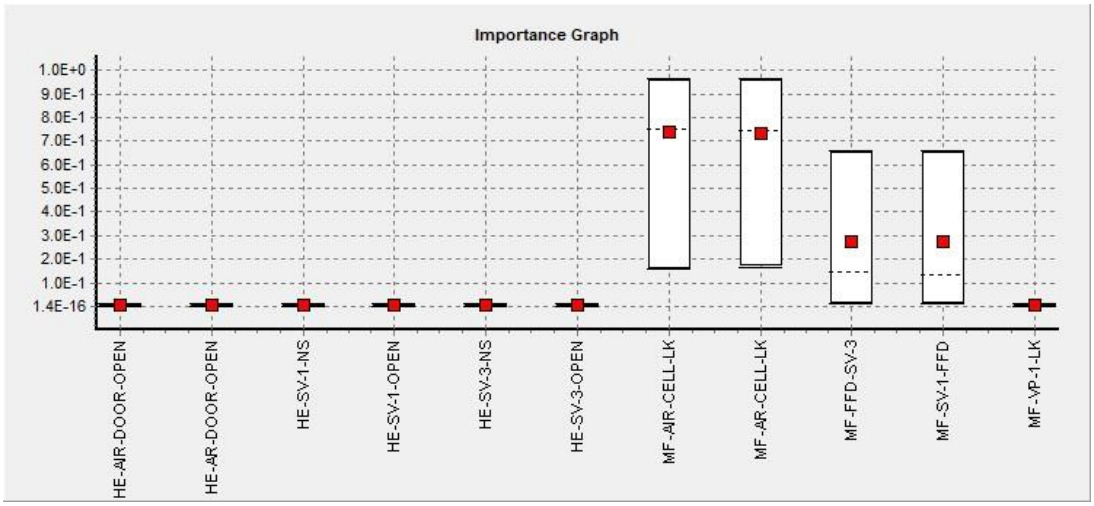


Figure 114: Importance graph of FV results for basic system w/ Bruce B fault rate and SV_NRPD.

Table 109: FV Results for Basic System w/ Bruce B Fault Rate and Diagnostic HE

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-DOOR-OPEN	1.51E-2	2.45E-2	1.54E-5	6.26E-3	6.67E-2	2.72E-11	4.04E-1
HE-AR-DOOR-OPEN	1.51E-2	2.48E-2	2.55E-5	6.41E-3	6.76E-2	1.40E-10	4.62E-1
HE-SV-1-NS	1.51E-2	2.41E-2	1.99E-5	6.16E-3	6.54E-2	2.91E-10	3.89E-1
HE-SV-1-OPEN	1.51E-2	2.46E-2	1.72E-5	6.38E-3	6.61E-2	8.82E-11	4.82E-1
HE-SV-3-NS	1.51E-2	2.40E-2	2.07E-5	6.21E-3	6.55E-2	2.56E-12	3.49E-1
HE-SV-3-OPEN	1.51E-2	2.44E-2	1.71E-5	6.31E-3	6.53E-2	1.81E-12	4.02E-1
MF-AIR-CELL-LK	8.82E-1	5.10E-1	8.91E-2	4.66E-1	7.75E-1	1.99E-3	9.38E-1
MF-AR-CELL-LK	8.82E-1	5.08E-1	9.30E-2	4.67E-1	7.73E-1	5.72E-3	9.59E-1
MF-FS-SV-1	3.29E-1	4.64E-1	1.42E-1	3.95E-1	7.34E-1	4.29E-2	9.66E-1
MF-FS-SV-3	3.29E-1	4.66E-1	1.44E-1	3.98E-1	7.32E-1	3.91E-2	9.67E-1
MF-LK-SV-1	1.99E-2	3.32E-2	5.81E-3	2.07E-2	6.65E-2	1.36E-3	3.35E-1
MF-LK-SV-3	1.99E-2	3.34E-2	5.69E-3	2.08E-2	6.62E-2	1.40E-3	4.19E-1
MF-RP-SV-1	2.89E-3	4.89E-3	9.32E-5	1.17E-3	1.10E-2	1.45E-5	3.00E-1
MF-RP-SV-3	2.89E-3	4.91E-3	9.98E-5	1.18E-3	1.09E-2	9.67E-6	5.97E-1
MF-VP-1-LK	1.76E-3	2.01E-3	3.19E-4	1.28E-3	3.98E-3	6.07E-5	1.94E-2

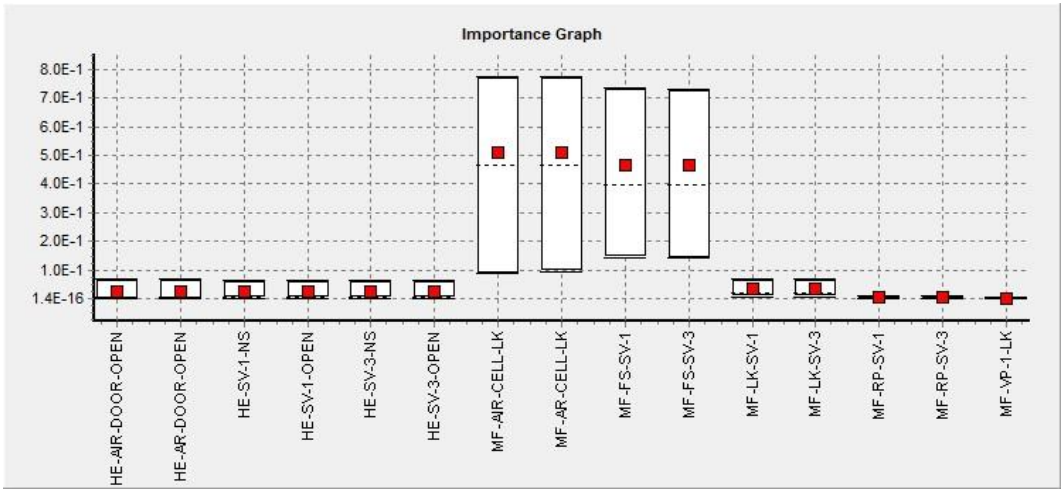


Figure 115: FV importance graph for the basic system w/ Bruce B fault rate and diagnostic HE.

Table 110: FV Results for Basic System w/ Bruce B Fault Rate and Diagnostic HE and SV_OL

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-DOOR-OPEN	1.44E-2	4.73E-2	2.85E-5	1.04E-2	1.30E-1	2.81E-13	7.50E-1
HE-AR-DOOR-OPEN	1.44E-2	4.80E-2	2.80E-5	1.09E-2	1.33E-1	2.17E-13	8.68E-1
HE-SV-1-NS	1.44E-2	4.80E-2	2.65E-5	1.09E-2	1.27E-1	2.69E-11	8.56E-1
HE-SV-1-OPEN	1.44E-2	4.82E-2	3.96E-5	1.11E-2	1.32E-1	8.36E-10	7.20E-1
HE-SV-3-NS	1.44E-2	4.66E-2	3.26E-5	1.04E-2	1.27E-1	3.31E-10	8.21E-1
HE-SV-3-OPEN	1.44E-2	4.67E-2	2.91E-5	1.05E-2	1.25E-1	7.65E-13	7.93E-1
MF-AIR-CELL-LK	9.80E-1	8.39E-1	3.89E-1	8.62E-1	9.72E-1	3.89E-2	9.97E-1
MF-AR-CELL-LK	9.80E-1	8.41E-1	3.93E-1	8.63E-1	9.72E-1	2.94E-2	9.98E-1
MF-FFD-SV-3	7.74E-3	2.44E-2	4.19E-4	5.81E-3	6.01E-2	4.35E-5	8.01E-1
MF-SV-1-FFD	7.74E-3	2.47E-2	4.43E-4	5.64E-3	6.00E-2	1.38E-5	8.49E-1
MF-VP-1-LK	2.21E-3	7.55E-3	1.07E-3	4.19E-3	1.56E-2	2.15E-4	1.10E-1

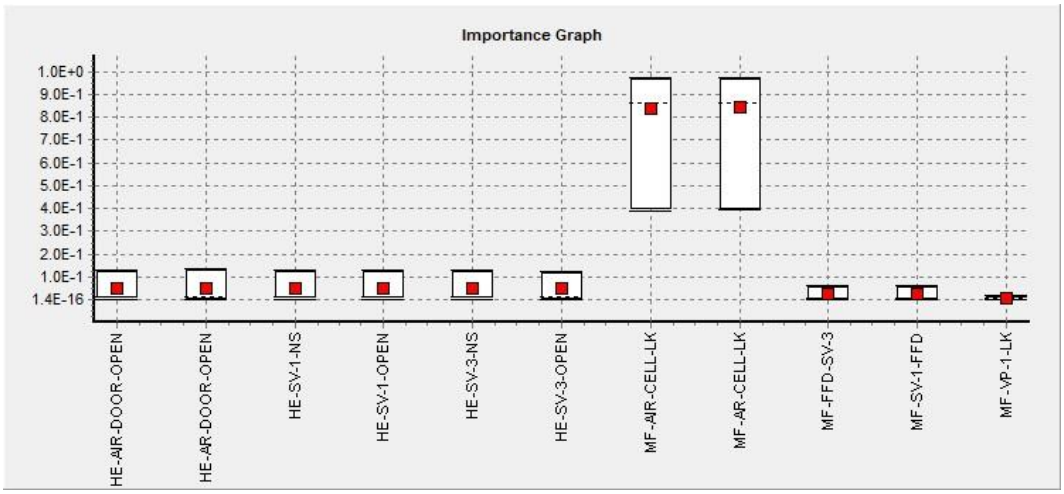


Figure 116: FV importance graph for the basic system w/ Bruce B fault rate and diagnostic HE and SV_OL.

Table 111: FV Results for Basic System w/ Bruce B Fault Rate and Diagnostic HE and SV_OM

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-DOOR-OPEN	1.54E-2	2.89E-2	1.90E-5	6.52E-3	7.79E-2	1.03E-13	6.17E-1
HE-AR-DOOR-OPEN	1.54E-2	2.88E-2	1.78E-5	6.69E-3	7.80E-2	1.70E-13	5.81E-1
HE-SV-1-NS	1.53E-2	2.88E-2	1.70E-5	6.74E-3	7.69E-2	2.73E-11	5.85E-1
HE-SV-1-OPEN	1.53E-2	2.92E-2	2.43E-5	6.93E-3	7.92E-2	8.33E-10	6.13E-1
HE-SV-3-NS	1.53E-2	2.81E-2	1.91E-5	6.34E-3	7.54E-2	2.85E-10	7.18E-1
HE-SV-3-OPEN	1.53E-2	2.82E-2	1.80E-5	6.66E-3	7.35E-2	8.44E-13	6.84E-1
MF-AIR-CELL-LK	8.65E-1	5.70E-1	8.72E-2	5.17E-1	8.79E-1	3.06E-3	9.91E-1
MF-AR-CELL-LK	8.65E-1	5.70E-1	9.24E-2	5.17E-1	8.80E-1	6.37E-3	9.91E-1
MF-FFD-SV-3	4.42E-1	4.13E-1	3.07E-2	2.98E-1	8.01E-1	3.37E-3	9.97E-1
MF-SV-1-FFD	4.42E-1	4.11E-1	3.21E-2	2.94E-1	7.98E-1	1.03E-3	9.97E-1
MF-VP-1-LK	1.66E-3	2.76E-3	2.96E-4	1.49E-3	5.80E-3	6.57E-5	4.34E-2

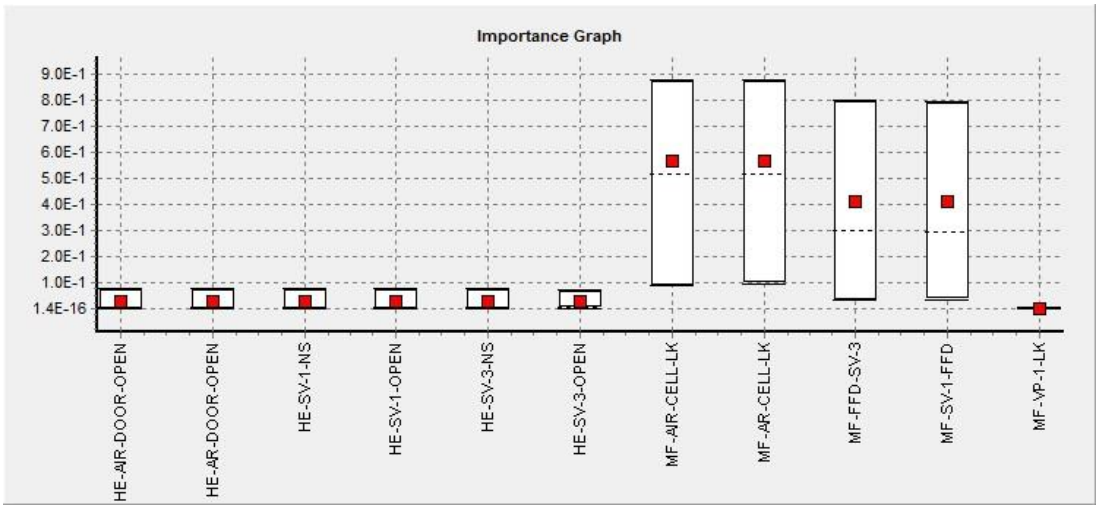


Figure 117: FV importance graph for the basic system w/ Bruce B fault rate and diagnostic HE and SV_OM.

Table 112: FV Results for Basic System w/ Bruce B Fault Rate and Diagnostic HE and SV_OH

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-DOOR-OPEN	1.80E-2	2.08E-2	1.42E-5	4.86E-3	5.58E-2	5.16E-14	5.37E-1
HE-AR-DOOR-OPEN	1.80E-2	2.08E-2	1.28E-5	4.98E-3	5.58E-2	1.10E-13	4.06E-1
HE-SV-1-NS	1.80E-2	2.08E-2	1.25E-5	5.02E-3	5.55E-2	2.42E-11	4.58E-1
HE-SV-1-OPEN	1.80E-2	2.11E-2	2.01E-5	5.19E-3	5.75E-2	7.29E-10	4.33E-1
HE-SV-3-NS	1.80E-2	2.03E-2	1.40E-5	4.73E-3	5.30E-2	2.16E-10	5.78E-1
HE-SV-3-OPEN	1.80E-2	2.03E-2	1.34E-5	4.99E-3	5.34E-2	8.35E-13	5.14E-1
MF-AIR-CELL-LK	8.68E-1	4.40E-1	5.57E-2	3.58E-1	7.72E-1	2.08E-3	9.87E-1
MF-AR-CELL-LK	8.68E-1	4.40E-1	5.30E-2	3.58E-1	7.77E-1	3.11E-3	9.82E-1
MF-FFD-SV-3	8.90E-1	6.54E-1	1.13E-1	6.34E-1	9.40E-1	1.39E-2	1.00E+0
MF-SV-1-FFD	8.90E-1	6.53E-1	1.17E-1	6.27E-1	9.39E-1	4.10E-3	1.00E+0
MF-VP-1-LK	1.40E-3	1.34E-3	1.44E-4	7.07E-4	2.84E-3	1.89E-5	2.41E-2

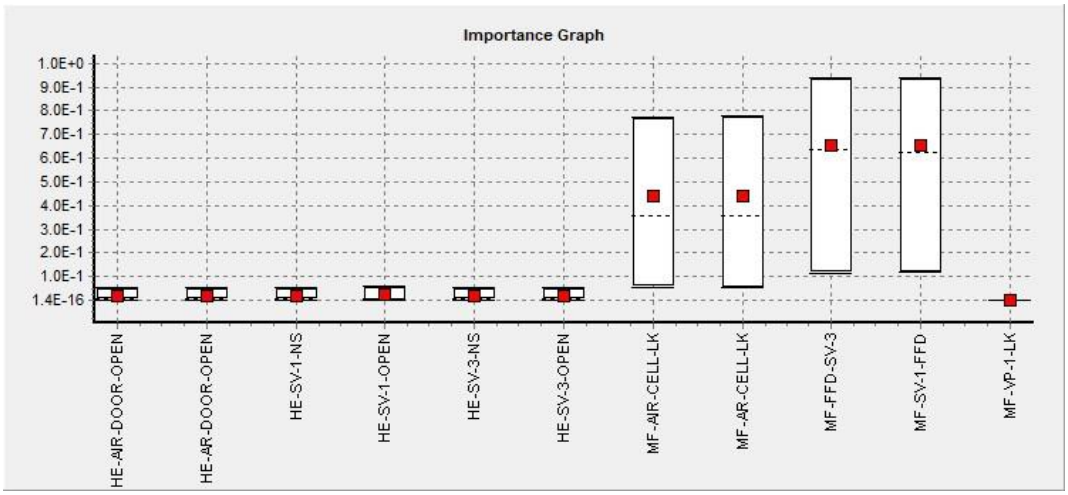


Figure 118: FV importance graph for the basic system w/ Bruce B fault rate and diagnostic HE and SV_OH.

Table 113: FV Results for Basic System w/ Bruce B Fault Rate and Diagnostic HE and SV_DOW

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-DOOR-OPEN	1.44E-2	4.73E-2	2.84E-5	1.04E-2	1.30E-1	2.81E-13	7.47E-1
HE-AR-DOOR-OPEN	1.44E-2	4.80E-2	2.80E-5	1.09E-2	1.33E-1	2.17E-13	8.68E-1
HE-SV-1-NS	1.44E-2	4.79E-2	2.65E-5	1.09E-2	1.27E-1	2.69E-11	8.55E-1
HE-SV-1-OPEN	1.44E-2	4.81E-2	3.96E-5	1.11E-2	1.31E-1	8.37E-10	7.20E-1
HE-SV-3-NS	1.44E-2	4.65E-2	3.25E-5	1.04E-2	1.27E-1	3.31E-10	8.19E-1
HE-SV-3-OPEN	1.44E-2	4.67E-2	2.91E-5	1.05E-2	1.25E-1	7.66E-13	7.93E-1
MF-AIR-CELL-LK	9.80E-1	8.38E-1	3.87E-1	8.62E-1	9.72E-1	3.85E-2	9.97E-1
MF-AR-CELL-LK	9.80E-1	8.40E-1	3.91E-1	8.62E-1	9.72E-1	2.93E-2	9.98E-1
MF-FFD-SV-3	8.00E-3	2.51E-2	4.33E-4	6.01E-3	6.20E-2	4.49E-5	8.06E-1
MF-SV-1-FFD	8.00E-3	2.55E-2	4.58E-4	5.83E-3	6.19E-2	1.43E-5	8.53E-1
MF-VP-1-LK	2.21E-3	7.54E-3	1.06E-3	4.19E-3	1.56E-2	2.15E-4	1.10E-1

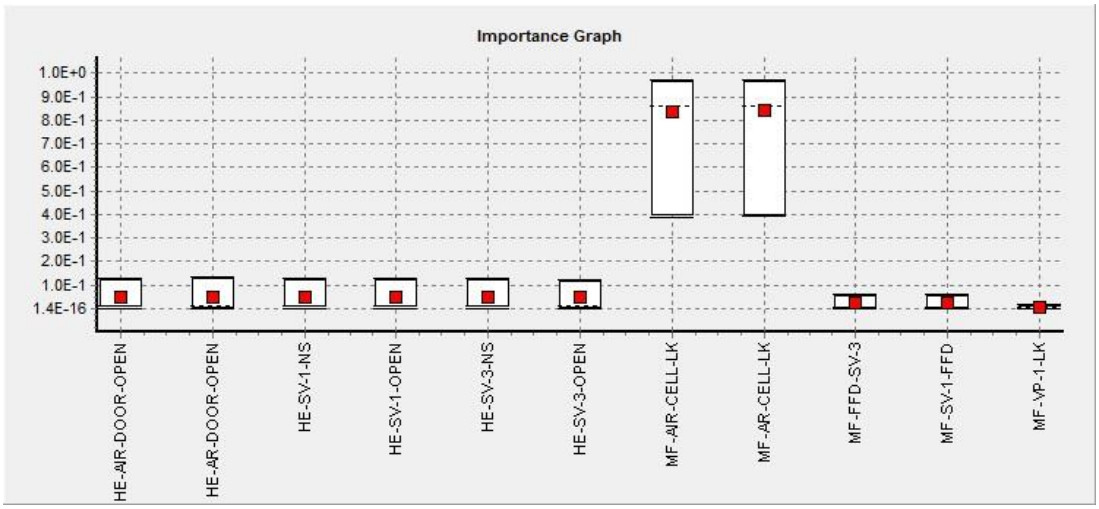


Figure 119: FV importance graph for the basic system w/ Bruce B fault rate and diagnostic HE and SV_DOW.

Table 114: FV Results for Basic System w/ Bruce B Fault Rate and Diagnostic HE and SV_MAN

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-DOOR-OPEN	1.44E-2	4.87E-2	2.87E-5	1.06E-2	1.35E-1	2.89E-13	8.53E-1
HE-AR-DOOR-OPEN	1.44E-2	4.95E-2	2.80E-5	1.11E-2	1.36E-1	2.18E-13	8.88E-1
HE-SV-1-NS	1.43E-2	4.95E-2	2.75E-5	1.11E-2	1.31E-1	2.68E-11	8.81E-1
HE-SV-1-OPEN	1.43E-2	4.98E-2	3.99E-5	1.14E-2	1.36E-1	8.19E-10	7.21E-1
HE-SV-3-NS	1.43E-2	4.80E-2	3.32E-5	1.07E-2	1.30E-1	3.31E-10	8.62E-1
HE-SV-3-OPEN	1.43E-2	4.82E-2	2.97E-5	1.07E-2	1.29E-1	7.59E-13	7.95E-1
MF-AIR-CELL-LK	9.83E-1	8.56E-1	4.16E-1	8.80E-1	9.80E-1	4.17E-2	9.99E-1
MF-AR-CELL-LK	9.83E-1	8.59E-1	4.19E-1	8.83E-1	9.80E-1	3.00E-2	9.99E-1
MF-FFD-SV-3	1.94E-4	7.31E-4	1.05E-5	1.46E-4	1.60E-3	1.09E-6	9.76E-2
MF-SV-1-FFD	1.94E-4	7.54E-4	1.11E-5	1.42E-4	1.60E-3	3.46E-7	1.43E-1
MF-VP-1-LK	2.22E-3	8.02E-3	1.09E-3	4.39E-3	1.67E-2	2.15E-4	1.36E-1

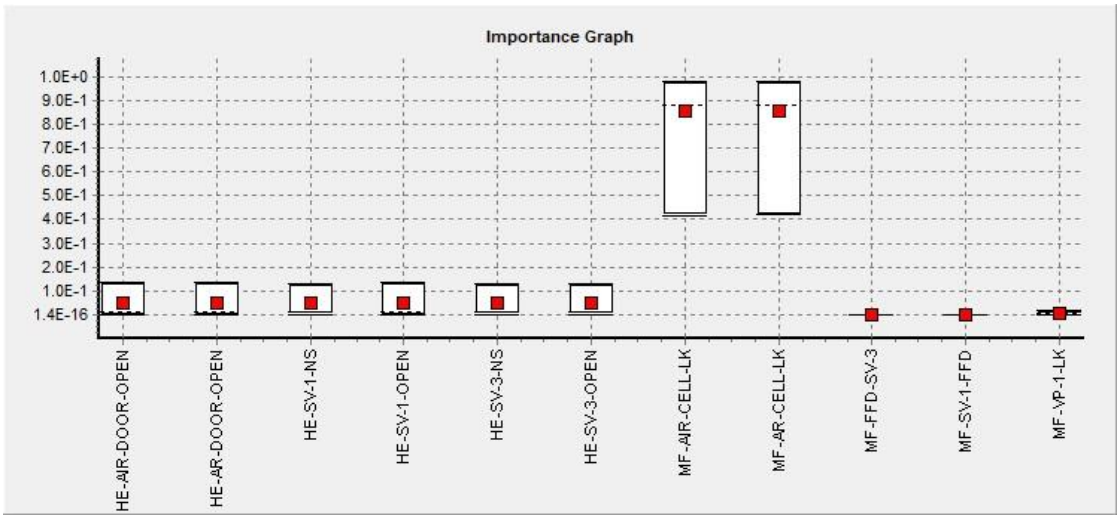


Figure 120: FV importance graph for the basic system w/ Bruce B fault rate and diagnostic HE and SV_MAN.

Table 115: FV Results for Basic System w/ Bruce B Fault Rate and Diagnostic HE and SV_NRPD

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-DOOR-OPEN	1.47E-2	3.59E-2	2.25E-5	8.08E-3	9.93E-2	1.71E-13	6.86E-1
HE-AR-DOOR-OPEN	1.47E-2	3.60E-2	2.21E-5	8.46E-3	9.81E-2	2.00E-13	6.51E-1
HE-SV-1-NS	1.47E-2	3.60E-2	2.02E-5	8.38E-3	9.54E-2	2.77E-11	6.24E-1
HE-SV-1-OPEN	1.47E-2	3.63E-2	3.07E-5	8.63E-3	9.88E-2	8.60E-10	6.81E-1
HE-SV-3-NS	1.47E-2	3.51E-2	2.46E-5	7.94E-3	9.42E-2	3.13E-10	7.61E-1
HE-SV-3-OPEN	1.47E-2	3.52E-2	2.25E-5	8.33E-3	9.18E-2	8.26E-13	7.51E-1
MF-AIR-CELL-LK	9.23E-1	6.78E-1	1.51E-1	6.67E-1	9.23E-1	6.00E-3	9.93E-1
MF-AR-CELL-LK	9.23E-1	6.79E-1	1.49E-1	6.70E-1	9.25E-1	1.24E-2	9.94E-1
MF-FFD-SV-3	1.79E-1	2.48E-1	1.05E-2	1.27E-1	5.97E-1	1.11E-3	9.73E-1
MF-SV-1-FFD	1.79E-1	2.47E-1	1.11E-2	1.23E-1	5.97E-1	3.47E-4	9.75E-1
MF-VP-1-LK	1.95E-3	4.34E-3	5.48E-4	2.45E-3	8.92E-3	9.91E-5	6.12E-2

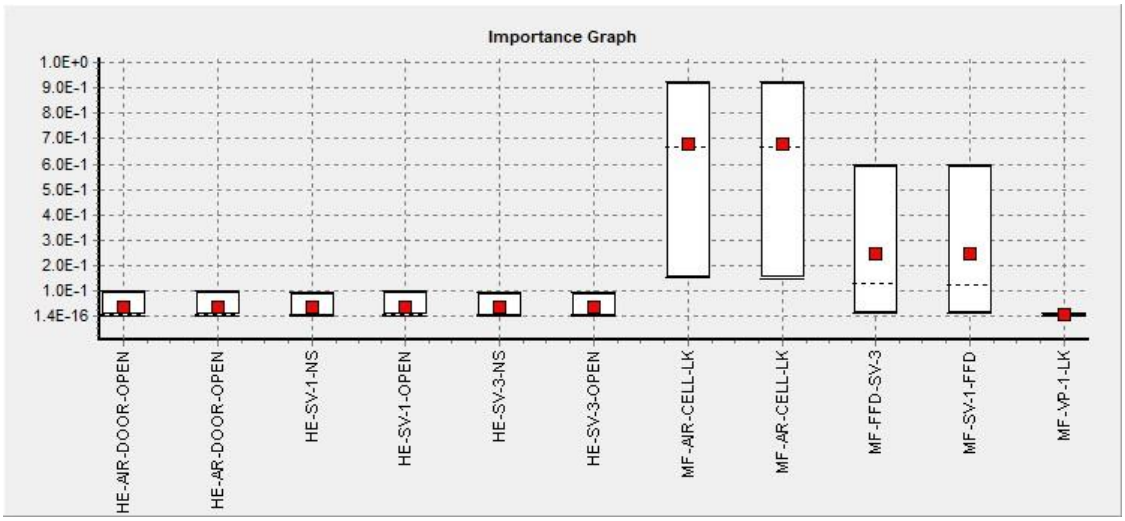


Figure 121: FV importance graph for the basic system w/ Bruce B fault rate and diagnostic HE and SV_NRPD.

Table 116: FV Results for Basic System w/ Bruce A Fault Rate

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-DOOR-OPEN	2.29E-3	3.44E-3	2.96E-6	7.79E-4	9.26E-3	1.06E-12	1.50E-1
HE-AR-DOOR-OPEN	2.29E-3	3.46E-3	2.60E-6	8.20E-4	9.28E-3	1.46E-11	9.79E-2
HE-SV-1-NS	2.28E-3	3.38E-3	3.56E-6	8.15E-4	9.01E-3	2.05E-10	6.01E-2
HE-SV-1-OPEN	2.28E-3	3.47E-3	2.57E-6	8.25E-4	9.25E-3	1.95E-12	8.35E-2
HE-SV-3-NS	2.28E-3	3.44E-3	2.92E-6	8.01E-4	9.04E-3	1.53E-14	8.43E-2
HE-SV-3-OPEN	2.28E-3	3.36E-3	2.51E-6	7.79E-4	8.80E-3	1.94E-12	1.41E-1
MF-AIR-CELL-LK	4.58E-1	3.12E-1	2.13E-2	2.02E-1	6.53E-1	1.38E-3	9.47E-1
MF-AR-CELL-LK	4.58E-1	3.12E-1	2.10E-2	2.02E-1	6.50E-1	1.07E-3	9.47E-1
MF-FS-SV-1	5.60E-1	6.52E-1	2.12E-1	6.24E-1	8.97E-1	5.39E-2	9.86E-1
MF-FS-SV-3	5.60E-1	6.55E-1	2.16E-1	6.26E-1	9.00E-1	6.13E-2	9.85E-1
MF-LK-SV-1	3.30E-2	4.91E-2	7.52E-3	2.94E-2	1.01E-1	1.73E-3	4.72E-1
MF-LK-SV-3	3.30E-2	4.70E-2	7.35E-3	2.86E-2	9.50E-2	1.49E-3	4.02E-1
MF-RP-SV-1	4.79E-3	7.13E-3	1.27E-4	1.62E-3	1.67E-2	6.26E-6	4.02E-1
MF-RP-SV-3	4.79E-3	6.90E-3	1.30E-4	1.67E-3	1.62E-2	1.10E-5	2.98E-1
MF-VP-1-LK	1.73E-3	1.86E-3	1.63E-4	9.97E-4	4.00E-3	1.27E-5	2.91E-2

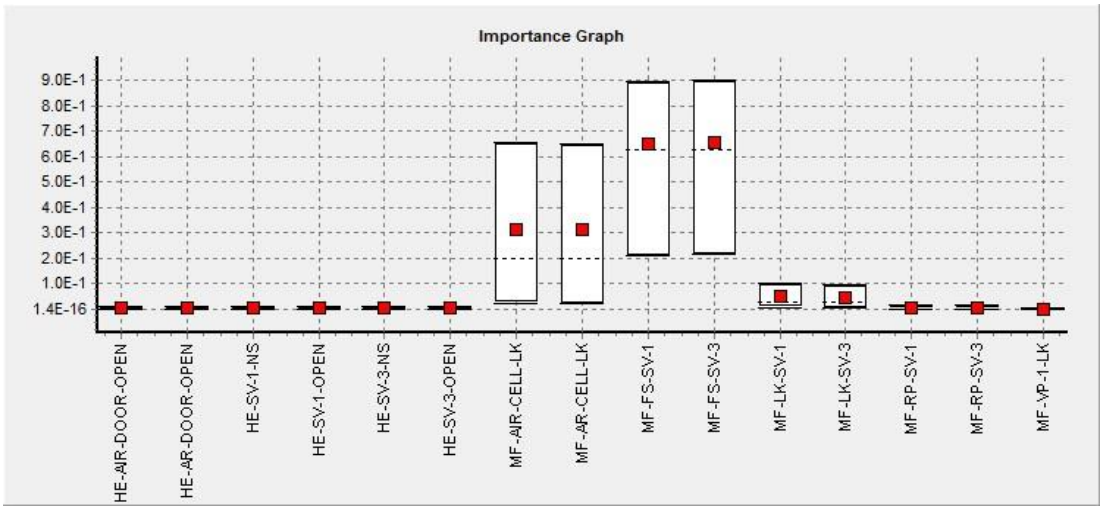


Figure 122: Importance graph for FV results for basic system w/ Bruce A fault rate.

Table 117: FV Results for Basic System w/ Bruce A Fault Rate and SV_OL

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-DOOR-OPEN	4.66E-3	1.87E-2	6.75E-6	2.89E-3	5.06E-2	1.62E-13	6.72E-1
HE-AR-DOOR-OPEN	4.66E-3	1.83E-2	7.30E-6	2.70E-3	4.86E-2	1.24E-12	5.02E-1
HE-SV-1-NS	4.65E-3	1.80E-2	8.54E-6	2.61E-3	4.68E-2	1.90E-14	6.20E-1
HE-SV-1-OPEN	4.65E-3	1.81E-2	7.65E-6	2.62E-3	4.74E-2	1.25E-11	6.39E-1
HE-SV-3-NS	4.65E-3	1.84E-2	7.90E-6	2.69E-3	4.92E-2	6.55E-11	4.84E-1
HE-SV-3-OPEN	4.65E-3	1.81E-2	7.86E-6	2.76E-3	4.83E-2	1.40E-12	5.72E-1
MF-AIR-CELL-LK	9.57E-1	8.53E-1	3.41E-1	8.89E-1	9.86E-1	1.10E-2	9.99E-1
MF-AR-CELL-LK	9.57E-1	8.53E-1	3.50E-1	8.88E-1	9.86E-1	1.81E-2	9.99E-1
MF-FFD-SV-3	2.76E-2	7.86E-2	9.70E-4	1.76E-2	2.21E-1	4.23E-5	9.60E-1
MF-SV-1-FFD	2.76E-2	7.80E-2	8.17E-4	1.73E-2	2.21E-1	2.44E-5	9.28E-1
MF-VP-1-LK	7.83E-3	2.94E-2	2.53E-3	1.40E-2	6.53E-2	3.07E-4	5.58E-1

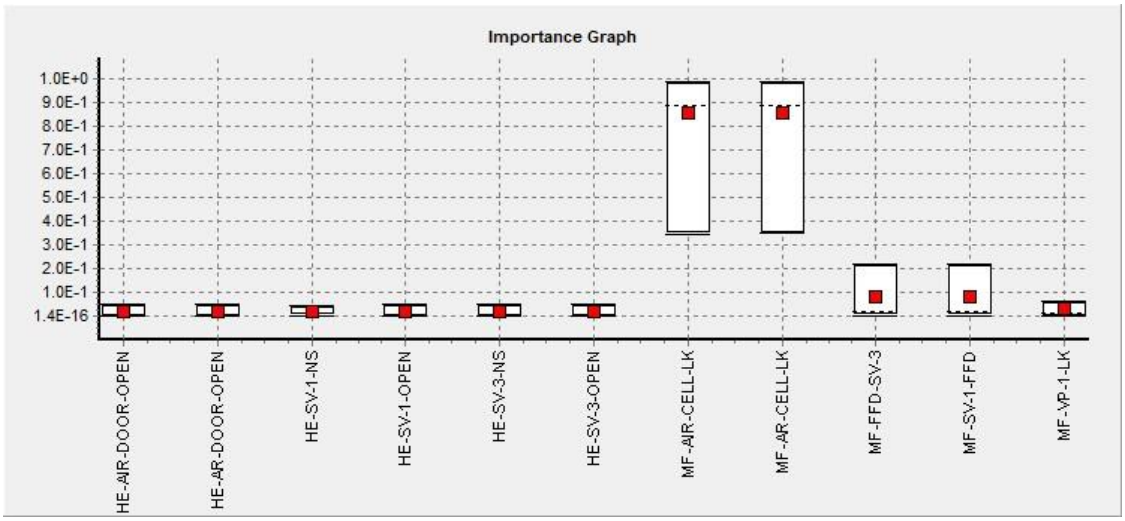


Figure 123: Importance graph for FV results for basic system w/ Bruce A fault rate and SV_OL.

Table 118: FV Results for Basic System w/ Bruce A Fault Rate and SV_OM

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-DOOR-OPEN	2.01E-3	5.46E-3	2.46E-6	9.96E-4	1.37E-2	8.96E-15	2.06E-1
HE-AR-DOOR-OPEN	2.01E-3	5.34E-3	2.49E-6	9.36E-4	1.35E-2	1.07E-12	1.86E-1
HE-SV-1-NS	2.01E-3	5.33E-3	3.03E-6	9.41E-4	1.32E-2	6.46E-15	2.10E-1
HE-SV-1-OPEN	2.01E-3	5.39E-3	2.57E-6	9.36E-4	1.36E-2	8.89E-12	3.21E-1
HE-SV-3-NS	2.01E-3	5.34E-3	2.96E-6	9.14E-4	1.37E-2	4.32E-11	1.95E-1
HE-SV-3-OPEN	2.01E-3	5.24E-3	2.71E-6	9.56E-4	1.32E-2	1.96E-13	3.01E-1
MF-AIR-CELL-LK	4.03E-1	3.99E-1	1.94E-2	2.58E-1	8.35E-1	4.39E-4	9.97E-1
MF-AR-CELL-LK	4.03E-1	3.95E-1	2.00E-2	2.52E-1	8.25E-1	1.60E-3	9.93E-1
MF-FFD-SV-3	6.67E-1	6.10E-1	6.60E-2	5.57E-1	9.45E-1	3.18E-3	9.99E-1
MF-SV-1-FFD	6.67E-1	6.05E-1	5.78E-2	5.55E-1	9.43E-1	1.82E-3	1.00E+0
MF-VP-1-LK	1.31E-3	3.71E-3	1.33E-4	1.40E-3	8.66E-3	1.28E-5	2.18E-1

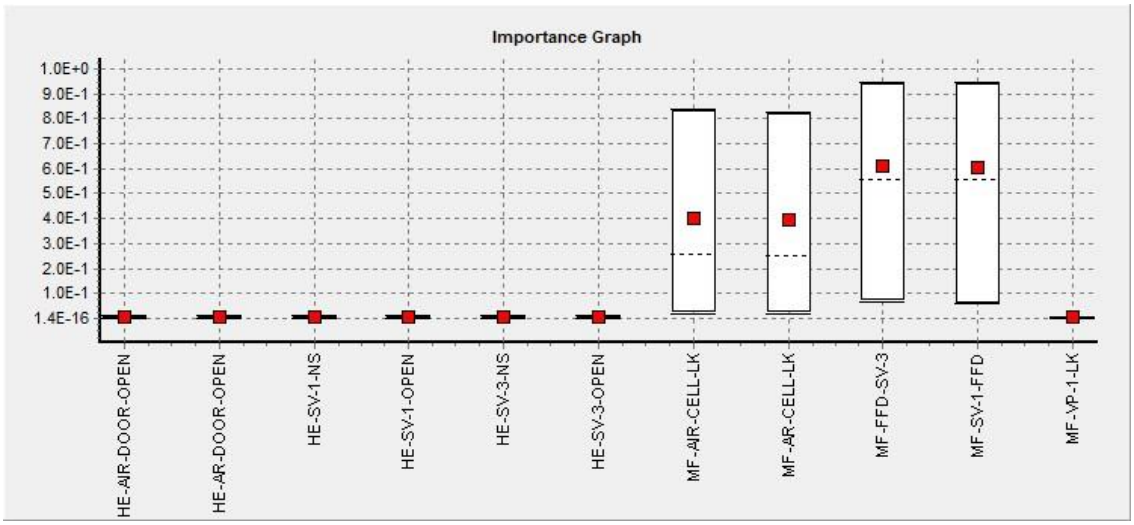


Figure 124: Importance graph for FV results for basic system w/ Bruce A fault rate and SV_OM.

Table 119: FV Results for Basic System w/ Bruce A Fault Rate and SV_OH

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-DOOR-OPEN	1.32E-3	2.81E-3	1.50E-6	5.61E-4	6.90E-3	6.33E-15	1.34E-1
HE-AR-DOOR-OPEN	1.32E-3	2.72E-3	1.51E-6	5.24E-4	6.78E-3	8.00E-13	1.02E-1
HE-SV-1-NS	1.32E-3	2.73E-3	1.91E-6	5.51E-4	6.64E-3	4.92E-15	1.02E-1
HE-SV-1-OPEN	1.32E-3	2.74E-3	1.65E-6	5.44E-4	6.98E-3	6.18E-12	1.44E-1
HE-SV-3-NS	1.32E-3	2.75E-3	1.70E-6	5.30E-4	7.01E-3	2.90E-11	1.47E-1
HE-SV-3-OPEN	1.32E-3	2.69E-3	1.70E-6	5.45E-4	6.81E-3	1.42E-13	2.45E-1
MF-AIR-CELL-LK	2.62E-1	2.55E-1	1.05E-2	1.25E-1	6.24E-1	3.32E-4	9.95E-1
MF-AR-CELL-LK	2.62E-1	2.51E-1	1.03E-2	1.23E-1	6.10E-1	1.22E-3	9.86E-1
MF-FFD-SV-3	9.24E-1	7.97E-1	2.19E-1	8.27E-1	9.86E-1	1.25E-2	1.00E+0
MF-SV-1-FFD	9.24E-1	7.93E-1	1.96E-1	8.27E-1	9.85E-1	7.06E-3	1.00E+0
MF-VP-1-LK	4.69E-4	1.13E-3	4.04E-5	4.05E-4	2.61E-3	3.08E-6	5.18E-2

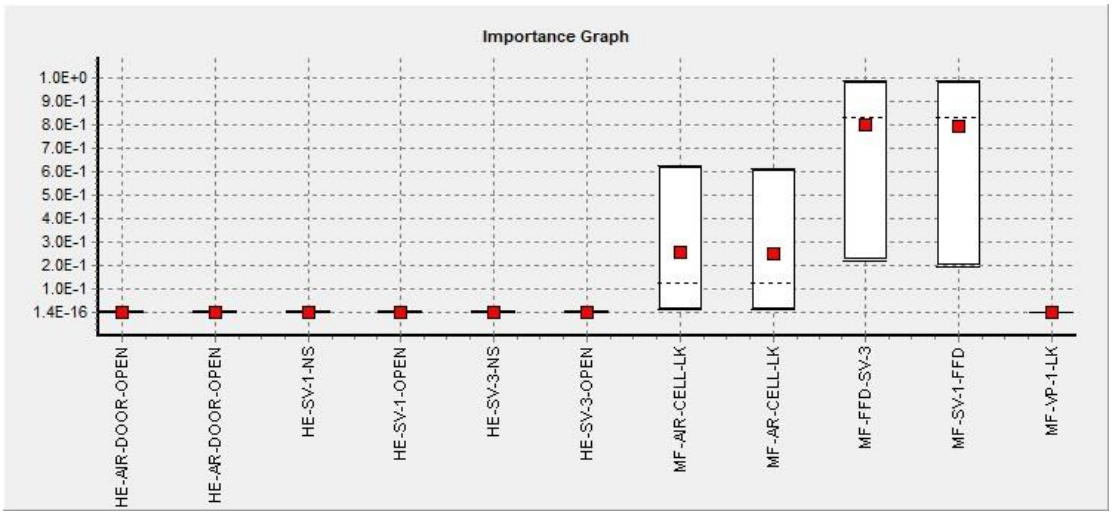


Figure 125: Importance graph for FV results for basic system w/ Bruce A fault rate and SV_OH.

Table 120: FV Results for Basic System w/ Bruce A Fault Rate and SV_DOW

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-DOOR-OPEN	4.66E-3	1.86E-2	6.74E-6	2.88E-3	5.03E-2	1.59E-13	6.70E-1
HE-AR-DOOR-OPEN	4.66E-3	1.83E-2	7.22E-6	2.70E-3	4.85E-2	1.22E-12	4.99E-1
HE-SV-1-NS	4.64E-3	1.80E-2	8.53E-6	2.61E-3	4.67E-2	1.89E-14	6.19E-1
HE-SV-1-OPEN	4.64E-3	1.81E-2	7.48E-6	2.61E-3	4.73E-2	1.25E-11	6.37E-1
HE-SV-3-NS	4.64E-3	1.83E-2	7.87E-6	2.68E-3	4.91E-2	6.55E-11	4.84E-1
HE-SV-3-OPEN	4.64E-3	1.81E-2	7.86E-6	2.75E-3	4.81E-2	1.40E-12	5.69E-1
MF-AIR-CELL-LK	9.56E-1	8.52E-1	3.36E-1	8.87E-1	9.85E-1	1.08E-2	9.99E-1
MF-AR-CELL-LK	9.56E-1	8.51E-1	3.46E-1	8.86E-1	9.85E-1	1.76E-2	9.99E-1
MF-FFD-SV-3	2.85E-2	8.05E-2	1.00E-3	1.81E-2	2.27E-1	4.38E-5	9.61E-1
MF-SV-1-FFD	2.85E-2	7.99E-2	8.45E-4	1.79E-2	2.27E-1	2.52E-5	9.30E-1
MF-VP-1-LK	7.82E-3	2.92E-2	2.53E-3	1.40E-2	6.49E-2	3.07E-4	5.58E-1

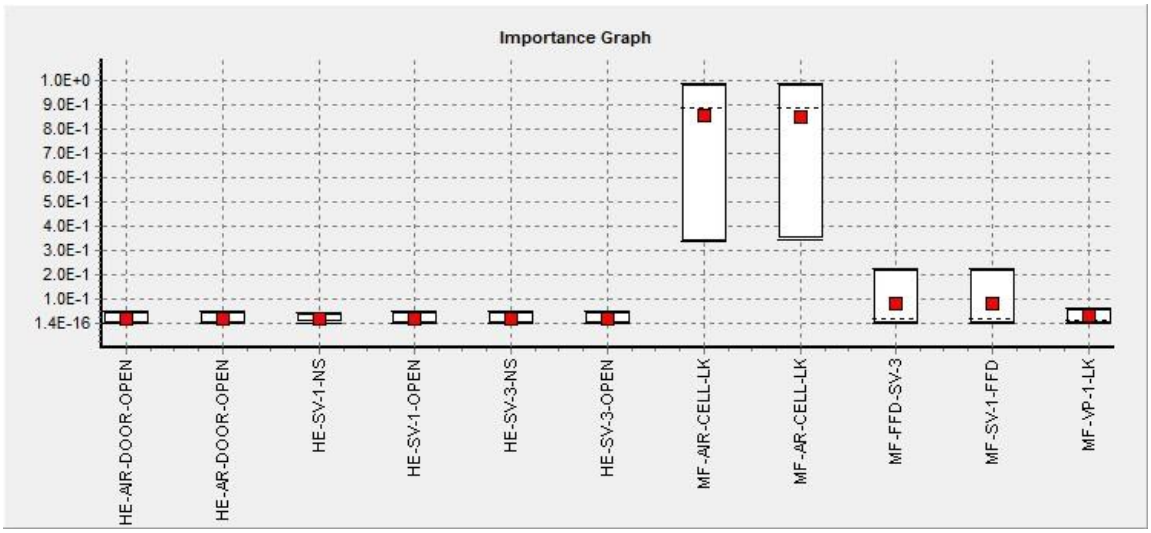


Figure 126: Importance graph for FV results for basic system w/ Bruce A fault rate and SV_DOW.

Table 121: FV Results for Basic System w/ Bruce A Fault Rate and SV_MAN

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-DOOR-OPEN	4.78E-3	2.18E-2	6.93E-6	3.11E-3	5.97E-2	2.49E-13	7.12E-1
HE-AR-DOOR-OPEN	4.78E-3	2.13E-2	7.99E-6	2.91E-3	5.46E-2	1.23E-12	6.45E-1
HE-SV-1-NS	4.76E-3	2.12E-2	9.08E-6	2.82E-3	5.36E-2	1.77E-14	6.37E-1
HE-SV-1-OPEN	4.76E-3	2.10E-2	8.04E-6	2.83E-3	5.48E-2	1.26E-11	7.08E-1
HE-SV-3-NS	4.76E-3	2.13E-2	8.56E-6	2.84E-3	5.70E-2	6.60E-11	5.54E-1
HE-SV-3-OPEN	4.76E-3	2.09E-2	9.11E-6	2.93E-3	5.50E-2	1.67E-12	6.72E-1
MF-AIR-CELL-LK	9.82E-1	9.15E-1	5.55E-1	9.43E-1	9.92E-1	2.78E-2	9.99E-1
MF-AR-CELL-LK	9.82E-1	9.15E-1	5.58E-1	9.44E-1	9.92E-1	1.28E-1	9.99E-1
MF-FFD-SV-3	7.09E-4	3.27E-3	2.42E-5	4.45E-4	6.99E-3	1.06E-6	3.82E-1
MF-SV-1-FFD	7.09E-4	3.25E-3	2.04E-5	4.40E-4	7.06E-3	6.06E-7	2.44E-1
MF-VP-1-LK	8.25E-3	3.72E-2	2.71E-3	1.66E-2	8.56E-2	3.08E-4	5.66E-1

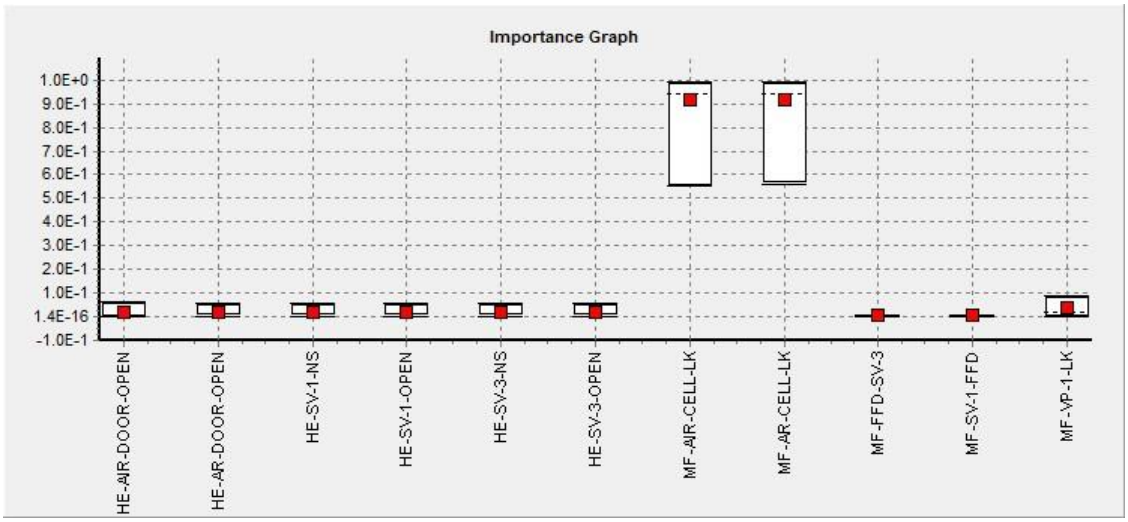


Figure 127: Importance graph for FV results for basic system w/ Bruce A fault rate and SV_MAN.

Table 122: FV Results for Basic System w/ Bruce A Fault Rate and SV_NRPD

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-DOOR-OPEN	3.03E-3	8.69E-3	3.60E-6	1.53E-3	2.20E-2	1.82E-14	2.91E-1
HE-AR-DOOR-OPEN	3.03E-3	8.52E-3	3.85E-6	1.43E-3	2.20E-2	1.18E-12	2.82E-1
HE-SV-1-NS	3.02E-3	8.47E-3	4.63E-6	1.41E-3	2.17E-2	1.00E-14	3.44E-1
HE-SV-1-OPEN	3.02E-3	8.56E-3	4.19E-6	1.43E-3	2.21E-2	1.09E-11	4.49E-1
HE-SV-3-NS	3.02E-3	8.52E-3	4.26E-6	1.46E-3	2.18E-2	5.50E-11	2.94E-1
HE-SV-3-OPEN	3.02E-3	8.37E-3	4.11E-6	1.49E-3	2.13E-2	3.57E-13	3.15E-1
MF-AIR-CELL-LK	6.12E-1	5.43E-1	3.82E-2	4.58E-1	9.23E-1	8.60E-4	9.97E-1
MF-AR-CELL-LK	6.12E-1	5.38E-1	4.02E-2	4.49E-1	9.18E-1	1.92E-3	9.96E-1
MF-FFD-SV-3	4.07E-1	4.41E-1	2.35E-2	3.04E-1	8.66E-1	1.07E-3	9.97E-1
MF-SV-1-FFD	4.07E-1	4.37E-1	2.05E-2	3.02E-1	8.65E-1	6.21E-4	9.95E-1
MF-VP-1-LK	3.17E-3	8.27E-3	4.24E-4	3.58E-3	1.96E-2	5.07E-5	3.97E-1

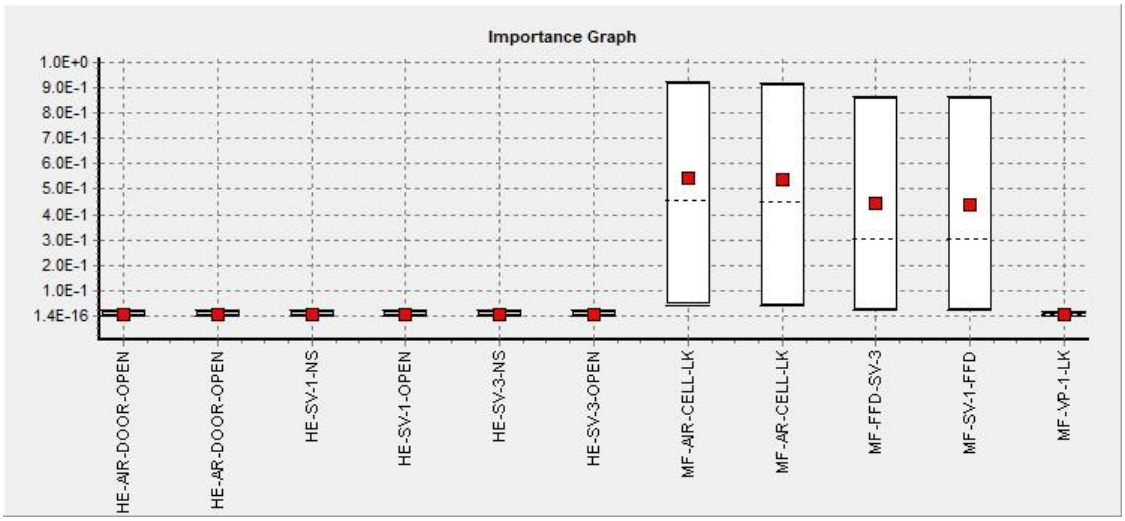


Figure 128: Importance graph for FV results for basic system w/ Bruce A fault rate and SV_NRPD.

Table 123: FV Results for Basic System w/ Bruce A Fault Rate and Diagnostic HE Component.

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-DOOR-OPEN	2.40E-2	3.20E-2	2.51E-5	8.07E-3	8.90E-2	7.08E-12	5.71E-1
HE-AR-DOOR-OPEN	2.40E-2	3.25E-2	2.13E-5	8.29E-3	8.95E-2	2.91E-11	4.69E-1
HE-SV-1-NS	2.40E-2	3.14E-2	2.55E-5	8.26E-3	8.42E-2	4.15E-10	4.45E-1
HE-SV-1-OPEN	2.40E-2	3.27E-2	2.40E-5	8.55E-3	9.07E-2	3.88E-14	5.21E-1
HE-SV-3-NS	2.40E-2	3.30E-2	2.93E-5	8.67E-3	8.94E-2	6.72E-10	5.55E-1
HE-SV-3-OPEN	2.40E-2	3.19E-2	2.74E-5	8.35E-3	8.63E-2	2.44E-12	4.62E-1
MF-AIR-CELL-LK	4.36E-1	2.88E-1	1.80E-2	1.79E-1	6.16E-1	2.41E-3	9.22E-1
MF-AR-CELL-LK	4.36E-1	2.84E-1	1.93E-2	1.78E-1	6.06E-1	8.56E-4	9.20E-1
MF-FS-SV-1	5.33E-1	6.06E-1	2.06E-1	5.66E-1	8.51E-1	4.28E-2	9.73E-1
MF-FS-SV-3	5.33E-1	6.09E-1	2.03E-1	5.75E-1	8.47E-1	5.72E-2	9.76E-1
MF-LK-SV-1	3.16E-2	4.46E-2	7.32E-3	2.73E-2	8.94E-2	1.61E-3	4.25E-1
MF-LK-SV-3	3.16E-2	4.50E-2	7.23E-3	2.77E-2	9.17E-2	2.19E-3	4.49E-1
MF-RP-SV-1	4.59E-3	6.57E-3	1.32E-4	1.53E-3	1.43E-2	9.18E-6	3.80E-1
MF-RP-SV-3	4.59E-3	6.28E-3	1.33E-4	1.62E-3	1.41E-2	1.81E-5	2.86E-1
MF-VP-1-LK	1.63E-3	1.68E-3	1.85E-4	9.37E-4	3.54E-3	1.26E-5	2.34E-2

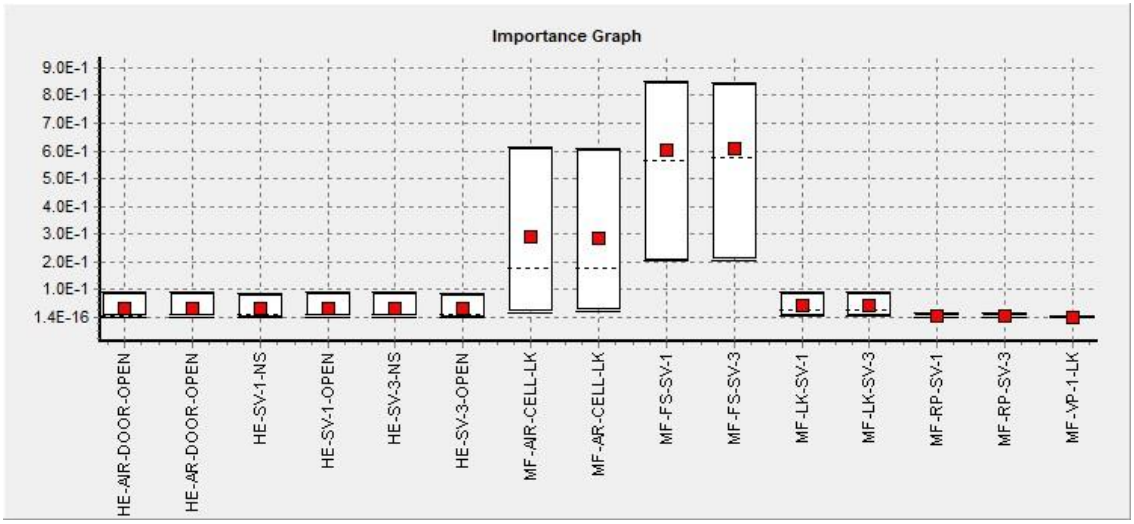


Figure 129: Importance graph for FV results for basic system with Bruce A fault rate and diagnostic HE component.

Table 124: FV Results for Basic System w/ Bruce A Fault Rate and Diagnostic HE Component and SV_OL

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-DOOR-OPEN	4.55E-2	9.66E-2	6.80E-5	2.31E-2	2.83E-1	9.58E-10	9.15E-1
HE-AR-DOOR-OPEN	4.55E-2	9.61E-2	5.85E-5	2.38E-2	2.74E-1	4.24E-13	8.79E-1
HE-SV-1-NS	4.54E-2	9.55E-2	6.73E-5	2.08E-2	2.84E-1	1.44E-12	9.11E-1
HE-SV-1-OPEN	4.54E-2	9.61E-2	6.78E-5	2.34E-2	2.80E-1	2.48E-9	9.40E-1
HE-SV-3-NS	4.54E-2	9.63E-2	5.94E-5	2.25E-2	2.88E-1	2.10E-13	8.67E-1
HE-SV-3-OPEN	4.54E-2	9.56E-2	5.71E-5	2.25E-2	2.76E-1	2.00E-10	9.20E-1
MF-AIR-CELL-LK	8.45E-1	6.56E-1	1.06E-1	6.38E-1	9.38E-1	1.31E-2	9.95E-1
MF-AR-CELL-LK	8.45E-1	6.56E-1	1.04E-1	6.29E-1	9.42E-1	3.99E-3	9.97E-1
MF-FFD-SV-3	2.45E-2	5.29E-2	7.82E-4	1.23E-2	1.40E-1	5.97E-5	9.10E-1
MF-SV-1-FFD	2.45E-2	5.24E-2	7.52E-4	1.28E-2	1.41E-1	2.44E-5	8.99E-1
MF-VP-1-LK	6.40E-3	1.50E-2	1.80E-3	8.16E-3	3.14E-2	4.16E-4	2.28E-1

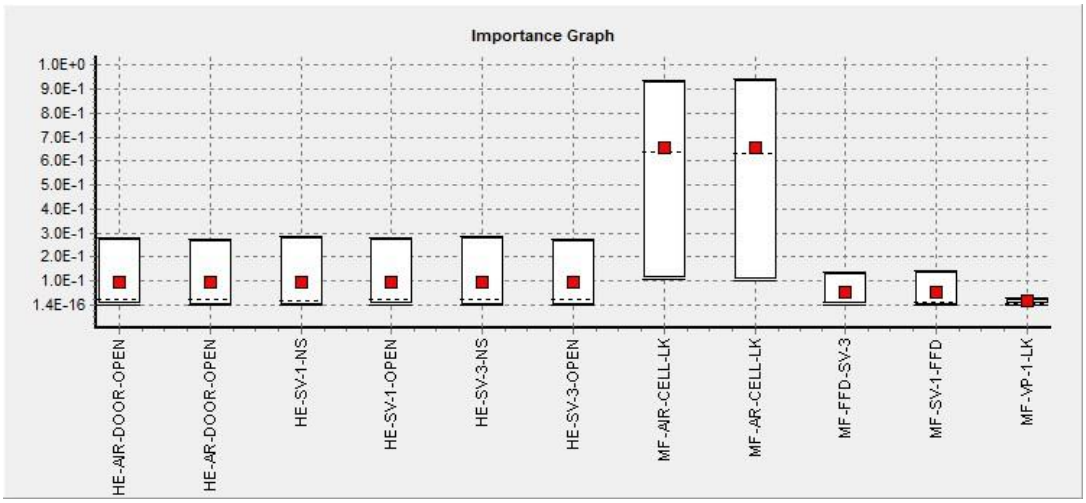


Figure 130: Importance graph for FV results for basic system with Bruce A fault rate and diagnostic HE component and SV_OL.

Table 125: FV Results for Basic System w/ Bruce A Fault Rate and Diagnostic HE Component and SV_OM

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-DOOR-OPEN	2.14E-2	4.39E-2	2.59E-5	9.04E-3	1.23E-1	2.00E-10	7.84E-1
HE-AR-DOOR-OPEN	2.14E-2	4.28E-2	2.36E-5	9.31E-3	1.17E-1	1.05E-13	6.40E-1
HE-SV-1-NS	2.14E-2	4.23E-2	2.74E-5	8.75E-3	1.14E-1	6.78E-13	7.11E-1
HE-SV-1-OPEN	2.14E-2	4.31E-2	2.89E-5	9.61E-3	1.21E-1	1.11E-9	8.24E-1
HE-SV-3-NS	2.14E-2	4.26E-2	2.39E-5	9.23E-3	1.17E-1	4.00E-14	6.82E-1
HE-SV-3-OPEN	2.14E-2	4.23E-2	2.38E-5	9.14E-3	1.16E-1	1.57E-10	7.42E-1
MF-AIR-CELL-LK	3.88E-1	3.53E-1	1.78E-2	2.23E-1	7.48E-1	9.66E-4	9.87E-1
MF-AR-CELL-LK	3.88E-1	3.56E-1	1.71E-2	2.20E-1	7.60E-1	9.50E-4	9.85E-1
MF-FFD-SV-3	6.41E-1	5.48E-1	5.45E-2	4.69E-1	9.06E-1	4.33E-3	9.98E-1
MF-SV-1-FFD	6.41E-1	5.50E-1	5.26E-2	4.78E-1	9.03E-1	1.81E-3	9.97E-1
MF-VP-1-LK	1.26E-3	2.97E-3	1.49E-4	1.26E-3	6.80E-3	1.18E-5	7.22E-2

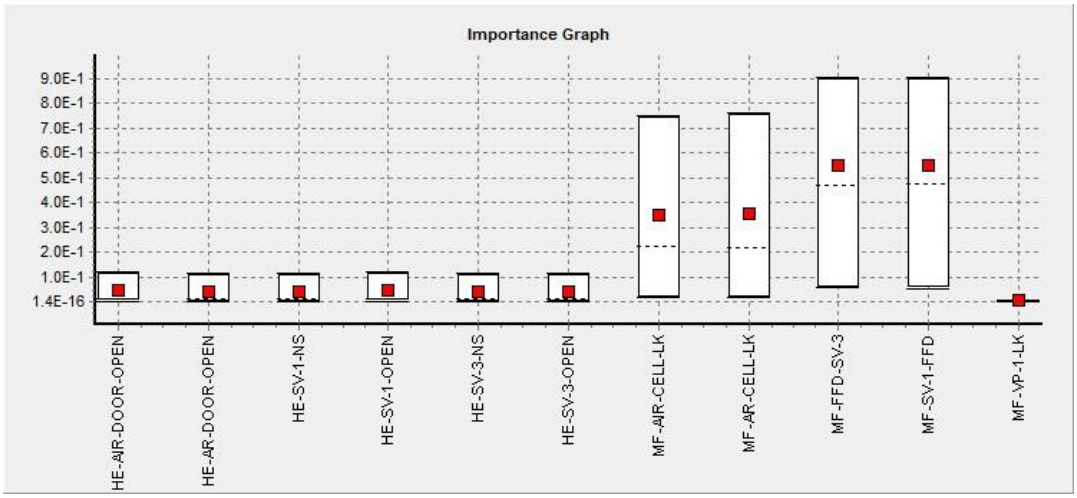


Figure 131: Importance graph for FV results for basic system with Bruce A fault rate and diagnostic HE component and SV_OM.

Table 126: FV Results for Basic System w/ Bruce A Fault Rate and Diagnostic HE Component and SV_OH

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-DOOR-OPEN	1.47E-2	2.64E-2	1.66E-5	5.56E-3	6.96E-2	1.47E-10	6.65E-1
HE-AR-DOOR-OPEN	1.47E-2	2.56E-2	1.35E-5	5.56E-3	6.72E-2	4.21E-14	4.57E-1
HE-SV-1-NS	1.46E-2	2.53E-2	1.59E-5	5.23E-3	6.76E-2	4.24E-13	6.74E-1
HE-SV-1-OPEN	1.46E-2	2.60E-2	1.81E-5	5.77E-3	6.83E-2	9.53E-10	6.66E-1
HE-SV-3-NS	1.46E-2	2.56E-2	1.55E-5	5.58E-3	6.81E-2	4.13E-14	5.36E-1
HE-SV-3-OPEN	1.46E-2	2.51E-2	1.47E-5	5.60E-3	6.62E-2	9.76E-11	5.39E-1
MF-AIR-CELL-LK	2.64E-1	2.38E-1	1.01E-2	1.19E-1	5.64E-1	8.35E-4	9.88E-1
MF-AR-CELL-LK	2.64E-1	2.40E-1	9.53E-3	1.20E-1	5.83E-1	9.55E-4	9.70E-1
MF-FFD-SV-3	9.16E-1	7.59E-1	1.85E-1	7.76E-1	9.74E-1	1.68E-2	1.00E+0
MF-SV-1-FFD	9.16E-1	7.61E-1	1.80E-1	7.79E-1	9.73E-1	7.06E-3	1.00E+0
MF-VP-1-LK	4.83E-4	1.05E-3	5.10E-5	4.23E-4	2.43E-3	5.38E-6	2.50E-2

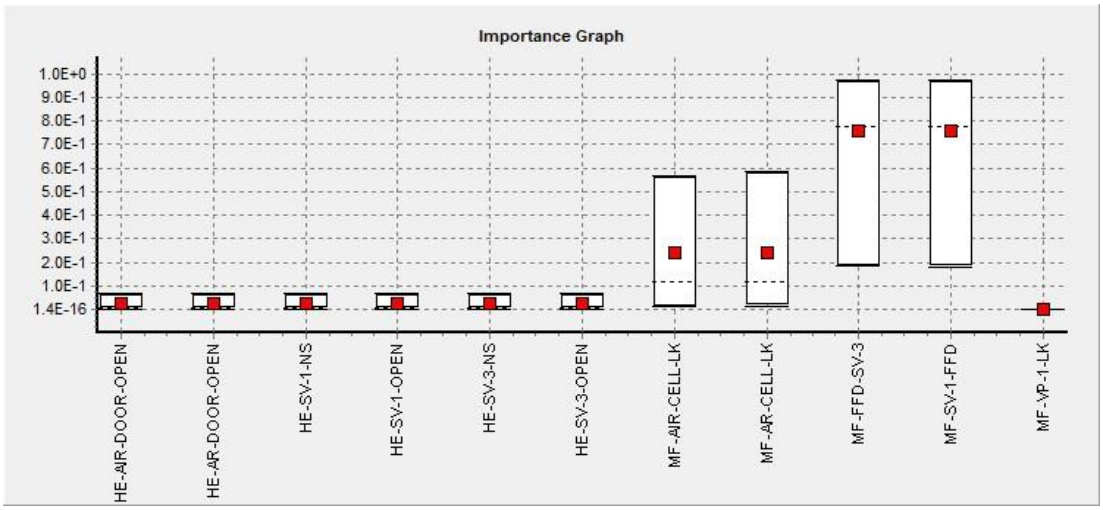


Figure 132: Importance graph for FV results for basic system with Bruce A fault rate and diagnostic HE component and SV_OH.

Table 127: FV Results for Basic System w/ Bruce A Fault Rate and Diagnostic HE Component and SV_DOW

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-DOOR-OPEN	4.55E-2	9.65E-2	6.80E-5	2.31E-2	2.82E-1	9.58E-10	9.15E-1
HE-AR-DOOR-OPEN	4.55E-2	9.59E-2	5.84E-5	2.38E-2	2.74E-1	4.22E-13	8.79E-1
HE-SV-1-NS	4.53E-2	9.53E-2	6.73E-5	2.07E-2	2.83E-1	1.44E-12	9.10E-1
HE-SV-1-OPEN	4.53E-2	9.60E-2	6.77E-5	2.34E-2	2.80E-1	2.48E-9	9.40E-1
HE-SV-3-NS	4.53E-2	9.61E-2	5.94E-5	2.25E-2	2.87E-1	2.05E-13	8.67E-1
HE-SV-3-OPEN	4.53E-2	9.55E-2	5.71E-5	2.24E-2	2.75E-1	2.00E-10	9.20E-1
MF-AIR-CELL-LK	8.44E-1	6.56E-1	1.05E-1	6.36E-1	9.38E-1	1.31E-2	9.95E-1
MF-AR-CELL-LK	8.44E-1	6.55E-1	1.04E-1	6.28E-1	9.42E-1	3.88E-3	9.97E-1
MF-FFD-SV-3	2.53E-2	5.43E-2	8.08E-4	1.27E-2	1.44E-1	6.18E-5	9.13E-1
MF-SV-1-FFD	2.53E-2	5.38E-2	7.77E-4	1.32E-2	1.45E-1	2.52E-5	9.02E-1
MF-VP-1-LK	6.39E-3	1.49E-2	1.80E-3	8.13E-3	3.13E-2	4.02E-4	2.27E-1

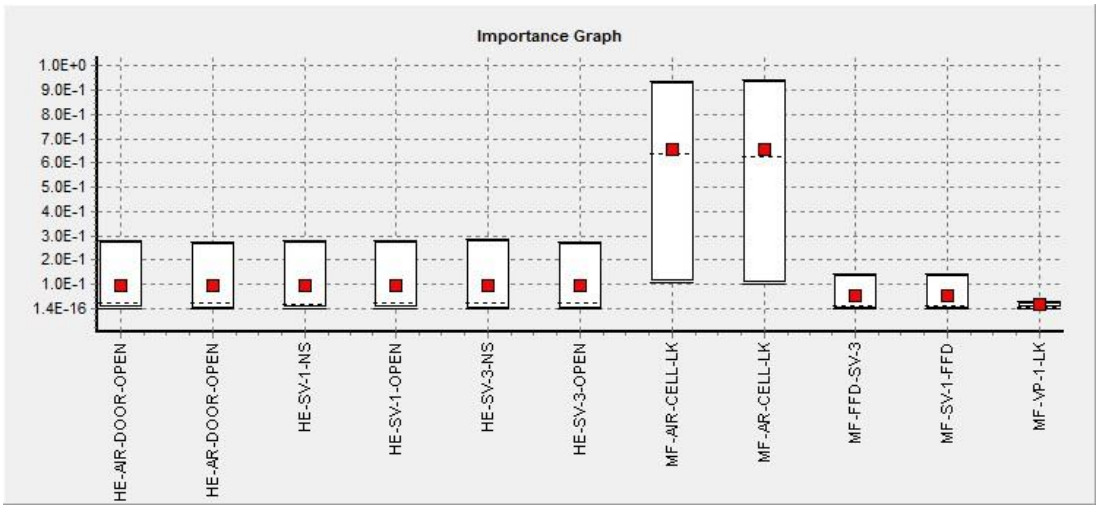


Figure 133: Importance graph for FV results for basic system with Bruce A fault rate and diagnostic HE component and SV_DOW.

Table 128: FV Results for Basic System w/ Bruce A Fault Rate and Diagnostic HE Component and SV_MAN

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-DOOR-OPEN	4.65E-2	1.03E-1	7.00E-5	2.44E-2	2.99E-1	9.65E-10	9.49E-1
HE-AR-DOOR-OPEN	4.65E-2	1.02E-1	6.15E-5	2.50E-2	2.94E-1	4.46E-13	8.99E-1
HE-SV-1-NS	4.64E-2	1.02E-1	7.18E-5	2.18E-2	3.05E-1	1.47E-12	9.42E-1
HE-SV-1-OPEN	4.64E-2	1.03E-1	7.05E-5	2.44E-2	3.01E-1	2.55E-9	9.43E-1
HE-SV-3-NS	4.64E-2	1.03E-1	6.10E-5	2.37E-2	3.09E-1	9.09E-13	9.62E-1
HE-SV-3-OPEN	4.64E-2	1.02E-1	5.96E-5	2.37E-2	2.98E-1	2.00E-10	9.30E-1
MF-AIR-CELL-LK	8.64E-1	6.86E-1	1.22E-1	6.76E-1	9.54E-1	1.31E-2	9.99E-1
MF-AR-CELL-LK	8.64E-1	6.86E-1	1.22E-1	6.73E-1	9.55E-1	1.52E-2	9.98E-1
MF-FFD-SV-3	6.28E-4	1.97E-3	1.95E-5	3.12E-4	4.07E-3	1.50E-6	2.15E-1
MF-SV-1-FFD	6.28E-4	1.81E-3	1.88E-5	3.24E-4	4.08E-3	6.07E-7	1.89E-1
MF-VP-1-LK	6.70E-3	1.72E-2	1.94E-3	9.14E-3	3.63E-2	5.11E-4	2.98E-1

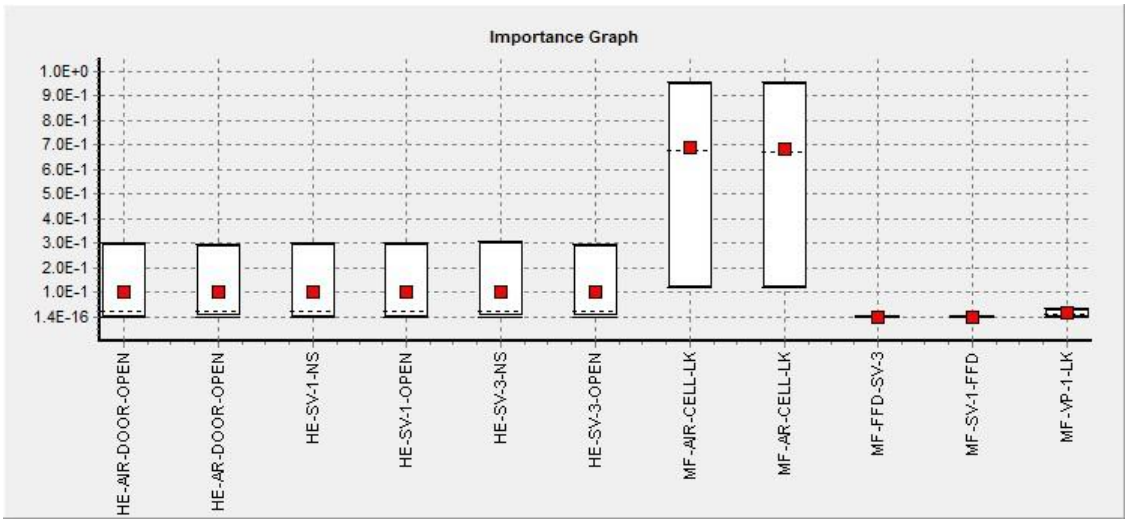


Figure 134: Importance graph for FV results for basic system with Bruce A fault rate and diagnostic HE component and SV_MAN.

Table 129: FV Results for Basic System w/ Bruce A Fault Rate and Diagnostic HE Component and SV_NRPD

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-DOOR-OPEN	3.10E-2	6.10E-2	3.76E-5	1.36E-2	1.72E-1	3.90E-10	8.32E-1
HE-AR-DOOR-OPEN	3.10E-2	6.00E-2	3.46E-5	1.37E-2	1.70E-1	2.03E-13	7.81E-1
HE-SV-1-NS	3.10E-2	5.95E-2	4.14E-5	1.28E-2	1.66E-1	9.98E-13	8.11E-1
HE-SV-1-OPEN	3.10E-2	6.02E-2	4.20E-5	1.43E-2	1.71E-1	1.56E-9	8.74E-1
HE-SV-3-NS	3.10E-2	5.97E-2	3.48E-5	1.37E-2	1.68E-1	3.97E-14	7.65E-1
HE-SV-3-OPEN	3.10E-2	5.95E-2	3.27E-5	1.34E-2	1.68E-1	1.83E-10	8.25E-1
MF-AIR-CELL-LK	5.68E-1	4.59E-1	3.32E-2	3.52E-1	8.38E-1	1.67E-3	9.87E-1
MF-AR-CELL-LK	5.68E-1	4.62E-1	3.19E-2	3.53E-1	8.49E-1	9.41E-4	9.92E-1
MF-FFD-SV-3	3.78E-1	3.72E-1	1.92E-2	2.34E-1	7.85E-1	1.48E-3	9.92E-1
MF-SV-1-FFD	3.78E-1	3.74E-1	1.85E-2	2.41E-1	7.86E-1	6.17E-4	9.89E-1
MF-VP-1-LK	2.85E-3	5.83E-3	4.01E-4	2.85E-3	1.28E-2	2.03E-5	1.04E-1

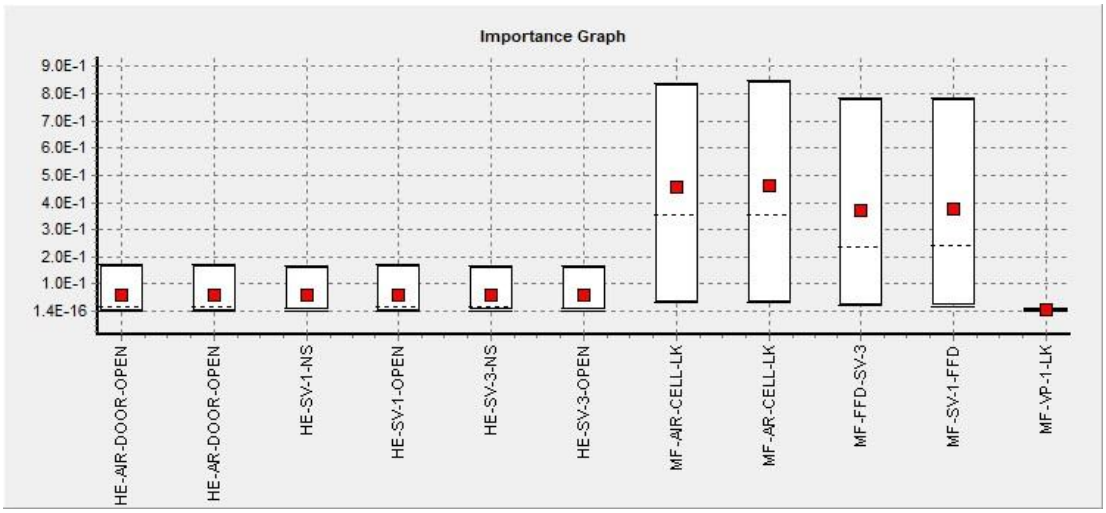


Figure 135: Importance graph for FV results for basic system with Bruce A fault rate and diagnostic HE component and SV_NRPD.

Table 130: FV Results for Basic System w/ Door Interlocks

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	1.62E-4	2.06E-4	4.42E-8	1.47E-5	4.26E-4	0.00E+0	3.05E-2
DI-AR-MF	1.62E-4	1.96E-4	2.77E-8	1.48E-5	4.36E-4	1.87E-13	1.70E-2
HE-AIR-DOOR-OPEN	1.62E-4	2.06E-4	4.42E-8	1.47E-5	4.26E-4	0.00E+0	3.05E-2
HE-AR-DOOR-OPEN	1.62E-4	1.96E-4	2.77E-8	1.48E-5	4.36E-4	1.87E-13	1.70E-2
HE-SV-1-NS	3.24E-3	4.33E-3	3.27E-6	1.04E-3	1.16E-2	1.54E-13	1.04E-1
HE-SV-1-OPEN	3.24E-3	4.37E-3	4.09E-6	9.87E-4	1.18E-2	2.14E-11	1.14E-1
HE-SV-3-NS	3.24E-3	4.37E-3	3.11E-6	1.03E-3	1.17E-2	9.08E-12	1.16E-1
HE-SV-3-OPEN	3.24E-3	4.27E-3	3.68E-6	1.04E-3	1.16E-2	9.94E-11	1.32E-1
MF-AIR-CELL-LK	1.47E-1	1.30E-1	3.86E-3	5.09E-2	3.44E-1	2.91E-4	9.38E-1
MF-AR-CELL-LK	1.47E-1	1.32E-1	3.98E-3	5.13E-2	3.44E-1	1.29E-4	9.03E-1
MF-FS-SV-1	8.09E-1	8.04E-1	3.91E-1	8.14E-1	9.48E-1	4.73E-2	9.91E-1
MF-FS-SV-3	8.09E-1	8.02E-1	3.76E-1	8.13E-1	9.48E-1	8.34E-2	9.92E-1
MF-LK-SV-1	4.69E-2	6.10E-2	9.11E-3	3.67E-2	1.26E-1	2.15E-3	6.64E-1
MF-LK-SV-3	4.69E-2	6.03E-2	8.93E-3	3.68E-2	1.24E-1	2.18E-3	5.62E-1
MF-RP-SV-1	6.81E-3	8.48E-3	1.73E-4	2.10E-3	2.04E-2	1.30E-5	3.73E-1
MF-RP-SV-3	6.81E-3	9.01E-3	1.67E-4	2.13E-3	2.04E-2	1.50E-5	4.29E-1
MF-VP-1-LK	8.12E-4	1.00E-3	4.04E-5	3.93E-4	2.35E-3	2.47E-6	3.00E-2

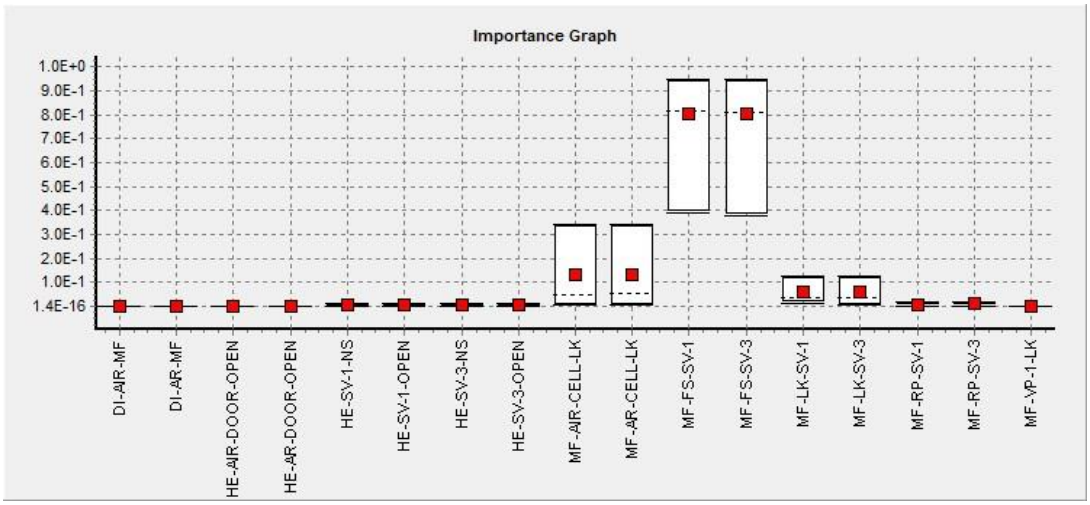


Figure 136: Importance graph for basic system with door interlocks.

Table 131: FV Results for Basic System w/ Door Interlocks and SV_OL

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	9.24E-4	2.31E-3	2.54E-7	1.36E-4	4.82E-3	2.96E-12	1.61E-1
DI-AR-MF	9.24E-4	2.53E-3	2.76E-7	1.24E-4	4.94E-3	6.01E-13	3.36E-1
HE-AIR-DOOR-OPEN	9.24E-4	2.31E-3	2.54E-7	1.36E-4	4.82E-3	2.96E-12	1.61E-1
HE-AR-DOOR-OPEN	9.24E-4	2.53E-3	2.76E-7	1.24E-4	4.94E-3	6.01E-13	3.36E-1
HE-SV-1-NS	1.82E-2	4.76E-2	1.78E-5	8.22E-3	1.34E-1	1.21E-12	7.95E-1
HE-SV-1-OPEN	1.82E-2	4.62E-2	2.35E-5	7.79E-3	1.32E-1	4.56E-11	7.46E-1
HE-SV-3-NS	1.82E-2	4.70E-2	2.57E-5	8.27E-3	1.35E-1	9.68E-13	7.71E-1
HE-SV-3-OPEN	1.82E-2	4.67E-2	2.73E-5	8.33E-3	1.32E-1	2.48E-11	7.41E-1
MF-AIR-CELL-LK	8.41E-1	6.94E-1	1.08E-1	6.91E-1	9.64E-1	8.75E-4	9.98E-1
MF-AR-CELL-LK	8.41E-1	6.94E-1	1.13E-1	6.87E-1	9.62E-1	3.79E-4	9.98E-1
MF-SV-1-FFD	1.08E-1	1.78E-1	2.60E-3	5.92E-2	4.99E-1	1.62E-4	9.87E-1
MF-SV-3-FFD	1.08E-1	1.78E-1	2.80E-3	5.88E-2	5.04E-1	1.66E-4	9.96E-1
MF-VP-1-LK	2.72E-2	6.42E-2	5.86E-3	3.50E-2	1.41E-1	6.21E-4	8.24E-1

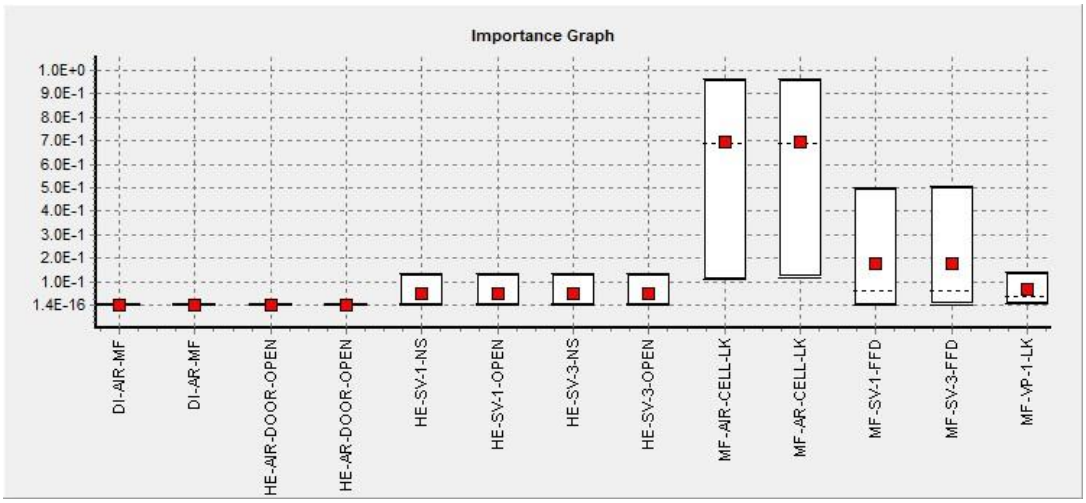


Figure 137: Importance graph for basic system with door interlocks and SV_OL.

Table 132: FV Results for Basic System w/ Door Interlocks and SV_OM

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
DI-AIR-MF	1.30E-4	3.73E-4	4.82E-8	2.01E-5	7.64E-4	2.32E-12	3.00E-2
DI-AR-MF	1.30E-4	4.15E-4	4.05E-8	1.87E-5	7.44E-4	1.10E-13	1.35E-1
HE-AIR-DOOR-OPEN	1.30E-4	3.73E-4	4.82E-8	2.01E-5	7.64E-4	2.32E-12	3.00E-2
HE-AR-DOOR-OPEN	1.30E-4	4.15E-4	4.05E-8	1.87E-5	7.44E-4	1.10E-13	1.35E-1
HE-SV-1-NS	2.61E-3	8.84E-3	3.14E-6	1.32E-3	2.22E-2	1.81E-13	3.96E-1
HE-SV-1-OPEN	2.61E-3	8.58E-3	3.00E-6	1.21E-3	2.15E-2	1.77E-11	4.16E-1
HE-SV-3-NS	2.61E-3	8.55E-3	4.24E-6	1.25E-3	2.22E-2	4.95E-13	3.81E-1
HE-SV-3-OPEN	2.61E-3	8.55E-3	4.71E-6	1.28E-3	2.12E-2	3.42E-12	3.29E-1
MF-AIR-CELL-LK	1.18E-1	2.06E-1	4.05E-3	7.31E-2	5.79E-1	1.80E-4	9.85E-1
MF-AR-CELL-LK	1.18E-1	2.03E-1	4.04E-3	7.23E-2	5.65E-1	1.04E-4	9.85E-1
MF-SV-1-FFD	8.93E-1	7.82E-1	1.63E-1	8.20E-1	9.84E-1	1.16E-2	1.00E+0
MF-SV-3-FFD	8.93E-1	7.86E-1	1.71E-1	8.21E-1	9.84E-1	1.18E-2	1.00E+0
MF-VP-1-LK	5.26E-4	3.22E-3	3.22E-5	6.82E-4	7.77E-3	1.80E-6	1.32E-1

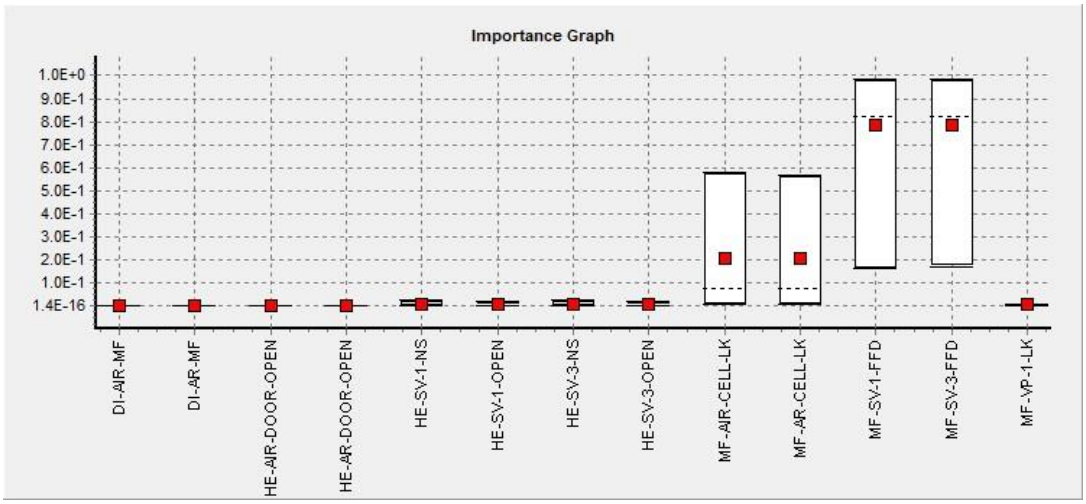


Figure 138: Importance graph for basic system with door interlocks and SV_OM.

Table 133: FV Results for Basic System w/ Door Interlocks and SV_OH

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	6.27E-5	1.51E-4	2.13E-8	9.28E-6	3.15E-4	8.92E-13	1.34E-2
DI-AR-MF	6.27E-5	1.69E-4	1.97E-8	8.70E-6	3.00E-4	5.76E-14	4.65E-2
HE-AIR-DOOR-OPEN	6.27E-5	1.51E-4	2.13E-8	9.28E-6	3.15E-4	8.92E-13	1.34E-2
HE-AR-DOOR-OPEN	6.27E-5	1.69E-4	1.97E-8	8.70E-6	3.00E-4	5.76E-14	4.65E-2
HE-SV-1-NS	1.26E-3	3.69E-3	1.47E-6	6.21E-4	8.81E-3	8.02E-14	2.19E-1
HE-SV-1-OPEN	1.26E-3	3.60E-3	1.63E-6	5.79E-4	8.44E-3	8.49E-12	2.47E-1
HE-SV-3-NS	1.26E-3	3.54E-3	1.97E-6	5.97E-4	8.44E-3	2.63E-13	1.73E-1
HE-SV-3-OPEN	1.26E-3	3.56E-3	2.38E-6	5.92E-4	8.27E-3	1.05E-12	1.53E-1
MF-AIR-CELL-LK	5.70E-2	1.08E-1	2.03E-3	2.95E-2	3.03E-1	1.20E-4	9.70E-1
MF-AR-CELL-LK	5.70E-2	1.04E-1	2.11E-3	2.90E-2	2.91E-1	1.04E-4	9.56E-1
MF-SV-1-FFD	9.80E-1	9.04E-1	4.36E-1	9.46E-1	9.96E-1	4.37E-2	1.00E+0
MF-SV-3-FFD	9.80E-1	9.07E-1	4.44E-1	9.46E-1	9.96E-1	4.44E-2	1.00E+0
MF-VP-1-LK	1.17E-4	6.72E-4	8.86E-6	1.31E-4	1.51E-3	6.64E-7	4.78E-2

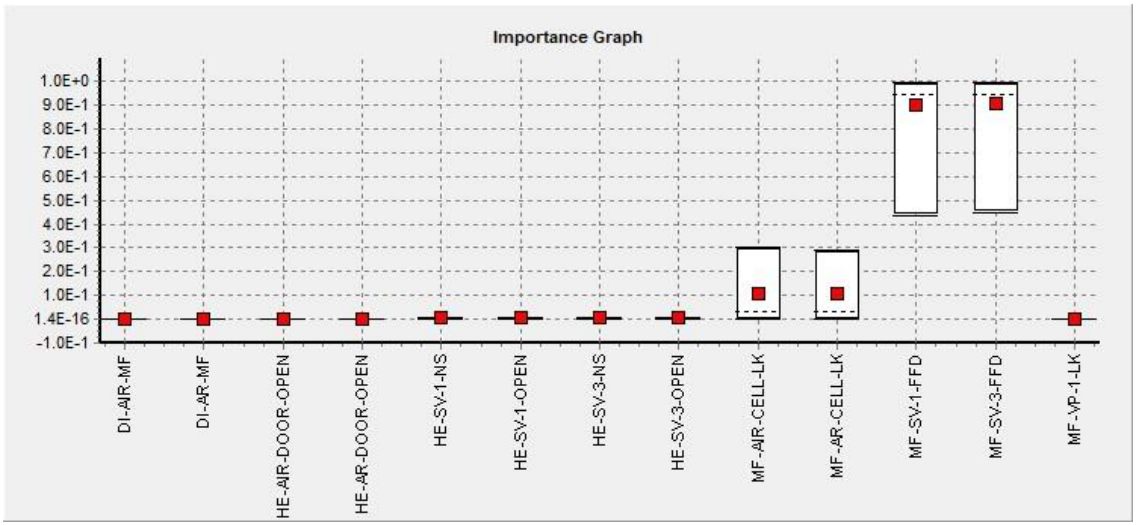


Figure 139: Importance graph for basic system with door interlocks and SV_OH.

Table 134: FV Results for Basic System w/ Door Interlocks and SV_DOW

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	9.21E-4	2.29E-3	2.54E-7	1.35E-4	4.80E-3	2.94E-12	1.60E-1
DI-AR-MF	9.21E-4	2.51E-3	2.74E-7	1.24E-4	4.90E-3	5.99E-13	3.36E-1
HE-AIR-DOOR-OPEN	9.21E-4	2.29E-3	2.54E-7	1.35E-4	4.80E-3	2.94E-12	1.60E-1
HE-AR-DOOR-OPEN	9.21E-4	2.51E-3	2.74E-7	1.24E-4	4.90E-3	5.99E-13	3.36E-1
HE-SV-1-NS	1.82E-2	4.73E-2	1.77E-5	8.18E-3	1.34E-1	1.20E-12	7.94E-1
HE-SV-1-OPEN	1.82E-2	4.60E-2	2.32E-5	7.76E-3	1.31E-1	4.56E-11	7.45E-1
HE-SV-3-NS	1.82E-2	4.68E-2	2.55E-5	8.23E-3	1.34E-1	9.73E-13	7.70E-1
HE-SV-3-OPEN	1.82E-2	4.64E-2	2.73E-5	8.29E-3	1.31E-1	2.48E-11	7.40E-1
MF-AIR-CELL-LK	8.38E-1	6.92E-1	1.05E-1	6.88E-1	9.63E-1	8.50E-4	9.98E-1
MF-AR-CELL-LK	8.38E-1	6.91E-1	1.11E-1	6.84E-1	9.61E-1	3.68E-4	9.98E-1
MF-SV-1-FFD	1.11E-1	1.81E-1	2.69E-3	6.11E-2	5.07E-1	1.67E-4	9.87E-1
MF-SV-3-FFD	1.11E-1	1.82E-1	2.89E-3	6.06E-2	5.13E-1	1.72E-4	9.96E-1
MF-VP-1-LK	2.70E-2	6.35E-2	5.75E-3	3.46E-2	1.40E-1	5.92E-4	8.22E-1

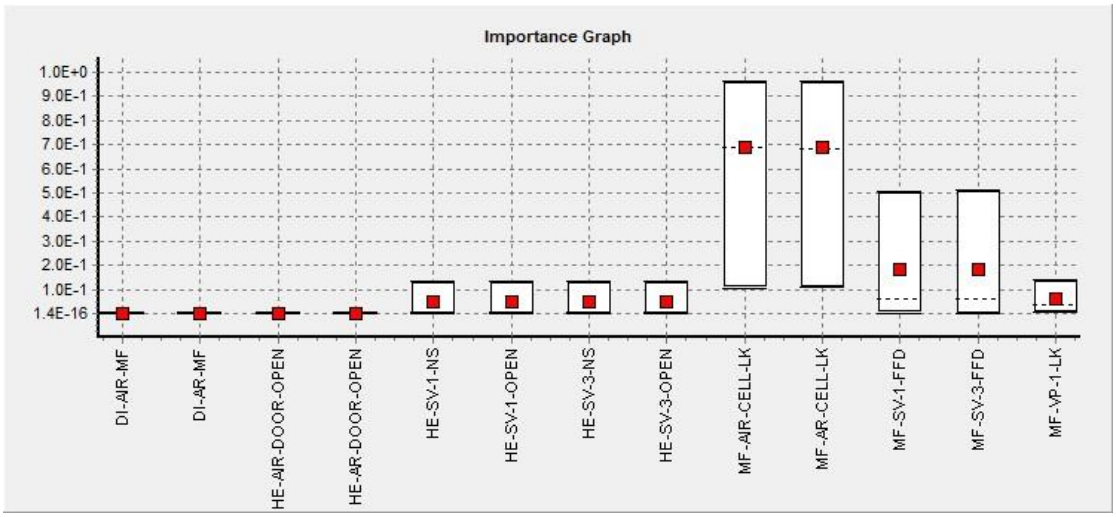


Figure 140: Importance graph for basic system with door interlocks and SV_DOW.

Table 135: FV Results for Basic System w/ Door Interlocks and SV_MAN

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
DI-AIR-MF	1.03E-3	3.13E-3	2.97E-7	1.66E-4	6.46E-3	2.88E-12	1.92E-1
DI-AR-MF	1.03E-3	3.43E-3	3.36E-7	1.55E-4	6.74E-3	6.47E-13	5.57E-1
HE-AIR-DOOR-OPEN	1.03E-3	3.13E-3	2.97E-7	1.66E-4	6.46E-3	2.88E-12	1.92E-1
HE-AR-DOOR-OPEN	1.03E-3	3.43E-3	3.36E-7	1.55E-4	6.74E-3	6.47E-13	5.57E-1
HE-SV-1-NS	2.03E-2	6.15E-2	2.19E-5	9.95E-3	1.76E-1	1.32E-12	8.42E-1
HE-SV-1-OPEN	2.03E-2	5.97E-2	2.82E-5	9.32E-3	1.72E-1	4.60E-11	8.18E-1
HE-SV-3-NS	2.03E-2	6.03E-2	3.26E-5	1.00E-2	1.77E-1	9.76E-13	9.07E-1
HE-SV-3-OPEN	2.03E-2	6.06E-2	3.32E-5	1.02E-2	1.77E-1	2.69E-11	7.81E-1
MF-AIR-CELL-LK	9.38E-1	8.14E-1	2.53E-1	8.45E-1	9.83E-1	2.13E-2	9.99E-1
MF-AR-CELL-LK	9.38E-1	8.15E-1	2.70E-1	8.44E-1	9.82E-1	1.14E-2	9.99E-1
MF-SV-1-FFD	3.03E-3	1.07E-2	6.44E-5	1.54E-3	2.37E-2	4.01E-6	6.73E-1
MF-SV-3-FFD	3.03E-3	1.00E-2	6.79E-5	1.53E-3	2.40E-2	4.16E-6	8.70E-1
MF-VP-1-LK	3.40E-2	1.02E-1	9.01E-3	5.65E-2	2.21E-1	9.75E-4	8.81E-1

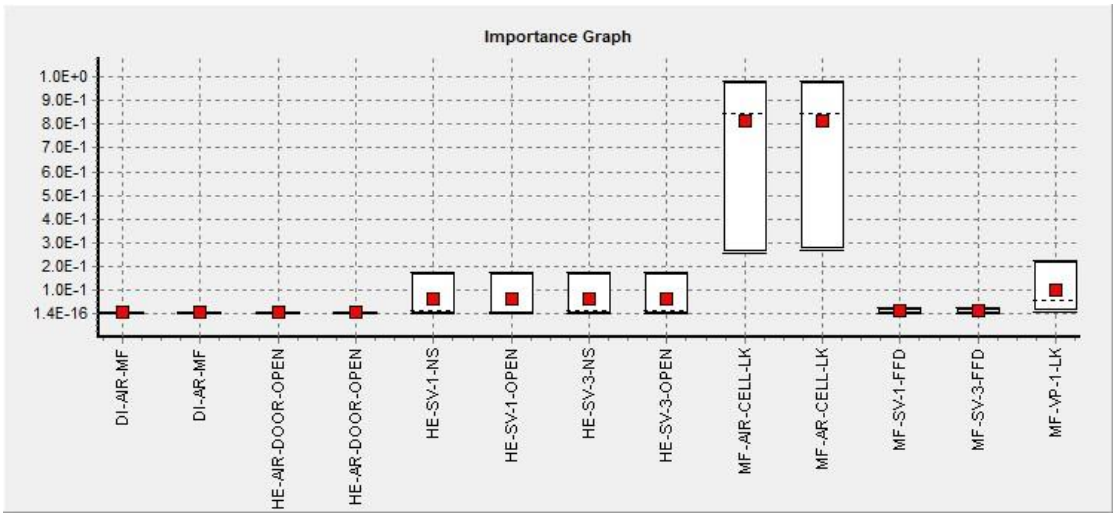


Figure 141: Importance graph for basic system with door interlocks and SV_MAN.

Table 136: FV Results for Basic System w/ Door Interlocks and SV_NRPD

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	2.75E-4	7.12E-4	8.75E-8	3.89E-5	1.48E-3	2.81E-12	5.27E-2
DI-AR-MF	2.75E-4	7.82E-4	7.51E-8	3.62E-5	1.45E-3	2.17E-13	2.37E-1
HE-AIR-DOOR-OPEN	2.75E-4	7.12E-4	8.75E-8	3.89E-5	1.48E-3	2.81E-12	5.27E-2
HE-AR-DOOR-OPEN	2.75E-4	7.82E-4	7.51E-8	3.62E-5	1.45E-3	2.17E-13	2.37E-1
HE-SV-1-NS	5.49E-3	1.63E-2	5.93E-6	2.52E-3	4.25E-2	3.83E-13	4.99E-1
HE-SV-1-OPEN	5.49E-3	1.58E-2	6.40E-6	2.36E-3	4.15E-2	3.67E-11	5.39E-1
HE-SV-3-NS	5.49E-3	1.59E-2	8.19E-6	2.43E-3	4.24E-2	7.91E-13	5.18E-1
HE-SV-3-OPEN	5.49E-3	1.58E-2	9.05E-6	2.51E-3	4.08E-2	7.99E-12	4.50E-1
MF-AIR-CELL-LK	2.50E-1	3.24E-1	8.25E-3	1.65E-1	7.77E-1	1.80E-4	9.93E-1
MF-AR-CELL-LK	2.50E-1	3.21E-1	8.51E-3	1.65E-1	7.67E-1	1.04E-4	9.93E-1
MF-SV-1-FFD	7.44E-1	6.41E-1	6.25E-2	6.13E-1	9.59E-1	4.01E-3	9.99E-1
MF-SV-3-FFD	7.44E-1	6.44E-1	6.57E-2	6.15E-1	9.60E-1	4.08E-3	9.99E-1
MF-VP-1-LK	2.38E-3	9.55E-3	1.35E-4	2.80E-3	2.37E-2	8.68E-6	3.10E-1

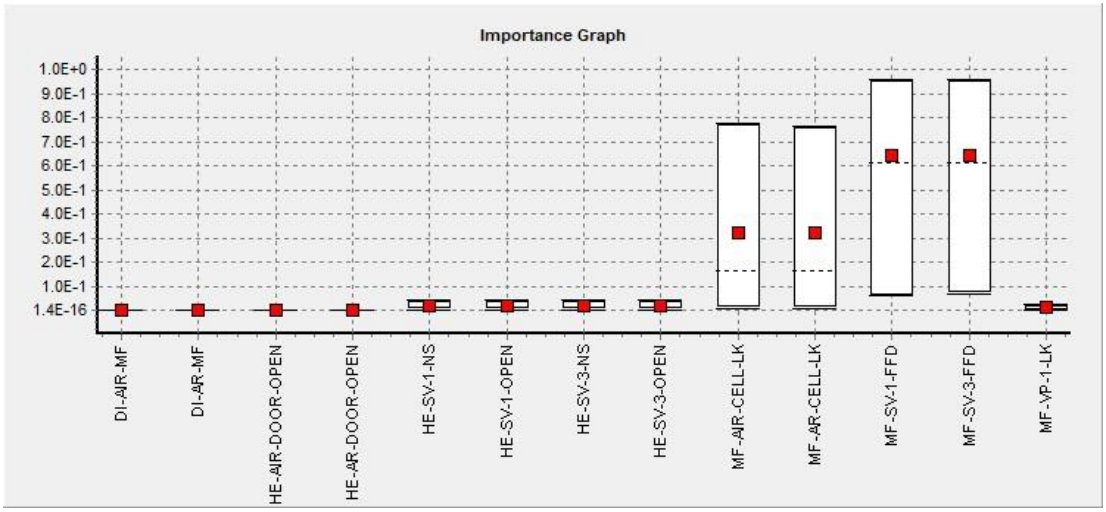


Figure 142: Importance graph for basic system with door interlocks and SV_NRPD.

Table 137: FV Results for Basic System w/ Door Interlocks and Diagnostic HE

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	1.69E-3	1.90E-3	3.67E-7	1.47E-4	4.10E-3	1.96E-12	1.53E-1
DI-AR-MF	1.69E-3	1.89E-3	2.20E-7	1.39E-4	4.49E-3	6.25E-11	1.38E-1
HE-AIR-DOOR-OPEN	1.69E-3	1.90E-3	3.67E-7	1.47E-4	4.10E-3	1.96E-12	1.53E-1
HE-AR-DOOR-OPEN	1.69E-3	1.89E-3	2.20E-7	1.39E-4	4.49E-3	6.25E-11	1.38E-1
HE-SV-1-NS	3.38E-2	4.09E-2	3.21E-5	1.04E-2	1.13E-1	4.16E-13	6.65E-1
HE-SV-1-OPEN	3.38E-2	4.11E-2	2.82E-5	1.05E-2	1.11E-1	4.16E-10	5.59E-1
HE-SV-3-NS	3.38E-2	4.06E-2	2.97E-5	1.06E-2	1.12E-1	3.62E-9	5.87E-1
HE-SV-3-OPEN	3.38E-2	4.08E-2	3.26E-5	1.06E-2	1.14E-1	1.20E-10	6.01E-1
MF-AIR-CELL-LK	1.39E-1	1.26E-1	3.89E-3	4.95E-2	3.25E-1	3.26E-4	8.96E-1
MF-AR-CELL-LK	1.39E-1	1.25E-1	4.10E-3	4.79E-2	3.27E-1	3.11E-4	9.13E-1
MF-FS-SV-1	7.64E-1	7.44E-1	3.47E-1	7.40E-1	9.17E-1	7.50E-2	9.91E-1
MF-FS-SV-3	7.64E-1	7.45E-1	3.50E-1	7.42E-1	9.19E-1	6.61E-2	9.86E-1
MF-LK-SV-1	4.45E-2	5.63E-2	8.84E-3	3.50E-2	1.14E-1	3.01E-3	5.98E-1
MF-LK-SV-3	4.45E-2	5.65E-2	8.92E-3	3.45E-2	1.13E-1	2.00E-3	5.98E-1
MF-RP-SV-1	6.45E-3	7.83E-3	1.58E-4	1.93E-3	1.87E-2	1.78E-5	3.45E-1
MF-RP-SV-3	6.45E-3	8.01E-3	1.58E-4	1.96E-3	1.90E-2	1.46E-5	5.50E-1
MF-VP-1-LK	7.31E-4	8.85E-4	3.67E-5	3.50E-4	2.04E-3	2.23E-6	1.82E-2

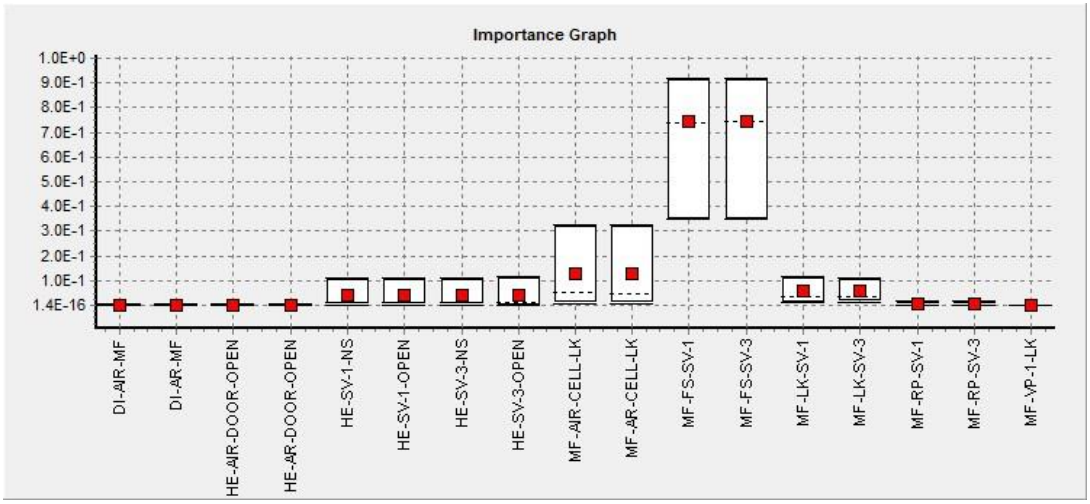


Figure 143: Importance graph for basic system with door interlocks and diagnostic HE.

Table 138: FV Results for Basic System w/ Door Interlocks and Diagnostic HE and SV_OL

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	7.42E-3	1.29E-2	1.86E-6	8.24E-4	3.00E-2	1.69E-12	6.85E-1
DI-AR-MF	7.42E-3	1.18E-2	1.48E-6	8.11E-4	2.69E-2	2.35E-11	8.43E-1
HE-AIR-DOOR-OPEN	7.42E-3	1.29E-2	1.86E-6	8.24E-4	3.00E-2	1.69E-12	6.85E-1
HE-AR-DOOR-OPEN	7.42E-3	1.18E-2	1.48E-6	8.11E-4	2.69E-2	2.35E-11	8.43E-1
HE-SV-1-NS	1.47E-1	1.91E-1	1.85E-4	6.33E-2	5.27E-1	4.40E-12	9.78E-1
HE-SV-1-OPEN	1.47E-1	1.95E-1	1.87E-4	6.38E-2	5.41E-1	2.04E-11	9.72E-1
HE-SV-3-NS	1.47E-1	1.94E-1	2.06E-4	6.34E-2	5.29E-1	4.65E-9	9.51E-1
HE-SV-3-OPEN	1.47E-1	1.93E-1	1.70E-4	6.39E-2	5.36E-1	2.27E-10	9.86E-1
MF-AIR-CELL-LK	6.13E-1	4.76E-1	3.48E-2	3.60E-1	8.78E-1	2.43E-3	9.97E-1
MF-AR-CELL-LK	6.13E-1	4.77E-1	3.45E-2	3.62E-1	8.81E-1	8.08E-4	9.98E-1
MF-SV-1-FFD	7.93E-2	1.14E-1	2.00E-3	3.39E-2	3.19E-1	1.10E-4	9.33E-1
MF-SV-3-FFD	7.93E-2	1.14E-1	1.96E-3	3.32E-2	3.20E-1	1.32E-4	9.72E-1
MF-VP-1-LK	1.46E-2	2.44E-2	1.95E-3	1.17E-2	5.43E-2	3.57E-5	4.41E-1

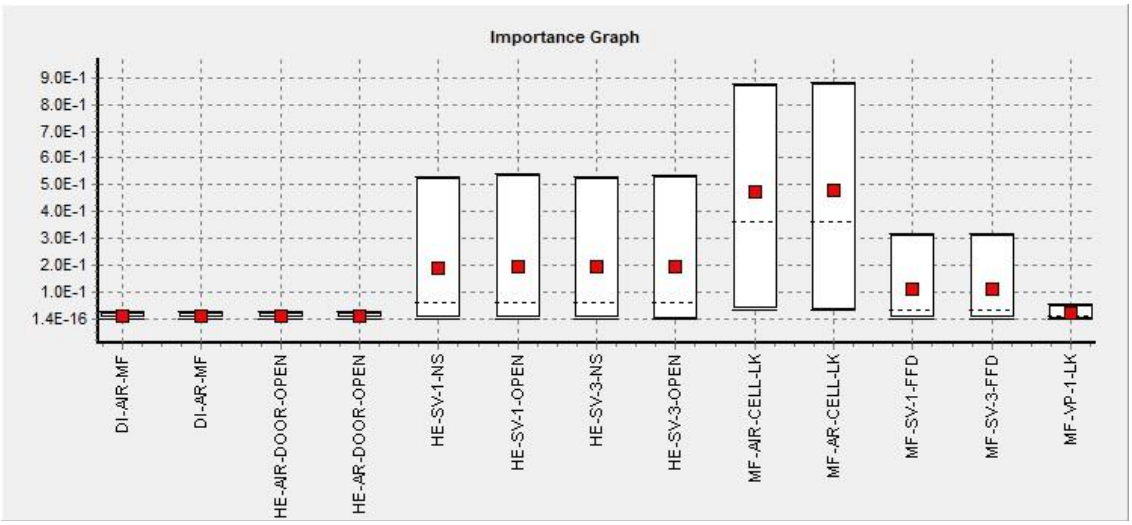


Figure 144: Importance graph for basic system with door interlocks and diagnostic HE and SV_OL.

Table 139: FV Results for Basic System w/ Door Interlocks and Diagnostic HE and SV_OM

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	1.38E-3	3.37E-3	4.12E-7	1.81E-4	7.14E-3	1.57E-13	2.81E-1
DI-AR-MF	1.38E-3	3.09E-3	3.53E-7	1.84E-4	6.11E-3	3.65E-12	5.07E-1
HE-AIR-DOOR-OPEN	1.38E-3	3.37E-3	4.12E-7	1.81E-4	7.14E-3	1.57E-13	2.81E-1
HE-AR-DOOR-OPEN	1.38E-3	3.09E-3	3.53E-7	1.84E-4	6.11E-3	3.65E-12	5.07E-1
HE-SV-1-NS	2.76E-2	6.25E-2	3.34E-5	1.28E-2	1.78E-1	3.80E-13	9.23E-1
HE-SV-1-OPEN	2.76E-2	6.28E-2	3.51E-5	1.27E-2	1.77E-1	1.13E-12	8.89E-1
HE-SV-3-NS	2.76E-2	6.40E-2	4.24E-5	1.27E-2	1.86E-1	2.34E-10	8.45E-1
HE-SV-3-OPEN	2.76E-2	6.27E-2	3.34E-5	1.25E-2	1.77E-1	7.98E-11	8.61E-1
MF-AIR-CELL-LK	1.14E-1	1.74E-1	3.81E-3	5.97E-2	4.81E-1	9.02E-5	9.81E-1
MF-AR-CELL-LK	1.14E-1	1.77E-1	4.00E-3	6.27E-2	4.86E-1	1.84E-4	9.83E-1
MF-SV-1-FFD	8.54E-1	7.09E-1	1.29E-1	7.12E-1	9.63E-1	8.36E-3	1.00E+0
MF-SV-3-FFD	8.54E-1	7.04E-1	1.26E-1	7.08E-1	9.63E-1	9.40E-3	1.00E+0
MF-VP-1-LK	4.86E-4	2.13E-3	3.22E-5	5.57E-4	5.15E-3	1.52E-6	1.24E-1

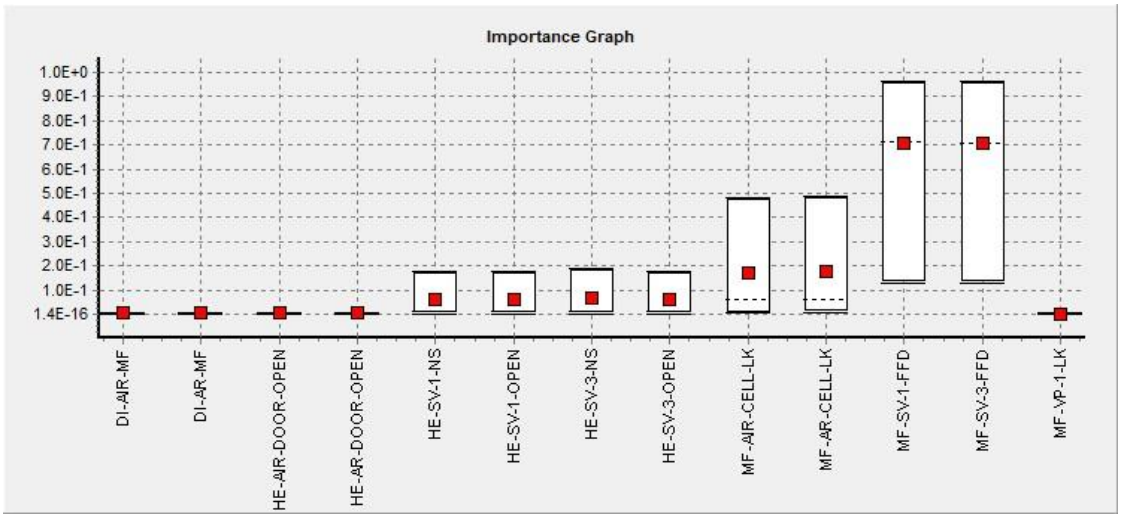


Figure 145: Importance graph for basic system with door interlocks and diagnostic HE and SV_OM.

Table 140: FV Results for Basic System w/ Door Interlocks and Diagnostic HE and SV_OH

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	6.95E-4	1.58E-3	2.04E-7	8.96E-5	3.25E-3	1.57E-13	1.59E-1
DI-AR-MF	6.95E-4	1.48E-3	1.84E-7	9.41E-5	2.86E-3	1.94E-12	2.85E-1
HE-AIR-DOOR-OPEN	6.95E-4	1.58E-3	2.04E-7	8.96E-5	3.25E-3	1.57E-13	1.59E-1
HE-AR-DOOR-OPEN	6.95E-4	1.48E-3	1.84E-7	9.41E-5	2.86E-3	1.94E-12	2.85E-1
HE-SV-1-NS	1.39E-2	3.20E-2	1.72E-5	6.20E-3	8.42E-2	3.17E-13	8.53E-1
HE-SV-1-OPEN	1.39E-2	3.23E-2	1.77E-5	6.25E-3	8.23E-2	7.86E-13	7.85E-1
HE-SV-3-NS	1.39E-2	3.28E-2	2.04E-5	6.25E-3	8.71E-2	1.50E-10	6.53E-1
HE-SV-3-OPEN	1.39E-2	3.20E-2	1.60E-5	6.19E-3	8.35E-2	3.51E-11	7.13E-1
MF-AIR-CELL-LK	5.73E-2	9.67E-2	2.01E-3	2.69E-2	2.65E-1	5.72E-5	9.58E-1
MF-AR-CELL-LK	5.73E-2	9.90E-2	2.12E-3	2.81E-2	2.69E-1	1.84E-4	9.68E-1
MF-SV-1-FFD	9.72E-1	8.66E-1	3.65E-1	9.04E-1	9.90E-1	3.18E-2	1.00E+0
MF-SV-3-FFD	9.72E-1	8.64E-1	3.62E-1	9.01E-1	9.90E-1	3.57E-2	1.00E+0
MF-VP-1-LK	1.16E-4	5.36E-4	9.26E-6	1.24E-4	1.20E-3	3.39E-7	3.59E-2

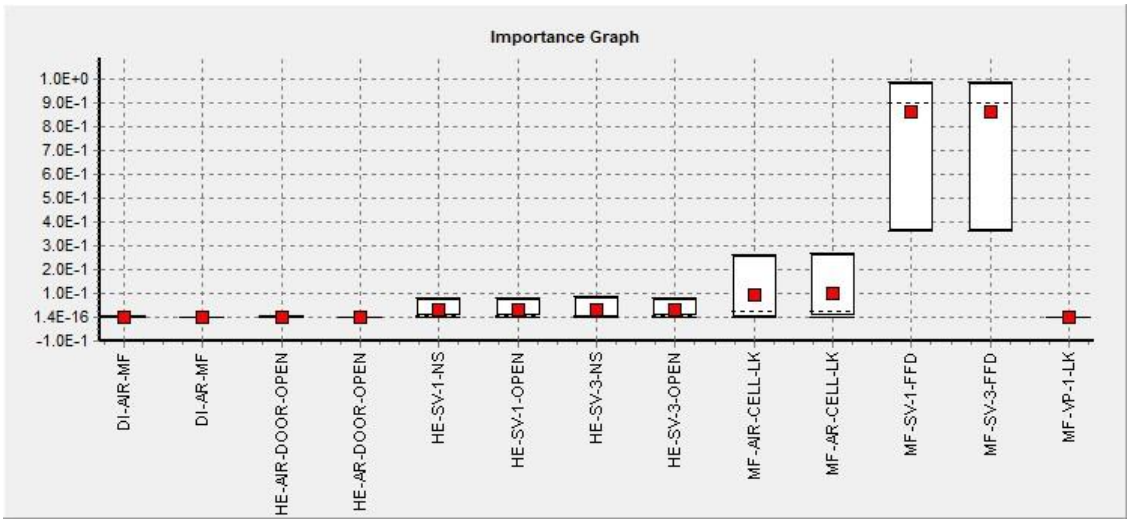


Figure 146: Importance graph for basic system with door interlocks and diagnostic HE and SV_OH.

Table 141: FV Results for Basic System w/ Door Interlocks and Diagnostic HE for SV_DOW

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	7.40E-3	1.29E-2	1.85E-6	8.21E-4	2.98E-2	1.62E-12	6.84E-1
DI-AR-MF	7.40E-3	1.17E-2	1.47E-6	8.09E-4	2.67E-2	2.34E-11	8.42E-1
HE-AIR-DOOR-OPEN	7.40E-3	1.29E-2	1.85E-6	8.21E-4	2.98E-2	1.62E-12	6.84E-1
HE-AR-DOOR-OPEN	7.40E-3	1.17E-2	1.47E-6	8.09E-4	2.67E-2	2.34E-11	8.42E-1
HE-SV-1-NS	1.47E-1	1.90E-1	1.85E-4	6.30E-2	5.27E-1	4.37E-12	9.78E-1
HE-SV-1-OPEN	1.47E-1	1.94E-1	1.86E-4	6.34E-2	5.40E-1	2.04E-11	9.72E-1
HE-SV-3-NS	1.47E-1	1.93E-1	2.06E-4	6.32E-2	5.28E-1	4.59E-9	9.51E-1
HE-SV-3-OPEN	1.47E-1	1.92E-1	1.68E-4	6.36E-2	5.35E-1	2.27E-10	9.85E-1
MF-AIR-CELL-LK	6.12E-1	4.74E-1	3.45E-2	3.58E-1	8.77E-1	2.42E-3	9.97E-1
MF-AR-CELL-LK	6.12E-1	4.76E-1	3.44E-2	3.61E-1	8.80E-1	7.86E-4	9.98E-1
MF-SV-1-FFD	8.18E-2	1.17E-1	2.07E-3	3.50E-2	3.26E-1	1.13E-4	9.35E-1
MF-SV-3-FFD	8.18E-2	1.16E-1	2.02E-3	3.42E-2	3.28E-1	1.36E-4	9.73E-1
MF-VP-1-LK	1.45E-2	2.43E-2	1.93E-3	1.16E-2	5.41E-2	3.51E-5	4.40E-1

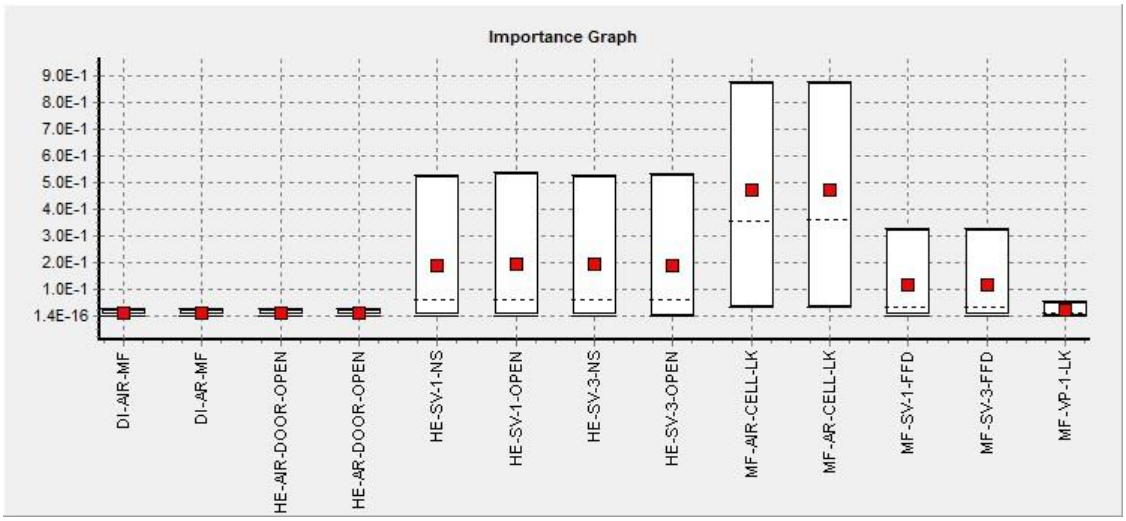


Figure 147: Importance graph for basic system with door interlocks and diagnostic HE and SV_DOW.

Table 142: FV Results for Basic System w/ Door Interlocks and Diagnostic HE and SV_MAN

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	8.03E-3	1.54E-2	1.94E-6	9.43E-4	3.55E-2	3.72E-12	7.02E-1
DI-AR-MF	8.03E-3	1.40E-2	1.69E-6	9.11E-4	3.20E-2	2.63E-11	8.65E-1
HE-AIR-DOOR-OPEN	8.03E-3	1.54E-2	1.94E-6	9.43E-4	3.55E-2	3.72E-12	7.02E-1
HE-AR-DOOR-OPEN	8.03E-3	1.40E-2	1.69E-6	9.11E-4	3.20E-2	2.63E-11	8.65E-1
HE-SV-1-NS	1.59E-1	2.14E-1	2.10E-4	7.28E-2	5.91E-1	6.33E-12	9.85E-1
HE-SV-1-OPEN	1.59E-1	2.19E-1	2.15E-4	7.31E-2	6.07E-1	2.06E-11	9.84E-1
HE-SV-3-NS	1.59E-1	2.17E-1	2.27E-4	7.30E-2	5.90E-1	7.84E-9	9.83E-1
HE-SV-3-OPEN	1.59E-1	2.16E-1	1.98E-4	7.40E-2	5.98E-1	2.33E-10	9.92E-1
MF-AIR-CELL-LK	6.64E-1	5.30E-1	4.32E-2	4.29E-1	9.21E-1	2.49E-3	9.99E-1
MF-AR-CELL-LK	6.64E-1	5.31E-1	4.24E-2	4.36E-1	9.24E-1	1.82E-3	9.99E-1
MF-SV-1-FFD	2.15E-3	4.99E-3	4.99E-5	8.76E-4	1.16E-2	2.72E-6	2.64E-1
MF-SV-3-FFD	2.15E-3	5.31E-3	4.88E-5	8.55E-4	1.17E-2	3.30E-6	4.97E-1
MF-VP-1-LK	1.71E-2	3.35E-2	2.56E-3	1.52E-2	7.44E-2	7.88E-5	6.21E-1

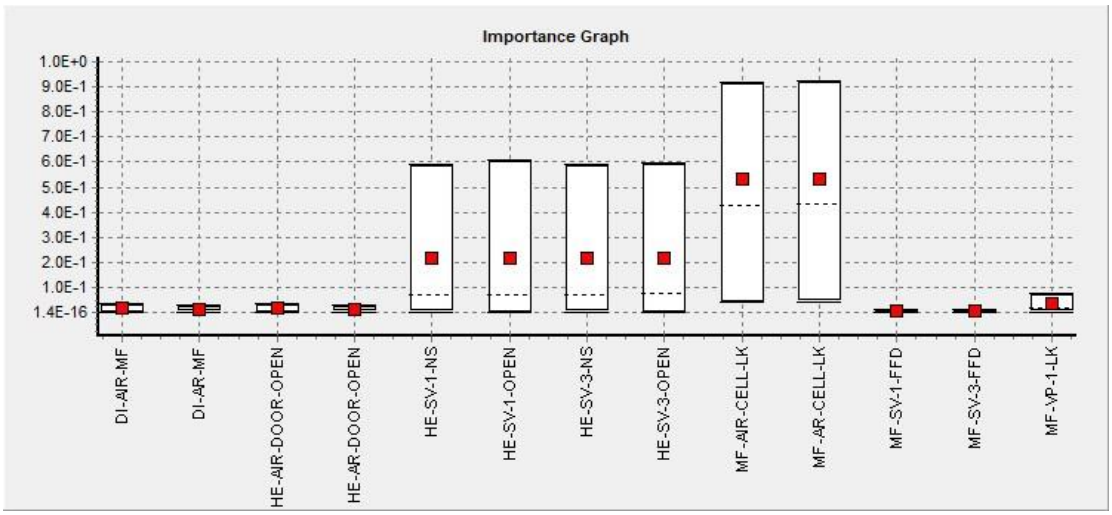


Figure 148: Importance graph for basic system with door interlocks and diagnostic HE and SV_MAN.

Table 143: FV Results for Basic System w/ Door Interlocks and Diagnostic HE and SV_NRPD

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	2.73E-3	5.61E-3	7.68E-7	3.23E-4	1.24E-2	1.97E-13	4.31E-1
DI-AR-MF	2.73E-3	5.12E-3	5.94E-7	3.26E-4	1.09E-2	7.38E-12	6.22E-1
HE-AIR-DOOR-OPEN	2.73E-3	5.61E-3	7.68E-7	3.23E-4	1.24E-2	1.97E-13	4.31E-1
HE-AR-DOOR-OPEN	2.73E-3	5.12E-3	5.94E-7	3.26E-4	1.09E-2	7.38E-12	6.22E-1
HE-SV-1-NS	5.46E-2	9.72E-2	5.95E-5	2.32E-2	2.80E-1	6.67E-13	9.55E-1
HE-SV-1-OPEN	5.46E-2	9.79E-2	6.89E-5	2.31E-2	2.81E-1	2.30E-12	9.37E-1
HE-SV-3-NS	5.46E-2	9.94E-2	7.72E-5	2.32E-2	2.91E-1	4.96E-10	9.12E-1
HE-SV-3-OPEN	5.46E-2	9.80E-2	6.26E-5	2.29E-2	2.83E-1	1.38E-10	9.05E-1
MF-AIR-CELL-LK	2.26E-1	2.57E-1	7.43E-3	1.18E-1	6.47E-1	1.93E-4	9.88E-1
MF-AR-CELL-LK	2.26E-1	2.61E-1	7.49E-3	1.22E-1	6.56E-1	1.83E-4	9.91E-1
MF-SV-1-FFD	6.72E-1	5.45E-1	4.81E-2	4.62E-1	9.12E-1	2.81E-3	9.96E-1
MF-SV-3-FFD	6.72E-1	5.39E-1	4.67E-2	4.58E-1	9.13E-1	3.24E-3	9.97E-1
MF-VP-1-LK	1.96E-3	5.38E-3	1.21E-4	1.83E-3	1.30E-2	4.40E-6	2.15E-1

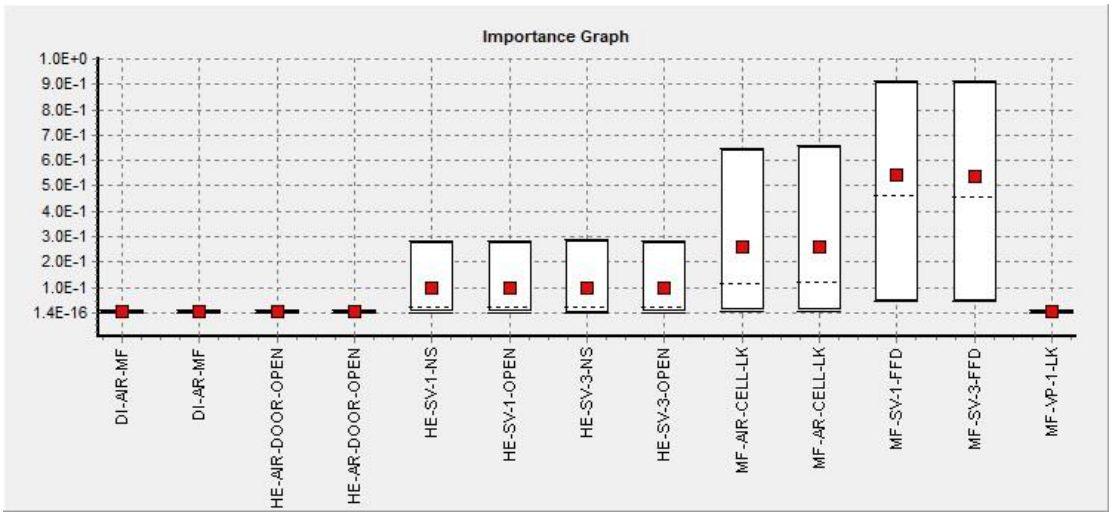


Figure 149: Importance graph for basic system with door interlocks and diagnostic HE and SV_NRPD.

Table 144: FV Results for Basic System w/ Door Interlocks and Bruce B Fault Rate

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	6.80E-5	1.09E-4	2.07E-8	8.63E-6	2.32E-4	4.07E-13	9.53E-3
DI-AR-MF	6.80E-5	1.11E-4	2.17E-8	8.97E-6	2.40E-4	1.59E-13	1.25E-2
HE-AIR-DOOR-OPEN	6.80E-5	1.09E-4	2.07E-8	8.63E-6	2.32E-4	4.07E-13	9.53E-3
HE-AR-DOOR-OPEN	6.80E-5	1.11E-4	2.17E-8	8.97E-6	2.40E-4	1.59E-13	1.25E-2
HE-SV-1-NS	1.36E-3	2.46E-3	2.10E-6	5.88E-4	6.52E-3	2.06E-11	1.08E-1
HE-SV-1-OPEN	1.36E-3	2.43E-3	2.23E-6	5.80E-4	6.57E-3	5.78E-11	5.74E-2
HE-SV-3-NS	1.36E-3	2.42E-3	2.24E-6	6.10E-4	6.47E-3	6.94E-13	5.32E-2
HE-SV-3-OPEN	1.36E-3	2.42E-3	1.89E-6	5.86E-4	6.25E-3	6.53E-15	9.56E-2
MF-AIR-CELL-LK	8.89E-1	5.28E-1	9.19E-2	4.87E-1	7.94E-1	9.04E-3	9.56E-1
MF-AR-CELL-LK	8.89E-1	5.28E-1	9.86E-2	4.88E-1	7.95E-1	8.37E-3	9.57E-1
MF-FS-SV-1	3.28E-1	4.95E-1	1.46E-1	4.23E-1	7.79E-1	4.17E-2	9.71E-1
MF-FS-SV-3	3.28E-1	4.95E-1	1.42E-1	4.25E-1	7.77E-1	3.34E-2	9.86E-1
MF-LK-SV-1	1.97E-2	3.53E-2	5.74E-3	2.11E-2	7.17E-2	1.48E-3	3.22E-1
MF-LK-SV-3	1.97E-2	3.52E-2	5.90E-3	2.14E-2	7.15E-2	1.52E-3	3.43E-1
MF-RP-SV-1	2.86E-3	5.00E-3	1.11E-4	1.20E-3	1.14E-2	1.13E-5	2.61E-1
MF-RP-SV-3	2.86E-3	5.10E-3	1.10E-4	1.22E-3	1.15E-2	1.10E-5	2.59E-1
MF-VP-1-LK	1.77E-3	2.14E-3	3.42E-4	1.31E-3	4.25E-3	6.25E-5	2.31E-2

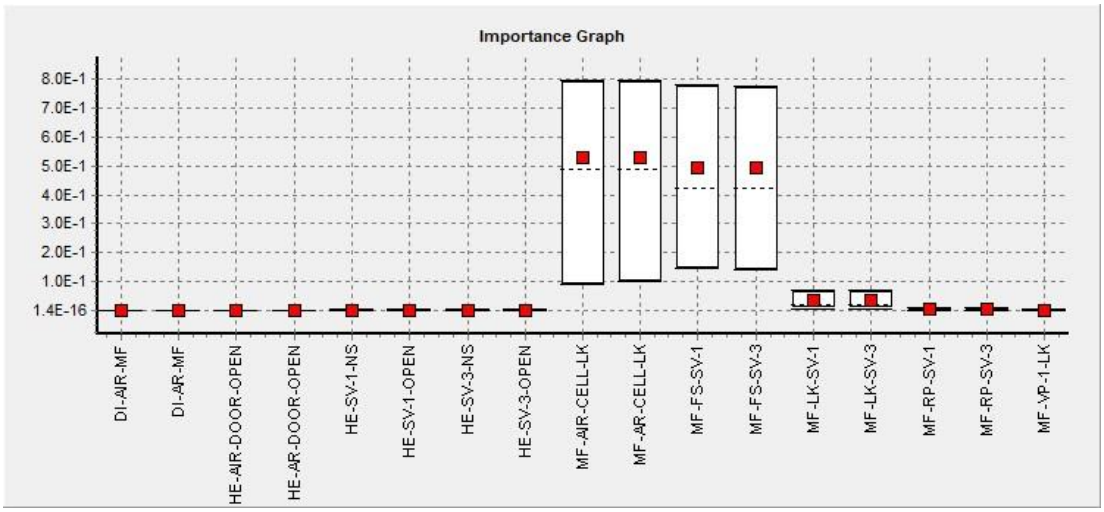


Figure 150: Importance graph for basic system w/ door interlocks and Bruce B fault rate.

Table 145: FV Results for Basic System w/ Door Interlocks and Bruce B Fault Rate and SV_OL

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	6.46E-5	3.00E-4	3.51E-8	1.61E-5	5.56E-4	3.04E-15	4.66E-2
DI-AR-MF	6.46E-5	2.99E-4	4.57E-8	1.64E-5	5.51E-4	1.72E-15	7.99E-2
HE-AIR-DOOR-OPEN	6.46E-5	3.00E-4	3.51E-8	1.61E-5	5.56E-4	3.04E-15	4.66E-2
HE-AR-DOOR-OPEN	6.46E-5	2.99E-4	4.57E-8	1.64E-5	5.51E-4	1.72E-15	7.99E-2
HE-SV-1-NS	1.30E-3	6.21E-3	3.27E-6	1.02E-3	1.51E-2	5.21E-13	3.88E-1
HE-SV-1-OPEN	1.30E-3	6.38E-3	3.79E-6	1.11E-3	1.56E-2	3.19E-11	4.13E-1
HE-SV-3-NS	1.30E-3	5.94E-3	3.14E-6	1.05E-3	1.47E-2	1.05E-10	3.02E-1
HE-SV-3-OPEN	1.30E-3	6.05E-3	4.48E-6	1.06E-3	1.47E-2	9.81E-12	2.83E-1
MF-AIR-CELL-LK	9.95E-1	9.53E-1	7.32E-1	9.71E-1	9.94E-1	3.99E-2	9.99E-1
MF-AR-CELL-LK	9.95E-1	9.53E-1	7.43E-1	9.71E-1	9.94E-1	1.17E-2	9.99E-1
MF-SV-1-FFD	7.69E-3	3.16E-2	4.44E-4	6.28E-3	7.76E-2	7.08E-6	9.57E-1
MF-SV-3-FFD	7.69E-3	3.14E-2	4.26E-4	6.37E-3	7.85E-2	2.06E-5	9.87E-1
MF-VP-1-LK	2.25E-3	1.06E-2	1.27E-3	5.10E-3	2.22E-2	3.83E-4	2.71E-1

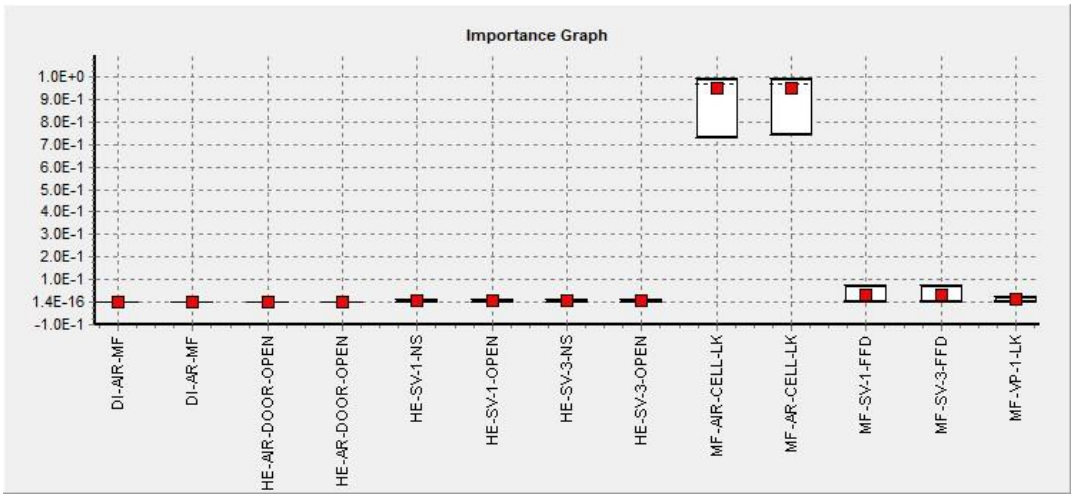


Figure 151: Importance graph for basic system w/ door interlocks and Bruce B fault rate and SV_OL.

Table 146: FV Results for Basic System w/ Door Interlocks and Bruce B Fault Rate and SV_OM

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	6.89E-5	1.54E-4	2.12E-8	9.26E-6	2.82E-4	2.69E-15	2.91E-2
DI-AR-MF	6.89E-5	1.41E-4	2.91E-8	9.28E-6	2.82E-4	1.60E-15	1.70E-2
HE-AIR-DOOR-OPEN	6.89E-5	1.54E-4	2.12E-8	9.26E-6	2.82E-4	2.69E-15	2.91E-2
HE-AR-DOOR-OPEN	6.89E-5	1.41E-4	2.91E-8	9.28E-6	2.82E-4	1.60E-15	1.70E-2
HE-SV-1-NS	1.38E-3	3.00E-3	1.80E-6	6.02E-4	7.72E-3	2.75E-13	1.49E-1
HE-SV-1-OPEN	1.38E-3	3.16E-3	2.33E-6	6.67E-4	7.95E-3	3.21E-11	1.80E-1
HE-SV-3-NS	1.38E-3	2.96E-3	1.76E-6	6.03E-4	7.61E-3	9.87E-11	1.11E-1
HE-SV-3-OPEN	1.38E-3	2.99E-3	2.61E-6	6.13E-4	7.56E-3	8.87E-12	1.20E-1
MF-AIR-CELL-LK	8.70E-1	6.08E-1	9.26E-2	5.58E-1	9.26E-1	5.73E-3	9.96E-1
MF-AR-CELL-LK	8.70E-1	6.07E-1	8.87E-2	5.56E-1	9.27E-1	3.53E-3	9.97E-1
MF-SV-1-FFD	4.40E-1	4.38E-1	3.22E-2	3.15E-1	8.38E-1	5.18E-4	9.97E-1
MF-SV-3-FFD	4.40E-1	4.40E-1	3.09E-2	3.20E-1	8.40E-1	1.64E-3	9.98E-1
MF-VP-1-LK	1.67E-3	3.08E-3	2.95E-4	1.59E-3	6.61E-3	4.11E-5	9.42E-2

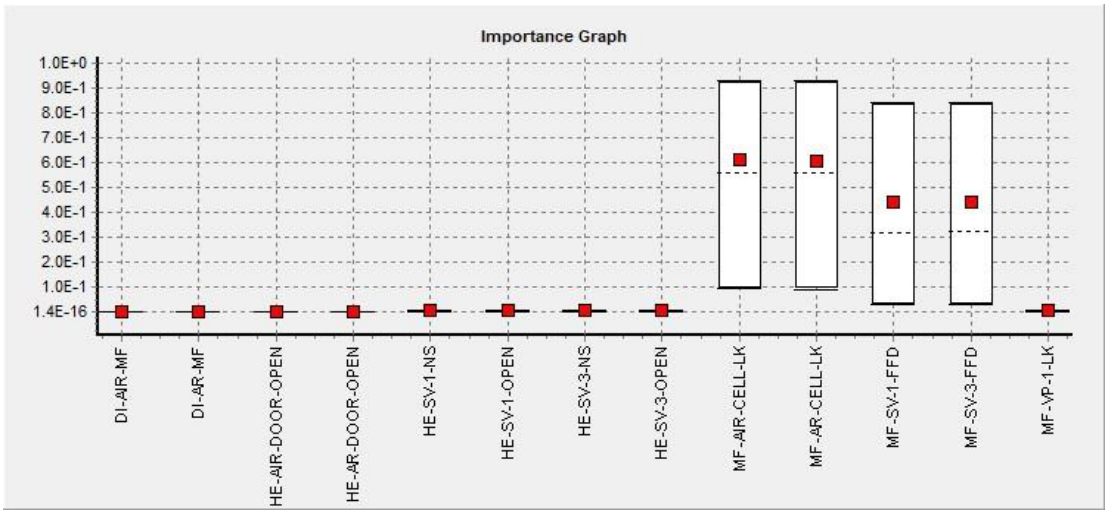


Figure 152: Importance graph for basic system w/ door interlocks and Bruce B fault rate and SV_OM.

Table 147: FV Results for Basic System w/ Door Interlocks and Bruce B Fault Rate and SV_OH

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	8.05E-5	1.04E-4	1.62E-8	6.69E-6	2.00E-4	1.98E-15	1.70E-2
DI-AR-MF	8.05E-5	9.37E-5	1.99E-8	6.62E-6	1.94E-4	1.37E-15	1.24E-2
HE-AIR-DOOR-OPEN	8.05E-5	1.04E-4	1.62E-8	6.69E-6	2.00E-4	1.98E-15	1.70E-2
HE-AR-DOOR-OPEN	8.05E-5	9.37E-5	1.99E-8	6.62E-6	1.94E-4	1.37E-15	1.24E-2
HE-SV-1-NS	1.61E-3	2.00E-3	1.33E-6	4.43E-4	5.22E-3	2.04E-13	8.03E-2
HE-SV-1-OPEN	1.61E-3	2.12E-3	1.70E-6	4.92E-4	5.45E-3	3.01E-11	8.99E-2
HE-SV-3-NS	1.61E-3	1.97E-3	1.35E-6	4.40E-4	5.10E-3	8.48E-11	5.76E-2
HE-SV-3-OPEN	1.61E-3	2.00E-3	1.86E-6	4.48E-4	5.16E-3	7.04E-12	7.56E-2
MF-AIR-CELL-LK	8.66E-1	4.56E-1	5.33E-2	3.72E-1	8.08E-1	5.75E-3	9.92E-1
MF-AR-CELL-LK	8.66E-1	4.56E-1	5.24E-2	3.71E-1	8.08E-1	4.10E-3	9.95E-1
MF-SV-1-FFD	8.88E-1	6.71E-1	1.18E-1	6.54E-1	9.54E-1	2.08E-3	1.00E+0
MF-SV-3-FFD	8.88E-1	6.72E-1	1.13E-1	6.58E-1	9.56E-1	6.44E-3	1.00E+0
MF-VP-1-LK	1.38E-3	1.40E-3	1.34E-4	7.29E-4	2.95E-3	9.99E-6	3.04E-2

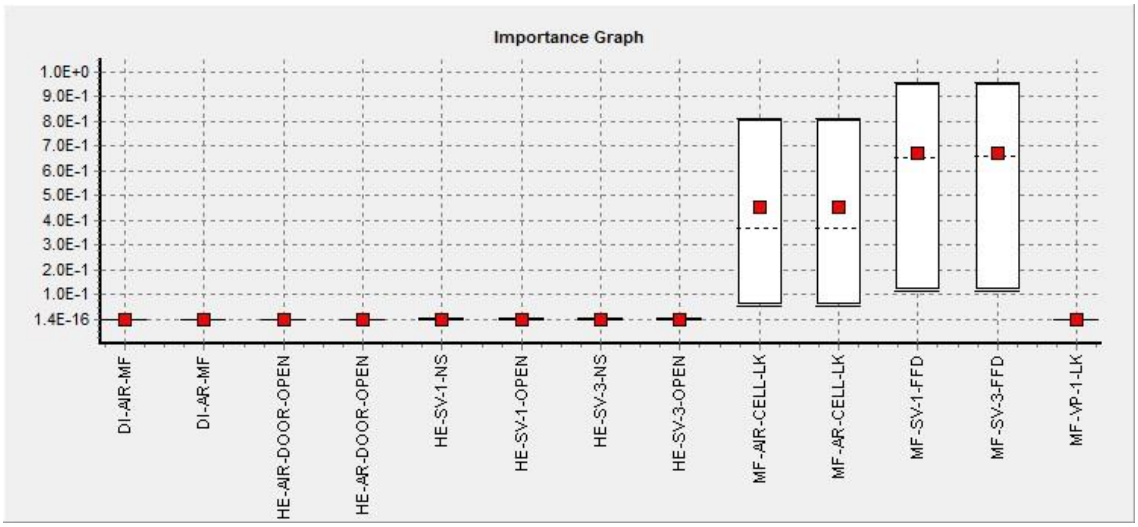


Figure 153: Importance graph for basic system w/ door interlocks and Bruce B fault rate and SV_OH.

Table 148: FV Results for Basic System w/ Door Interlocks and Bruce B Fault Rate and SV_DOW

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	6.46E-5	2.99E-4	3.51E-8	1.61E-5	5.54E-4	3.04E-15	4.65E-2
DI-AR-MF	6.46E-5	2.98E-4	4.57E-8	1.64E-5	5.50E-4	1.72E-15	7.87E-2
HE-AIR-DOOR-OPEN	6.46E-5	2.99E-4	3.51E-8	1.61E-5	5.54E-4	3.04E-15	4.65E-2
HE-AR-DOOR-OPEN	6.46E-5	2.98E-4	4.57E-8	1.64E-5	5.50E-4	1.72E-15	7.87E-2
HE-SV-1-NS	1.30E-3	6.19E-3	3.27E-6	1.02E-3	1.51E-2	5.20E-13	3.87E-1
HE-SV-1-OPEN	1.30E-3	6.37E-3	3.79E-6	1.11E-3	1.56E-2	3.19E-11	4.13E-1
HE-SV-3-NS	1.30E-3	5.93E-3	3.14E-6	1.05E-3	1.47E-2	1.05E-10	3.01E-1
HE-SV-3-OPEN	1.30E-3	6.04E-3	4.48E-6	1.06E-3	1.47E-2	9.81E-12	2.83E-1
MF-AIR-CELL-LK	9.95E-1	9.52E-1	7.27E-1	9.71E-1	9.94E-1	3.87E-2	9.99E-1
MF-AR-CELL-LK	9.95E-1	9.52E-1	7.39E-1	9.71E-1	9.94E-1	1.14E-2	9.99E-1
MF-SV-1-FFD	7.95E-3	3.25E-2	4.59E-4	6.49E-3	8.01E-2	7.32E-6	9.58E-1
MF-SV-3-FFD	7.95E-3	3.23E-2	4.40E-4	6.58E-3	8.10E-2	2.13E-5	9.87E-1
MF-VP-1-LK	2.25E-3	1.05E-2	1.27E-3	5.09E-3	2.22E-2	3.83E-4	2.70E-1

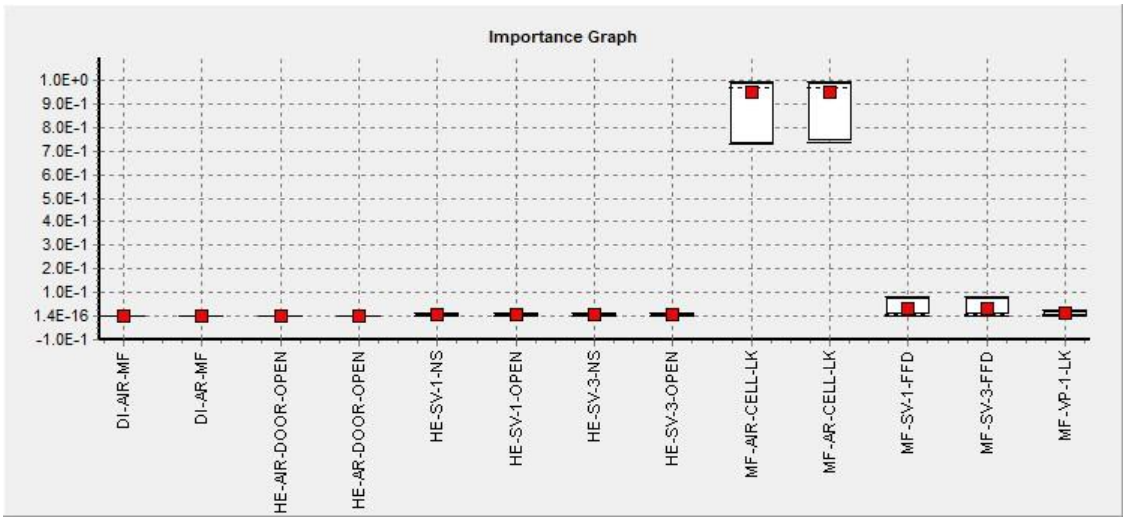


Figure 154: Importance graph for basic system w/ door interlocks and Bruce B fault rate and SV_DOW.

Table 149: FV Results for Basic System w/ Door Interlocks and Bruce B Fault Rate and SV_MAN

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
DI-AIR-MF	6.45E-5	3.19E-4	3.54E-8	1.65E-5	5.96E-4	3.05E-15	5.03E-2
DI-AR-MF	6.45E-5	3.23E-4	4.60E-8	1.69E-5	5.74E-4	1.73E-15	1.47E-1
HE-AIR-DOOR-OPEN	6.45E-5	3.19E-4	3.54E-8	1.65E-5	5.96E-4	3.05E-15	5.03E-2
HE-AR-DOOR-OPEN	6.45E-5	3.23E-4	4.60E-8	1.69E-5	5.74E-4	1.73E-15	1.47E-1
HE-SV-1-NS	1.29E-3	6.68E-3	3.40E-6	1.04E-3	1.59E-2	5.29E-13	4.12E-1
HE-SV-1-OPEN	1.29E-3	6.81E-3	3.86E-6	1.15E-3	1.65E-2	3.19E-11	4.20E-1
HE-SV-3-NS	1.29E-3	6.30E-3	3.14E-6	1.07E-3	1.54E-2	1.05E-10	3.15E-1
HE-SV-3-OPEN	1.29E-3	6.50E-3	4.58E-6	1.08E-3	1.55E-2	9.82E-12	2.89E-1
MF-AIR-CELL-LK	9.98E-1	9.80E-1	8.89E-1	9.88E-1	9.97E-1	3.56E-1	1.00E+0
MF-AR-CELL-LK	9.98E-1	9.81E-1	8.96E-1	9.88E-1	9.97E-1	2.64E-1	1.00E+0
MF-SV-1-FFD	1.93E-4	1.08E-3	1.11E-5	1.58E-4	2.10E-3	1.77E-7	3.72E-1
MF-SV-3-FFD	1.93E-4	1.10E-3	1.07E-5	1.60E-4	2.13E-3	5.12E-7	6.49E-1
MF-VP-1-LK	2.26E-3	1.17E-2	1.30E-3	5.40E-3	2.48E-2	3.85E-4	2.93E-1

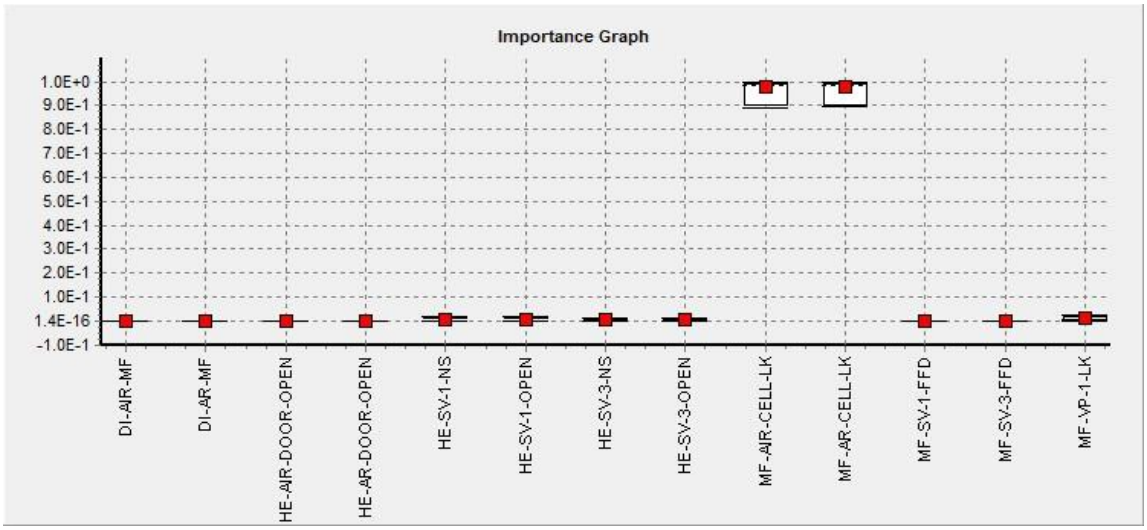


Figure 155: Importance graph for basic system w/ door interlocks and Bruce B fault rate and SV_MAN.

Table 150: FV Results for Basic System w/ Door Interlocks and Bruce B Fault Rate and SV_NRPD

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	6.63E-5	2.00E-4	2.75E-8	1.19E-5	3.76E-4	2.92E-15	3.82E-2
DI-AR-MF	6.63E-5	1.89E-4	3.64E-8	1.18E-5	3.67E-4	1.50E-15	2.21E-2
HE-AIR-DOOR-OPEN	6.63E-5	2.00E-4	2.75E-8	1.19E-5	3.76E-4	2.92E-15	3.82E-2
HE-AR-DOOR-OPEN	6.63E-5	1.89E-4	3.64E-8	1.18E-5	3.67E-4	1.50E-15	2.21E-2
HE-SV-1-NS	1.33E-3	4.01E-3	2.34E-6	7.70E-4	1.00E-2	3.79E-13	1.98E-1
HE-SV-1-OPEN	1.33E-3	4.19E-3	2.93E-6	8.37E-4	1.07E-2	3.24E-11	2.88E-1
HE-SV-3-NS	1.33E-3	3.93E-3	2.44E-6	7.67E-4	9.90E-3	1.03E-10	1.48E-1
HE-SV-3-OPEN	1.33E-3	3.96E-3	3.25E-6	7.89E-4	9.81E-3	9.47E-12	1.82E-1
MF-AIR-CELL-LK	9.35E-1	7.40E-1	1.62E-1	7.53E-1	9.68E-1	5.87E-3	9.98E-1
MF-AR-CELL-LK	9.35E-1	7.39E-1	1.69E-1	7.53E-1	9.68E-1	3.35E-3	9.98E-1
MF-SV-1-FFD	1.78E-1	2.74E-1	1.10E-2	1.36E-1	6.59E-1	1.75E-4	9.94E-1
MF-SV-3-FFD	1.78E-1	2.75E-1	1.07E-2	1.37E-1	6.65E-1	5.44E-4	9.98E-1
MF-VP-1-LK	1.98E-3	5.17E-3	5.93E-4	2.73E-3	1.07E-2	1.20E-4	1.48E-1

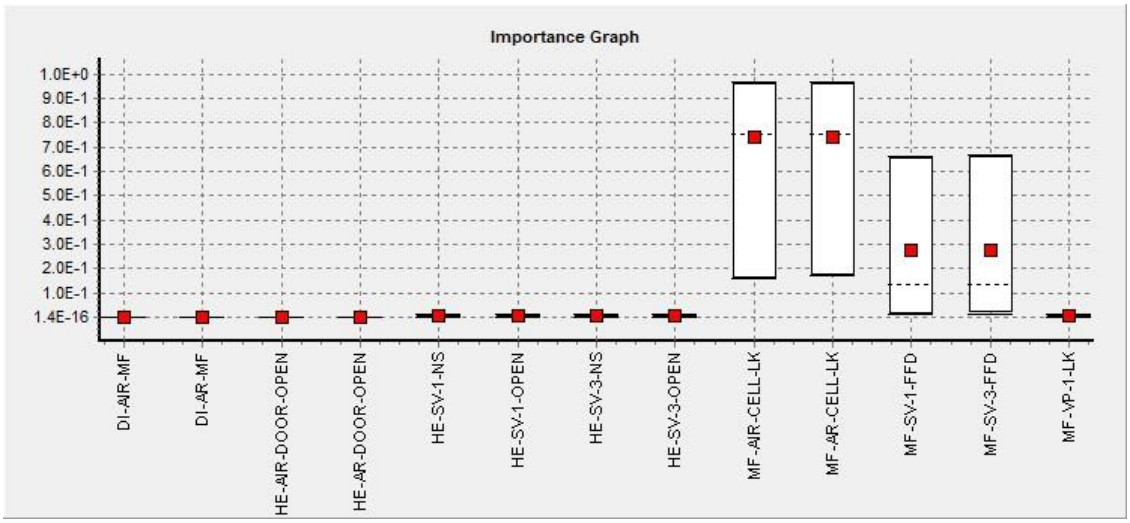


Figure 156: Importance graph for basic system w/ door interlocks and Bruce B fault rate and SV_NRPD.

Table 151: FV Results for Basic System w/Door Interlocks, Bruce B Fault Rate, and Diagnostic HE Component

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	7.53E-4	1.15E-3	1.47E-7	8.58E-5	2.57E-3	2.27E-14	1.03E-1
DI-AR-MF	7.53E-4	1.21E-3	1.99E-7	9.67E-5	2.59E-3	2.48E-15	1.17E-1
HE-AIR-DOOR-OPEN	7.53E-4	1.15E-3	1.47E-7	8.58E-5	2.57E-3	2.27E-14	1.03E-1
HE-AR-DOOR-OPEN	7.53E-4	1.21E-3	1.99E-7	9.67E-5	2.59E-3	2.48E-15	1.17E-1
HE-SV-1-NS	1.51E-2	2.48E-2	2.08E-5	5.93E-3	6.75E-2	2.70E-11	5.73E-1
HE-SV-1-OPEN	1.51E-2	2.54E-2	1.80E-5	6.42E-3	6.89E-2	1.01E-10	6.66E-1
HE-SV-3-NS	1.51E-2	2.41E-2	2.64E-5	6.35E-3	6.37E-2	1.48E-12	3.57E-1
HE-SV-3-OPEN	1.51E-2	2.44E-2	1.51E-5	6.10E-3	6.66E-2	2.84E-14	5.26E-1
MF-AIR-CELL-LK	8.84E-1	5.12E-1	9.06E-2	4.69E-1	7.77E-1	1.12E-2	9.38E-1
MF-AR-CELL-LK	8.84E-1	5.12E-1	9.33E-2	4.70E-1	7.79E-1	1.24E-2	9.70E-1
MF-FS-SV-1	3.28E-1	4.77E-1	1.47E-1	4.08E-1	7.50E-1	2.83E-2	9.74E-1
MF-FS-SV-3	3.28E-1	4.78E-1	1.43E-1	4.10E-1	7.47E-1	4.97E-2	9.75E-1
MF-LK-SV-1	1.98E-2	3.41E-2	5.87E-3	2.07E-2	6.87E-2	1.58E-3	3.22E-1
MF-LK-SV-3	1.98E-2	3.40E-2	5.65E-3	2.09E-2	6.80E-2	1.44E-3	3.39E-1
MF-RP-SV-1	2.88E-3	4.94E-3	1.01E-4	1.22E-3	1.08E-2	1.62E-5	3.83E-1
MF-RP-SV-3	2.88E-3	4.81E-3	1.00E-4	1.16E-3	1.10E-2	7.87E-6	2.56E-1
MF-VP-1-LK	1.75E-3	2.00E-3	3.23E-4	1.24E-3	3.95E-3	4.49E-5	2.08E-2

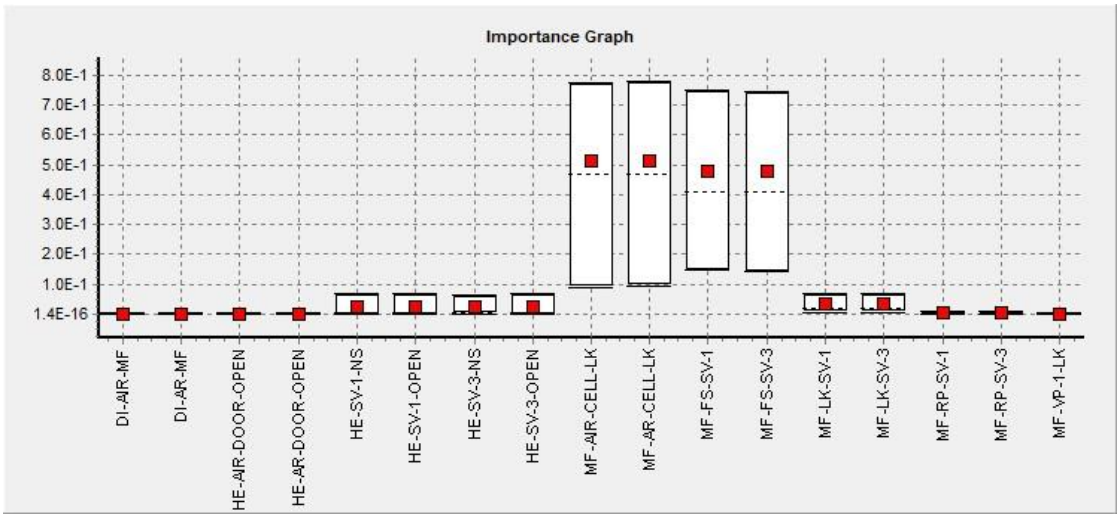


Figure 157: Importance graph for basic system w/door interlocks, Bruce B fault rate, and diagnostic HE.

Table 152: FV Results for Basic System w/Door Interlocks, Bruce B Fault Rate, and Diagnostic HE Component and SV_OL

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	7.15E-4	2.48E-3	2.99E-7	1.59E-4	5.34E-3	3.38E-15	2.58E-1
DI-AR-MF	7.15E-4	2.75E-3	3.79E-7	1.69E-4	5.59E-3	7.39E-15	4.57E-1
HE-AIR-DOOR-OPEN	7.15E-4	2.48E-3	2.99E-7	1.59E-4	5.34E-3	3.38E-15	2.58E-1
HE-AR-DOOR-OPEN	7.15E-4	2.75E-3	3.79E-7	1.69E-4	5.59E-3	7.39E-15	4.57E-1
HE-SV-1-NS	1.43E-2	5.01E-2	2.85E-5	1.07E-2	1.38E-1	8.48E-10	7.64E-1
HE-SV-1-OPEN	1.43E-2	5.10E-2	3.53E-5	1.16E-2	1.40E-1	1.15E-9	8.85E-1
HE-SV-3-NS	1.43E-2	4.92E-2	3.38E-5	1.13E-2	1.35E-1	2.36E-11	7.43E-1
HE-SV-3-OPEN	1.43E-2	4.88E-2	2.80E-5	1.06E-2	1.31E-1	4.91E-11	8.35E-1
MF-AIR-CELL-LK	9.85E-1	8.73E-1	4.50E-1	8.99E-1	9.83E-1	3.92E-2	9.99E-1
MF-AR-CELL-LK	9.85E-1	8.76E-1	4.61E-1	9.01E-1	9.83E-1	1.15E-2	9.99E-1
MF-SV-1-FFD	7.72E-3	2.70E-2	4.42E-4	5.68E-3	6.60E-2	3.50E-5	9.43E-1
MF-SV-3-FFD	7.72E-3	2.75E-2	4.40E-4	5.97E-3	6.66E-2	4.35E-5	9.73E-1
MF-VP-1-LK	2.20E-3	8.01E-3	1.10E-3	4.31E-3	1.63E-2	1.93E-4	1.95E-1

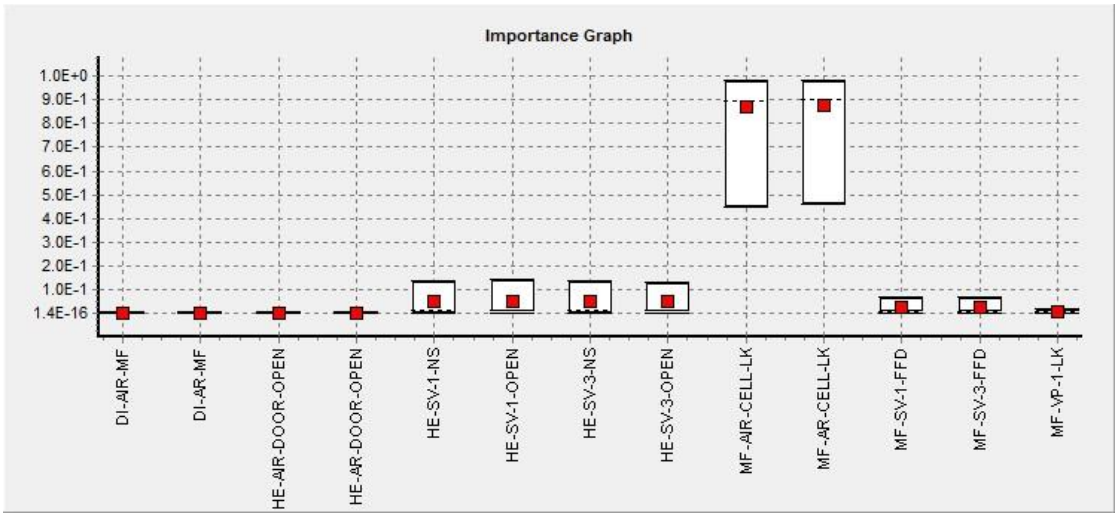


Figure 158: Importance graph for basic system w/door interlocks, Bruce B fault rate, and diagnostic HE and SV_OL.

Table 153: FV Results for Basic System w/Door Interlocks, Bruce B Fault Rate, and Diagnostic HE Component and SV_OM

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	7.64E-4	1.38E-3	1.74E-7	9.86E-5	2.93E-3	7.04E-16	1.87E-1
DI-AR-MF	7.64E-4	1.54E-3	2.29E-7	1.01E-4	3.10E-3	7.39E-15	2.06E-1
HE-AIR-DOOR-OPEN	7.64E-4	1.38E-3	1.74E-7	9.86E-5	2.93E-3	7.04E-16	1.87E-1
HE-AR-DOOR-OPEN	7.64E-4	1.54E-3	2.29E-7	1.01E-4	3.10E-3	7.39E-15	2.06E-1
HE-SV-1-NS	1.53E-2	2.95E-2	1.77E-5	6.52E-3	8.04E-2	3.74E-10	6.35E-1
HE-SV-1-OPEN	1.53E-2	3.02E-2	2.36E-5	7.05E-3	8.07E-2	1.15E-9	7.38E-1
HE-SV-3-NS	1.53E-2	2.88E-2	1.87E-5	6.50E-3	7.63E-2	9.55E-12	5.72E-1
HE-SV-3-OPEN	1.53E-2	2.85E-2	1.60E-5	6.42E-3	7.61E-2	4.44E-11	6.59E-1
MF-AIR-CELL-LK	8.66E-1	5.82E-1	8.91E-2	5.27E-1	8.93E-1	5.75E-3	9.95E-1
MF-AR-CELL-LK	8.66E-1	5.82E-1	9.23E-2	5.29E-1	8.96E-1	3.53E-3	9.92E-1
MF-SV-1-FFD	4.41E-1	4.21E-1	3.21E-2	2.95E-1	8.13E-1	2.53E-3	9.96E-1
MF-SV-3-FFD	4.41E-1	4.23E-1	3.20E-2	3.06E-1	8.13E-1	3.19E-3	9.98E-1
MF-VP-1-LK	1.65E-3	2.75E-3	2.77E-4	1.45E-3	5.78E-3	1.92E-5	4.87E-2

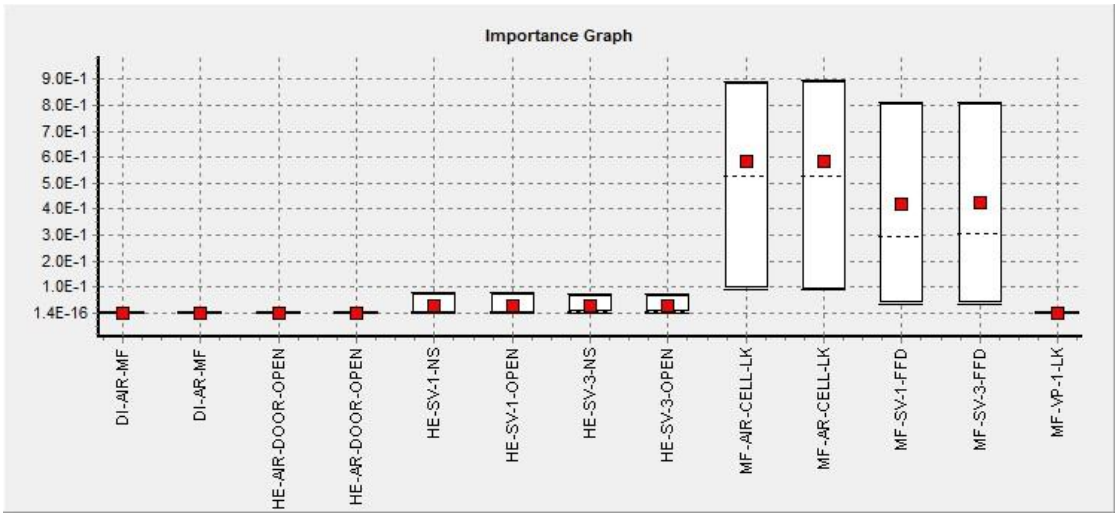


Figure 159: Importance graph for basic system w/door interlocks, Bruce B fault rate, and diagnostic HE and SV_OM.

Table 154: FV Results for Basic System w/Door Interlocks, Bruce B Fault Rate, and Diagnostic HE Component and SV_OH

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	8.96E-4	9.77E-4	1.31E-7	7.43E-5	2.04E-3	6.79E-16	1.36E-1
DI-AR-MF	8.96E-4	1.08E-3	1.57E-7	7.44E-5	2.19E-3	7.12E-15	1.45E-1
HE-AIR-DOOR-OPEN	8.96E-4	9.77E-4	1.31E-7	7.43E-5	2.04E-3	6.79E-16	1.36E-1
HE-AR-DOOR-OPEN	8.96E-4	1.08E-3	1.57E-7	7.44E-5	2.19E-3	7.12E-15	1.45E-1
HE-SV-1-NS	1.79E-2	2.11E-2	1.34E-5	4.86E-3	5.67E-2	3.34E-10	5.38E-1
HE-SV-1-OPEN	1.79E-2	2.17E-2	1.72E-5	5.18E-3	5.77E-2	1.10E-9	5.07E-1
HE-SV-3-NS	1.79E-2	2.07E-2	1.36E-5	4.91E-3	5.43E-2	4.26E-12	4.96E-1
HE-SV-3-OPEN	1.79E-2	2.05E-2	1.18E-5	4.80E-3	5.43E-2	3.41E-11	4.47E-1
MF-AIR-CELL-LK	8.67E-1	4.47E-1	5.28E-2	3.66E-1	7.83E-1	5.78E-3	9.88E-1
MF-AR-CELL-LK	8.67E-1	4.47E-1	5.31E-2	3.67E-1	7.87E-1	2.05E-3	9.80E-1
MF-SV-1-FFD	8.89E-1	6.59E-1	1.18E-1	6.34E-1	9.47E-1	1.00E-2	1.00E+0
MF-SV-3-FFD	8.89E-1	6.60E-1	1.18E-1	6.42E-1	9.48E-1	1.25E-2	1.00E+0
MF-VP-1-LK	1.38E-3	1.32E-3	1.32E-4	7.05E-4	2.79E-3	9.53E-6	2.16E-2

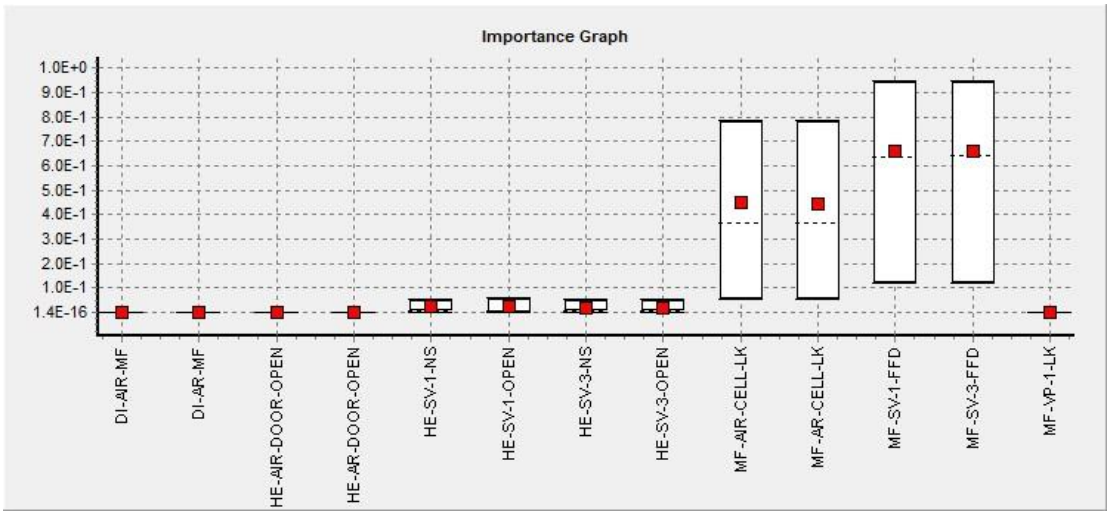


Figure 160: Importance graph for basic system w/door interlocks, Bruce B fault rate, and diagnostic HE and SV_OH.

Table 155: FV Results for Basic System w/Door Interlocks, Bruce B Fault Rate, and Diagnostic HE Component and SV_DOW

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	7.15E-4	2.48E-3	2.99E-7	1.59E-4	5.34E-3	3.37E-15	2.58E-1
DI-AR-MF	7.15E-4	2.74E-3	3.79E-7	1.69E-4	5.58E-3	7.38E-15	4.56E-1
HE-AIR-DOOR-OPEN	7.15E-4	2.48E-3	2.99E-7	1.59E-4	5.34E-3	3.37E-15	2.58E-1
HE-AR-DOOR-OPEN	7.15E-4	2.74E-3	3.79E-7	1.69E-4	5.58E-3	7.38E-15	4.56E-1
HE-SV-1-NS	1.43E-2	5.00E-2	2.85E-5	1.07E-2	1.37E-1	8.47E-10	7.63E-1
HE-SV-1-OPEN	1.43E-2	5.09E-2	3.53E-5	1.16E-2	1.40E-1	1.15E-9	8.85E-1
HE-SV-3-NS	1.43E-2	4.91E-2	3.38E-5	1.13E-2	1.35E-1	2.36E-11	7.43E-1
HE-SV-3-OPEN	1.43E-2	4.88E-2	2.80E-5	1.06E-2	1.31E-1	4.91E-11	8.35E-1
MF-AIR-CELL-LK	9.85E-1	8.73E-1	4.50E-1	8.98E-1	9.82E-1	3.81E-2	9.99E-1
MF-AR-CELL-LK	9.85E-1	8.75E-1	4.61E-1	9.01E-1	9.82E-1	1.12E-2	9.99E-1
MF-SV-1-FFD	7.98E-3	2.78E-2	4.57E-4	5.87E-3	6.81E-2	3.62E-5	9.45E-1
MF-SV-3-FFD	7.98E-3	2.83E-2	4.55E-4	6.17E-3	6.87E-2	4.50E-5	9.74E-1
MF-VP-1-LK	2.20E-3	7.99E-3	1.10E-3	4.31E-3	1.62E-2	1.92E-4	1.94E-1

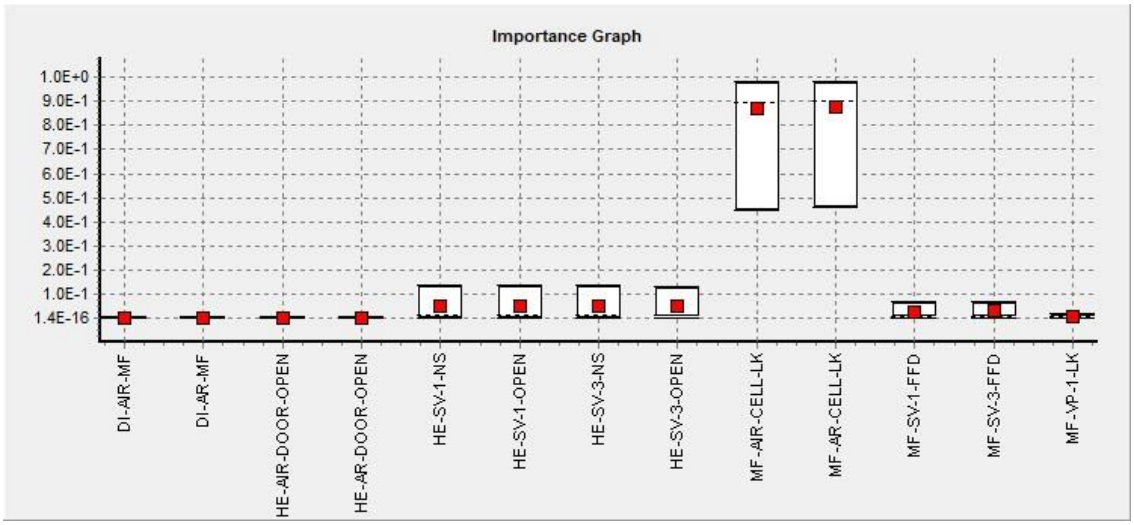


Figure 161: Importance graph for basic system w/door interlocks, Bruce B fault rate, and diagnostic HE and SV_DOW.

Table 156: FV Results for Basic System w/Door Interlocks, Bruce B Fault Rate, and Diagnostic HE Component and SV_MAN

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	7.14E-4	2.59E-3	3.03E-7	1.63E-4	5.52E-3	3.83E-15	2.64E-1
DI-AR-MF	7.14E-4	2.86E-3	3.80E-7	1.73E-4	5.80E-3	7.43E-15	4.83E-1
HE-AIR-DOOR-OPEN	7.14E-4	2.59E-3	3.03E-7	1.63E-4	5.52E-3	3.83E-15	2.64E-1
HE-AR-DOOR-OPEN	7.14E-4	2.86E-3	3.80E-7	1.73E-4	5.80E-3	7.43E-15	4.83E-1
HE-SV-1-NS	1.43E-2	5.20E-2	2.87E-5	1.09E-2	1.42E-1	8.75E-10	8.06E-1
HE-SV-1-OPEN	1.43E-2	5.29E-2	3.56E-5	1.18E-2	1.45E-1	1.15E-9	8.88E-1
HE-SV-3-NS	1.43E-2	5.10E-2	3.39E-5	1.15E-2	1.39E-1	2.41E-11	7.60E-1
HE-SV-3-OPEN	1.43E-2	5.08E-2	2.82E-5	1.09E-2	1.35E-1	4.91E-11	8.38E-1
MF-AIR-CELL-LK	9.88E-1	8.94E-1	4.99E-1	9.19E-1	9.89E-1	7.01E-2	1.00E+0
MF-AR-CELL-LK	9.88E-1	8.96E-1	5.15E-1	9.21E-1	9.89E-1	1.10E-1	9.99E-1
MF-SV-1-FFD	1.94E-4	8.71E-4	1.11E-5	1.43E-4	1.77E-3	8.76E-7	3.07E-1
MF-SV-3-FFD	1.94E-4	9.41E-4	1.10E-5	1.50E-4	1.79E-3	1.09E-6	4.68E-1
MF-VP-1-LK	2.21E-3	8.60E-3	1.13E-3	4.52E-3	1.76E-2	1.98E-4	2.07E-1

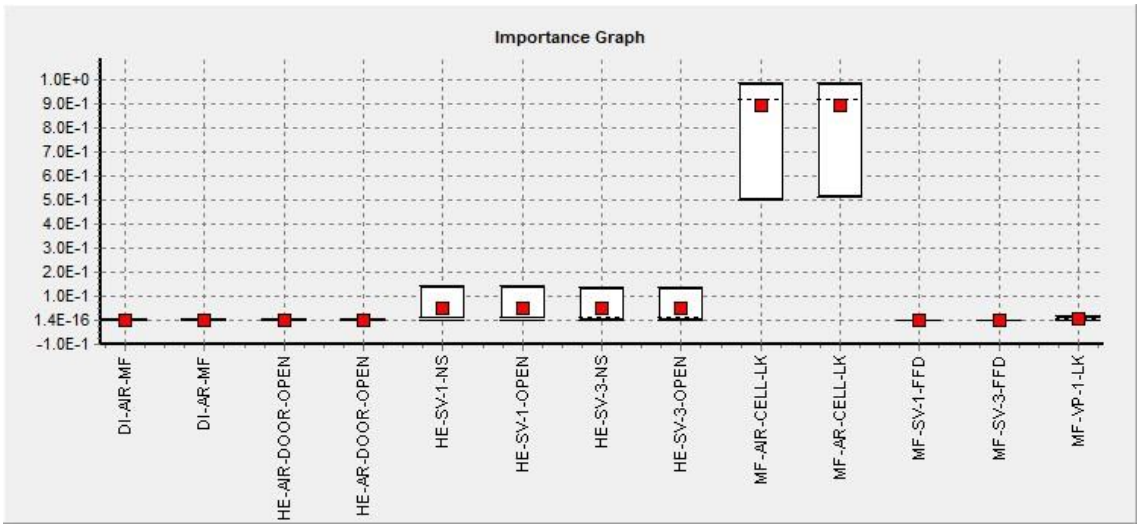


Figure 162: Importance graph for basic system w/door interlocks, Bruce B fault rate, and diagnostic HE and SV_MAN.

Table 157: FV Results for Basic System w/Door Interlocks, Bruce B Fault Rate, and Diagnostic HE Component and SV_NRPD

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	7.33E-4	1.76E-3	2.15E-7	1.23E-4	3.65E-3	1.18E-15	2.05E-1
DI-AR-MF	7.33E-4	1.97E-3	3.01E-7	1.29E-4	3.99E-3	7.37E-15	2.28E-1
HE-AIR-DOOR-OPEN	7.33E-4	1.76E-3	2.15E-7	1.23E-4	3.65E-3	1.18E-15	2.05E-1
HE-AR-DOOR-OPEN	7.33E-4	1.97E-3	3.01E-7	1.29E-4	3.99E-3	7.37E-15	2.28E-1
HE-SV-1-NS	1.47E-2	3.69E-2	2.17E-5	8.23E-3	1.00E-1	5.26E-10	6.65E-1
HE-SV-1-OPEN	1.47E-2	3.78E-2	2.93E-5	8.73E-3	1.02E-1	1.15E-9	8.30E-1
HE-SV-3-NS	1.47E-2	3.63E-2	2.41E-5	8.15E-3	9.73E-2	1.55E-11	6.00E-1
HE-SV-3-OPEN	1.47E-2	3.58E-2	1.94E-5	8.22E-3	9.70E-2	4.80E-11	7.66E-1
MF-AIR-CELL-LK	9.27E-1	6.97E-1	1.57E-1	6.91E-1	9.37E-1	5.88E-3	9.98E-1
MF-AR-CELL-LK	9.27E-1	6.98E-1	1.57E-1	6.95E-1	9.40E-1	3.34E-3	9.96E-1
MF-SV-1-FFD	1.79E-1	2.57E-1	1.10E-2	1.24E-1	6.21E-1	8.63E-4	9.92E-1
MF-SV-3-FFD	1.79E-1	2.58E-1	1.10E-2	1.31E-1	6.24E-1	1.08E-3	9.96E-1
MF-VP-1-LK	1.94E-3	4.40E-3	5.23E-4	2.43E-3	8.88E-3	3.75E-5	7.45E-2

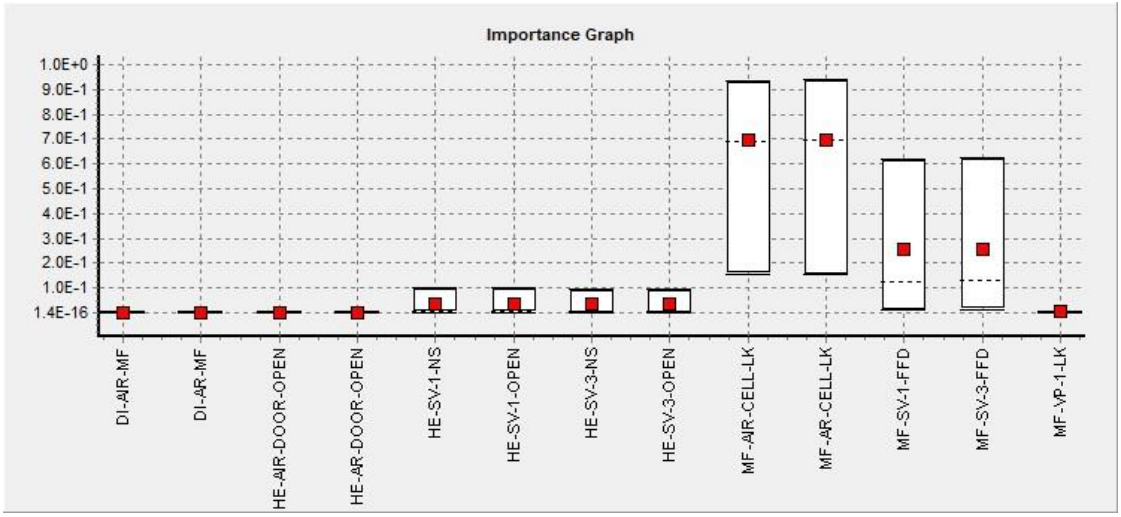


Figure 163: Importance graph for basic system w/door interlocks, Bruce B fault rate, and diagnostic HE and SV_NRPD.

Table 158: FV Results for Basic System w/ Door Interlocks and Bruce A Fault Rate

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	1.14E-4	1.57E-4	3.46E-8	1.18E-5	3.30E-4	5.57E-14	1.66E-2
DI-AR-MF	1.14E-4	1.58E-4	2.87E-8	1.15E-5	3.40E-4	5.17E-12	1.50E-2
HE-AIR-DOOR-OPEN	1.14E-4	1.57E-4	3.46E-8	1.18E-5	3.30E-4	5.57E-14	1.66E-2
HE-AR-DOOR-OPEN	1.14E-4	1.58E-4	2.87E-8	1.15E-5	3.40E-4	5.17E-12	1.50E-2
HE-SV-1-NS	2.29E-3	3.45E-3	2.31E-6	8.07E-4	9.26E-3	7.05E-14	1.42E-1
HE-SV-1-OPEN	2.29E-3	3.48E-3	3.09E-6	7.96E-4	9.36E-3	1.64E-13	7.32E-2
HE-SV-3-NS	2.29E-3	3.40E-3	3.29E-6	8.03E-4	8.95E-3	6.63E-12	7.15E-2
HE-SV-3-OPEN	2.29E-3	3.43E-3	3.17E-6	8.05E-4	9.38E-3	4.34E-13	7.58E-2
MF-AIR-CELL-LK	4.58E-1	3.12E-1	1.94E-2	2.01E-1	6.53E-1	1.49E-3	9.39E-1
MF-AR-CELL-LK	4.58E-1	3.10E-1	2.00E-2	2.00E-1	6.46E-1	6.15E-4	9.14E-1
MF-FS-SV-1	5.61E-1	6.55E-1	2.16E-1	6.24E-1	9.00E-1	5.71E-2	9.89E-1
MF-FS-SV-3	5.61E-1	6.57E-1	2.17E-1	6.29E-1	9.02E-1	4.99E-2	9.84E-1
MF-LK-SV-1	3.31E-2	4.85E-2	7.65E-3	2.88E-2	9.80E-2	2.04E-3	6.19E-1
MF-LK-SV-3	3.31E-2	4.85E-2	7.26E-3	2.94E-2	9.93E-2	1.69E-3	6.43E-1
MF-RP-SV-1	4.80E-3	7.16E-3	1.25E-4	1.68E-3	1.67E-2	6.96E-6	3.17E-1
MF-RP-SV-3	4.80E-3	7.08E-3	1.31E-4	1.71E-3	1.62E-2	1.28E-5	4.39E-1
MF-VP-1-LK	1.72E-3	1.86E-3	1.60E-4	1.02E-3	3.94E-3	1.67E-5	3.38E-2

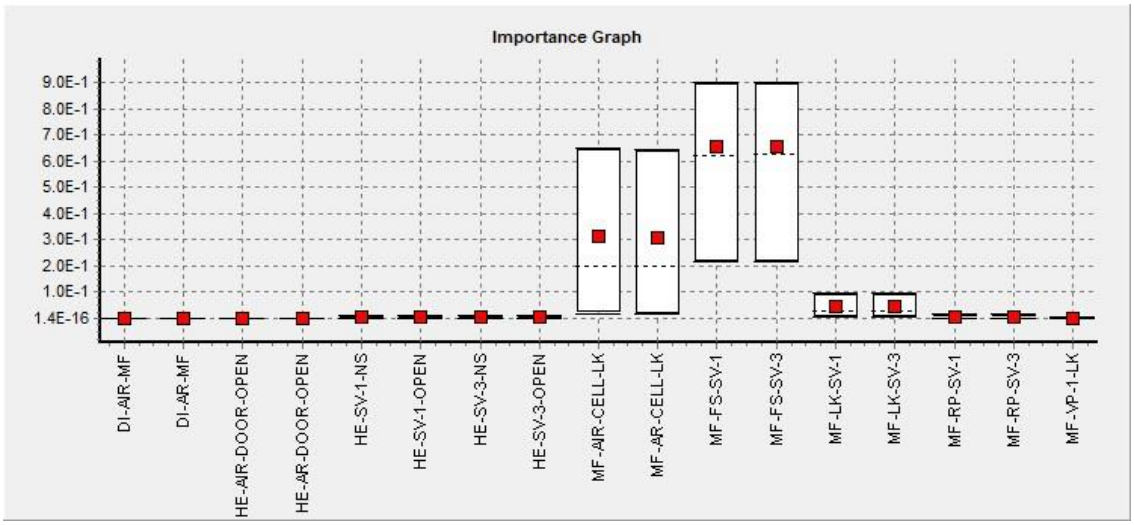


Figure 164: Importance graph for basic system w/ door interlocks and Bruce A failure data.

Table 159: FV Results for Basic System w/ Door Interlocks and Bruce A Fault Rate and SV_OL

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	2.33E-4	8.81E-4	1.09E-7	4.46E-5	1.67E-3	8.12E-13	9.82E-2
DI-AR-MF	2.33E-4	9.46E-4	1.00E-7	4.38E-5	1.74E-3	3.48E-11	1.93E-1
HE-AIR-DOOR-OPEN	2.33E-4	8.81E-4	1.09E-7	4.46E-5	1.67E-3	8.12E-13	9.82E-2
HE-AR-DOOR-OPEN	2.33E-4	9.46E-4	1.00E-7	4.38E-5	1.74E-3	3.48E-11	1.93E-1
HE-SV-1-NS	4.66E-3	1.86E-2	8.18E-6	2.59E-3	4.76E-2	7.21E-11	6.37E-1
HE-SV-1-OPEN	4.66E-3	1.81E-2	7.89E-6	2.70E-3	4.76E-2	7.34E-13	5.43E-1
HE-SV-3-NS	4.66E-3	1.77E-2	8.33E-6	2.55E-3	4.77E-2	4.05E-14	5.42E-1
HE-SV-3-OPEN	4.66E-3	1.91E-2	8.11E-6	2.63E-3	5.04E-2	5.65E-12	5.58E-1
MF-AIR-CELL-LK	9.61E-1	8.72E-1	3.89E-1	9.08E-1	9.88E-1	4.31E-3	9.99E-1
MF-AR-CELL-LK	9.61E-1	8.66E-1	3.69E-1	9.02E-1	9.88E-1	1.84E-3	9.99E-1
MF-SV-1-FFD	2.77E-2	7.67E-2	8.53E-4	1.76E-2	2.17E-1	4.00E-5	9.85E-1
MF-SV-3-FFD	2.77E-2	8.20E-2	9.37E-4	1.67E-2	2.38E-1	2.41E-5	9.94E-1
MF-VP-1-LK	7.86E-3	3.03E-2	2.51E-3	1.42E-2	6.93E-2	5.04E-4	4.94E-1

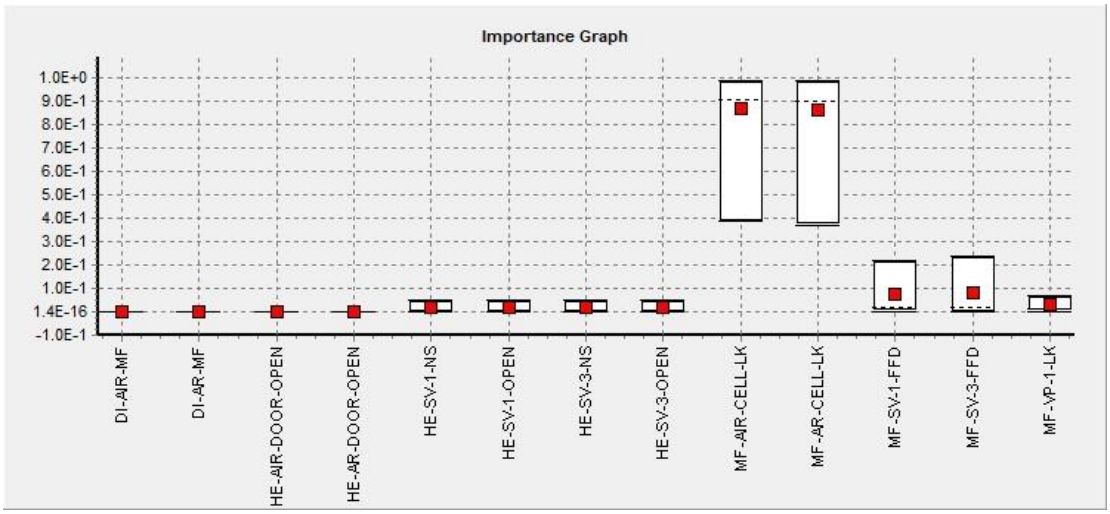


Figure 165: Importance graph for basic system w/ door interlocks and Bruce A failure data and SV_OL.

Table 160: FV Results for Basic System w/ Door Interlocks and Bruce A Fault Rate and SV_OM.

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	1.00E-4	2.52E-4	4.03E-8	1.46E-5	4.91E-4	7.81E-13	3.45E-2
DI-AR-MF	1.00E-4	2.64E-4	3.21E-8	1.42E-5	4.94E-4	2.49E-11	5.16E-2
HE-AIR-DOOR-OPEN	1.00E-4	2.52E-4	4.03E-8	1.46E-5	4.91E-4	7.81E-13	3.45E-2
HE-AR-DOOR-OPEN	1.00E-4	2.64E-4	3.21E-8	1.42E-5	4.94E-4	2.49E-11	5.16E-2
HE-SV-1-NS	2.01E-3	5.36E-3	3.41E-6	9.01E-4	1.31E-2	3.19E-11	3.75E-1
HE-SV-1-OPEN	2.01E-3	5.29E-3	3.07E-6	9.47E-4	1.34E-2	3.00E-13	2.70E-1
HE-SV-3-NS	2.01E-3	5.19E-3	3.06E-6	8.87E-4	1.31E-2	8.46E-15	2.03E-1
HE-SV-3-OPEN	2.01E-3	5.67E-3	2.98E-6	9.15E-4	1.36E-2	2.37E-12	3.01E-1
MF-AIR-CELL-LK	4.03E-1	4.04E-1	2.21E-2	2.68E-1	8.30E-1	8.89E-4	9.95E-1
MF-AR-CELL-LK	4.03E-1	4.02E-1	1.89E-2	2.60E-1	8.32E-1	5.34E-4	9.96E-1
MF-SV-1-FFD	6.68E-1	6.06E-1	5.91E-2	5.57E-1	9.44E-1	2.96E-3	9.99E-1
MF-SV-3-FFD	6.68E-1	6.06E-1	6.38E-2	5.48E-1	9.49E-1	1.80E-3	9.99E-1
MF-VP-1-LK	1.31E-3	3.83E-3	1.34E-4	1.43E-3	8.87E-3	4.03E-6	7.67E-2

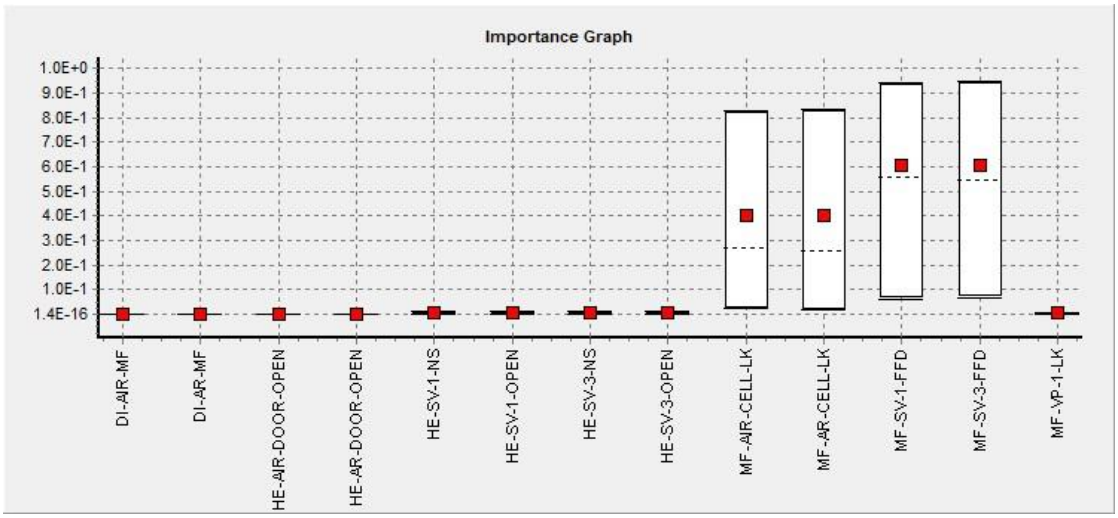


Figure 166: Importance graph for basic system w/ door interlocks and Bruce A failure data and SV_OM.

Table 161: FV Results for Basic System w/ Door Interlocks and Bruce A Fault Rate and SV_OH

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	6.57E-5	1.28E-4	2.32E-8	8.20E-6	2.54E-4	7.02E-13	1.72E-2
DI-AR-MF	6.57E-5	1.33E-4	1.93E-8	8.26E-6	2.55E-4	1.54E-11	1.92E-2
HE-AIR-DOOR-OPEN	6.57E-5	1.28E-4	2.32E-8	8.20E-6	2.54E-4	7.02E-13	1.72E-2
HE-AR-DOOR-OPEN	6.57E-5	1.33E-4	1.93E-8	8.26E-6	2.55E-4	1.54E-11	1.92E-2
HE-SV-1-NS	1.32E-3	2.71E-3	1.90E-6	5.20E-4	6.67E-3	1.25E-11	1.81E-1
HE-SV-1-OPEN	1.32E-3	2.72E-3	1.71E-6	5.29E-4	6.88E-3	1.30E-13	1.67E-1
HE-SV-3-NS	1.32E-3	2.66E-3	1.73E-6	5.12E-4	6.60E-3	4.87E-15	9.05E-2
HE-SV-3-OPEN	1.32E-3	2.92E-3	1.77E-6	5.39E-4	7.05E-3	9.50E-13	1.36E-1
MF-AIR-CELL-LK	2.62E-1	2.56E-1	1.18E-2	1.28E-1	6.15E-1	9.06E-4	9.87E-1
MF-AR-CELL-LK	2.62E-1	2.56E-1	1.01E-2	1.27E-1	6.18E-1	5.54E-4	9.94E-1
MF-SV-1-FFD	9.24E-1	7.94E-1	1.98E-1	8.27E-1	9.85E-1	1.14E-2	1.00E+0
MF-SV-3-FFD	9.24E-1	7.93E-1	2.11E-1	8.23E-1	9.86E-1	7.03E-3	1.00E+0
MF-VP-1-LK	4.67E-4	1.17E-3	4.07E-5	4.24E-4	2.73E-3	2.12E-6	4.21E-2

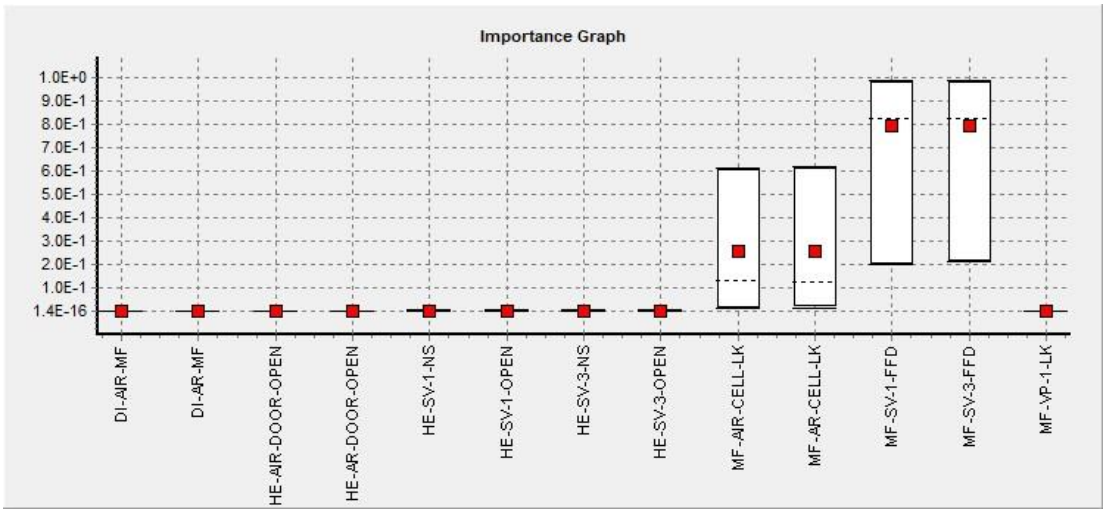


Figure 167: Importance graph for basic system w/ door interlocks and Bruce A failure data and SV_OH.

Table 162: FV Results for Basic System w/ Door Interlocks and Bruce A Fault Rate and SV_DOW

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	2.33E-4	8.78E-4	1.09E-7	4.45E-5	1.66E-3	8.10E-13	9.79E-2
DI-AR-MF	2.33E-4	9.42E-4	9.99E-8	4.37E-5	1.74E-3	3.48E-11	1.93E-1
HE-AIR-DOOR-OPEN	2.33E-4	8.78E-4	1.09E-7	4.45E-5	1.66E-3	8.10E-13	9.79E-2
HE-AR-DOOR-OPEN	2.33E-4	9.42E-4	9.99E-8	4.37E-5	1.74E-3	3.48E-11	1.93E-1
HE-SV-1-NS	4.66E-3	1.85E-2	8.16E-6	2.58E-3	4.73E-2	7.21E-11	6.36E-1
HE-SV-1-OPEN	4.66E-3	1.81E-2	7.88E-6	2.70E-3	4.72E-2	7.22E-13	5.42E-1
HE-SV-3-NS	4.66E-3	1.76E-2	8.32E-6	2.55E-3	4.75E-2	4.04E-14	5.41E-1
HE-SV-3-OPEN	4.66E-3	1.90E-2	8.09E-6	2.63E-3	5.02E-2	5.66E-12	5.57E-1
MF-AIR-CELL-LK	9.60E-1	8.70E-1	3.84E-1	9.07E-1	9.88E-1	4.19E-3	9.99E-1
MF-AR-CELL-LK	9.60E-1	8.64E-1	3.63E-1	9.01E-1	9.88E-1	1.79E-3	9.99E-1
MF-SV-1-FFD	2.86E-2	7.86E-2	8.82E-4	1.82E-2	2.23E-1	4.14E-5	9.85E-1
MF-SV-3-FFD	2.86E-2	8.39E-2	9.69E-4	1.72E-2	2.44E-1	2.49E-5	9.95E-1
MF-VP-1-LK	7.85E-3	3.01E-2	2.51E-3	1.41E-2	6.88E-2	5.03E-4	4.92E-1

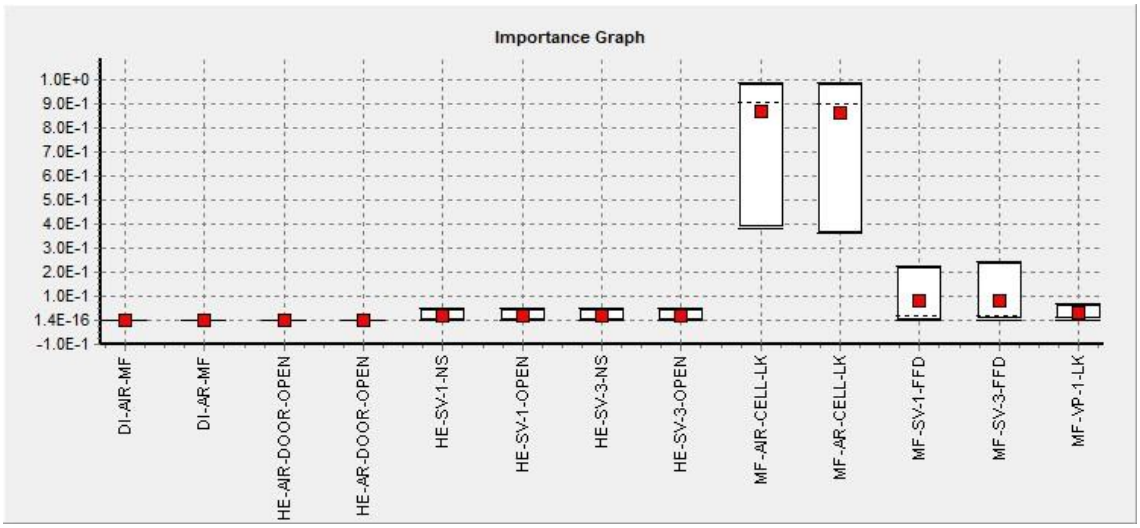


Figure 168: Importance graph for basic system w/ door interlocks and Bruce A failure data and SV_DOW.

Table 163: FV Results for Basic System w/ Door Interlocks and Bruce A Fault Rate and SV_MAN

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	2.39E-4	1.02E-3	1.15E-7	4.77E-5	1.92E-3	8.07E-13	1.06E-1
DI-AR-MF	2.39E-4	1.12E-3	1.05E-7	4.70E-5	2.00E-3	3.49E-11	2.01E-1
HE-AIR-DOOR-OPEN	2.39E-4	1.02E-3	1.15E-7	4.77E-5	1.92E-3	8.07E-13	1.06E-1
HE-AR-DOOR-OPEN	2.39E-4	1.12E-3	1.05E-7	4.70E-5	2.00E-3	3.49E-11	2.01E-1
HE-SV-1-NS	4.78E-3	2.14E-2	8.71E-6	2.75E-3	5.33E-2	7.33E-11	7.32E-1
HE-SV-1-OPEN	4.78E-3	2.10E-2	8.22E-6	2.89E-3	5.47E-2	7.08E-13	5.77E-1
HE-SV-3-NS	4.78E-3	2.06E-2	8.64E-6	2.74E-3	5.38E-2	4.45E-14	5.83E-1
HE-SV-3-OPEN	4.78E-3	2.24E-2	8.58E-6	2.87E-3	5.90E-2	5.78E-12	6.09E-1
MF-AIR-CELL-LK	9.86E-1	9.35E-1	6.42E-1	9.59E-1	9.95E-1	9.71E-2	1.00E+0
MF-AR-CELL-LK	9.86E-1	9.33E-1	6.30E-1	9.58E-1	9.95E-1	5.30E-2	1.00E+0
MF-SV-1-FFD	7.12E-4	3.20E-3	2.12E-5	4.44E-4	6.88E-3	9.93E-7	6.18E-1
MF-SV-3-FFD	7.12E-4	3.61E-3	2.34E-5	4.23E-4	7.74E-3	6.01E-7	8.34E-1
MF-VP-1-LK	8.29E-3	3.85E-2	2.66E-3	1.69E-2	8.93E-2	5.26E-4	5.56E-1

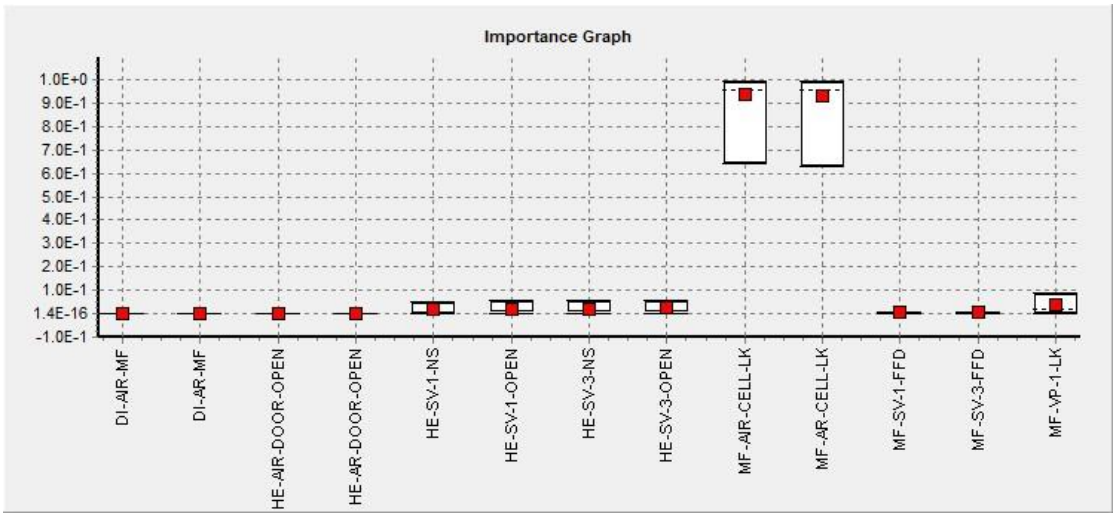


Figure 169: Importance graph for basic system w/ door interlocks and Bruce A failure data and SV_MAN.

Table 164: FV Results for Basic System w/ Door Interlocks and Bruce A Fault Rate and SV_NRPD

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	1.51E-4	4.03E-4	6.23E-8	2.27E-5	7.83E-4	8.05E-13	5.31E-2
DI-AR-MF	1.51E-4	4.26E-4	5.62E-8	2.21E-5	7.87E-4	3.10E-11	9.98E-2
HE-AIR-DOOR-OPEN	1.51E-4	4.03E-4	6.23E-8	2.27E-5	7.83E-4	8.05E-13	5.31E-2
HE-AR-DOOR-OPEN	1.51E-4	4.26E-4	5.62E-8	2.21E-5	7.87E-4	3.10E-11	9.98E-2
HE-SV-1-NS	3.03E-3	8.59E-3	4.68E-6	1.38E-3	2.13E-2	5.11E-11	5.01E-1
HE-SV-1-OPEN	3.03E-3	8.42E-3	4.68E-6	1.48E-3	2.20E-2	4.87E-13	3.60E-1
HE-SV-3-NS	3.03E-3	8.24E-3	4.69E-6	1.35E-3	2.13E-2	1.63E-14	3.19E-1
HE-SV-3-OPEN	3.03E-3	8.93E-3	4.57E-6	1.41E-3	2.23E-2	3.86E-12	4.13E-1
MF-AIR-CELL-LK	6.14E-1	5.51E-1	4.33E-2	4.73E-1	9.24E-1	8.89E-4	9.98E-1
MF-AR-CELL-LK	6.14E-1	5.47E-1	3.86E-2	4.62E-1	9.24E-1	5.20E-4	9.97E-1
MF-SV-1-FFD	4.08E-1	4.36E-1	2.10E-2	3.05E-1	8.64E-1	1.01E-3	9.99E-1
MF-SV-3-FFD	4.08E-1	4.40E-1	2.28E-2	2.96E-1	8.77E-1	6.09E-4	9.99E-1
MF-VP-1-LK	3.17E-3	8.50E-3	4.14E-4	3.68E-3	1.95E-2	1.62E-5	1.62E-1

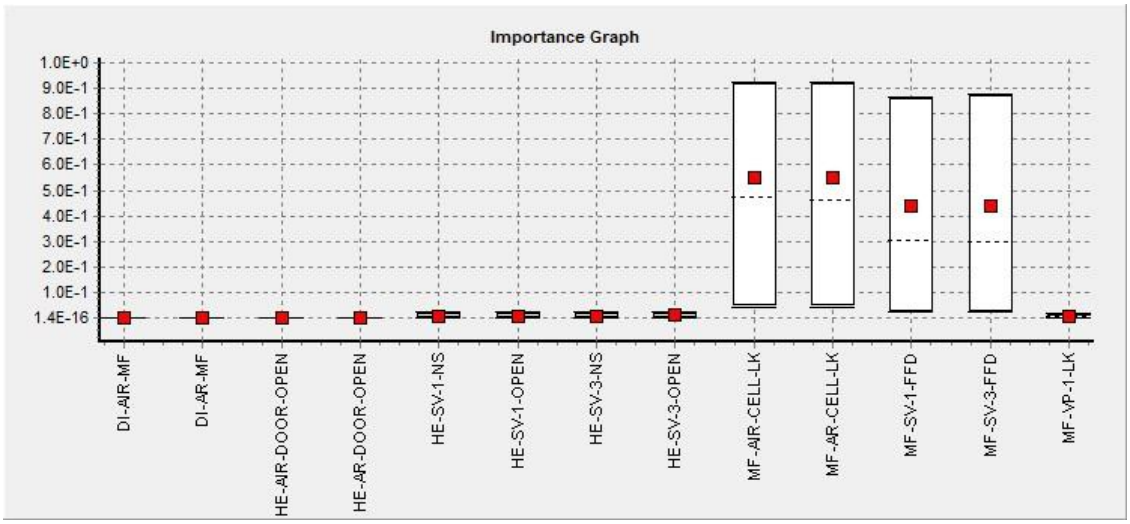


Figure 170: Importance graph for basic system w/ door interlocks and Bruce A failure data and SV_NRPD.

Table 165: FV Results for Basic System w/ Door Interlocks, Bruce A Fault Rate, and Diagnostic HE

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	1.22E-3	1.59E-3	3.45E-7	1.21E-4	3.52E-3	1.07E-12	1.35E-1
DI-AR-MF	1.22E-3	1.64E-3	2.34E-7	1.12E-4	3.51E-3	5.33E-13	2.22E-1
HE-AIR-DOOR-OPEN	1.22E-3	1.59E-3	3.45E-7	1.21E-4	3.52E-3	1.07E-12	1.35E-1
HE-AR-DOOR-OPEN	1.22E-3	1.64E-3	2.34E-7	1.12E-4	3.51E-3	5.33E-13	2.22E-1
HE-SV-1-NS	2.44E-2	3.34E-2	2.35E-5	8.31E-3	9.02E-2	3.87E-13	4.18E-1
HE-SV-1-OPEN	2.44E-2	3.23E-2	2.34E-5	8.04E-3	8.82E-2	8.43E-13	5.12E-1
HE-SV-3-NS	2.44E-2	3.24E-2	2.47E-5	8.38E-3	8.95E-2	2.89E-10	4.63E-1
HE-SV-3-OPEN	2.44E-2	3.32E-2	2.66E-5	8.45E-3	9.26E-2	9.28E-11	5.06E-1
MF-AIR-CELL-LK	4.43E-1	2.99E-1	1.89E-2	1.92E-1	6.28E-1	4.63E-4	9.24E-1
MF-AR-CELL-LK	4.43E-1	2.99E-1	1.89E-2	1.88E-1	6.30E-1	6.29E-4	9.26E-1
MF-FS-SV-1	5.42E-1	6.20E-1	2.09E-1	5.86E-1	8.66E-1	4.56E-2	9.79E-1
MF-FS-SV-3	5.42E-1	6.20E-1	2.06E-1	5.84E-1	8.67E-1	6.30E-2	9.82E-1
MF-LK-SV-1	3.21E-2	4.56E-2	7.33E-3	2.80E-2	9.15E-2	1.98E-3	4.54E-1
MF-LK-SV-3	3.21E-2	4.58E-2	7.37E-3	2.75E-2	9.21E-2	1.88E-3	5.32E-1
MF-RP-SV-1	4.66E-3	6.71E-3	1.26E-4	1.61E-3	1.54E-2	1.04E-5	3.55E-1
MF-RP-SV-3	4.66E-3	6.28E-3	1.37E-4	1.59E-3	1.46E-2	1.26E-5	3.67E-1
MF-VP-1-LK	1.61E-3	1.63E-3	1.45E-4	8.95E-4	3.47E-3	1.05E-5	3.19E-2

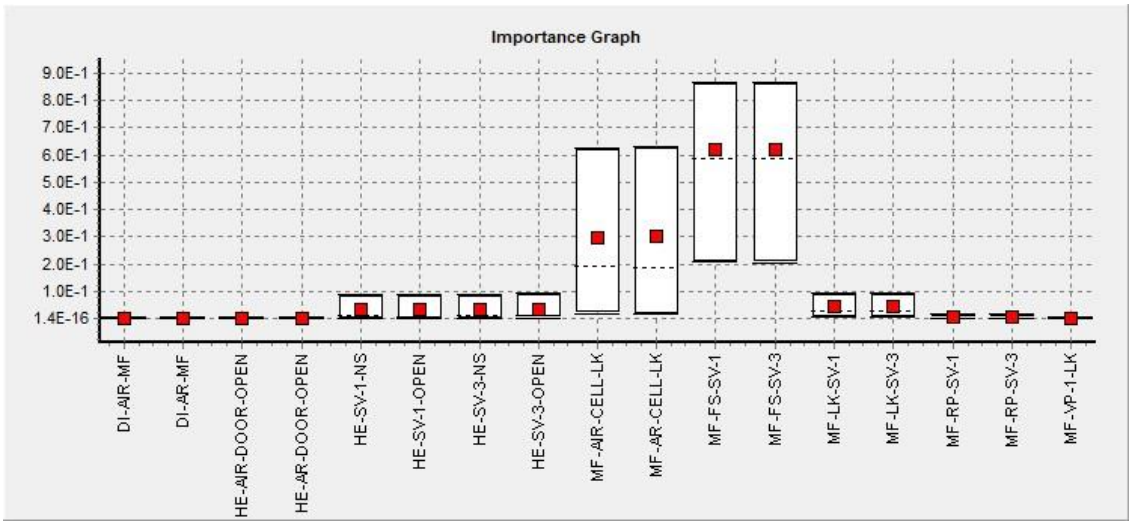


Figure 171: Importance graph for the basic system with door interlocks, Bruce A fault rate, and diagnostic HE.

Table 166: FV Results for Basic System w/ Door Interlocks, Bruce A Fault Rate, and Diagnostic HE and SV_OL

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	2.36E-3	6.38E-3	9.65E-7	3.62E-4	1.33E-2	1.49E-10	5.21E-1
DI-AR-MF	2.36E-3	6.12E-3	6.36E-7	3.65E-4	1.32E-2	1.38E-11	6.84E-1
HE-AIR-DOOR-OPEN	2.36E-3	6.38E-3	9.65E-7	3.62E-4	1.33E-2	1.49E-10	5.21E-1
HE-AR-DOOR-OPEN	2.36E-3	6.12E-3	6.36E-7	3.65E-4	1.32E-2	1.38E-11	6.84E-1
HE-SV-1-NS	4.72E-2	1.05E-1	6.87E-5	2.46E-2	3.08E-1	3.80E-13	9.38E-1
HE-SV-1-OPEN	4.72E-2	1.08E-1	8.27E-5	2.58E-2	3.17E-1	4.68E-12	9.30E-1
HE-SV-3-NS	4.72E-2	1.07E-1	6.81E-5	2.43E-2	3.15E-1	1.40E-13	9.20E-1
HE-SV-3-OPEN	4.72E-2	1.09E-1	7.07E-5	2.61E-2	3.24E-1	6.23E-11	9.28E-1
MF-AIR-CELL-LK	8.81E-1	7.16E-1	1.48E-1	7.19E-1	9.62E-1	1.18E-2	9.99E-1
MF-AR-CELL-LK	8.81E-1	7.11E-1	1.49E-1	7.10E-1	9.61E-1	1.36E-2	9.98E-1
MF-SV-1-FFD	2.55E-2	5.96E-2	7.54E-4	1.39E-2	1.58E-1	4.23E-5	9.09E-1
MF-SV-3-FFD	2.55E-2	6.14E-2	8.77E-4	1.41E-2	1.64E-1	6.43E-5	9.19E-1
MF-VP-1-LK	6.62E-3	1.70E-2	2.03E-3	8.76E-3	3.57E-2	1.04E-4	3.94E-1

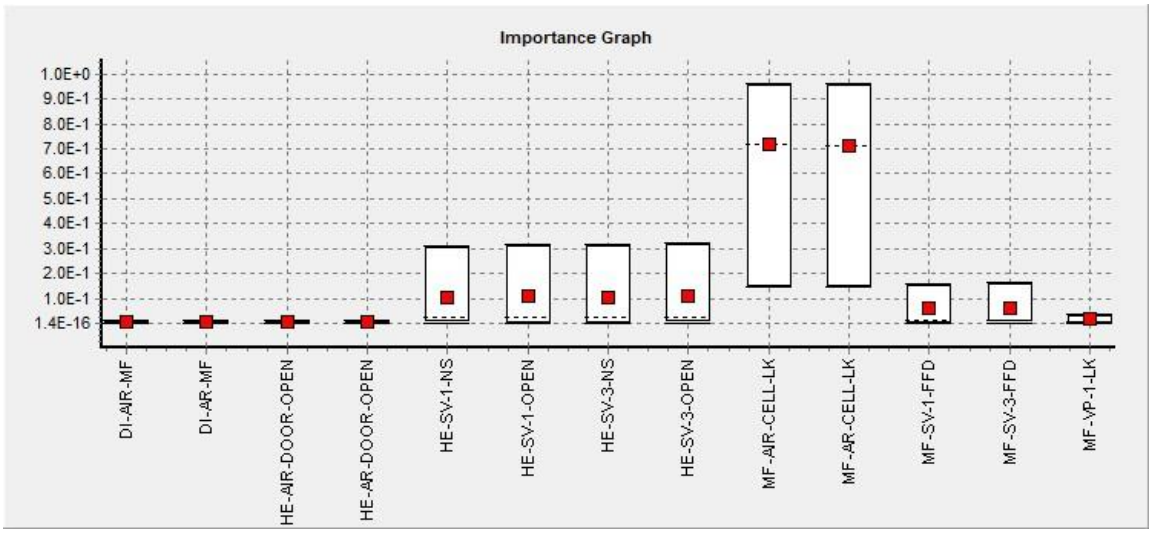


Figure 172: Importance graph for the basic system with door interlocks, Bruce A fault rate, and diagnostic HE and SV_OL.

Table 167: FV Results for Basic System w/ Door Interlocks, Bruce A Fault Rate, and Diagnostic HE and SV_OM

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	1.08E-3	2.39E-3	3.76E-7	1.35E-4	4.87E-3	6.26E-11	2.22E-1
DI-AR-MF	1.08E-3	2.31E-3	2.76E-7	1.43E-4	4.61E-3	3.39E-12	3.23E-1
HE-AIR-DOOR-OPEN	1.08E-3	2.39E-3	3.76E-7	1.35E-4	4.87E-3	6.26E-11	2.22E-1
HE-AR-DOOR-OPEN	1.08E-3	2.31E-3	2.76E-7	1.43E-4	4.61E-3	3.39E-12	3.23E-1
HE-SV-1-NS	2.16E-2	4.43E-2	2.61E-5	9.27E-3	1.22E-1	2.61E-13	8.78E-1
HE-SV-1-OPEN	2.16E-2	4.59E-2	3.24E-5	9.59E-3	1.25E-1	4.03E-12	7.79E-1
HE-SV-3-NS	2.16E-2	4.50E-2	2.54E-5	9.32E-3	1.23E-1	3.37E-14	7.35E-1
HE-SV-3-OPEN	2.16E-2	4.56E-2	2.66E-5	9.70E-3	1.29E-1	4.28E-11	7.67E-1
MF-AIR-CELL-LK	3.93E-1	3.69E-1	1.85E-2	2.31E-1	7.77E-1	1.62E-3	9.91E-1
MF-AR-CELL-LK	3.93E-1	3.65E-1	1.80E-2	2.33E-1	7.72E-1	1.67E-3	9.87E-1
MF-SV-1-FFD	6.49E-1	5.66E-1	5.23E-2	5.00E-1	9.15E-1	3.40E-3	9.99E-1
MF-SV-3-FFD	6.49E-1	5.69E-1	6.06E-2	5.03E-1	9.19E-1	4.87E-3	9.97E-1
MF-VP-1-LK	1.23E-3	3.00E-3	1.30E-4	1.21E-3	6.83E-3	7.13E-6	7.34E-2

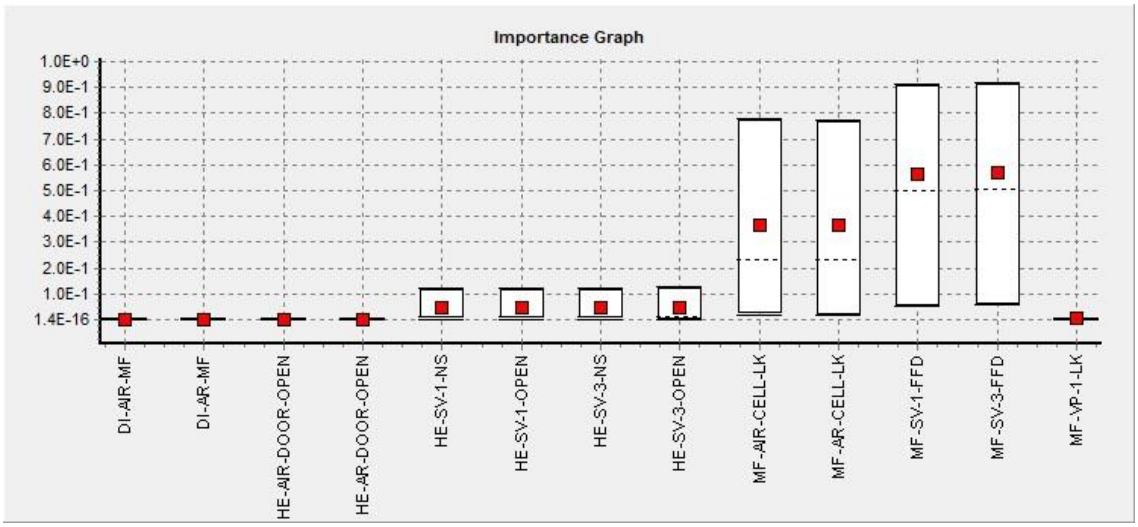


Figure 173: Importance graph for the basic system with door interlocks, Bruce A fault rate, and diagnostic HE and SV_OM.

Table 168: FV Results for Basic System w/ Door Interlocks, Bruce A Fault Rate, and Diagnostic HE and SV_OH

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	7.29E-4	1.33E-3	2.25E-7	8.12E-5	2.70E-3	3.41E-11	1.15E-1
DI-AR-MF	7.29E-4	1.27E-3	1.65E-7	8.73E-5	2.54E-3	1.94E-12	1.51E-1
HE-AIR-DOOR-OPEN	7.29E-4	1.33E-3	2.25E-7	8.12E-5	2.70E-3	3.41E-11	1.15E-1
HE-AR-DOOR-OPEN	7.29E-4	1.27E-3	1.65E-7	8.73E-5	2.54E-3	1.94E-12	1.51E-1
HE-SV-1-NS	1.46E-2	2.58E-2	1.47E-5	5.52E-3	6.87E-2	1.59E-13	7.85E-1
HE-SV-1-OPEN	1.46E-2	2.70E-2	2.00E-5	5.64E-3	7.13E-2	2.96E-12	6.19E-1
HE-SV-3-NS	1.46E-2	2.65E-2	1.51E-5	5.49E-3	6.99E-2	2.13E-14	6.03E-1
HE-SV-3-OPEN	1.46E-2	2.66E-2	1.59E-5	5.77E-3	7.00E-2	2.78E-11	6.60E-1
MF-AIR-CELL-LK	2.63E-1	2.44E-1	1.05E-2	1.19E-1	5.88E-1	9.73E-4	9.84E-1
MF-AR-CELL-LK	2.63E-1	2.41E-1	1.03E-2	1.19E-1	5.78E-1	9.41E-4	9.65E-1
MF-SV-1-FFD	9.19E-1	7.70E-1	1.78E-1	7.93E-1	9.78E-1	1.34E-2	1.00E+0
MF-SV-3-FFD	9.19E-1	7.72E-1	2.03E-1	7.95E-1	9.78E-1	1.90E-2	1.00E+0
MF-VP-1-LK	4.62E-4	1.03E-3	3.95E-5	3.82E-4	2.33E-3	1.62E-6	3.86E-2

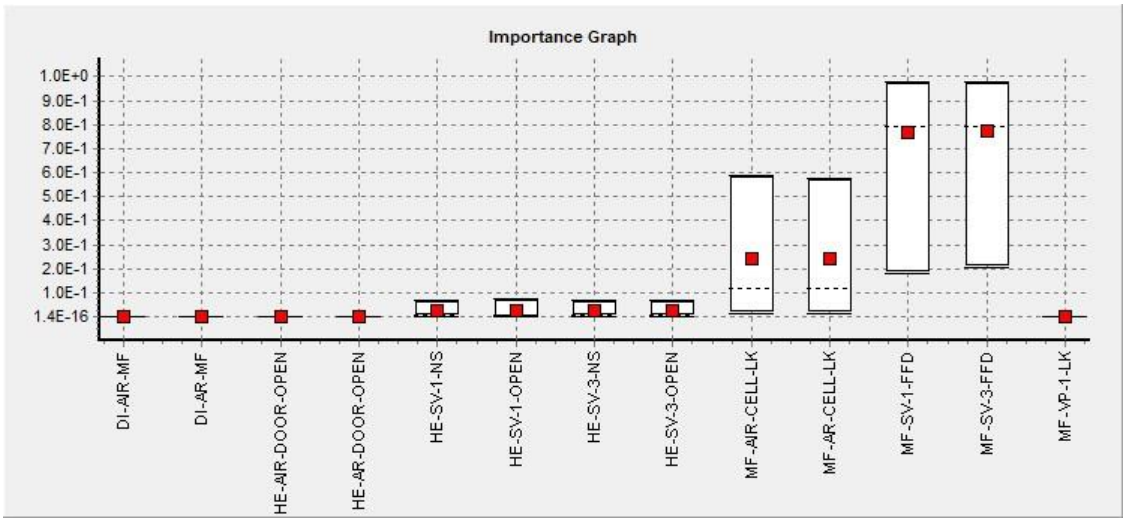


Figure 174: Importance graph for the basic system with door interlocks, Bruce A fault rate, and diagnostic HE and SV_OH.

Table 169: FV Results for Basic System w/ Door Interlocks, Bruce A Fault Rate, and Diagnostic HE and SV_DOW

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	2.36E-3	6.36E-3	9.65E-7	3.62E-4	1.33E-2	1.48E-10	5.20E-1
DI-AR-MF	2.36E-3	6.11E-3	6.36E-7	3.64E-4	1.31E-2	1.38E-11	6.84E-1
HE-AIR-DOOR-OPEN	2.36E-3	6.36E-3	9.65E-7	3.62E-4	1.33E-2	1.48E-10	5.20E-1
HE-AR-DOOR-OPEN	2.36E-3	6.11E-3	6.36E-7	3.64E-4	1.31E-2	1.38E-11	6.84E-1
HE-SV-1-NS	4.72E-2	1.05E-1	6.87E-5	2.46E-2	3.07E-1	3.76E-13	9.38E-1
HE-SV-1-OPEN	4.72E-2	1.08E-1	8.26E-5	2.58E-2	3.16E-1	4.68E-12	9.29E-1
HE-SV-3-NS	4.72E-2	1.06E-1	6.81E-5	2.43E-2	3.14E-1	1.40E-13	9.20E-1
HE-SV-3-OPEN	4.72E-2	1.09E-1	7.06E-5	2.60E-2	3.23E-1	6.23E-11	9.28E-1
MF-AIR-CELL-LK	8.80E-1	7.15E-1	1.47E-1	7.18E-1	9.62E-1	1.18E-2	9.99E-1
MF-AR-CELL-LK	8.80E-1	7.10E-1	1.49E-1	7.08E-1	9.61E-1	1.33E-2	9.98E-1
MF-SV-1-FFD	2.63E-2	6.12E-2	7.80E-4	1.44E-2	1.62E-1	4.37E-5	9.12E-1
MF-SV-3-FFD	2.63E-2	6.30E-2	9.06E-4	1.46E-2	1.69E-1	6.65E-5	9.21E-1
MF-VP-1-LK	6.61E-3	1.69E-2	2.02E-3	8.73E-3	3.55E-2	1.02E-4	3.93E-1

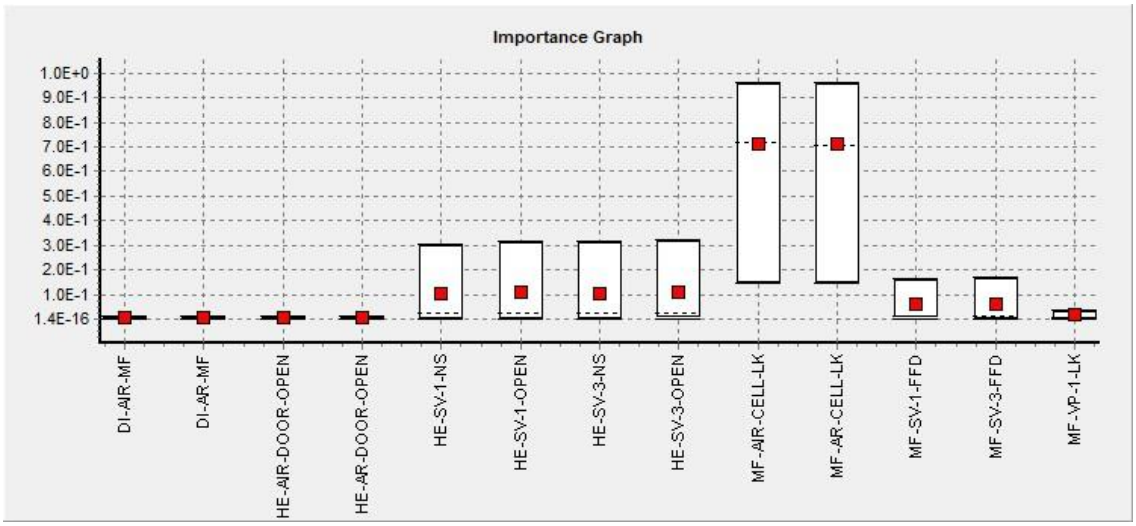


Figure 175: Importance graph for the basic system with door interlocks, Bruce A fault rate, and diagnostic HE and SV_DOW.

Table 170: FV Results for Basic System w/ Door Interlocks, Bruce A Fault Rate, and Diagnostic HE and SV_MAN

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR-MF	2.42E-3	7.00E-3	1.01E-6	3.88E-4	1.45E-2	1.52E-10	5.40E-1
DI-AR-MF	2.42E-3	6.76E-3	6.72E-7	3.87E-4	1.47E-2	1.47E-11	6.95E-1
HE-AIR-DOOR-OPEN	2.42E-3	7.00E-3	1.01E-6	3.88E-4	1.45E-2	1.52E-10	5.40E-1
HE-AR-DOOR-OPEN	2.42E-3	6.76E-3	6.72E-7	3.87E-4	1.47E-2	1.47E-11	6.95E-1
HE-SV-1-NS	4.83E-2	1.13E-1	7.04E-5	2.60E-2	3.34E-1	3.58E-13	9.44E-1
HE-SV-1-OPEN	4.83E-2	1.16E-1	8.74E-5	2.74E-2	3.43E-1	4.68E-12	9.44E-1
HE-SV-3-NS	4.83E-2	1.15E-1	7.12E-5	2.59E-2	3.37E-1	1.53E-13	9.40E-1
HE-SV-3-OPEN	4.83E-2	1.18E-1	7.45E-5	2.75E-2	3.52E-1	6.27E-11	9.42E-1
MF-AIR-CELL-LK	9.02E-1	7.54E-1	1.77E-1	7.75E-1	9.74E-1	1.21E-2	9.99E-1
MF-AR-CELL-LK	9.02E-1	7.50E-1	1.76E-1	7.65E-1	9.75E-1	2.72E-2	9.99E-1
MF-SV-1-FFD	6.54E-4	2.22E-3	1.88E-5	3.53E-4	4.67E-3	1.05E-6	2.01E-1
MF-SV-3-FFD	6.54E-4	2.32E-3	2.20E-5	3.58E-4	4.94E-3	1.59E-6	2.31E-1
MF-VP-1-LK	6.94E-3	2.01E-2	2.19E-3	1.00E-2	4.24E-2	2.22E-4	4.12E-1

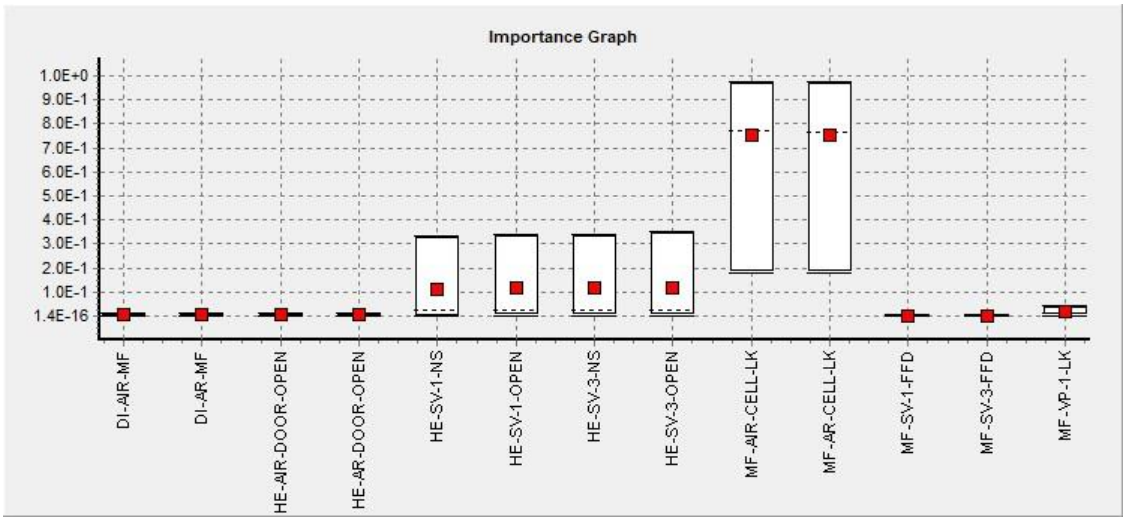


Figure 176: Importance graph for the basic system with door interlocks, Bruce A fault rate, and diagnostic HE and SV_MAN.

Table 171: FV Results for Basic System w/ Door Interlocks, Bruce A Fault Rate, and Diagnostic HE and SV_NRPD

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
DI-AIR-MF	1.59E-3	3.54E-3	5.35E-7	2.05E-4	7.57E-3	9.79E-11	3.51E-1
DI-AR-MF	1.59E-3	3.42E-3	3.80E-7	2.13E-4	6.98E-3	6.14E-12	4.99E-1
HE-AIR-DOOR-OPEN	1.59E-3	3.54E-3	5.35E-7	2.05E-4	7.57E-3	9.79E-11	3.51E-1
HE-AR-DOOR-OPEN	1.59E-3	3.42E-3	3.80E-7	2.13E-4	6.98E-3	6.14E-12	4.99E-1
HE-SV-1-NS	3.17E-2	6.33E-2	3.61E-5	1.38E-2	1.81E-1	3.12E-13	9.07E-1
HE-SV-1-OPEN	3.17E-2	6.51E-2	4.95E-5	1.44E-2	1.82E-1	4.47E-12	8.37E-1
HE-SV-3-NS	3.17E-2	6.41E-2	4.11E-5	1.38E-2	1.82E-1	5.91E-14	8.07E-1
HE-SV-3-OPEN	3.17E-2	6.54E-2	3.98E-5	1.43E-2	1.88E-1	5.37E-11	7.96E-1
MF-AIR-CELL-LK	5.82E-1	4.86E-1	3.53E-2	3.85E-1	8.70E-1	2.95E-3	9.94E-1
MF-AR-CELL-LK	5.82E-1	4.83E-1	3.40E-2	3.81E-1	8.69E-1	1.93E-3	9.94E-1
MF-SV-1-FFD	3.88E-1	3.92E-1	1.85E-2	2.57E-1	8.07E-1	1.12E-3	9.95E-1
MF-SV-3-FFD	3.88E-1	3.95E-1	2.14E-2	2.60E-1	8.19E-1	1.66E-3	9.93E-1
MF-VP-1-LK	2.86E-3	6.06E-3	3.80E-4	2.84E-3	1.33E-2	1.70E-5	1.67E-1

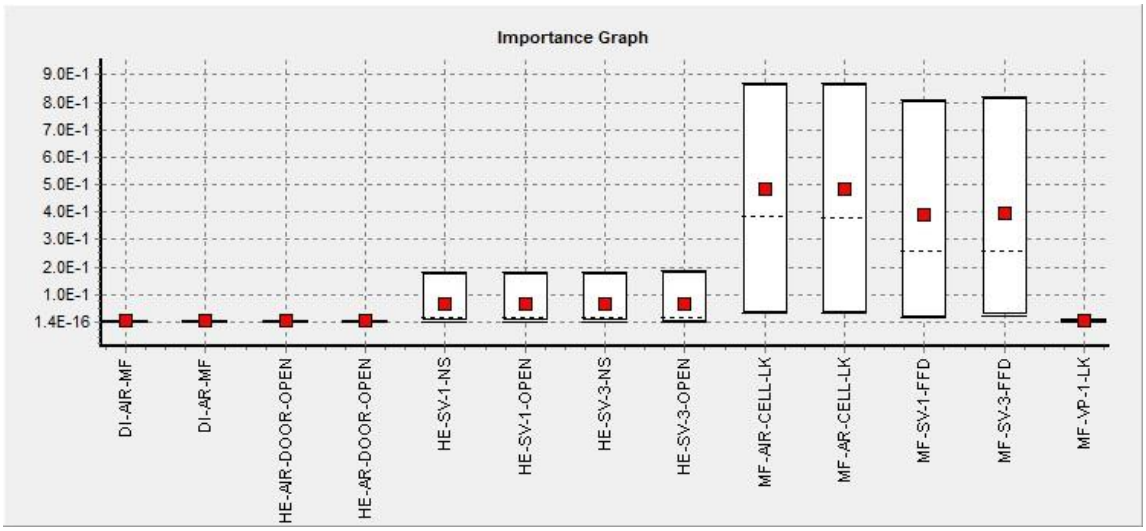


Figure 177: Importance graph for the basic system with door interlocks, Bruce A fault rate, and diagnostic HE and SV_NRPD.

Table 172: FV Results for Extended System

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	7.79E-3	1.33E-2	9.69E-6	2.89E-3	3.51E-2	1.61E-12	3.61E-1
HE-AR-OP	7.80E-3	1.36E-2	9.80E-6	2.78E-3	3.59E-2	2.79E-11	4.30E-1
HE-SV-B-LO	2.12E-3	2.97E-3	1.87E-6	6.65E-4	7.98E-3	1.03E-12	8.37E-2
HE-SV-B-OP	2.12E-3	2.99E-3	2.44E-6	6.50E-4	7.93E-3	9.57E-10	7.96E-2
HE-SV-C-LO	2.12E-3	2.95E-3	2.23E-6	6.22E-4	7.97E-3	1.47E-10	7.84E-2
HE-SV-C-OP	2.12E-3	2.89E-3	2.15E-6	6.18E-4	7.91E-3	2.29E-11	8.42E-2
HE-SV-D-LO	2.12E-3	3.01E-3	2.08E-6	6.74E-4	7.94E-3	6.81E-12	1.09E-1
HE-SV-D-OP	2.12E-3	2.88E-3	2.60E-6	6.32E-4	7.68E-3	9.28E-14	9.82E-2
HE-SV-E-LO	2.12E-3	3.02E-3	2.63E-6	6.46E-4	8.13E-3	5.16E-11	7.22E-2
HE-SV-E-OP	2.12E-3	2.90E-3	2.30E-6	6.51E-4	7.87E-3	4.29E-13	7.09E-2
MF-AIR-LK	3.53E-1	2.99E-1	1.38E-2	1.70E-1	6.86E-1	7.82E-4	9.87E-1
MF-AR-LK	3.53E-1	3.03E-1	1.41E-2	1.75E-1	6.85E-1	4.99E-4	9.82E-1
MF-SV-A-FS	6.20E-4	9.39E-4	1.48E-5	2.43E-4	2.23E-3	8.91E-7	5.70E-2
MF-SV-A-LK	3.55E-5	5.86E-5	7.69E-7	1.42E-5	1.36E-4	6.59E-8	9.72E-3
MF-SV-A-RP	5.14E-6	8.16E-6	2.41E-8	8.52E-7	1.68E-5	6.56E-10	1.60E-3
MF-SV-B-FS	5.35E-1	5.70E-1	1.09E-1	5.43E-1	8.24E-1	9.39E-3	9.41E-1
MF-SV-B-LK	3.07E-2	4.20E-2	4.74E-3	2.41E-2	8.77E-2	5.00E-4	4.71E-1
MF-SV-B-RP	4.45E-3	6.12E-3	1.02E-4	1.36E-3	1.44E-2	3.68E-6	3.10E-1
MF-SV-C-FS	5.35E-1	5.70E-1	1.10E-1	5.42E-1	8.24E-1	8.25E-3	9.50E-1
MF-SV-C-LK	3.07E-2	4.19E-2	4.38E-3	2.39E-2	8.78E-2	3.10E-4	4.85E-1
MF-SV-C-RP	4.45E-3	6.05E-3	9.23E-5	1.43E-3	1.38E-2	7.61E-6	2.63E-1
MF-SV-D-FS	5.35E-1	5.69E-1	1.06E-1	5.43E-1	8.25E-1	9.50E-3	9.43E-1
MF-SV-D-LK	3.07E-2	4.13E-2	4.46E-3	2.37E-2	8.83E-2	5.44E-4	4.46E-1

Name	Point Est.	Mean	5th	50th	95th	Min	Max
MF-SV-D-RP	4.45E-3	5.71E-3	1.03E-4	1.33E-3	1.30E-2	2.24E-6	4.18E-1
MF-SV-E-FS	5.35E-1	5.68E-1	1.04E-1	5.41E-1	8.22E-1	1.50E-2	9.52E-1
MF-SV-E-LK	3.07E-2	4.17E-2	4.64E-3	2.39E-2	8.71E-2	4.96E-4	3.66E-1
MF-SV-E-RP	4.45E-3	6.39E-3	1.01E-4	1.35E-3	1.40E-2	2.40E-6	7.29E-1
MF-VP-A-LK	6.61E-4	1.01E-3	1.67E-5	2.67E-4	2.38E-3	1.01E-6	6.68E-2
SV-B-C_CCF	6.96E-2	6.52E-2	1.48E-2	5.64E-2	1.04E-1	1.79E-3	2.17E-1
SV-D-E_CCF	6.96E-2	6.46E-2	1.46E-2	5.51E-2	1.03E-1	2.02E-3	2.33E-1

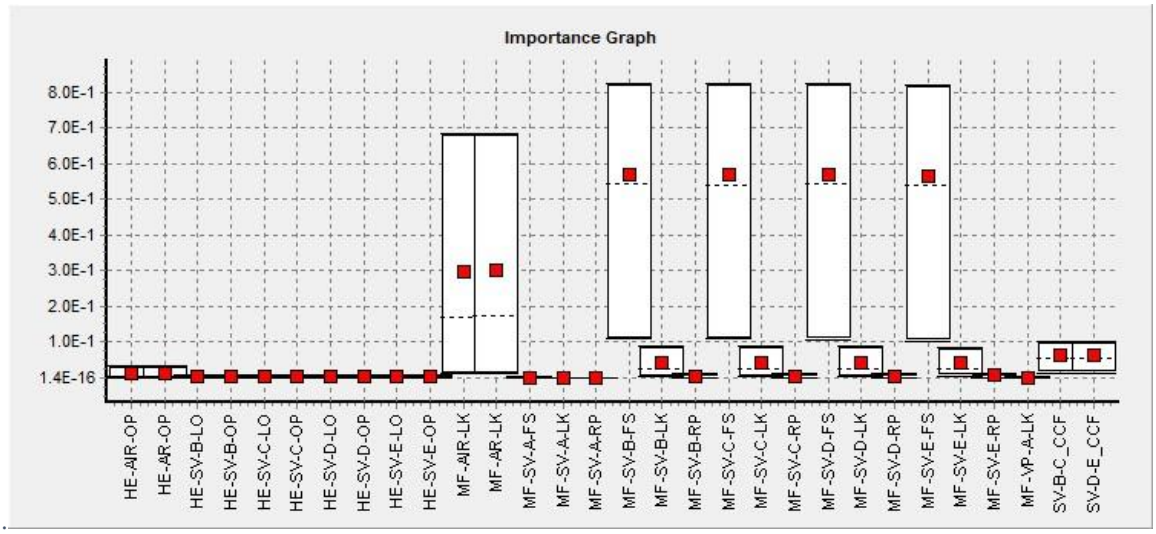


Figure 178: Importance graph for extended system.

Table 173: FV Results for Extended System and SV_OL

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	2.15E-2	7.65E-2	3.23E-5	1.14E-2	2.31E-1	2.58E-10	9.57E-1
HE-AR-OP	2.15E-2	8.03E-2	3.87E-5	1.26E-2	2.39E-1	6.86E-11	9.63E-1
HE-SV-B-LO	1.71E-4	8.12E-4	1.02E-7	4.72E-5	1.55E-3	0.00E+0	1.57E-1
HE-SV-B-OP	1.71E-4	8.27E-4	1.27E-7	4.82E-5	1.62E-3	0.00E+0	2.30E-1
HE-SV-C-LO	1.71E-4	8.99E-4	1.39E-7	4.69E-5	1.61E-3	0.00E+0	2.10E-1
HE-SV-C-OP	1.71E-4	8.21E-4	1.27E-7	5.01E-5	1.65E-3	2.70E-11	1.30E-1
HE-SV-D-LO	1.71E-4	8.55E-4	1.21E-7	4.60E-5	1.62E-3	5.42E-13	1.12E-1
HE-SV-D-OP	1.71E-4	7.70E-4	1.59E-7	4.91E-5	1.61E-3	1.58E-12	8.61E-2
HE-SV-E-LO	1.71E-4	8.35E-4	9.62E-8	4.54E-5	1.60E-3	8.67E-13	3.27E-1
HE-SV-E-OP	1.71E-4	8.38E-4	1.20E-7	4.75E-5	1.70E-3	6.08E-13	1.60E-1
MF-AIR-LK	9.76E-1	9.15E-1	4.73E-1	9.57E-1	9.98E-1	2.94E-2	1.00E+0
MF-AR-LK	9.77E-1	9.12E-1	4.50E-1	9.52E-1	9.98E-1	2.97E-2	1.00E+0
MF-SV-A-FFD	1.12E-4	5.36E-4	1.61E-6	4.90E-5	1.00E-3	9.07E-8	1.17E-1
MF-SV-B-FFD	1.01E-3	4.29E-3	8.41E-6	3.28E-4	8.31E-3	2.32E-7	3.90E-1
MF-SV-C-FFD	1.01E-3	4.21E-3	8.20E-6	3.36E-4	7.76E-3	1.29E-7	3.65E-1
MF-SV-D-FFD	1.01E-3	4.64E-3	7.66E-6	3.29E-4	8.42E-3	1.19E-7	7.29E-1
MF-SV-E-FFD	1.01E-3	4.59E-3	8.16E-6	3.25E-4	8.37E-3	1.61E-7	7.32E-1
MF-VP-A-LK	1.12E-4	5.36E-4	1.61E-6	4.90E-5	1.00E-3	9.07E-8	1.17E-1
SV-B-C_CCF	6.08E-4	2.06E-3	5.29E-5	5.83E-4	4.56E-3	5.41E-6	1.25E-1
SV-D-E_CCF	6.08E-4	1.97E-3	5.41E-5	5.96E-4	4.61E-3	6.62E-6	7.56E-2

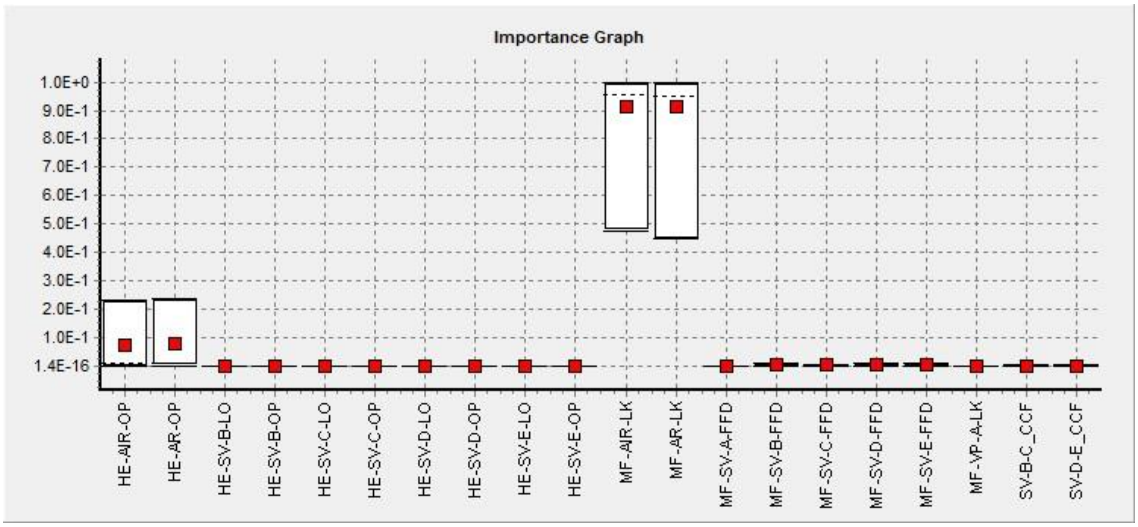


Figure 179: Importance graph for extended system and SV_OL.

Table 174: FV Results for Extended System and SV_OM

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	5.99E-3	2.72E-2	1.13E-5	3.81E-3	7.15E-2	5.29E-11	8.19E-1
HE-AR-OP	6.00E-3	2.83E-2	1.40E-5	3.98E-3	7.73E-2	6.12E-11	7.57E-1
HE-SV-B-LO	2.09E-3	4.18E-3	1.31E-6	5.50E-4	1.07E-2	6.13E-15	1.79E-1
HE-SV-B-OP	2.09E-3	4.35E-3	1.74E-6	5.58E-4	1.03E-2	2.82E-12	4.16E-1
HE-SV-C-LO	2.09E-3	4.51E-3	1.76E-6	5.78E-4	1.08E-2	2.36E-12	2.12E-1
HE-SV-C-OP	2.09E-3	4.49E-3	1.56E-6	5.98E-4	1.09E-2	7.75E-10	3.24E-1
HE-SV-D-LO	2.09E-3	4.30E-3	1.66E-6	5.38E-4	1.06E-2	7.36E-12	4.00E-1
HE-SV-D-OP	2.09E-3	4.29E-3	2.31E-6	5.73E-4	1.06E-2	4.86E-11	2.82E-1
HE-SV-E-LO	2.09E-3	4.19E-3	1.37E-6	5.27E-4	1.05E-2	2.93E-11	2.22E-1
HE-SV-E-OP	2.09E-3	4.34E-3	1.59E-6	5.60E-4	1.07E-2	3.74E-11	2.70E-1
MF-AIR-LK	2.71E-1	4.60E-1	1.55E-2	3.10E-1	9.12E-1	4.05E-4	9.99E-1
MF-AR-LK	2.72E-1	4.64E-1	1.46E-2	3.16E-1	9.17E-1	6.90E-4	9.99E-1
MF-SV-A-FFD	5.02E-4	3.03E-3	7.45E-6	3.44E-4	7.05E-3	6.93E-8	3.76E-1
MF-SV-B-FFD	7.24E-1	5.02E-1	1.40E-2	3.77E-1	9.28E-1	3.62E-4	9.97E-1
MF-SV-C-FFD	7.24E-1	5.01E-1	1.39E-2	3.76E-1	9.26E-1	2.83E-4	9.96E-1
MF-SV-D-FFD	7.24E-1	5.00E-1	1.30E-2	3.72E-1	9.31E-1	4.19E-4	9.98E-1
MF-SV-E-FFD	7.24E-1	5.00E-1	1.27E-2	3.73E-1	9.31E-1	6.67E-4	9.98E-1
MF-VP-A-LK	5.02E-4	3.03E-3	7.45E-6	3.44E-4	7.05E-3	6.93E-8	3.76E-1
SV-B-C_CCF	1.69E-4	5.62E-4	2.49E-5	1.99E-4	1.32E-3	3.92E-6	2.40E-2
SV-D-E_CCF	1.69E-4	5.64E-4	2.53E-5	1.99E-4	1.30E-3	5.93E-6	2.86E-2

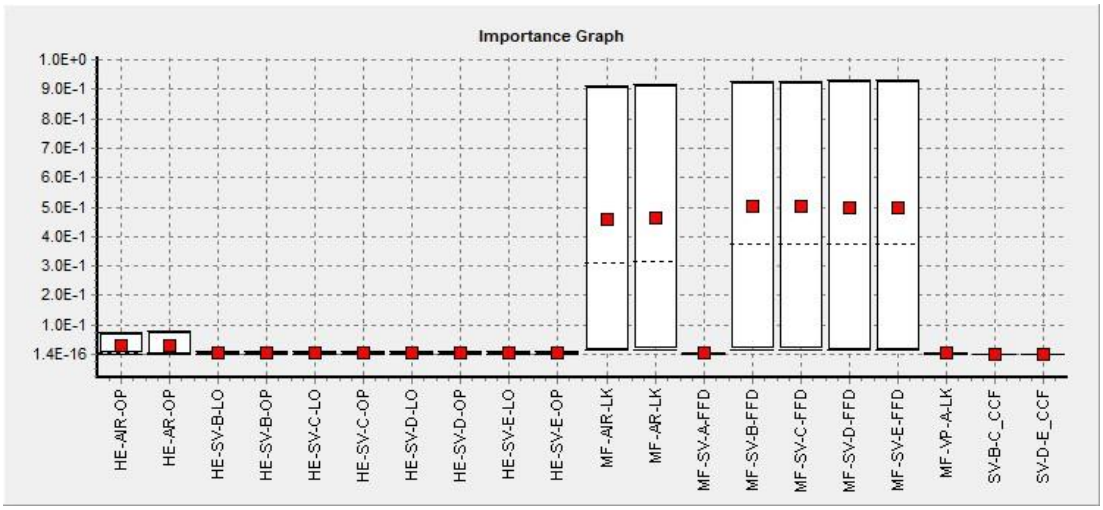


Figure 180: Importance graph for extended system and SV_OM.

Table 175: FV Results for Extended System and SV_OH

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	1.51E-3	8.67E-3	3.57E-6	1.14E-3	2.04E-2	1.33E-11	4.47E-1
HE-AR-OP	1.51E-3	9.05E-3	4.54E-6	1.20E-3	2.30E-2	2.72E-11	4.46E-1
HE-SV-B-LO	1.22E-3	2.77E-3	1.26E-6	4.70E-4	6.71E-3	2.85E-15	1.16E-1
HE-SV-B-OP	1.22E-3	2.88E-3	1.71E-6	4.84E-4	6.65E-3	3.00E-12	2.69E-1
HE-SV-C-LO	1.22E-3	2.92E-3	1.73E-6	4.90E-4	6.85E-3	2.07E-12	2.37E-1
HE-SV-C-OP	1.22E-3	2.92E-3	1.38E-6	5.01E-4	6.98E-3	1.36E-9	3.14E-1
HE-SV-D-LO	1.22E-3	2.87E-3	1.59E-6	4.57E-4	6.74E-3	5.14E-12	2.08E-1
HE-SV-D-OP	1.22E-3	2.88E-3	2.05E-6	4.92E-4	6.56E-3	5.87E-11	2.10E-1
HE-SV-E-LO	1.22E-3	2.80E-3	1.30E-6	4.56E-4	6.92E-3	1.29E-11	1.59E-1
HE-SV-E-OP	1.22E-3	2.83E-3	1.51E-6	4.76E-4	6.83E-3	3.50E-11	1.43E-1
MF-AIR-LK	6.84E-2	2.03E-1	3.77E-3	6.75E-2	5.78E-1	1.99E-4	9.92E-1
MF-AR-LK	6.84E-2	2.05E-1	3.78E-3	6.72E-2	5.91E-1	2.33E-4	9.92E-1
MF-SV-A-FFD	7.05E-5	8.25E-4	1.99E-6	7.79E-5	1.74E-3	2.77E-8	1.32E-1
MF-SV-B-FFD	9.60E-1	7.90E-1	1.41E-1	8.34E-1	9.85E-1	4.35E-3	9.99E-1
MF-SV-C-FFD	9.60E-1	7.90E-1	1.41E-1	8.35E-1	9.85E-1	4.05E-3	9.99E-1
MF-SV-D-FFD	9.60E-1	7.87E-1	1.35E-1	8.37E-1	9.86E-1	5.64E-3	1.00E+0
MF-SV-E-FFD	9.60E-1	7.87E-1	1.35E-1	8.37E-1	9.86E-1	7.74E-3	9.99E-1
MF-VP-A-LK	7.05E-5	8.25E-4	1.99E-6	7.79E-5	1.74E-3	2.77E-8	1.32E-1
SV-B-C_CCF	4.26E-5	1.64E-4	1.03E-5	5.57E-5	3.88E-4	2.48E-6	5.73E-3
SV-D-E_CCF	4.26E-5	1.70E-4	1.07E-5	5.59E-5	3.80E-4	3.81E-6	1.27E-2

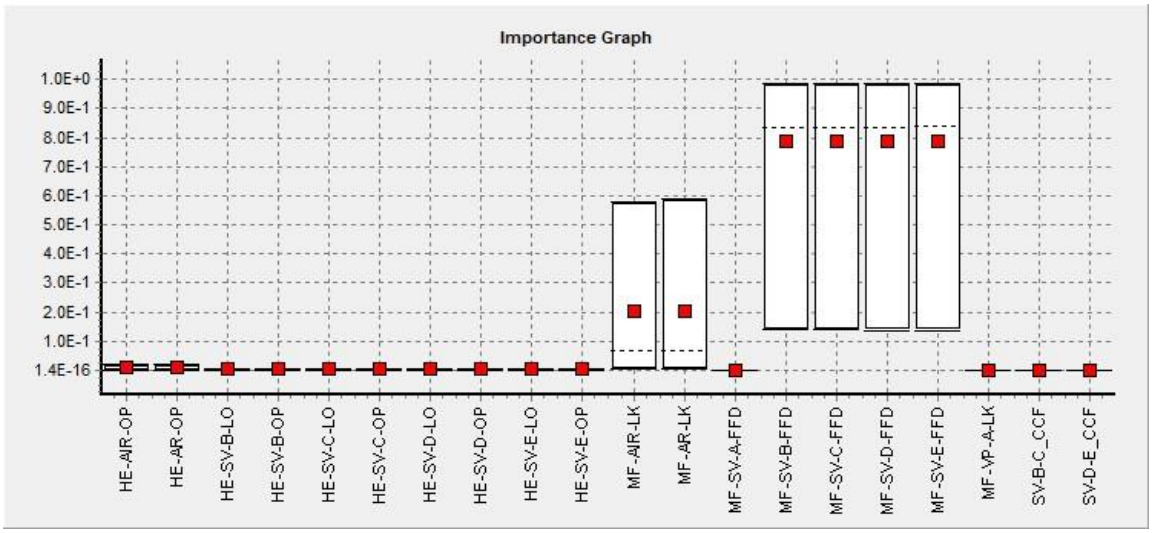


Figure 181: Importance graph for extended system and SV_OH.

Table 176: FV Results for Extended System and SV_DOW

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	2.15E-2	7.64E-2	3.23E-5	1.14E-2	2.30E-1	2.58E-10	9.57E-1
HE-AR-OP	2.15E-2	8.02E-2	3.87E-5	1.26E-2	2.39E-1	6.86E-11	9.63E-1
HE-SV-B-LO	1.75E-4	8.30E-4	1.04E-7	4.81E-5	1.58E-3	0.00E+0	1.61E-1
HE-SV-B-OP	1.75E-4	8.45E-4	1.29E-7	4.91E-5	1.65E-3	0.00E+0	2.35E-1
HE-SV-C-LO	1.75E-4	9.19E-4	1.41E-7	4.78E-5	1.65E-3	0.00E+0	2.13E-1
HE-SV-C-OP	1.75E-4	8.40E-4	1.30E-7	5.12E-5	1.69E-3	2.73E-11	1.33E-1
HE-SV-D-LO	1.75E-4	8.75E-4	1.22E-7	4.71E-5	1.66E-3	5.42E-13	1.14E-1
HE-SV-D-OP	1.75E-4	7.88E-4	1.62E-7	4.99E-5	1.65E-3	1.62E-12	8.84E-2
HE-SV-E-LO	1.75E-4	8.54E-4	9.67E-8	4.63E-5	1.63E-3	8.67E-13	3.33E-1
HE-SV-E-OP	1.75E-4	8.57E-4	1.21E-7	4.82E-5	1.73E-3	6.08E-13	1.64E-1
MF-AIR-LK	9.76E-1	9.15E-1	4.73E-1	9.56E-1	9.98E-1	2.94E-2	1.00E+0
MF-AR-LK	9.76E-1	9.11E-1	4.49E-1	9.52E-1	9.98E-1	2.97E-2	1.00E+0
MF-SV-A-FFD	1.15E-4	5.53E-4	1.66E-6	5.06E-5	1.03E-3	9.38E-8	1.20E-1
MF-SV-B-FFD	1.07E-3	4.52E-3	8.85E-6	3.45E-4	8.77E-3	2.43E-7	4.04E-1
MF-SV-C-FFD	1.07E-3	4.43E-3	8.66E-6	3.54E-4	8.20E-3	1.37E-7	3.80E-1
MF-SV-D-FFD	1.07E-3	4.88E-3	8.00E-6	3.47E-4	8.85E-3	1.27E-7	7.41E-1
MF-SV-E-FFD	1.07E-3	4.83E-3	8.52E-6	3.42E-4	8.78E-3	1.72E-7	7.43E-1
MF-VP-A-LK	1.15E-4	5.53E-4	1.66E-6	5.06E-5	1.03E-3	9.38E-8	1.20E-1
SV-B-C_CCF	6.08E-4	2.05E-3	5.29E-5	5.83E-4	4.56E-3	5.41E-6	1.25E-1
SV-D-E_CCF	6.08E-4	1.97E-3	5.41E-5	5.96E-4	4.61E-3	6.62E-6	7.55E-2

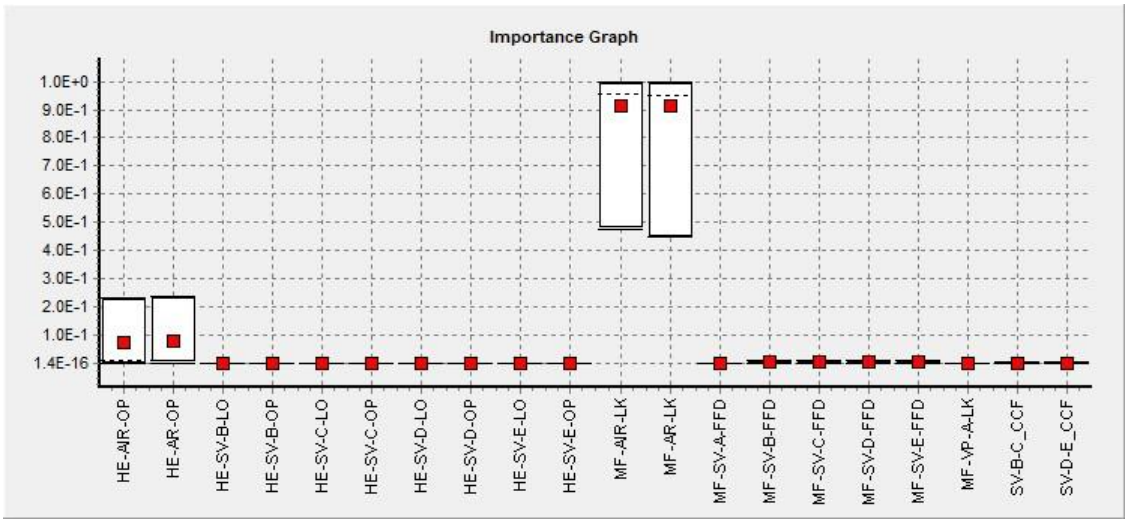


Figure 182: Importance graph for extended system and SV_DOW.

Table 177: FV Results for Extended System and SV_MAN

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	2.16E-2	7.73E-2	3.23E-5	1.15E-2	2.33E-1	2.58E-10	9.65E-1
HE-AR-OP	2.16E-2	8.12E-2	3.87E-5	1.26E-2	2.42E-1	6.86E-11	9.65E-1
HE-SV-B-LO	4.63E-5	2.52E-4	2.78E-8	1.37E-5	4.90E-4	0.00E+0	6.68E-2
HE-SV-B-OP	4.63E-5	2.55E-4	4.21E-8	1.40E-5	4.98E-4	0.00E+0	4.49E-2
HE-SV-C-LO	4.63E-5	2.67E-4	3.98E-8	1.40E-5	4.84E-4	0.00E+0	1.10E-1
HE-SV-C-OP	4.63E-5	2.43E-4	3.47E-8	1.39E-5	5.07E-4	1.25E-11	4.37E-2
HE-SV-D-LO	4.63E-5	2.36E-4	3.42E-8	1.31E-5	4.89E-4	3.21E-13	5.62E-2
HE-SV-D-OP	4.63E-5	2.22E-4	4.14E-8	1.44E-5	4.89E-4	7.50E-13	2.14E-2
HE-SV-E-LO	4.63E-5	2.33E-4	2.53E-8	1.36E-5	4.75E-4	0.00E+0	6.09E-2
HE-SV-E-OP	4.63E-5	2.27E-4	3.50E-8	1.39E-5	4.81E-4	0.00E+0	2.14E-2
MF-AIR-LK	9.78E-1	9.20E-1	4.82E-1	9.62E-1	9.98E-1	2.96E-2	1.00E+0
MF-AR-LK	9.78E-1	9.16E-1	4.58E-1	9.57E-1	9.99E-1	2.98E-2	1.00E+0
MF-SV-A-FFD	2.81E-6	1.41E-5	4.03E-8	1.24E-6	2.57E-5	2.27E-9	3.40E-3
MF-SV-B-FFD	6.90E-6	3.65E-5	5.00E-8	2.40E-6	6.51E-5	1.91E-9	1.20E-2
MF-SV-C-FFD	6.90E-6	3.37E-5	4.65E-8	2.49E-6	5.85E-5	5.60E-10	7.42E-3
MF-SV-D-FFD	6.90E-6	3.77E-5	4.85E-8	2.41E-6	6.48E-5	2.08E-10	1.31E-2
MF-SV-E-FFD	6.90E-6	3.53E-5	4.94E-8	2.41E-6	6.12E-5	6.18E-10	5.49E-3
MF-VP-A-LK	2.81E-6	1.41E-5	4.03E-8	1.24E-6	2.57E-5	2.27E-9	3.40E-3
SV-B-C_CCF	6.08E-4	2.10E-3	5.29E-5	5.84E-4	4.63E-3	5.42E-6	1.28E-1
SV-D-E_CCF	6.08E-4	2.01E-3	5.41E-5	5.98E-4	4.66E-3	6.62E-6	7.86E-2

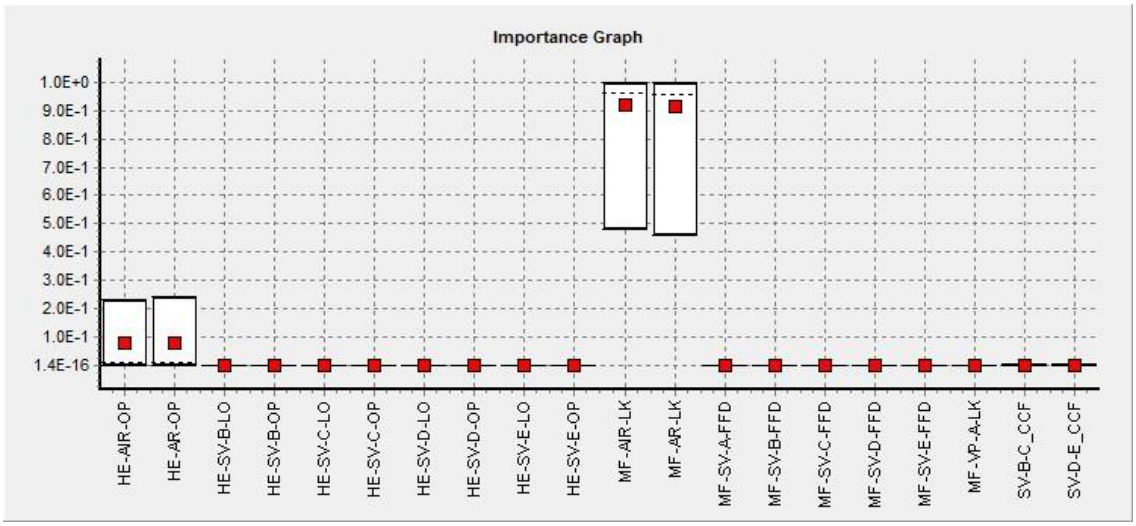


Figure 183: Importance graph for extended system and SV_MAN.

Table 178: FV Results for Extended System and SV_NRPD

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	1.54E-2	4.88E-2	2.26E-5	7.56E-3	1.36E-1	2.57E-10	8.69E-1
HE-AR-OP	1.54E-2	5.11E-2	2.80E-5	8.22E-3	1.43E-1	6.76E-11	9.31E-1
HE-SV-B-LO	2.10E-3	4.12E-3	8.74E-7	3.98E-4	1.03E-2	0.00E+0	2.30E-1
HE-SV-B-OP	2.10E-3	4.28E-3	9.86E-7	4.14E-4	1.02E-2	1.18E-12	3.11E-1
HE-SV-C-LO	2.10E-3	4.55E-3	1.28E-6	4.08E-4	1.12E-2	1.64E-12	2.96E-1
HE-SV-C-OP	2.10E-3	4.47E-3	1.05E-6	4.34E-4	1.06E-2	3.03E-10	3.21E-1
HE-SV-D-LO	2.10E-3	4.28E-3	1.06E-6	3.83E-4	1.04E-2	4.78E-12	4.68E-1
HE-SV-D-OP	2.10E-3	4.14E-3	1.42E-6	4.15E-4	1.02E-2	2.07E-11	1.97E-1
HE-SV-E-LO	2.10E-3	4.14E-3	9.28E-7	3.82E-4	1.02E-2	1.59E-11	2.59E-1
HE-SV-E-OP	2.10E-3	4.28E-3	9.54E-7	3.94E-4	1.08E-2	1.44E-11	4.30E-1
MF-AIR-LK	6.97E-1	6.90E-1	7.10E-2	6.92E-1	9.77E-1	1.80E-3	1.00E+0
MF-AR-LK	6.98E-1	6.91E-1	6.37E-2	6.94E-1	9.78E-1	2.85E-3	1.00E+0
MF-SV-A-FFD	1.29E-3	4.02E-3	1.53E-5	4.99E-4	8.72E-3	1.54E-7	3.29E-1
MF-SV-B-FFD	2.83E-1	2.48E-1	1.93E-3	8.06E-2	7.04E-1	6.00E-5	9.92E-1
MF-SV-C-FFD	2.83E-1	2.47E-1	1.90E-3	7.95E-2	6.99E-1	3.49E-5	9.92E-1
MF-SV-D-FFD	2.83E-1	2.49E-1	1.73E-3	7.83E-2	7.09E-1	5.85E-5	9.93E-1
MF-SV-E-FFD	2.83E-1	2.49E-1	1.77E-3	7.92E-2	7.09E-1	8.34E-5	9.93E-1
MF-VP-A-LK	1.29E-3	4.02E-3	1.53E-5	4.99E-4	8.72E-3	1.54E-7	3.29E-1
SV-B-C_CCF	4.34E-4	1.11E-3	4.32E-5	3.90E-4	2.55E-3	4.97E-6	4.98E-2
SV-D-E_CCF	4.34E-4	1.09E-3	4.44E-5	3.94E-4	2.48E-3	6.62E-6	5.13E-2

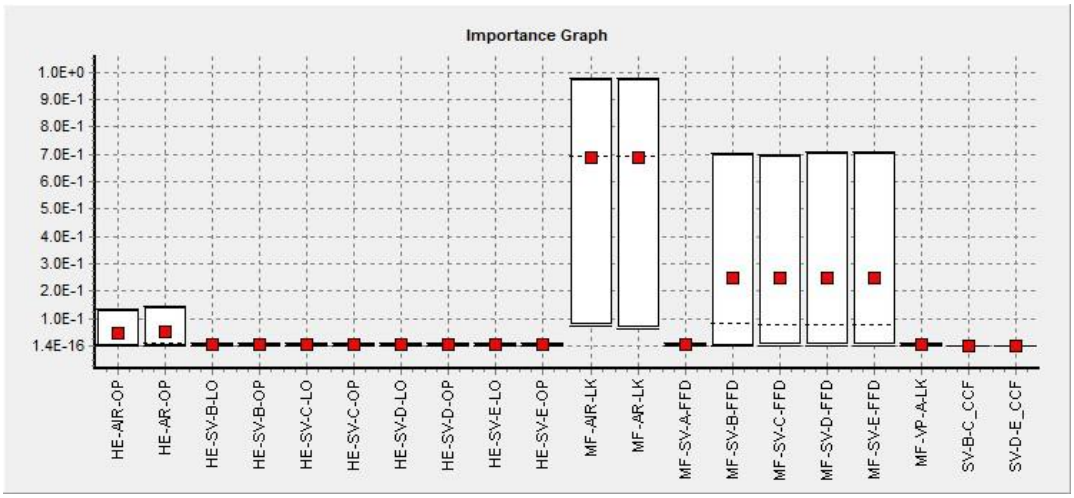


Figure 184: Importance graph for extended system and SV_NRPD.

Table 179: FV Results for Extended System w/ Diagnostic HE

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	7.38E-2	9.54E-2	6.83E-5	2.78E-2	2.67E-1	7.56E-12	8.29E-1
HE-AR-OP	7.39E-2	9.66E-2	7.44E-5	2.78E-2	2.69E-1	8.60E-10	8.55E-1
HE-SV-B-LO	2.15E-2	2.72E-2	1.56E-5	6.51E-3	7.46E-2	4.07E-11	4.93E-1
HE-SV-B-OP	2.15E-2	2.54E-2	1.33E-5	6.03E-3	6.92E-2	3.92E-10	3.93E-1
HE-SV-C-LO	2.15E-2	2.75E-2	1.68E-5	6.54E-3	7.44E-2	1.13E-9	5.78E-1
HE-SV-C-OP	2.15E-2	2.63E-2	1.75E-5	5.81E-3	7.25E-2	6.55E-10	3.77E-1
HE-SV-D-LO	2.15E-2	2.63E-2	1.79E-5	6.33E-3	7.18E-2	1.17E-9	5.21E-1
HE-SV-D-OP	2.15E-2	2.57E-2	2.16E-5	6.15E-3	6.97E-2	1.26E-11	4.76E-1
HE-SV-E-LO	2.15E-2	2.63E-2	1.84E-5	6.33E-3	7.22E-2	1.03E-9	5.45E-1
HE-SV-E-OP	2.15E-2	2.70E-2	2.34E-5	6.43E-3	7.44E-2	1.69E-8	4.57E-1
MF-AIR-LK	3.04E-1	2.54E-1	1.09E-2	1.32E-1	6.09E-1	8.38E-4	9.85E-1
MF-AR-LK	3.04E-1	2.54E-1	1.14E-2	1.32E-1	6.05E-1	9.04E-4	9.85E-1
MF-SV-A-FS	5.57E-4	7.60E-4	1.70E-5	2.48E-4	1.80E-3	7.43E-7	1.86E-2

Name	Point Est.	Mean	5th	50th	95th	Min	Max
MF-SV-A-LK	3.19E-5	4.73E-5	9.50E-7	1.40E-5	1.15E-4	3.12E-8	2.40E-3
MF-SV-A-RP	4.62E-6	6.82E-6	2.62E-8	8.27E-7	1.41E-5	3.19E-10	8.09E-4
MF-SV-B-FS	4.94E-1	5.09E-1	1.09E-1	4.65E-1	7.71E-1	1.28E-2	9.27E-1
MF-SV-B-LK	2.84E-2	3.64E-2	4.29E-3	2.11E-2	7.57E-2	5.67E-4	5.15E-1
MF-SV-B-RP	4.11E-3	5.27E-3	9.61E-5	1.21E-3	1.22E-2	1.23E-5	6.33E-1
MF-SV-C-FS	4.94E-1	5.08E-1	1.11E-1	4.61E-1	7.68E-1	8.77E-3	9.28E-1
MF-SV-C-LK	2.84E-2	3.63E-2	4.49E-3	2.11E-2	7.60E-2	8.46E-4	3.31E-1
MF-SV-C-RP	4.11E-3	5.16E-3	9.75E-5	1.22E-3	1.20E-2	6.19E-6	3.20E-1
MF-SV-D-FS	4.94E-1	5.08E-1	1.05E-1	4.61E-1	7.70E-1	7.01E-3	9.28E-1
MF-SV-D-LK	2.84E-2	3.62E-2	4.70E-3	2.11E-2	7.45E-2	2.15E-4	3.45E-1
MF-SV-D-RP	4.11E-3	5.25E-3	8.41E-5	1.21E-3	1.24E-2	2.29E-6	3.03E-1
MF-SV-E-FS	4.94E-1	5.06E-1	1.07E-1	4.62E-1	7.65E-1	7.46E-3	9.39E-1
MF-SV-E-LK	2.84E-2	3.65E-2	4.52E-3	2.15E-2	7.68E-2	5.17E-4	3.67E-1
MF-SV-E-RP	4.11E-3	5.49E-3	9.20E-5	1.25E-3	1.25E-2	5.20E-6	4.62E-1
MF-VP-A-LK	5.94E-4	8.14E-4	1.92E-5	2.70E-4	1.93E-3	8.21E-7	1.89E-2
SV-B-C_CCF	6.00E-2	5.16E-2	1.37E-2	4.44E-2	8.04E-2	1.80E-3	1.61E-1
SV-D-E_CCF	6.00E-2	5.22E-2	1.41E-2	4.48E-2	8.19E-2	1.03E-3	1.62E-1

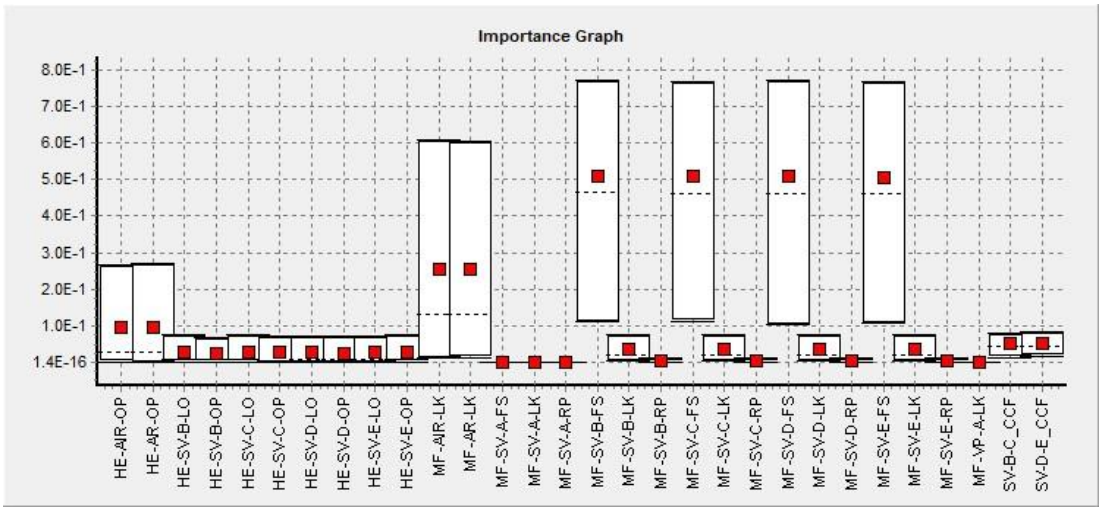


Figure 185: Importance graph for extended system w/ diagnostic HE.

Table 180: FV Results for Extended System w/ Diagnostic HE and SV_OL

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	1.93E-1	2.88E-1	2.81E-4	1.09E-1	7.49E-1	1.43E-12	9.91E-1
HE-AR-OP	1.93E-1	2.90E-1	2.32E-4	1.16E-1	7.53E-1	6.48E-12	9.96E-1
HE-SV-B-LO	5.38E-3	1.60E-2	2.45E-6	1.32E-3	3.88E-2	8.77E-11	6.75E-1
HE-SV-B-OP	5.38E-3	1.53E-2	3.22E-6	1.37E-3	3.84E-2	3.20E-10	7.11E-1
HE-SV-C-LO	5.38E-3	1.51E-2	3.24E-6	1.43E-3	3.68E-2	2.53E-10	7.83E-1
HE-SV-C-OP	5.38E-3	1.59E-2	3.46E-6	1.35E-3	3.92E-2	1.21E-10	7.42E-1
HE-SV-D-LO	5.38E-3	1.50E-2	3.49E-6	1.39E-3	3.71E-2	1.11E-12	6.83E-1
HE-SV-D-OP	5.38E-3	1.55E-2	3.84E-6	1.46E-3	3.83E-2	0.00E+0	5.84E-1
HE-SV-E-LO	5.38E-3	1.55E-2	3.31E-6	1.40E-3	3.81E-2	2.56E-11	8.78E-1
HE-SV-E-OP	5.38E-3	1.53E-2	3.29E-6	1.41E-3	3.90E-2	4.53E-10	7.46E-1
MF-AIR-LK	7.94E-1	6.71E-1	7.15E-2	6.53E-1	9.79E-1	4.59E-3	1.00E+0
MF-AR-LK	7.94E-1	6.71E-1	7.43E-2	6.52E-1	9.79E-1	2.72E-3	1.00E+0
MF-SV-A-FFD	8.96E-5	2.67E-4	1.30E-6	3.16E-5	5.35E-4	3.65E-8	4.81E-2
MF-SV-B-FFD	2.90E-3	7.88E-3	2.60E-5	8.68E-4	1.73E-2	1.00E-6	6.25E-1
MF-SV-C-FFD	2.90E-3	8.25E-3	2.75E-5	8.55E-4	1.89E-2	4.05E-7	6.34E-1
MF-SV-D-FFD	2.90E-3	8.18E-3	2.59E-5	8.57E-4	1.71E-2	8.69E-7	5.94E-1
MF-SV-E-FFD	2.90E-3	7.94E-3	2.51E-5	8.41E-4	1.72E-2	4.61E-7	6.23E-1
MF-VP-A-LK	8.96E-5	2.67E-4	1.30E-6	3.16E-5	5.35E-4	3.65E-8	4.81E-2
SV-B-C_CCF	4.94E-4	1.11E-3	4.79E-5	3.81E-4	2.38E-3	6.09E-6	5.92E-2
SV-D-E_CCF	4.94E-4	1.08E-3	4.94E-5	3.89E-4	2.36E-3	5.12E-6	4.71E-2

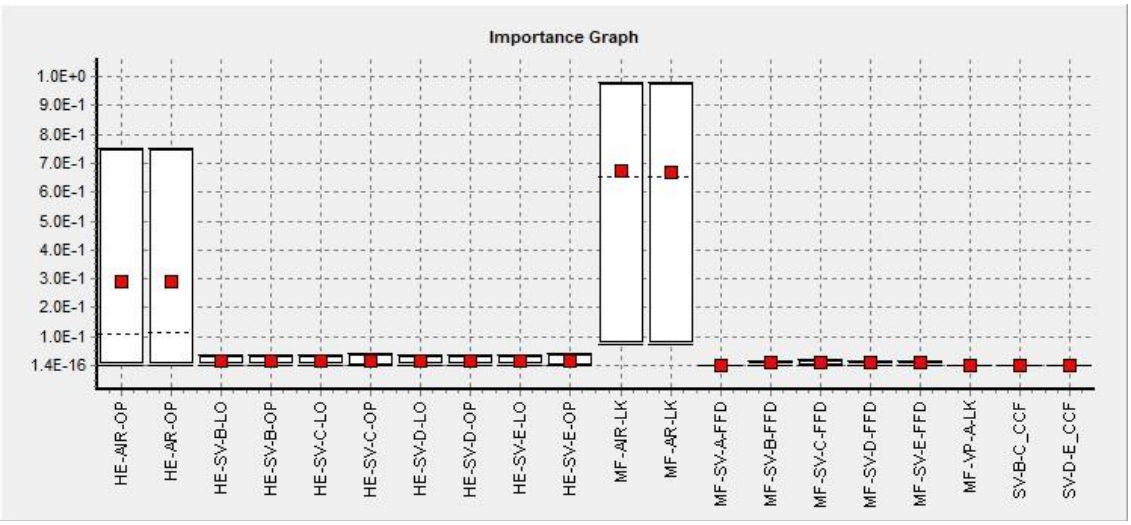


Figure 186: Importance graph for extended system w/ diagnostic HE and SV_OL.

Table 181: FV Results for Extended System w/ Diagnostic HE and SV_OM

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	5.79E-2	1.44E-1	1.01E-4	3.65E-2	4.20E-1	4.23E-14	9.78E-1
HE-AR-OP	5.79E-2	1.46E-1	7.76E-5	3.83E-2	4.24E-1	1.39E-12	9.72E-1
HE-SV-B-LO	2.14E-2	3.36E-2	1.07E-5	5.25E-3	9.38E-2	4.55E-10	6.62E-1
HE-SV-B-OP	2.14E-2	3.30E-2	1.92E-5	5.47E-3	8.95E-2	9.54E-9	7.37E-1
HE-SV-C-LO	2.14E-2	3.29E-2	1.49E-5	5.47E-3	9.16E-2	9.94E-10	7.38E-1
HE-SV-C-OP	2.14E-2	3.23E-2	1.52E-5	5.54E-3	8.79E-2	2.49E-10	8.33E-1
HE-SV-D-LO	2.14E-2	3.30E-2	1.38E-5	5.55E-3	8.95E-2	2.82E-12	7.03E-1
HE-SV-D-OP	2.14E-2	3.40E-2	1.57E-5	5.70E-3	9.41E-2	3.15E-13	7.82E-1
HE-SV-E-LO	2.14E-2	3.33E-2	1.48E-5	5.45E-3	9.05E-2	2.21E-10	7.81E-1
HE-SV-E-OP	2.14E-2	3.32E-2	1.68E-5	5.64E-3	9.26E-2	2.95E-10	6.60E-1
MF-AIR-LK	2.38E-1	3.57E-1	1.15E-2	2.04E-1	8.03E-1	8.42E-4	9.96E-1
MF-AR-LK	2.39E-1	3.58E-1	1.17E-2	2.05E-1	8.01E-1	4.15E-4	9.95E-1
MF-SV-A-FFD	4.68E-4	2.10E-3	7.81E-6	3.08E-4	4.79E-3	1.32E-7	1.22E-1
MF-SV-B-FFD	6.70E-1	4.33E-1	1.71E-2	3.00E-1	8.55E-1	6.69E-4	9.90E-1
MF-SV-C-FFD	6.70E-1	4.35E-1	1.79E-2	3.00E-1	8.56E-1	3.16E-4	9.93E-1
MF-SV-D-FFD	6.70E-1	4.32E-1	1.56E-2	3.07E-1	8.48E-1	4.64E-4	9.92E-1
MF-SV-E-FFD	6.70E-1	4.32E-1	1.51E-2	3.03E-1	8.49E-1	3.74E-4	9.97E-1
MF-VP-A-LK	4.68E-4	2.10E-3	7.81E-6	3.08E-4	4.79E-3	1.32E-7	1.22E-1
SV-B-C_CCF	1.49E-4	3.60E-4	2.33E-5	1.53E-4	8.06E-4	3.89E-6	1.57E-2
SV-D-E_CCF	1.49E-4	3.70E-4	2.40E-5	1.56E-4	8.19E-4	4.44E-6	1.06E-2

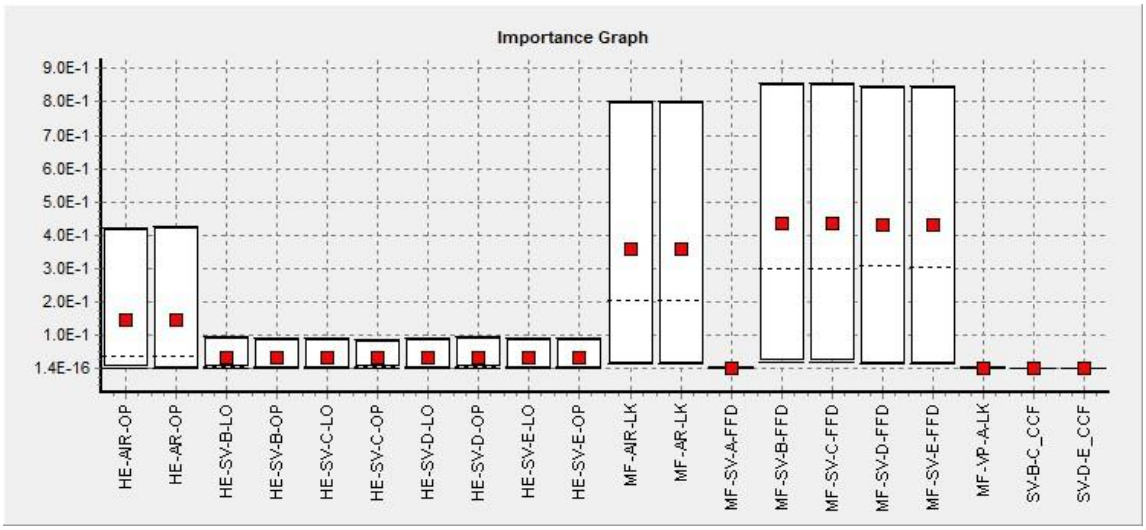


Figure 187: Importance graph for extended system w/ diagnostic HE and SV_OM.

Table 182: FV Results for Extended System w/ Diagnostic HE and SV_OH

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	1.65E-2	6.28E-2	3.45E-5	1.18E-2	1.75E-1	1.43E-14	8.92E-1
HE-AR-OP	1.65E-2	6.28E-2	2.65E-5	1.22E-2	1.78E-1	7.45E-13	9.00E-1
HE-SV-B-LO	1.37E-2	2.55E-2	8.75E-6	4.72E-3	6.75E-2	1.27E-9	7.32E-1
HE-SV-B-OP	1.37E-2	2.51E-2	1.60E-5	4.91E-3	6.48E-2	7.54E-9	7.07E-1
HE-SV-C-LO	1.37E-2	2.53E-2	1.54E-5	4.73E-3	6.72E-2	9.12E-10	6.92E-1
HE-SV-C-OP	1.37E-2	2.45E-2	1.52E-5	5.08E-3	6.38E-2	4.15E-10	7.37E-1
HE-SV-D-LO	1.37E-2	2.52E-2	1.36E-5	4.80E-3	6.53E-2	7.63E-12	5.52E-1
HE-SV-D-OP	1.37E-2	2.58E-2	1.30E-5	5.04E-3	6.68E-2	2.88E-13	7.26E-1
HE-SV-E-LO	1.37E-2	2.53E-2	1.30E-5	4.66E-3	6.71E-2	3.17E-10	6.91E-1
HE-SV-E-OP	1.37E-2	2.54E-2	1.35E-5	4.98E-3	6.76E-2	1.50E-10	5.58E-1
MF-AIR-LK	6.77E-2	1.71E-1	3.42E-3	5.74E-2	4.86E-1	2.23E-4	9.81E-1
MF-AR-LK	6.78E-2	1.70E-1	3.56E-3	5.72E-2	4.74E-1	1.93E-4	9.83E-1
MF-SV-A-FFD	8.01E-5	7.23E-4	3.00E-6	9.75E-5	1.61E-3	8.66E-8	7.03E-2
MF-SV-B-FFD	9.42E-1	7.28E-1	1.39E-1	7.43E-1	9.60E-1	3.57E-3	9.98E-1
MF-SV-C-FFD	9.42E-1	7.29E-1	1.43E-1	7.44E-1	9.61E-1	3.71E-3	9.97E-1
MF-SV-D-FFD	9.42E-1	7.30E-1	1.31E-1	7.43E-1	9.59E-1	4.92E-3	9.99E-1
MF-SV-E-FFD	9.42E-1	7.30E-1	1.29E-1	7.47E-1	9.60E-1	4.42E-3	9.98E-1
MF-VP-A-LK	8.01E-5	7.23E-4	3.00E-6	9.75E-5	1.61E-3	8.66E-8	7.03E-2
SV-B-C_CCF	4.23E-5	1.27E-4	1.06E-5	5.13E-5	2.84E-4	2.24E-6	4.00E-3
SV-D-E_CCF	4.23E-5	1.30E-4	1.08E-5	5.09E-5	2.90E-4	2.44E-6	3.63E-3

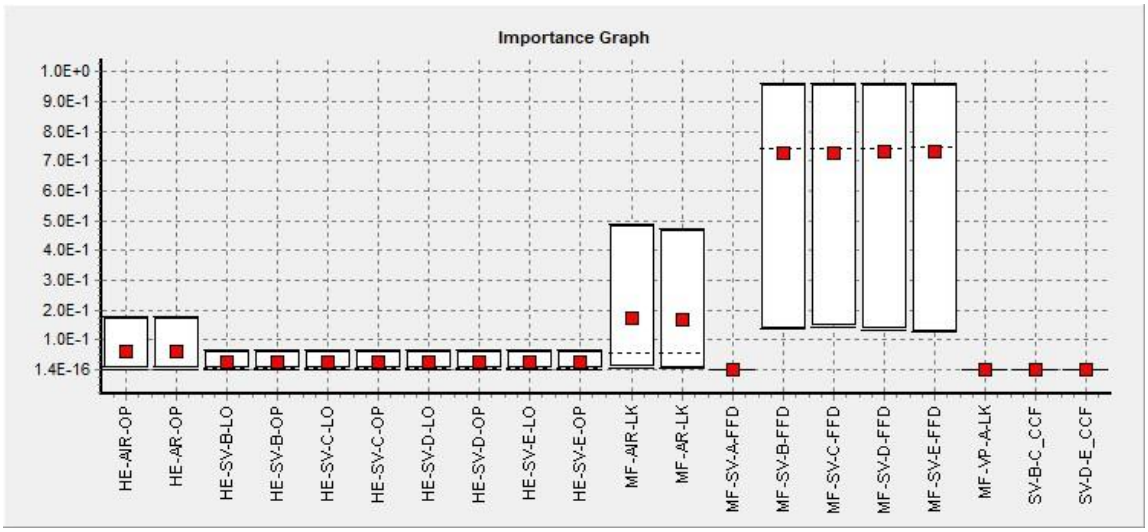


Figure 188: Importance graph for extended system w/ diagnostic HE and SV_OH.

Table 183: FV Results for Extended System w/ Diagnostic HE and SV_DOW

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	1.92E-1	2.88E-1	2.81E-4	1.09E-1	7.49E-1	1.42E-12	9.91E-1
HE-AR-OP	1.93E-1	2.90E-1	2.32E-4	1.16E-1	7.53E-1	6.50E-12	9.96E-1
HE-SV-B-LO	5.42E-3	1.61E-2	2.47E-6	1.33E-3	3.88E-2	9.04E-11	6.74E-1
HE-SV-B-OP	5.42E-3	1.54E-2	3.27E-6	1.38E-3	3.86E-2	3.29E-10	7.10E-1
HE-SV-C-LO	5.42E-3	1.52E-2	3.32E-6	1.44E-3	3.71E-2	2.54E-10	7.83E-1
HE-SV-C-OP	5.42E-3	1.59E-2	3.56E-6	1.36E-3	3.96E-2	1.21E-10	7.45E-1
HE-SV-D-LO	5.42E-3	1.50E-2	3.50E-6	1.40E-3	3.74E-2	1.12E-12	6.82E-1
HE-SV-D-OP	5.42E-3	1.56E-2	3.86E-6	1.48E-3	3.84E-2	0.00E+0	5.85E-1
HE-SV-E-LO	5.42E-3	1.55E-2	3.32E-6	1.41E-3	3.81E-2	2.58E-11	8.79E-1
HE-SV-E-OP	5.42E-3	1.53E-2	3.30E-6	1.42E-3	3.94E-2	4.54E-10	7.49E-1
MF-AIR-LK	7.94E-1	6.71E-1	7.14E-2	6.52E-1	9.79E-1	4.59E-3	1.00E+0
MF-AR-LK	7.94E-1	6.71E-1	7.43E-2	6.52E-1	9.79E-1	2.72E-3	1.00E+0
MF-SV-A-FFD	9.26E-5	2.75E-4	1.35E-6	3.26E-5	5.53E-4	3.77E-8	4.95E-2
MF-SV-B-FFD	3.02E-3	8.17E-3	2.73E-5	9.04E-4	1.80E-2	1.07E-6	6.32E-1
MF-SV-C-FFD	3.02E-3	8.54E-3	2.88E-5	8.91E-4	1.97E-2	4.27E-7	6.40E-1
MF-SV-D-FFD	3.02E-3	8.47E-3	2.74E-5	8.93E-4	1.78E-2	9.10E-7	6.01E-1
MF-SV-E-FFD	3.02E-3	8.23E-3	2.61E-5	8.75E-4	1.79E-2	4.91E-7	6.31E-1
MF-VP-A-LK	9.26E-5	2.75E-4	1.35E-6	3.26E-5	5.53E-4	3.77E-8	4.95E-2
SV-B-C_CCF	4.94E-4	1.11E-3	4.79E-5	3.81E-4	2.38E-3	6.09E-6	5.91E-2
SV-D-E_CCF	4.94E-4	1.08E-3	4.94E-5	3.89E-4	2.36E-3	5.12E-6	4.70E-2

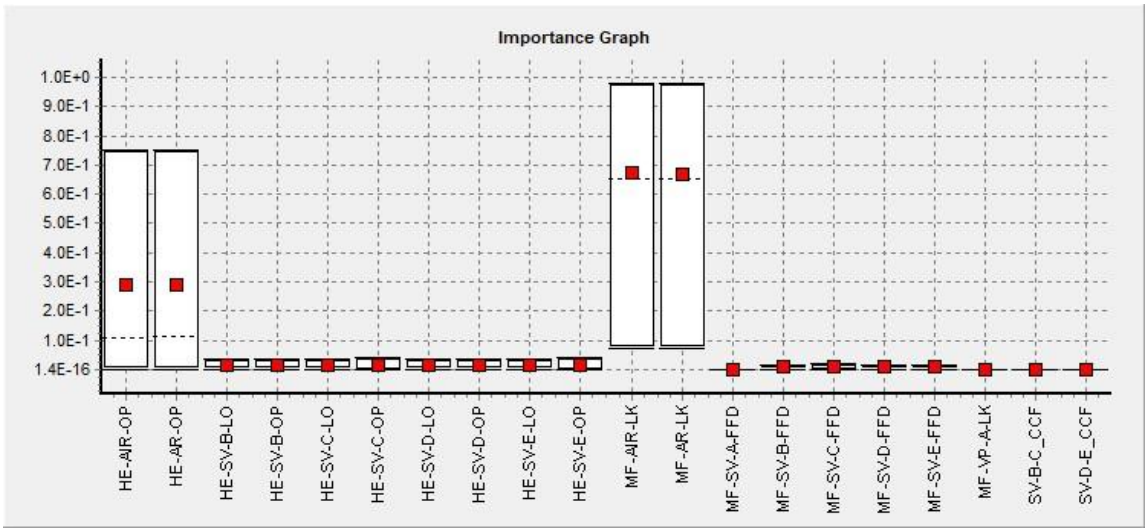


Figure 189: Importance graph for extended system w/ diagnostic HE and SV_DOW.

Table 184: FV Results for Extended System w/ Diagnostic HE and SV_MAN

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	1.94E-1	2.92E-1	2.82E-4	1.11E-1	7.57E-1	1.55E-12	9.92E-1
HE-AR-OP	1.94E-1	2.94E-1	2.32E-4	1.19E-1	7.63E-1	6.54E-12	9.96E-1
HE-SV-B-LO	4.29E-3	1.34E-2	1.43E-6	9.00E-4	3.14E-2	1.31E-11	7.01E-1
HE-SV-B-OP	4.29E-3	1.28E-2	1.90E-6	8.98E-4	3.06E-2	6.75E-11	7.52E-1
HE-SV-C-LO	4.29E-3	1.27E-2	1.86E-6	9.30E-4	3.03E-2	1.49E-10	7.90E-1
HE-SV-C-OP	4.29E-3	1.35E-2	2.10E-6	8.92E-4	3.23E-2	1.19E-10	6.96E-1
HE-SV-D-LO	4.29E-3	1.25E-2	2.06E-6	9.11E-4	3.04E-2	1.09E-12	7.21E-1
HE-SV-D-OP	4.29E-3	1.30E-2	2.18E-6	9.68E-4	3.16E-2	0.00E+0	5.71E-1
HE-SV-E-LO	4.29E-3	1.28E-2	1.66E-6	9.20E-4	3.07E-2	2.08E-11	7.30E-1
HE-SV-E-OP	4.29E-3	1.28E-2	2.02E-6	9.46E-4	3.11E-2	3.77E-10	6.31E-1
MF-AIR-LK	7.98E-1	6.80E-1	7.20E-2	6.67E-1	9.83E-1	4.63E-3	1.00E+0
MF-AR-LK	7.98E-1	6.80E-1	7.50E-2	6.64E-1	9.84E-1	2.73E-3	1.00E+0
MF-SV-A-FFD	2.27E-6	7.10E-6	3.40E-8	8.12E-7	1.39E-5	9.21E-10	1.35E-3
MF-SV-B-FFD	5.80E-5	1.88E-4	2.94E-7	1.48E-5	3.38E-4	2.73E-9	4.67E-2
MF-SV-C-FFD	5.80E-5	1.94E-4	2.88E-7	1.49E-5	3.77E-4	4.15E-9	4.58E-2
MF-SV-D-FFD	5.80E-5	1.94E-4	3.17E-7	1.48E-5	3.58E-4	1.01E-8	3.66E-2
MF-SV-E-FFD	5.80E-5	1.85E-4	2.88E-7	1.44E-5	3.48E-4	1.62E-9	3.93E-2
MF-VP-A-LK	2.27E-6	7.10E-6	3.40E-8	8.12E-7	1.39E-5	9.21E-10	1.35E-3
SV-B-C_CCF	4.97E-4	1.15E-3	4.79E-5	3.86E-4	2.47E-3	6.09E-6	6.64E-2
SV-D-E_CCF	4.97E-4	1.12E-3	4.95E-5	3.92E-4	2.43E-3	5.12E-6	4.98E-2

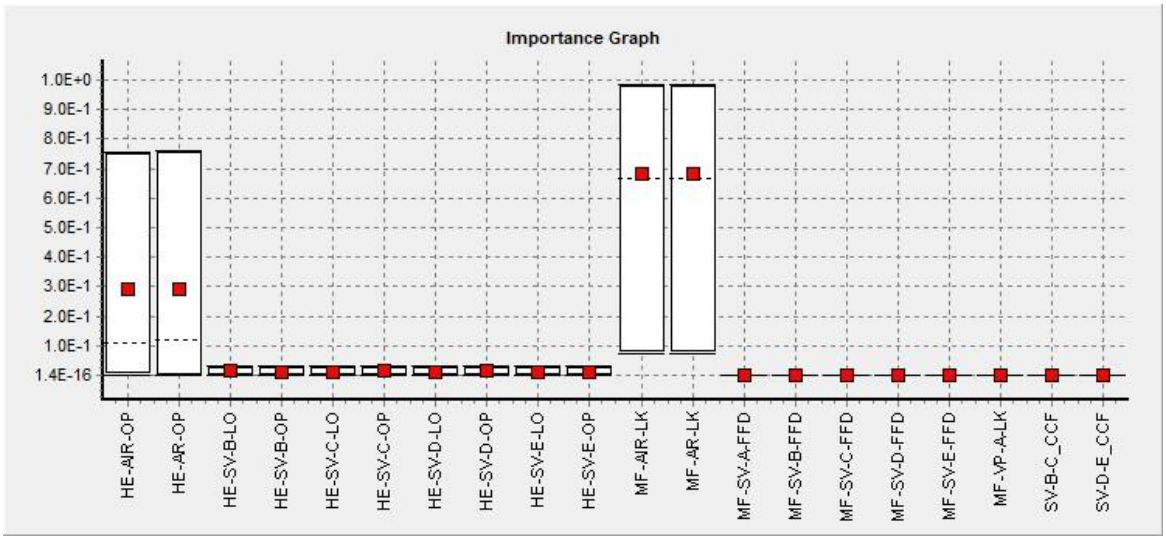


Figure 190: Importance graph for extended system w/ diagnostic HE and SV_MAN.

Table 185: FV Results for Extended System w/ Diagnostic HE and SV_NRPD

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	1.36E-1	2.14E-1	2.06E-4	6.79E-2	5.96E-1	1.88E-13	9.85E-1
HE-AR-OP	1.36E-1	2.17E-1	1.46E-4	7.31E-2	5.92E-1	3.52E-12	9.90E-1
HE-SV-B-LO	2.13E-2	3.23E-2	7.85E-6	4.17E-3	9.00E-2	2.18E-10	6.66E-1
HE-SV-B-OP	2.13E-2	3.16E-2	1.30E-5	4.36E-3	8.56E-2	4.59E-9	7.97E-1
HE-SV-C-LO	2.13E-2	3.11E-2	1.10E-5	4.58E-3	8.50E-2	5.92E-10	8.10E-1
HE-SV-C-OP	2.13E-2	3.12E-2	1.19E-5	4.40E-3	8.55E-2	1.70E-10	7.77E-1
HE-SV-D-LO	2.13E-2	3.12E-2	1.07E-5	4.45E-3	8.56E-2	1.67E-12	7.07E-1
HE-SV-D-OP	2.13E-2	3.25E-2	1.25E-5	4.62E-3	8.99E-2	0.00E+0	7.04E-1
HE-SV-E-LO	2.13E-2	3.17E-2	1.12E-5	4.45E-3	8.66E-2	1.23E-10	7.83E-1
HE-SV-E-OP	2.13E-2	3.16E-2	1.28E-5	4.60E-3	8.79E-2	4.05E-10	8.12E-1
MF-AIR-LK	5.61E-1	5.10E-1	3.44E-2	4.03E-1	9.15E-1	2.34E-3	9.99E-1
MF-AR-LK	5.62E-1	5.12E-1	3.42E-2	4.10E-1	9.14E-1	1.45E-3	9.98E-1
MF-SV-A-FFD	1.02E-3	2.33E-3	1.18E-5	3.57E-4	5.03E-3	2.23E-7	2.25E-1
MF-SV-B-FFD	2.61E-1	2.10E-1	2.88E-3	7.26E-2	5.82E-1	1.36E-4	9.82E-1
MF-SV-C-FFD	2.61E-1	2.12E-1	3.07E-3	7.32E-2	5.89E-1	5.59E-5	9.72E-1
MF-SV-D-FFD	2.61E-1	2.07E-1	2.67E-3	7.48E-2	5.68E-1	9.31E-5	9.82E-1
MF-SV-E-FFD	2.61E-1	2.08E-1	2.75E-3	7.36E-2	5.74E-1	6.32E-5	9.93E-1
MF-VP-A-LK	1.02E-3	2.33E-3	1.18E-5	3.57E-4	5.03E-3	2.23E-7	2.25E-1
SV-B-C_CCF	3.50E-4	6.32E-4	3.94E-5	2.70E-4	1.38E-3	6.01E-6	2.27E-2
SV-D-E_CCF	3.50E-4	6.44E-4	4.17E-5	2.73E-4	1.40E-3	5.12E-6	2.15E-2

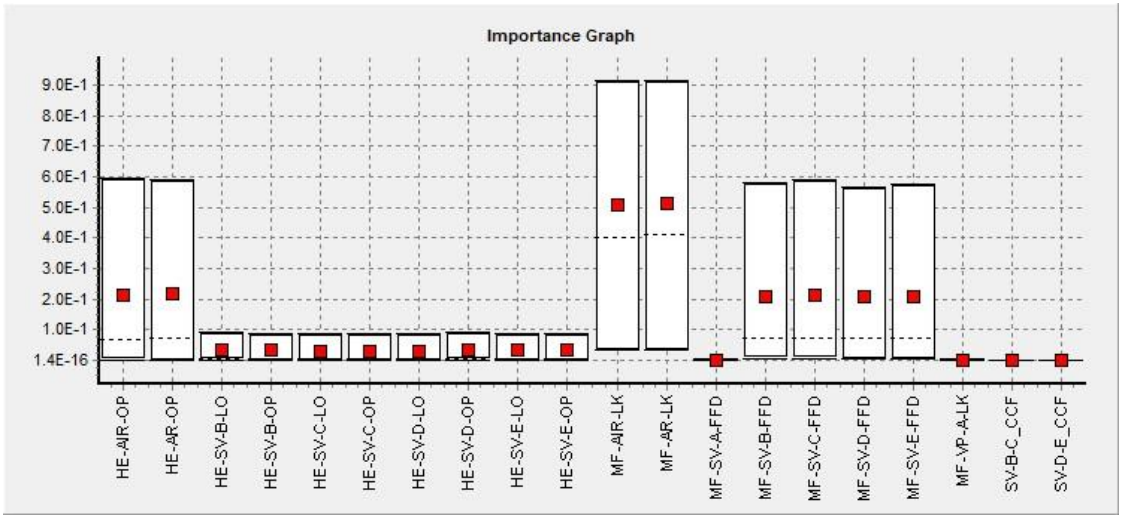


Figure 191: Importance graph for extended system w/ diagnostic HE and SV_NRPD.

Table 186: FV Results for Extended System w/ Bruce B Fault Rate

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	1.32E-3	4.01E-3	3.00E-6	8.44E-4	1.03E-2	3.60E-10	3.06E-1
HE-AR-OP	1.32E-3	4.16E-3	3.84E-6	9.56E-4	1.08E-2	8.21E-13	1.06E-1
HE-SV-B-LO	3.59E-4	1.02E-3	6.01E-7	1.92E-4	2.65E-3	1.86E-12	5.46E-2
HE-SV-B-OP	3.59E-4	9.93E-4	7.08E-7	1.95E-4	2.57E-3	4.69E-13	3.91E-2
HE-SV-C-LO	3.59E-4	9.86E-4	4.96E-7	1.83E-4	2.59E-3	4.50E-14	3.02E-2
HE-SV-C-OP	3.59E-4	9.69E-4	6.99E-7	1.82E-4	2.49E-3	7.69E-12	6.06E-2
HE-SV-D-LO	3.59E-4	9.90E-4	6.64E-7	1.88E-4	2.64E-3	1.20E-13	3.93E-2
HE-SV-D-OP	3.59E-4	9.93E-4	6.77E-7	1.98E-4	2.61E-3	6.81E-12	4.38E-2
HE-SV-E-LO	3.59E-4	9.75E-4	7.92E-7	2.00E-4	2.49E-3	1.62E-11	2.82E-2
HE-SV-E-OP	3.59E-4	9.42E-4	6.02E-7	1.98E-4	2.56E-3	9.08E-12	2.68E-2
MF-AIR-LK	9.59E-1	7.58E-1	2.48E-1	7.70E-1	9.44E-1	2.96E-2	9.94E-1
MF-AR-LK	9.59E-1	7.65E-1	2.69E-1	7.82E-1	9.42E-1	3.14E-2	9.91E-1
MF-SV-A-FS	2.64E-4	6.54E-4	3.92E-5	2.61E-4	1.44E-3	5.13E-6	2.20E-2

Name	Point Est.	Mean	5th	50th	95th	Min	Max
MF-SV-A-LK	1.51E-5	3.99E-5	2.10E-6	1.47E-5	8.97E-5	1.46E-7	2.77E-3
MF-SV-A-RP	2.19E-6	5.58E-6	4.84E-8	8.82E-7	1.11E-5	9.99E-10	1.14E-3
MF-SV-B-FS	9.00E-2	2.15E-1	2.60E-2	1.29E-1	4.65E-1	4.05E-3	8.61E-1
MF-SV-B-LK	5.19E-3	1.45E-2	1.36E-3	7.02E-3	3.11E-2	2.64E-4	2.60E-1
MF-SV-B-RP	7.53E-4	2.21E-3	2.77E-5	4.30E-4	4.78E-3	1.13E-6	1.36E-1
MF-SV-C-FS	9.00E-2	2.16E-1	2.63E-2	1.30E-1	4.69E-1	2.95E-3	9.06E-1
MF-SV-C-LK	5.19E-3	1.41E-2	1.25E-3	6.81E-3	3.07E-2	3.06E-4	3.57E-1
MF-SV-C-RP	7.53E-4	2.00E-3	2.94E-5	3.97E-4	4.47E-3	2.35E-6	1.73E-1
MF-SV-D-FS	9.00E-2	2.09E-1	2.70E-2	1.26E-1	4.51E-1	5.64E-3	8.99E-1
MF-SV-D-LK	5.19E-3	1.43E-2	1.35E-3	6.81E-3	3.10E-2	2.67E-4	3.17E-1
MF-SV-D-RP	7.53E-4	2.09E-3	2.63E-5	4.07E-4	4.85E-3	1.62E-6	1.65E-1
MF-SV-E-FS	9.00E-2	2.10E-1	2.67E-2	1.27E-1	4.56E-1	3.50E-3	8.93E-1
MF-SV-E-LK	5.19E-3	1.39E-2	1.29E-3	6.73E-3	3.08E-2	3.00E-4	2.79E-1
MF-SV-E-RP	7.53E-4	2.05E-3	2.96E-5	4.05E-4	4.54E-3	1.62E-6	3.90E-1
MF-VP-A-LK	2.82E-4	7.00E-4	4.50E-5	2.85E-4	1.53E-3	6.11E-6	2.30E-2
SV-B-C_CCF	1.18E-2	2.23E-2	4.58E-3	1.47E-2	4.41E-2	1.68E-3	1.29E-1
SV-D-E_CCF	1.18E-2	2.18E-2	4.83E-3	1.45E-2	4.28E-2	1.60E-3	1.41E-1

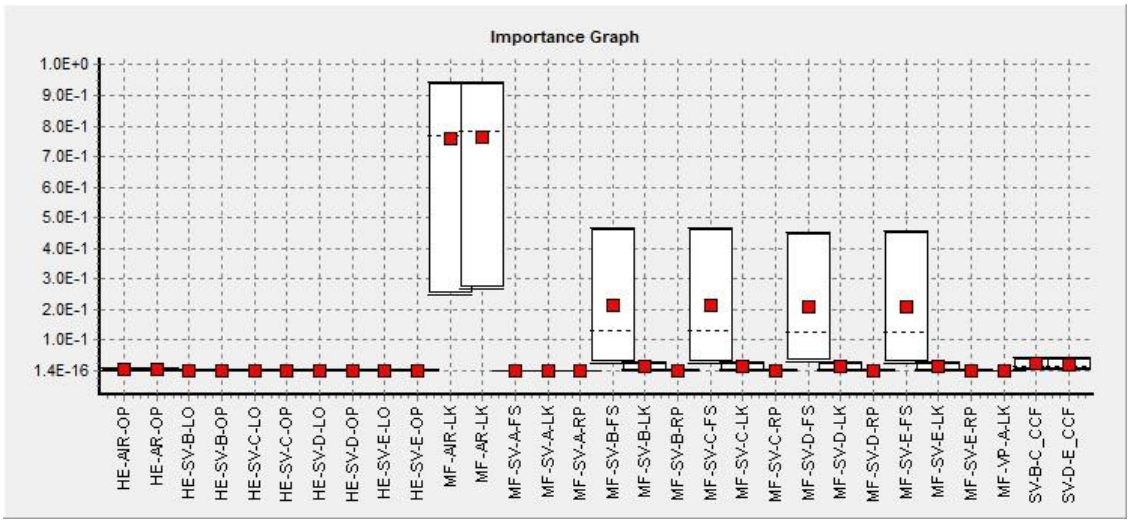


Figure 192: Importance graph for extended system w/ Bruce B fault rate.

Table 187: FV Results for Extended System w/ Bruce B Fault Rate and SV_OL

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	1.30E-3	7.40E-3	5.44E-6	1.24E-3	1.70E-2	1.49E-12	4.85E-1
HE-AR-OP	1.30E-3	6.97E-3	3.03E-6	1.07E-3	1.59E-2	9.99E-15	4.54E-1
HE-SV-B-LO	1.03E-5	6.04E-5	1.72E-8	4.28E-6	1.14E-4	1.02E-14	7.99E-3
HE-SV-B-OP	1.03E-5	5.94E-5	1.19E-8	4.68E-6	1.12E-4	9.29E-14	1.37E-2
HE-SV-C-LO	1.03E-5	6.27E-5	1.76E-8	4.56E-6	1.10E-4	8.69E-14	1.27E-2
HE-SV-C-OP	1.03E-5	6.06E-5	1.60E-8	4.36E-6	1.10E-4	8.71E-14	2.26E-2
HE-SV-D-LO	1.03E-5	5.76E-5	1.58E-8	4.50E-6	1.02E-4	3.52E-13	1.71E-2
HE-SV-D-OP	1.03E-5	5.70E-5	1.74E-8	4.52E-6	1.04E-4	0.00E+0	8.04E-3
HE-SV-E-LO	1.03E-5	8.12E-5	1.53E-8	4.66E-6	1.05E-4	0.00E+0	2.09E-1
HE-SV-E-OP	1.03E-5	5.62E-5	1.86E-8	4.72E-6	1.11E-4	4.50E-12	2.29E-2
MF-AIR-LK	9.99E-1	9.92E-1	9.51E-1	9.97E-1	1.00E+0	5.12E-1	1.00E+0
MF-AR-LK	9.99E-1	9.93E-1	9.52E-1	9.97E-1	1.00E+0	5.27E-1	1.00E+0
MF-SV-A-FFD	6.72E-6	3.78E-5	2.40E-7	4.52E-6	7.21E-5	8.27E-9	8.39E-3
MF-SV-B-FFD	6.09E-5	3.29E-4	1.25E-6	2.75E-5	5.56E-4	4.13E-8	6.33E-2
MF-SV-C-FFD	6.09E-5	3.25E-4	1.16E-6	2.90E-5	5.85E-4	4.28E-8	5.13E-2
MF-SV-D-FFD	6.09E-5	3.49E-4	1.29E-6	2.86E-5	5.37E-4	4.89E-8	2.44E-1
MF-SV-E-FFD	6.09E-5	3.26E-4	1.27E-6	2.75E-5	5.31E-4	2.20E-8	5.23E-2
MF-VP-A-LK	6.72E-6	3.78E-5	2.40E-7	4.52E-6	7.21E-5	8.27E-9	8.39E-3
SV-B-C_CCF	3.66E-5	1.42E-4	1.28E-5	4.92E-5	2.90E-4	4.31E-6	1.12E-2
SV-D-E_CCF	3.66E-5	1.26E-4	1.36E-5	4.99E-5	2.66E-4	4.04E-6	5.13E-3

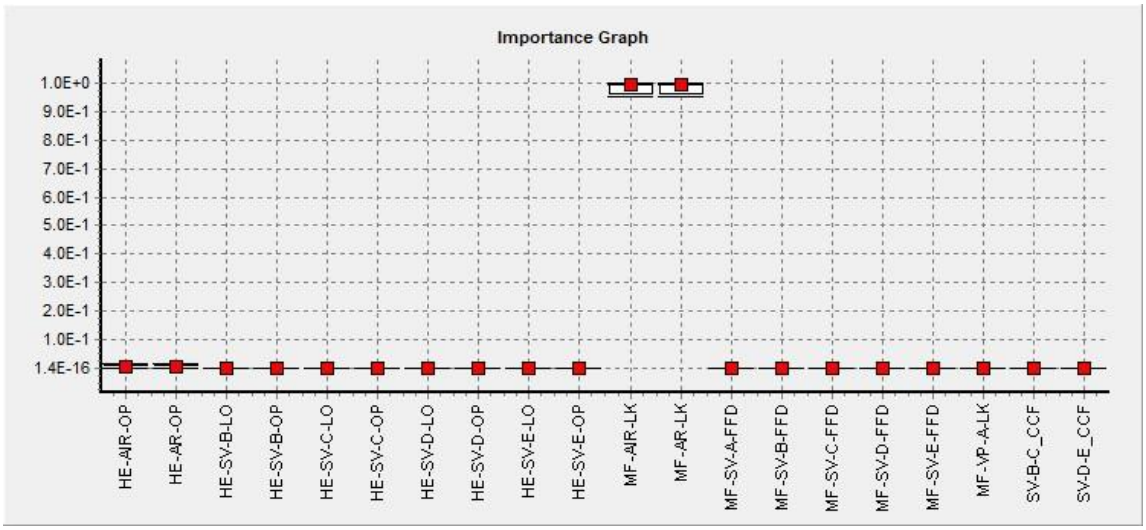


Figure 193: Importance graph for extended system w/ Bruce B fault rate and SV_OL.

Table 188: FV Results for Extended System w/ Bruce B Fault Rate and SV_OM

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	1.33E-3	5.34E-3	4.60E-6	1.00E-3	1.31E-2	1.56E-12	4.26E-1
HE-AR-OP	1.33E-3	5.00E-3	2.73E-6	8.95E-4	1.22E-2	3.78E-15	3.76E-1
HE-SV-B-LO	4.64E-4	1.09E-3	3.96E-7	1.09E-4	2.59E-3	3.37E-13	9.64E-2
HE-SV-B-OP	4.64E-4	1.06E-3	2.70E-7	1.20E-4	2.50E-3	3.30E-12	8.90E-2
HE-SV-C-LO	4.64E-4	1.04E-3	3.67E-7	1.15E-4	2.46E-3	1.10E-12	6.62E-2
HE-SV-C-OP	4.64E-4	9.52E-4	3.71E-7	1.10E-4	2.46E-3	2.36E-12	4.00E-2
HE-SV-D-LO	4.64E-4	9.80E-4	3.58E-7	1.12E-4	2.32E-3	7.37E-12	9.18E-2
HE-SV-D-OP	4.64E-4	9.83E-4	3.98E-7	1.14E-4	2.39E-3	0.00E+0	9.19E-2
HE-SV-E-LO	4.64E-4	1.01E-3	3.78E-7	1.16E-4	2.53E-3	5.94E-14	8.51E-2
HE-SV-E-OP	4.64E-4	1.00E-3	4.20E-7	1.21E-4	2.53E-3	9.88E-11	9.36E-2
MF-AIR-LK	9.41E-1	8.33E-1	2.57E-1	8.75E-1	9.90E-1	7.53E-3	1.00E+0
MF-AR-LK	9.41E-1	8.35E-1	2.57E-1	8.81E-1	9.90E-1	2.16E-2	1.00E+0
MF-SV-A-FFD	3.49E-4	9.11E-4	9.91E-6	1.94E-4	2.09E-3	2.02E-7	7.94E-2
MF-SV-B-FFD	1.59E-1	1.71E-1	1.94E-3	5.15E-2	4.98E-1	6.71E-5	9.88E-1
MF-SV-C-FFD	1.59E-1	1.72E-1	1.92E-3	5.19E-2	4.97E-1	8.55E-5	9.79E-1
MF-SV-D-FFD	1.59E-1	1.71E-1	2.21E-3	5.26E-2	4.87E-1	5.03E-5	9.78E-1
MF-SV-E-FFD	1.59E-1	1.71E-1	2.19E-3	5.28E-2	4.88E-1	3.30E-5	9.78E-1
MF-VP-A-LK	3.49E-4	9.11E-4	9.91E-6	1.94E-4	2.09E-3	2.02E-7	7.94E-2
SV-B-C_CCF	3.75E-5	9.74E-5	1.13E-5	4.19E-5	2.00E-4	3.27E-6	5.63E-3
SV-D-E_CCF	3.75E-5	8.99E-5	1.17E-5	4.30E-5	1.86E-4	4.02E-6	3.80E-3

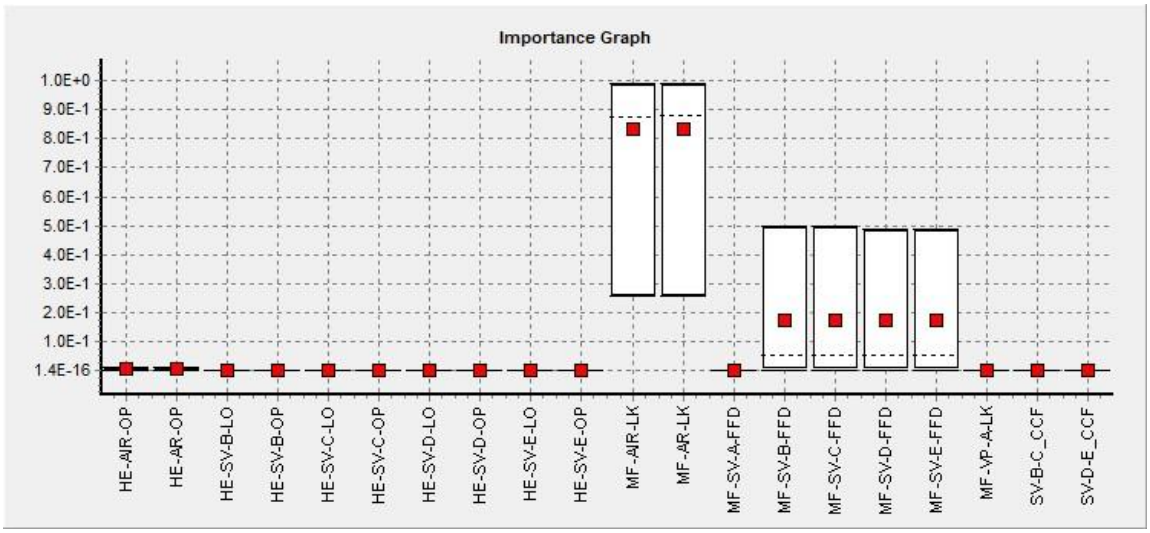


Figure 194: Importance graph for extended system w/ Bruce B fault rate and SV_OM.

Table 189: FV Results for Extended System w/ Bruce B Fault Rate and SV_OH

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	1.51E-3	3.22E-3	2.83E-6	6.67E-4	8.00E-3	1.45E-12	1.92E-1
HE-AR-OP	1.52E-3	3.04E-3	1.92E-6	6.02E-4	7.68E-3	1.79E-15	2.45E-1
HE-SV-B-LO	1.23E-3	1.32E-3	8.65E-7	2.18E-4	3.37E-3	8.01E-13	7.86E-2
HE-SV-B-OP	1.23E-3	1.31E-3	6.32E-7	2.41E-4	3.33E-3	3.92E-12	5.61E-2
HE-SV-C-LO	1.23E-3	1.26E-3	8.39E-7	2.23E-4	3.20E-3	4.13E-12	7.15E-2
HE-SV-C-OP	1.23E-3	1.19E-3	7.96E-7	2.26E-4	3.18E-3	5.44E-12	5.25E-2
HE-SV-D-LO	1.23E-3	1.20E-3	7.39E-7	2.25E-4	3.04E-3	1.25E-11	6.81E-2
HE-SV-D-OP	1.23E-3	1.22E-3	8.10E-7	2.16E-4	3.16E-3	0.00E+0	6.50E-2
HE-SV-E-LO	1.23E-3	1.27E-3	8.18E-7	2.27E-4	3.26E-3	1.02E-13	7.11E-2
HE-SV-E-OP	1.23E-3	1.31E-3	9.05E-7	2.28E-4	3.47E-3	2.03E-10	1.09E-1
MF-AIR-LK	8.48E-1	5.98E-1	8.67E-2	5.38E-1	9.33E-1	2.17E-3	9.99E-1
MF-AR-LK	8.49E-1	6.02E-1	8.99E-2	5.46E-1	9.31E-1	4.26E-3	9.99E-1
MF-SV-A-FFD	5.80E-4	8.00E-4	1.31E-5	2.37E-4	1.85E-3	5.05E-7	5.91E-2
MF-SV-B-FFD	7.61E-1	4.52E-1	2.34E-2	3.37E-1	8.49E-1	1.01E-3	9.97E-1
MF-SV-C-FFD	7.61E-1	4.52E-1	2.36E-2	3.37E-1	8.50E-1	1.10E-3	9.95E-1
MF-SV-D-FFD	7.61E-1	4.50E-1	2.58E-2	3.40E-1	8.48E-1	5.60E-4	9.93E-1
MF-SV-E-FFD	7.61E-1	4.50E-1	2.59E-2	3.40E-1	8.47E-1	4.91E-4	9.93E-1
MF-VP-A-LK	5.80E-4	8.00E-4	1.31E-5	2.37E-4	1.85E-3	5.05E-7	5.91E-2
SV-B-C_CCF	4.28E-5	5.73E-5	8.22E-6	2.92E-5	1.13E-4	2.43E-6	3.67E-3
SV-D-E_CCF	4.28E-5	5.49E-5	8.29E-6	2.95E-5	1.09E-4	2.76E-6	1.44E-3

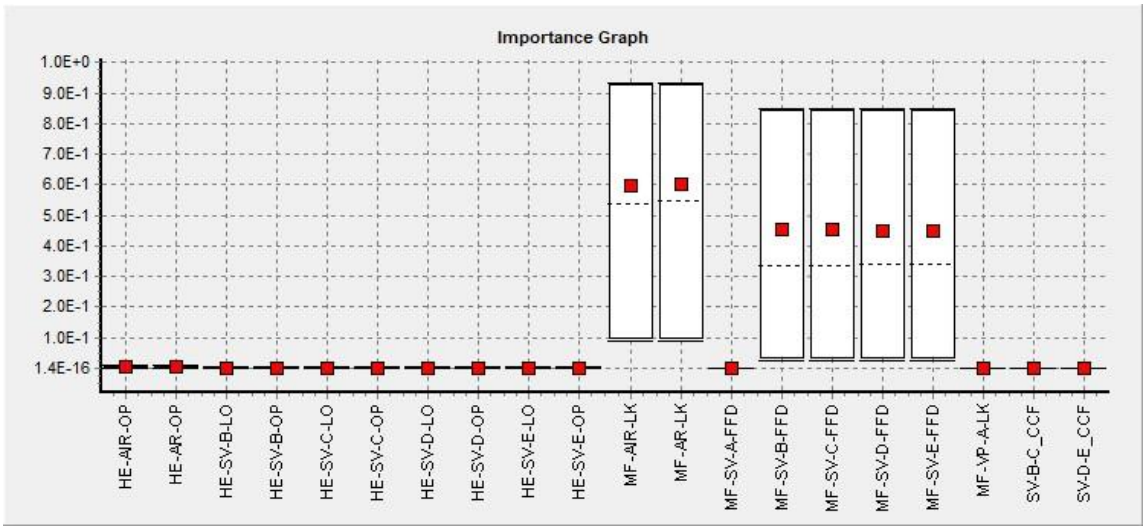


Figure 195: Importance graph for extended system w/ Bruce B fault rate and SV_OH.

Table 190: FV Results for Extended System w/ Bruce B Fault Rate and SV_DOW

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	1.30E-3	7.39E-3	5.44E-6	1.24E-3	1.70E-2	1.49E-12	4.85E-1
HE-AR-OP	1.30E-3	6.97E-3	3.03E-6	1.07E-3	1.59E-2	9.99E-15	4.54E-1
HE-SV-B-LO	1.05E-5	6.19E-5	1.73E-8	4.36E-6	1.16E-4	1.02E-14	8.23E-3
HE-SV-B-OP	1.05E-5	6.09E-5	1.23E-8	4.75E-6	1.14E-4	9.51E-14	1.42E-2
HE-SV-C-LO	1.05E-5	6.42E-5	1.78E-8	4.66E-6	1.12E-4	8.75E-14	1.30E-2
HE-SV-C-OP	1.05E-5	6.21E-5	1.62E-8	4.45E-6	1.12E-4	8.79E-14	2.32E-2
HE-SV-D-LO	1.05E-5	5.91E-5	1.61E-8	4.58E-6	1.03E-4	3.58E-13	1.76E-2
HE-SV-D-OP	1.05E-5	5.84E-5	1.80E-8	4.61E-6	1.07E-4	0.00E+0	8.27E-3
HE-SV-E-LO	1.05E-5	8.32E-5	1.56E-8	4.76E-6	1.07E-4	0.00E+0	2.13E-1
HE-SV-E-OP	1.05E-5	5.75E-5	1.90E-8	4.81E-6	1.13E-4	4.63E-12	2.36E-2
MF-AIR-LK	9.99E-1	9.92E-1	9.51E-1	9.97E-1	1.00E+0	5.12E-1	1.00E+0
MF-AR-LK	9.99E-1	9.93E-1	9.52E-1	9.97E-1	1.00E+0	5.27E-1	1.00E+0
MF-SV-A-FFD	6.95E-6	3.91E-5	2.48E-7	4.67E-6	7.45E-5	8.55E-9	8.67E-3
MF-SV-B-FFD	6.46E-5	3.48E-4	1.31E-6	2.89E-5	5.86E-4	4.31E-8	6.68E-2
MF-SV-C-FFD	6.46E-5	3.44E-4	1.22E-6	3.06E-5	6.17E-4	4.55E-8	5.45E-2
MF-SV-D-FFD	6.46E-5	3.69E-4	1.36E-6	3.02E-5	5.69E-4	5.10E-8	2.50E-1
MF-SV-E-FFD	6.46E-5	3.45E-4	1.33E-6	2.89E-5	5.62E-4	2.30E-8	5.48E-2
MF-VP-A-LK	6.95E-6	3.91E-5	2.48E-7	4.67E-6	7.45E-5	8.55E-9	8.67E-3
SV-B-C_CCF	3.66E-5	1.42E-4	1.28E-5	4.92E-5	2.90E-4	4.31E-6	1.12E-2
SV-D-E_CCF	3.66E-5	1.26E-4	1.36E-5	4.99E-5	2.66E-4	4.04E-6	5.13E-3

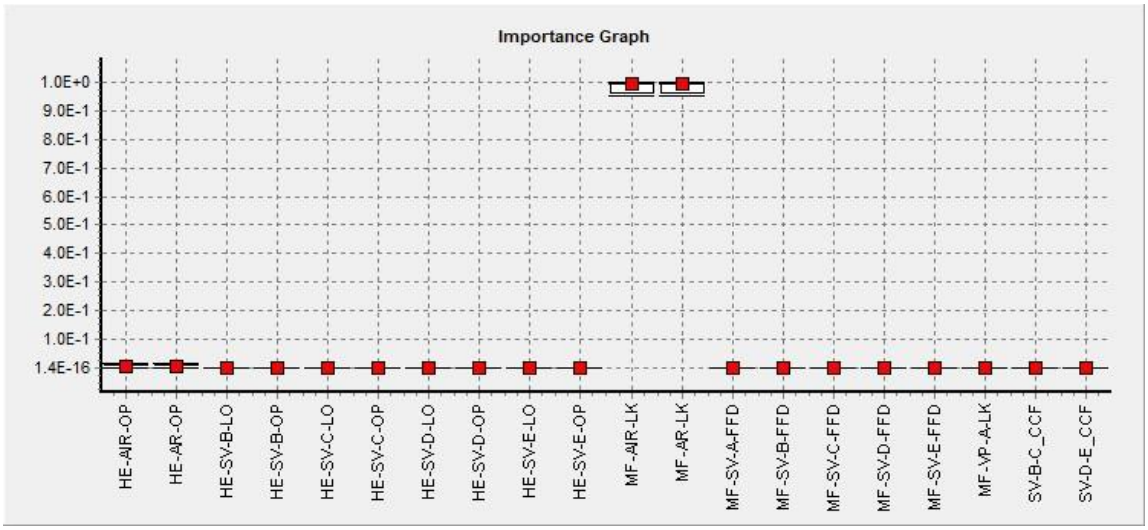


Figure 196: Importance graph for extended system w/ Bruce B fault rate and SV_DOW.

Table 191: FV Results for Extended System w/ Bruce B Fault Rate and SV_MAN

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	1.30E-3	7.41E-3	5.44E-6	1.24E-3	1.70E-2	1.49E-12	4.85E-1
HE-AR-OP	1.30E-3	6.98E-3	3.03E-6	1.07E-3	1.59E-2	1.00E-14	4.60E-1
HE-SV-B-LO	2.78E-6	1.64E-5	4.41E-9	1.31E-6	3.47E-5	5.08E-15	2.35E-3
HE-SV-B-OP	2.78E-6	1.62E-5	3.32E-9	1.34E-6	3.50E-5	2.51E-14	1.56E-3
HE-SV-C-LO	2.78E-6	1.67E-5	4.47E-9	1.39E-6	3.46E-5	4.72E-14	1.68E-3
HE-SV-C-OP	2.78E-6	1.61E-5	4.51E-9	1.33E-6	3.43E-5	4.65E-15	1.97E-3
HE-SV-D-LO	2.78E-6	1.46E-5	4.38E-9	1.33E-6	3.08E-5	1.90E-13	1.37E-3
HE-SV-D-OP	2.78E-6	1.63E-5	4.46E-9	1.30E-6	3.25E-5	0.00E+0	4.12E-3
HE-SV-E-LO	2.78E-6	1.61E-5	4.19E-9	1.35E-6	3.16E-5	0.00E+0	1.16E-2
HE-SV-E-OP	2.78E-6	1.57E-5	4.44E-9	1.33E-6	3.27E-5	9.59E-13	2.86E-3
MF-AIR-LK	9.99E-1	9.93E-1	9.52E-1	9.97E-1	1.00E+0	5.13E-1	1.00E+0
MF-AR-LK	9.99E-1	9.93E-1	9.53E-1	9.97E-1	1.00E+0	5.35E-1	1.00E+0
MF-SV-A-FFD	1.69E-7	9.69E-7	6.02E-9	1.13E-7	1.81E-6	2.07E-10	2.16E-4
MF-SV-B-FFD	4.14E-7	2.55E-6	7.52E-9	2.07E-7	4.27E-6	6.05E-10	7.45E-4
MF-SV-C-FFD	4.14E-7	2.45E-6	6.77E-9	2.19E-7	4.31E-6	1.53E-10	5.49E-4
MF-SV-D-FFD	4.14E-7	3.23E-6	7.77E-9	2.25E-7	4.30E-6	1.88E-10	7.70E-3
MF-SV-E-FFD	4.14E-7	2.36E-6	7.55E-9	2.11E-7	4.26E-6	4.02E-10	6.71E-4
MF-VP-A-LK	1.69E-7	9.69E-7	6.02E-9	1.13E-7	1.81E-6	2.07E-10	2.16E-4
SV-B-C_CCF	3.66E-5	1.42E-4	1.28E-5	4.92E-5	2.90E-4	4.31E-6	1.14E-2
SV-D-E_CCF	3.66E-5	1.26E-4	1.36E-5	4.99E-5	2.66E-4	4.04E-6	5.21E-3

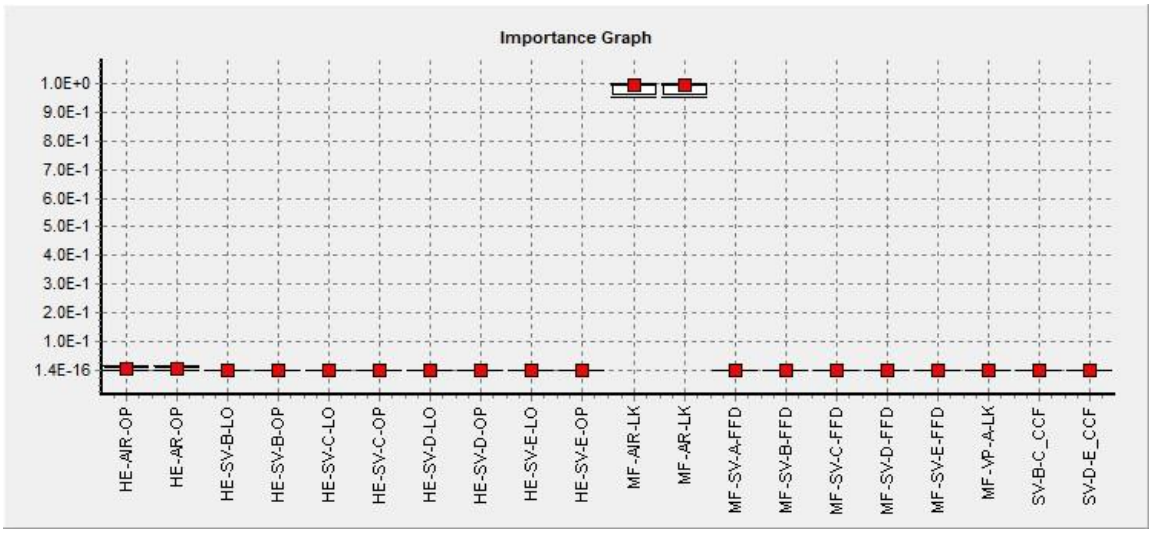


Figure 197: Importance graph for extended system w/ Bruce B fault rate and SV_MAN.

Table 192: FV Results for Extended System w/ Bruce B Fault Rate and SV_NRPD

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	1.30E-3	6.61E-3	5.31E-6	1.18E-3	1.55E-2	1.54E-12	4.74E-1
HE-AR-OP	1.30E-3	6.21E-3	3.02E-6	1.03E-3	1.46E-2	7.52E-15	3.92E-1
HE-SV-B-LO	1.78E-4	6.79E-4	1.68E-7	4.67E-5	1.41E-3	1.25E-13	7.42E-2
HE-SV-B-OP	1.78E-4	6.58E-4	1.16E-7	5.11E-5	1.33E-3	1.52E-12	1.00E-1
HE-SV-C-LO	1.78E-4	6.64E-4	1.57E-7	5.03E-5	1.39E-3	4.11E-13	7.56E-2
HE-SV-C-OP	1.78E-4	5.98E-4	1.54E-7	4.65E-5	1.35E-3	9.06E-13	7.22E-2
HE-SV-D-LO	1.78E-4	6.24E-4	1.47E-7	4.90E-5	1.26E-3	3.07E-12	9.96E-2
HE-SV-D-OP	1.78E-4	6.16E-4	1.70E-7	4.86E-5	1.31E-3	0.00E+0	6.82E-2
HE-SV-E-LO	1.78E-4	6.32E-4	1.56E-7	5.06E-5	1.40E-3	1.49E-14	1.73E-1
HE-SV-E-OP	1.78E-4	6.02E-4	1.76E-7	5.22E-5	1.41E-3	4.10E-11	4.81E-2
MF-AIR-LK	9.90E-1	9.42E-1	6.11E-1	9.72E-1	9.97E-1	3.93E-2	1.00E+0
MF-AR-LK	9.90E-1	9.43E-1	5.94E-1	9.74E-1	9.98E-1	6.95E-2	1.00E+0
MF-SV-A-FFD	1.50E-4	5.86E-4	5.18E-6	9.51E-5	1.30E-3	1.85E-7	1.02E-1
MF-SV-B-FFD	2.39E-2	5.26E-2	2.58E-4	7.50E-3	1.47E-1	7.82E-6	9.41E-1
MF-SV-C-FFD	2.39E-2	5.26E-2	2.61E-4	7.55E-3	1.48E-1	1.33E-5	9.27E-1
MF-SV-D-FFD	2.39E-2	5.27E-2	3.11E-4	7.66E-3	1.43E-1	9.32E-6	9.33E-1
MF-SV-E-FFD	2.39E-2	5.27E-2	2.82E-4	7.64E-3	1.44E-1	4.00E-6	9.34E-1
MF-VP-A-LK	1.50E-4	5.86E-4	5.18E-6	9.51E-5	1.30E-3	1.85E-7	1.02E-1
SV-B-C_CCF	3.67E-5	1.23E-4	1.26E-5	4.72E-5	2.61E-4	4.20E-6	8.62E-3
SV-D-E_CCF	3.67E-5	1.11E-4	1.33E-5	4.82E-5	2.36E-4	4.04E-6	4.33E-3

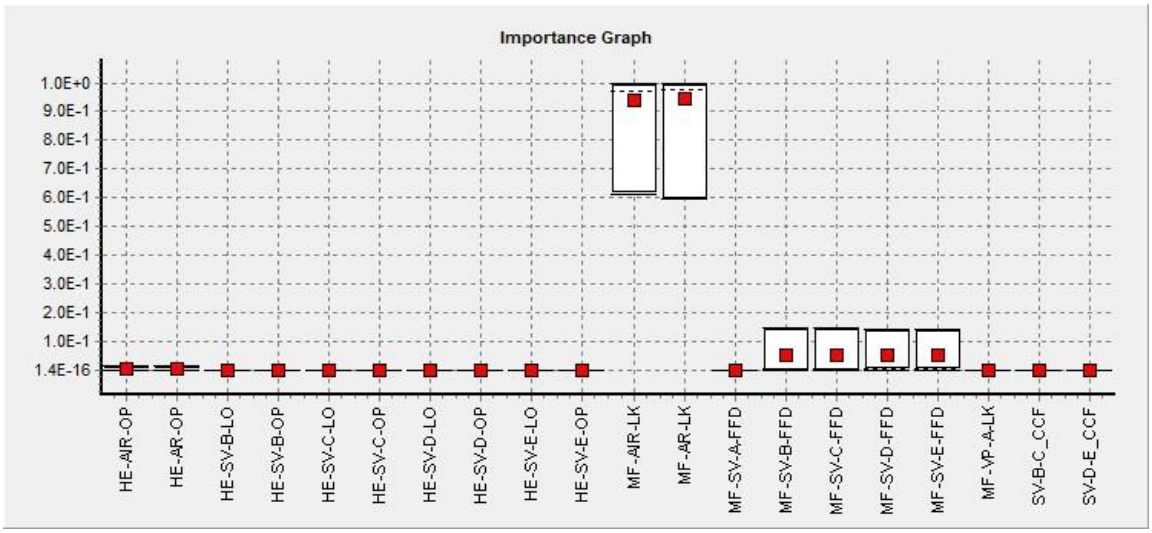


Figure 198: Importance graph for extended system w/ Bruce B fault rate and SV_NRPD.

Table 193: FV Results for Bruce B Fault Rate and Diagnostic HE

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-OP	1.46E-2	3.87E-2	3.07E-5	9.32E-3	1.05E-1	1.81E-10	6.93E-1
HE-AR-OP	1.46E-2	3.70E-2	3.44E-5	8.89E-3	9.96E-2	2.36E-12	7.75E-1
HE-SV-B-LO	4.25E-3	1.08E-2	5.43E-6	2.25E-3	2.86E-2	9.16E-13	2.79E-1
HE-SV-B-OP	4.25E-3	1.04E-2	5.68E-6	1.99E-3	2.84E-2	2.72E-12	2.77E-1
HE-SV-C-LO	4.25E-3	1.02E-2	4.60E-6	2.06E-3	2.76E-2	1.04E-12	2.73E-1
HE-SV-C-OP	4.25E-3	1.03E-2	6.55E-6	2.12E-3	2.70E-2	6.56E-10	2.85E-1
HE-SV-D-LO	4.25E-3	1.00E-2	6.92E-6	2.08E-3	2.75E-2	3.77E-11	2.52E-1
HE-SV-D-OP	4.25E-3	1.06E-2	5.28E-6	2.13E-3	2.74E-2	2.68E-11	2.97E-1
HE-SV-E-LO	4.25E-3	1.05E-2	7.96E-6	2.14E-3	2.80E-2	2.65E-13	3.77E-1
HE-SV-E-OP	4.25E-3	1.04E-2	6.54E-6	2.12E-3	2.84E-2	7.29E-11	2.29E-1
MF-AIR-LK	9.50E-1	7.16E-1	2.26E-1	7.14E-1	9.19E-1	1.27E-2	9.88E-1
MF-AR-LK	9.50E-1	7.21E-1	2.27E-1	7.27E-1	9.21E-1	2.51E-2	9.89E-1
MF-SV-A-FS	2.62E-4	5.81E-4	3.65E-5	2.44E-4	1.29E-3	4.41E-6	1.69E-2

Name	Point Est.	Mean	5th	50th	95th	Min	Max
MF-SV-A-LK	1.50E-5	3.53E-5	2.00E-6	1.37E-5	7.73E-5	2.75E-7	2.21E-3
MF-SV-A-RP	2.18E-6	4.99E-6	4.57E-8	8.27E-7	1.11E-5	1.67E-9	4.36E-4
MF-SV-B-FS	9.67E-2	2.13E-1	3.01E-2	1.34E-1	4.47E-1	7.02E-3	8.81E-1
MF-SV-B-LK	5.60E-3	1.42E-2	1.51E-3	7.30E-3	3.09E-2	2.84E-4	2.59E-1
MF-SV-B-RP	8.13E-4	2.04E-3	3.15E-5	4.39E-4	4.59E-3	2.20E-6	2.00E-1
MF-SV-C-FS	9.67E-2	2.14E-1	2.92E-2	1.35E-1	4.45E-1	3.96E-3	8.88E-1
MF-SV-C-LK	5.60E-3	1.39E-2	1.46E-3	7.08E-3	2.99E-2	3.70E-4	1.67E-1
MF-SV-C-RP	8.13E-4	1.98E-3	3.14E-5	4.06E-4	4.56E-3	1.13E-6	1.14E-1
MF-SV-D-FS	9.67E-2	2.11E-1	2.98E-2	1.32E-1	4.44E-1	7.76E-3	8.81E-1
MF-SV-D-LK	5.60E-3	1.40E-2	1.47E-3	7.16E-3	2.99E-2	2.91E-4	2.33E-1
MF-SV-D-RP	8.13E-4	1.98E-3	2.90E-5	4.20E-4	4.57E-3	1.61E-6	1.68E-1
MF-SV-E-FS	9.67E-2	2.10E-1	2.94E-2	1.32E-1	4.41E-1	6.32E-3	8.61E-1
MF-SV-E-LK	5.60E-3	1.39E-2	1.46E-3	7.10E-3	3.02E-2	3.33E-4	2.44E-1
MF-SV-E-RP	8.13E-4	1.99E-3	2.92E-5	4.38E-4	4.42E-3	1.80E-6	1.73E-1
MF-VP-A-LK	2.80E-4	6.21E-4	4.29E-5	2.68E-4	1.37E-3	5.88E-6	1.72E-2
SV-B-C_CCF	1.18E-2	2.05E-2	4.55E-3	1.42E-2	3.95E-2	1.13E-3	1.15E-1
SV-D-E_CCF	1.18E-2	2.02E-2	4.55E-3	1.38E-2	3.88E-2	1.36E-3	1.22E-1

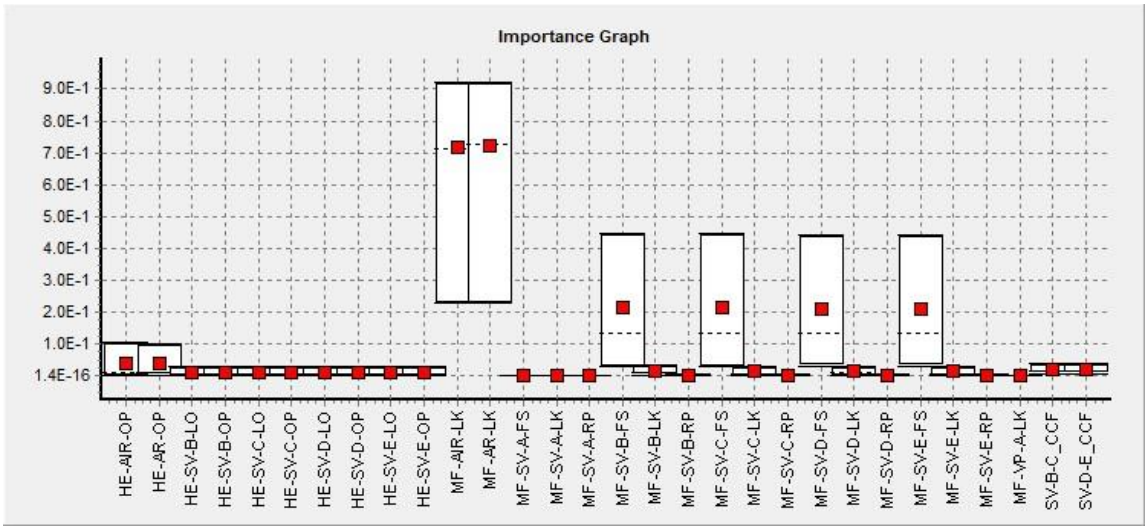


Figure 199: Importance graph for extended system with Bruce B fault rate and diagnostic human error.

Table 194: FV Results for Bruce B Fault Rate and Diagnostic HE and SV_OL

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	1.43E-2	5.85E-2	4.33E-5	1.26E-2	1.65E-1	6.00E-14	8.98E-1
HE-AR-OP	1.43E-2	5.75E-2	3.41E-5	1.16E-2	1.56E-1	1.39E-9	8.80E-1
HE-SV-B-LO	3.99E-4	2.03E-3	5.32E-7	1.88E-4	4.42E-3	1.77E-12	1.80E-1
HE-SV-B-OP	3.99E-4	2.01E-3	5.58E-7	2.01E-4	4.50E-3	1.51E-12	1.64E-1
HE-SV-C-LO	3.99E-4	1.98E-3	5.72E-7	2.09E-4	4.42E-3	3.94E-12	1.63E-1
HE-SV-C-OP	3.99E-4	2.06E-3	4.56E-7	1.89E-4	4.37E-3	2.68E-14	1.95E-1
HE-SV-D-LO	3.99E-4	1.79E-3	4.98E-7	1.90E-4	4.06E-3	1.79E-11	1.43E-1
HE-SV-D-OP	3.99E-4	1.93E-3	5.62E-7	1.99E-4	4.24E-3	6.98E-15	2.00E-1
HE-SV-E-LO	3.99E-4	1.81E-3	5.26E-7	1.91E-4	4.33E-3	2.44E-12	1.10E-1
HE-SV-E-OP	3.99E-4	1.99E-3	5.56E-7	1.94E-4	4.29E-3	2.92E-11	2.42E-1
MF-AIR-LK	9.94E-1	9.39E-1	6.36E-1	9.65E-1	9.98E-1	7.07E-2	1.00E+0
MF-AR-LK	9.94E-1	9.41E-1	6.31E-1	9.66E-1	9.98E-1	1.23E-1	1.00E+0
MF-SV-A-FFD	6.74E-6	3.19E-5	2.41E-7	4.03E-6	6.36E-5	9.24E-9	6.60E-3
MF-SV-B-FFD	2.15E-4	1.06E-3	4.50E-6	1.14E-4	2.09E-3	1.84E-7	1.68E-1
MF-SV-C-FFD	2.15E-4	1.06E-3	4.33E-6	1.16E-4	2.13E-3	8.22E-8	9.88E-2
MF-SV-D-FFD	2.15E-4	1.06E-3	4.81E-6	1.13E-4	2.17E-3	2.39E-7	1.78E-1
MF-SV-E-FFD	2.15E-4	9.75E-4	4.26E-6	1.14E-4	1.97E-3	2.94E-8	1.49E-1
MF-VP-A-LK	6.74E-6	3.19E-5	2.41E-7	4.03E-6	6.36E-5	9.24E-9	6.60E-3
SV-B-C_CCF	3.67E-5	1.21E-4	1.30E-5	4.85E-5	2.47E-4	5.03E-6	8.78E-3
SV-D-E_CCF	3.67E-5	1.13E-4	1.32E-5	4.86E-5	2.33E-4	2.55E-6	4.77E-3

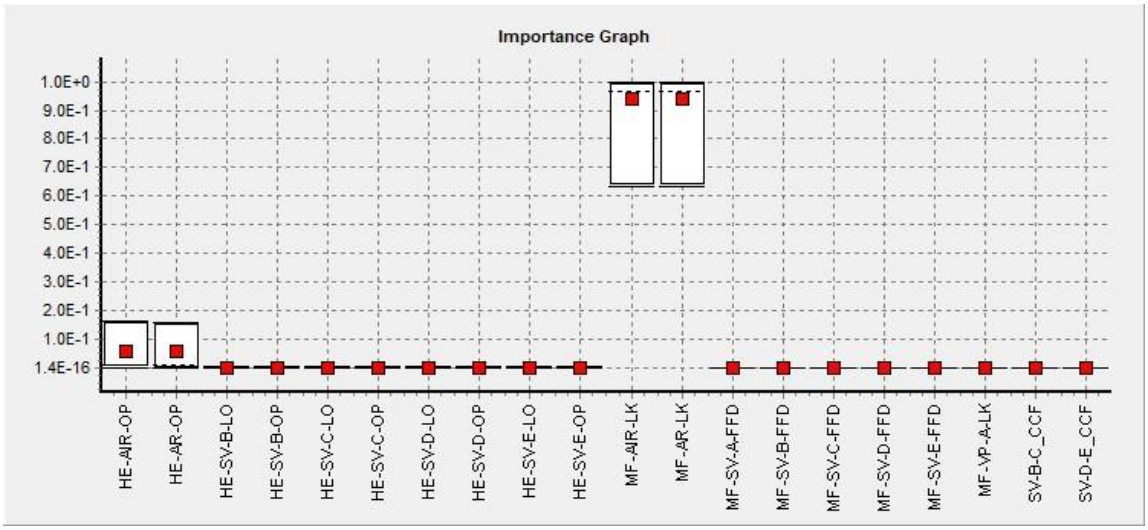


Figure 200: Importance graph for extended system with Bruce B fault rate and diagnostic human error and SV_OL.

Table 195: FV Results for Bruce B Fault Rate and Diagnostic HE and SV_OM

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	1.47E-2	4.44E-2	3.37E-5	1.01E-2	1.21E-1	2.44E-14	7.48E-1
HE-AR-OP	1.47E-2	4.33E-2	2.87E-5	9.29E-3	1.17E-1	1.14E-9	6.66E-1
HE-SV-B-LO	5.42E-3	1.07E-2	5.13E-6	1.44E-3	2.79E-2	8.98E-12	6.42E-1
HE-SV-B-OP	5.42E-3	1.10E-2	4.34E-6	1.45E-3	2.77E-2	2.24E-12	6.26E-1
HE-SV-C-LO	5.42E-3	1.06E-2	3.81E-6	1.48E-3	2.78E-2	7.66E-11	4.50E-1
HE-SV-C-OP	5.42E-3	1.05E-2	3.61E-6	1.42E-3	2.82E-2	2.20E-13	6.93E-1
HE-SV-D-LO	5.42E-3	9.67E-3	3.79E-6	1.44E-3	2.55E-2	7.47E-10	4.09E-1
HE-SV-D-OP	5.42E-3	1.01E-2	4.03E-6	1.47E-3	2.70E-2	6.51E-15	3.13E-1
HE-SV-E-LO	5.42E-3	1.02E-2	4.62E-6	1.41E-3	2.74E-2	8.20E-12	4.67E-1
HE-SV-E-OP	5.42E-3	1.07E-2	4.71E-6	1.48E-3	2.74E-2	2.13E-10	5.79E-1
MF-AIR-LK	9.32E-1	7.75E-1	2.12E-1	7.95E-1	9.72E-1	6.63E-3	9.99E-1
MF-AR-LK	9.32E-1	7.80E-1	2.08E-1	8.05E-1	9.74E-1	1.16E-2	9.99E-1
MF-SV-A-FFD	3.46E-4	7.56E-4	9.68E-6	1.70E-4	1.80E-3	4.02E-7	4.40E-2
MF-SV-B-FFD	1.68E-1	1.76E-1	3.10E-3	6.10E-2	4.84E-1	1.00E-4	9.82E-1
MF-SV-C-FFD	1.68E-1	1.77E-1	2.80E-3	6.18E-2	4.82E-1	8.66E-5	9.49E-1
MF-SV-D-FFD	1.68E-1	1.75E-1	2.87E-3	5.92E-2	4.92E-1	1.01E-4	9.84E-1
MF-SV-E-FFD	1.68E-1	1.74E-1	2.86E-3	5.98E-2	4.84E-1	8.79E-5	9.86E-1
MF-VP-A-LK	3.46E-4	7.56E-4	9.68E-6	1.70E-4	1.80E-3	4.02E-7	4.40E-2
SV-B-C_CCF	3.77E-5	8.38E-5	1.10E-5	4.08E-5	1.71E-4	3.75E-6	2.63E-3
SV-D-E_CCF	3.77E-5	7.94E-5	1.15E-5	4.09E-5	1.61E-4	2.37E-6	2.49E-3

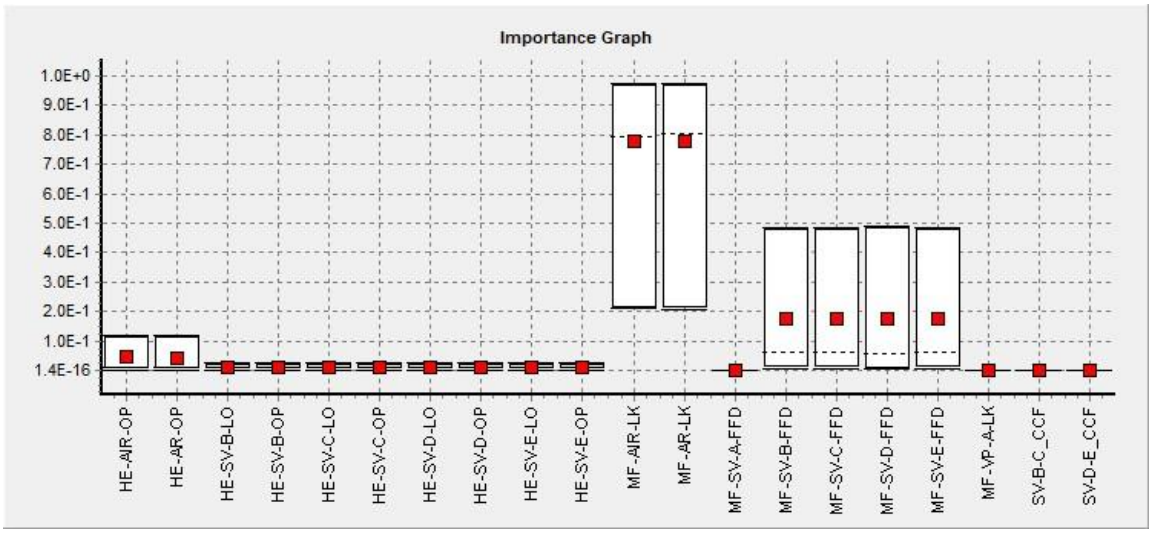


Figure 201: Importance graph for extended system with Bruce B fault rate and diagnostic human error and SV_OM.

Table 196: FV Results for Bruce B Fault Rate and Diagnostic HE and SV_OH

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	1.70E-2	2.94E-2	2.26E-5	6.78E-3	7.65E-2	1.39E-14	6.45E-1
HE-AR-OP	1.70E-2	2.87E-2	1.89E-5	6.20E-3	7.65E-2	8.59E-10	6.49E-1
HE-SV-B-LO	1.41E-2	1.32E-2	8.58E-6	2.47E-3	3.50E-2	1.73E-11	5.84E-1
HE-SV-B-OP	1.41E-2	1.35E-2	7.30E-6	2.54E-3	3.54E-2	3.78E-12	6.60E-1
HE-SV-C-LO	1.41E-2	1.31E-2	6.42E-6	2.65E-3	3.53E-2	9.29E-11	3.74E-1
HE-SV-C-OP	1.41E-2	1.29E-2	6.47E-6	2.45E-3	3.46E-2	5.47E-13	6.96E-1
HE-SV-D-LO	1.41E-2	1.23E-2	6.77E-6	2.54E-3	3.29E-2	1.14E-9	4.51E-1
HE-SV-D-OP	1.41E-2	1.27E-2	7.35E-6	2.59E-3	3.40E-2	8.81E-15	3.39E-1
HE-SV-E-LO	1.41E-2	1.29E-2	8.22E-6	2.51E-3	3.61E-2	2.08E-11	4.18E-1
HE-SV-E-OP	1.41E-2	1.33E-2	8.33E-6	2.61E-3	3.52E-2	6.54E-10	5.04E-1
MF-AIR-LK	8.49E-1	5.62E-1	8.36E-2	4.96E-1	8.96E-1	2.08E-3	9.97E-1
MF-AR-LK	8.50E-1	5.69E-1	7.37E-2	5.10E-1	8.99E-1	4.24E-3	9.98E-1
MF-SV-A-FFD	5.84E-4	6.91E-4	1.31E-5	2.17E-4	1.62E-3	4.21E-7	3.45E-2
MF-SV-B-FFD	7.71E-1	4.52E-1	2.94E-2	3.42E-1	8.30E-1	1.23E-3	9.98E-1
MF-SV-C-FFD	7.71E-1	4.53E-1	2.82E-2	3.47E-1	8.28E-1	1.27E-3	9.98E-1
MF-SV-D-FFD	7.71E-1	4.48E-1	2.87E-2	3.41E-1	8.34E-1	8.16E-4	9.98E-1
MF-SV-E-FFD	7.71E-1	4.47E-1	2.94E-2	3.37E-1	8.31E-1	1.04E-3	9.98E-1
MF-VP-A-LK	5.84E-4	6.91E-4	1.31E-5	2.17E-4	1.62E-3	4.21E-7	3.45E-2
SV-B-C_CCF	4.38E-5	5.16E-5	8.11E-6	2.85E-5	1.02E-4	2.67E-6	2.14E-3
SV-D-E_CCF	4.38E-5	4.99E-5	8.09E-6	2.85E-5	9.90E-5	2.09E-6	1.09E-3

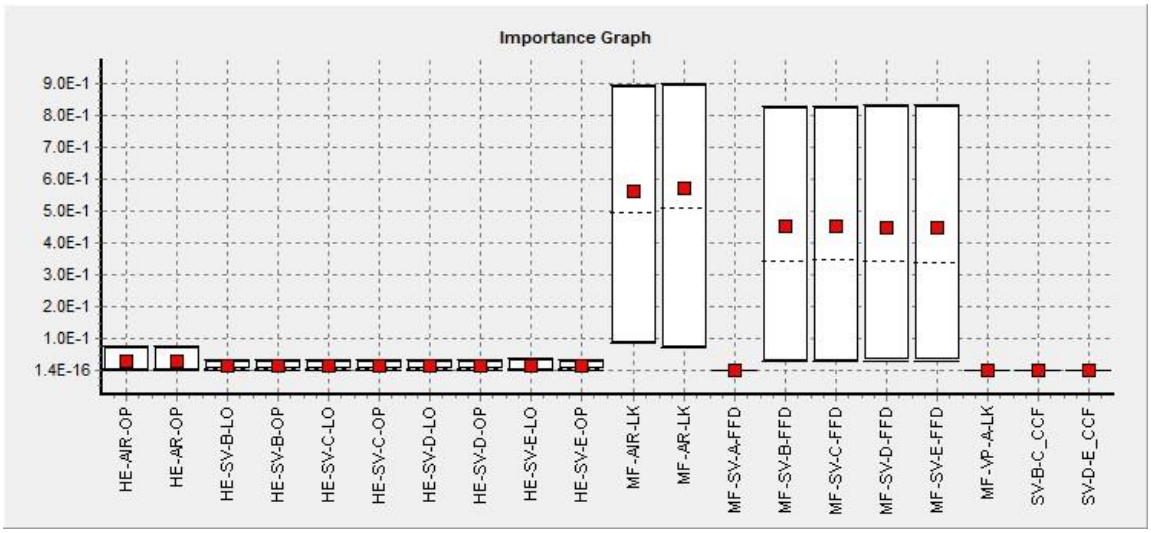


Figure 202: Importance graph for extended system with Bruce B fault rate and diagnostic human error and SV_OH.

Table 197: FV Results for Bruce B Fault Rate and Diagnostic HE and SV_DOW

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	1.43E-2	5.85E-2	4.33E-5	1.26E-2	1.65E-1	6.00E-14	8.98E-1
HE-AR-OP	1.43E-2	5.75E-2	3.41E-5	1.16E-2	1.56E-1	1.39E-9	8.80E-1
HE-SV-B-LO	4.02E-4	2.04E-3	5.42E-7	1.90E-4	4.45E-3	1.78E-12	1.81E-1
HE-SV-B-OP	4.02E-4	2.02E-3	5.61E-7	2.03E-4	4.51E-3	1.51E-12	1.65E-1
HE-SV-C-LO	4.02E-4	1.99E-3	5.74E-7	2.10E-4	4.45E-3	3.98E-12	1.67E-1
HE-SV-C-OP	4.02E-4	2.08E-3	4.59E-7	1.91E-4	4.39E-3	2.68E-14	1.95E-1
HE-SV-D-LO	4.02E-4	1.80E-3	4.98E-7	1.92E-4	4.10E-3	1.84E-11	1.46E-1
HE-SV-D-OP	4.02E-4	1.94E-3	5.70E-7	2.01E-4	4.29E-3	6.98E-15	2.01E-1
HE-SV-E-LO	4.02E-4	1.82E-3	5.32E-7	1.92E-4	4.36E-3	2.44E-12	1.11E-1
HE-SV-E-OP	4.02E-4	2.01E-3	5.60E-7	1.95E-4	4.32E-3	2.93E-11	2.43E-1
MF-AIR-LK	9.94E-1	9.39E-1	6.36E-1	9.65E-1	9.98E-1	7.07E-2	1.00E+0
MF-AR-LK	9.94E-1	9.41E-1	6.31E-1	9.66E-1	9.98E-1	1.23E-1	1.00E+0
MF-SV-A-FFD	6.96E-6	3.30E-5	2.49E-7	4.17E-6	6.58E-5	9.55E-9	6.81E-3
MF-SV-B-FFD	2.24E-4	1.10E-3	4.67E-6	1.20E-4	2.18E-3	1.94E-7	1.72E-1
MF-SV-C-FFD	2.24E-4	1.10E-3	4.55E-6	1.21E-4	2.21E-3	8.55E-8	1.02E-1
MF-SV-D-FFD	2.24E-4	1.10E-3	5.02E-6	1.19E-4	2.26E-3	2.53E-7	1.83E-1
MF-SV-E-FFD	2.24E-4	1.01E-3	4.47E-6	1.19E-4	2.05E-3	3.11E-8	1.54E-1
MF-VP-A-LK	6.96E-6	3.30E-5	2.49E-7	4.17E-6	6.58E-5	9.55E-9	6.81E-3
SV-B-C_CCF	3.67E-5	1.21E-4	1.30E-5	4.85E-5	2.47E-4	5.03E-6	8.77E-3
SV-D-E_CCF	3.67E-5	1.13E-4	1.32E-5	4.86E-5	2.33E-4	2.55E-6	4.77E-3

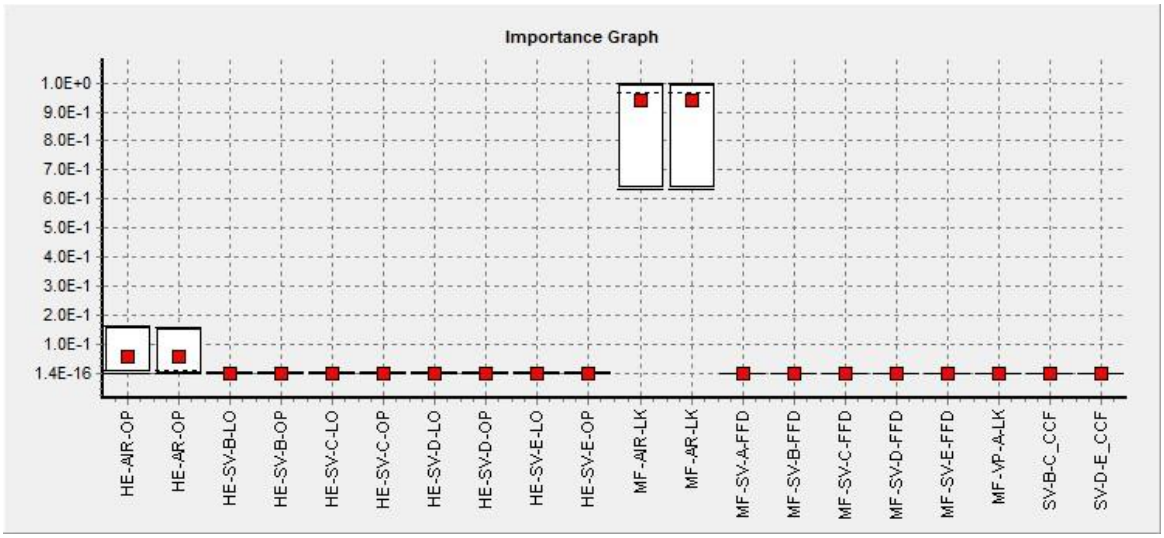


Figure 203: Importance graph for extended system with Bruce B fault rate and diagnostic human error and SV_DOW.

Table 198: FV Results for Bruce B Fault Rate and Diagnostic HE and SV_MAN

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	1.43E-2	5.87E-2	4.34E-5	1.26E-2	1.65E-1	6.04E-14	9.04E-1
HE-AR-OP	1.43E-2	5.77E-2	3.41E-5	1.16E-2	1.57E-1	1.39E-9	8.86E-1
HE-SV-B-LO	3.16E-4	1.65E-3	3.02E-7	1.24E-4	3.41E-3	1.28E-12	1.79E-1
HE-SV-B-OP	3.16E-4	1.60E-3	2.75E-7	1.31E-4	3.57E-3	1.50E-12	1.50E-1
HE-SV-C-LO	3.16E-4	1.59E-3	3.19E-7	1.32E-4	3.45E-3	1.50E-13	1.38E-1
HE-SV-C-OP	3.16E-4	1.65E-3	2.53E-7	1.26E-4	3.38E-3	2.22E-14	1.95E-1
HE-SV-D-LO	3.16E-4	1.44E-3	3.13E-7	1.25E-4	3.21E-3	3.29E-12	1.31E-1
HE-SV-D-OP	3.16E-4	1.56E-3	3.17E-7	1.34E-4	3.33E-3	7.01E-15	1.74E-1
HE-SV-E-LO	3.16E-4	1.43E-3	3.06E-7	1.29E-4	3.34E-3	2.35E-12	8.63E-2
HE-SV-E-OP	3.16E-4	1.58E-3	3.39E-7	1.33E-4	3.24E-3	2.66E-11	2.27E-1
MF-AIR-LK	9.94E-1	9.41E-1	6.42E-1	9.67E-1	9.98E-1	7.12E-2	1.00E+0
MF-AR-LK	9.94E-1	9.42E-1	6.37E-1	9.67E-1	9.98E-1	1.24E-1	1.00E+0
MF-SV-A-FFD	1.69E-7	8.21E-7	6.06E-9	1.01E-7	1.61E-6	2.32E-10	1.73E-4
MF-SV-B-FFD	4.28E-6	2.23E-5	5.28E-8	2.01E-6	4.06E-5	7.86E-10	5.26E-3
MF-SV-C-FFD	4.28E-6	2.21E-5	4.55E-8	2.04E-6	4.30E-5	5.59E-10	2.79E-3
MF-SV-D-FFD	4.28E-6	2.20E-5	4.89E-8	1.98E-6	4.10E-5	6.86E-10	5.51E-3
MF-SV-E-FFD	4.28E-6	1.95E-5	5.41E-8	1.94E-6	3.85E-5	2.46E-10	4.11E-3
MF-VP-A-LK	1.69E-7	8.21E-7	6.06E-9	1.01E-7	1.61E-6	2.32E-10	1.73E-4
SV-B-C_CCF	3.67E-5	1.22E-4	1.30E-5	4.86E-5	2.48E-4	5.03E-6	8.93E-3
SV-D-E_CCF	3.67E-5	1.13E-4	1.32E-5	4.86E-5	2.35E-4	2.55E-6	4.80E-3

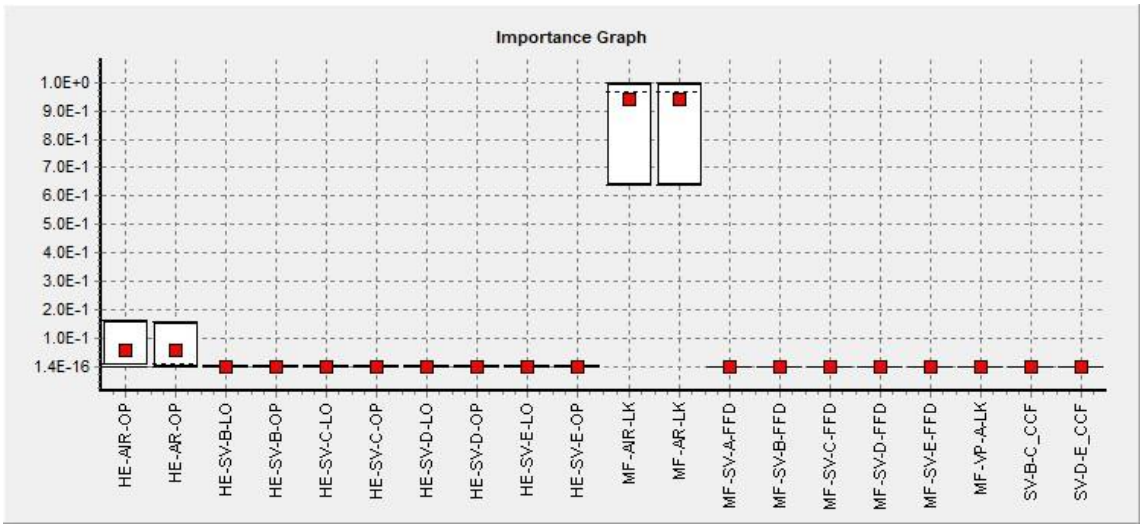


Figure 204: Importance graph for extended system with Bruce B fault rate and diagnostic human error and SV_MAN.

Table 199: FV Results for Bruce B Fault Rate and Diagnostic HE and SV_NRPD

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	1.44E-2	5.30E-2	4.13E-5	1.18E-2	1.47E-1	4.39E-14	8.12E-1
HE-AR-OP	1.44E-2	5.18E-2	3.27E-5	1.08E-2	1.39E-1	1.32E-9	7.87E-1
HE-SV-B-LO	2.25E-3	7.19E-3	2.63E-6	7.80E-4	1.77E-2	6.04E-12	4.87E-1
HE-SV-B-OP	2.25E-3	7.41E-3	2.27E-6	8.04E-4	1.74E-2	1.77E-12	4.54E-1
HE-SV-C-LO	2.25E-3	7.06E-3	2.15E-6	8.15E-4	1.74E-2	2.91E-11	5.59E-1
HE-SV-C-OP	2.25E-3	7.12E-3	2.03E-6	7.63E-4	1.75E-2	9.42E-14	5.69E-1
HE-SV-D-LO	2.25E-3	6.41E-3	2.08E-6	7.82E-4	1.58E-2	3.32E-10	4.16E-1
HE-SV-D-OP	2.25E-3	6.84E-3	2.31E-6	7.96E-4	1.71E-2	6.42E-15	3.23E-1
HE-SV-E-LO	2.25E-3	6.80E-3	2.32E-6	7.63E-4	1.71E-2	4.42E-12	3.86E-1
HE-SV-E-OP	2.25E-3	7.19E-3	2.41E-6	8.07E-4	1.75E-2	9.11E-11	4.61E-1
MF-AIR-LK	9.82E-1	8.81E-1	4.37E-1	9.11E-1	9.89E-1	2.78E-2	1.00E+0
MF-AR-LK	9.82E-1	8.83E-1	4.15E-1	9.15E-1	9.90E-1	2.24E-2	1.00E+0
MF-SV-A-FFD	1.49E-4	4.86E-4	5.05E-6	8.33E-5	1.10E-3	2.12E-7	6.23E-2
MF-SV-B-FFD	2.74E-2	5.79E-2	5.00E-4	1.12E-2	1.59E-1	1.63E-5	9.43E-1
MF-SV-C-FFD	2.74E-2	5.83E-2	4.52E-4	1.13E-2	1.55E-1	1.07E-5	8.84E-1
MF-SV-D-FFD	2.74E-2	5.85E-2	4.64E-4	1.07E-2	1.63E-1	2.00E-5	9.60E-1
MF-SV-E-FFD	2.74E-2	5.78E-2	4.72E-4	1.07E-2	1.59E-1	1.13E-5	9.60E-1
MF-VP-A-LK	1.49E-4	4.86E-4	5.05E-6	8.33E-5	1.10E-3	2.12E-7	6.23E-2
SV-B-C_CCF	3.69E-5	1.05E-4	1.24E-5	4.66E-5	2.15E-4	4.98E-6	5.27E-3
SV-D-E_CCF	3.69E-5	9.86E-5	1.29E-5	4.65E-5	2.03E-4	2.48E-6	3.85E-3

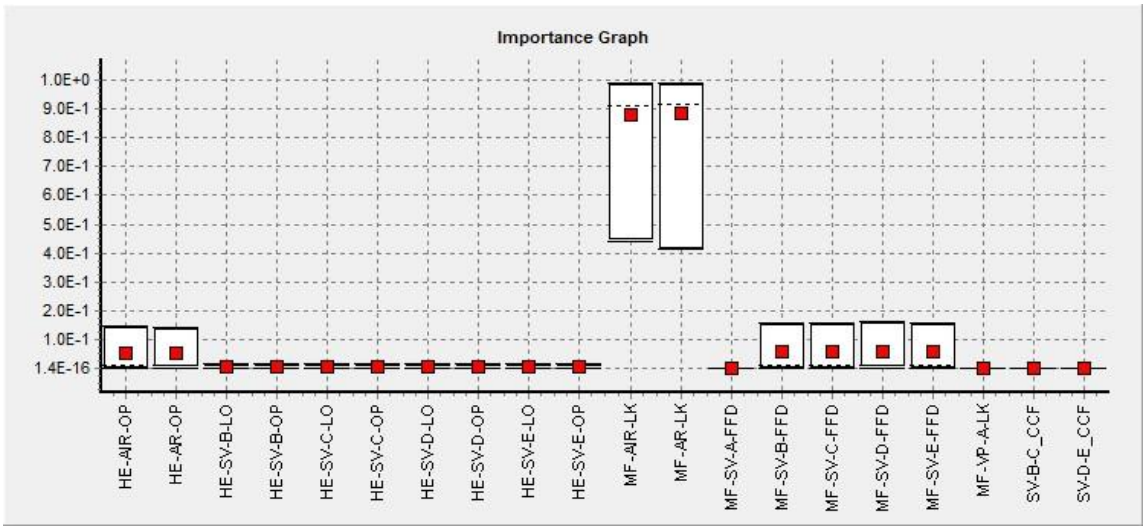


Figure 205: Importance graph for extended system with Bruce B fault rate and diagnostic human error and SV_NRPD.

Table 200: FV Results for Extended System w/ Bruce A Fault Rate

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-OP	3.56E-3	8.43E-3	6.74E-6	1.75E-3	2.23E-2	9.34E-11	3.27E-1
HE-AR-OP	3.56E-3	7.99E-3	5.66E-6	1.57E-3	2.07E-2	1.27E-13	2.07E-1
HE-SV-B-LO	9.67E-4	1.89E-3	1.23E-6	3.71E-4	4.99E-3	1.32E-12	5.27E-2
HE-SV-B-OP	9.67E-4	1.85E-3	1.19E-6	3.80E-4	4.99E-3	2.36E-10	6.00E-2
HE-SV-C-LO	9.67E-4	1.93E-3	1.28E-6	3.67E-4	5.27E-3	1.42E-12	6.24E-2
HE-SV-C-OP	9.67E-4	1.81E-3	9.44E-7	3.39E-4	4.79E-3	6.08E-11	6.89E-2
HE-SV-D-LO	9.67E-4	1.80E-3	1.10E-6	3.42E-4	4.91E-3	8.79E-11	3.85E-2
HE-SV-D-OP	9.67E-4	1.85E-3	9.56E-7	3.50E-4	4.98E-3	1.68E-12	8.71E-2
HE-SV-E-LO	9.67E-4	1.89E-3	1.46E-6	3.74E-4	5.17E-3	2.41E-13	6.44E-2
HE-SV-E-OP	9.67E-4	1.75E-3	1.43E-6	3.46E-4	4.67E-3	8.55E-14	1.06E-1
MF-AIR-LK	7.21E-1	5.44E-1	6.21E-2	4.76E-1	8.79E-1	4.11E-3	9.83E-1
MF-AR-LK	7.22E-1	5.50E-1	5.90E-2	4.85E-1	8.85E-1	5.85E-3	9.90E-1

Name	Point Est.	Mean	5th	50th	95th	Min	Max
MF-SV-A-FS	5.63E-4	9.67E-4	2.61E-5	3.22E-4	2.27E-3	1.81E-6	4.47E-2
MF-SV-A-LK	3.22E-5	5.90E-5	1.54E-6	1.81E-5	1.35E-4	7.63E-8	4.38E-3
MF-SV-A-RP	4.67E-6	7.89E-6	4.19E-8	1.04E-6	1.70E-5	2.81E-10	9.56E-4
MF-SV-B-FS	2.44E-1	3.79E-1	4.62E-2	2.80E-1	7.07E-1	1.05E-2	9.34E-1
MF-SV-B-LK	1.40E-2	2.66E-2	2.17E-3	1.38E-2	5.82E-2	3.95E-4	3.80E-1
MF-SV-B-RP	2.03E-3	3.84E-3	4.99E-5	7.87E-4	8.93E-3	4.37E-6	1.56E-1
MF-SV-C-FS	2.44E-1	3.79E-1	4.79E-2	2.80E-1	7.08E-1	8.42E-3	9.33E-1
MF-SV-C-LK	1.40E-2	2.68E-2	2.34E-3	1.37E-2	5.82E-2	3.66E-4	3.97E-1
MF-SV-C-RP	2.03E-3	3.60E-3	4.84E-5	7.79E-4	8.55E-3	2.67E-6	1.55E-1
MF-SV-D-FS	2.44E-1	3.76E-1	4.25E-2	2.76E-1	7.07E-1	7.87E-3	9.23E-1
MF-SV-D-LK	1.40E-2	2.61E-2	2.20E-3	1.31E-2	5.81E-2	3.72E-4	3.57E-1
MF-SV-D-RP	2.03E-3	3.77E-3	4.89E-5	8.11E-4	8.42E-3	2.32E-6	4.36E-1
MF-SV-E-FS	2.44E-1	3.76E-1	4.21E-2	2.75E-1	7.08E-1	5.98E-3	9.33E-1
MF-SV-E-LK	1.40E-2	2.61E-2	2.28E-3	1.33E-2	5.74E-2	4.60E-4	3.48E-1
MF-SV-E-RP	2.03E-3	3.77E-3	4.86E-5	7.46E-4	8.56E-3	3.49E-6	2.87E-1
MF-VP-A-LK	6.00E-4	1.03E-3	2.95E-5	3.55E-4	2.42E-3	1.96E-6	4.59E-2
SV-B-C_CCF	3.18E-2	4.14E-2	7.03E-3	3.08E-2	7.54E-2	2.48E-3	1.72E-1
SV-D-E_CCF	3.18E-2	4.08E-2	6.83E-3	3.04E-2	7.47E-2	1.69E-3	1.69E-1

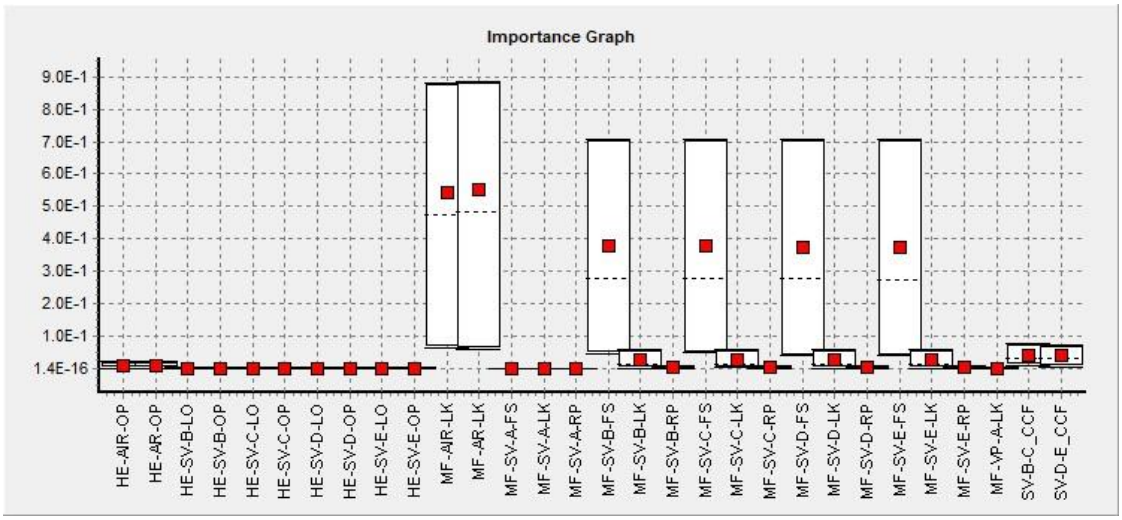


Figure 206: Importance graph for extended system w/ Bruce A fault rate.

Table 201: FV Results for Extended System w/ Bruce A Fault Rate and SV_OL

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	4.84E-3	2.45E-2	9.30E-6	2.99E-3	6.50E-2	4.91E-10	7.74E-1
HE-AR-OP	4.84E-3	2.43E-2	1.07E-5	3.06E-3	6.10E-2	5.47E-11	8.55E-1
HE-SV-B-LO	3.84E-5	2.17E-4	3.57E-8	1.20E-5	3.85E-4	0.00E+0	7.43E-2
HE-SV-B-OP	3.84E-5	2.10E-4	3.50E-8	1.28E-5	3.95E-4	1.43E-12	2.88E-2
HE-SV-C-LO	3.84E-5	2.29E-4	4.23E-8	1.23E-5	4.10E-4	3.84E-12	6.48E-2
HE-SV-C-OP	3.84E-5	2.23E-4	3.21E-8	1.24E-5	4.07E-4	5.97E-13	7.05E-2
HE-SV-D-LO	3.84E-5	2.17E-4	3.48E-8	1.18E-5	3.79E-4	8.19E-12	6.45E-2
HE-SV-D-OP	3.84E-5	2.02E-4	4.05E-8	1.19E-5	3.91E-4	0.00E+0	2.90E-2
HE-SV-E-LO	3.84E-5	2.34E-4	3.77E-8	1.11E-5	3.91E-4	2.25E-13	9.39E-2
HE-SV-E-OP	3.84E-5	2.28E-4	3.34E-8	1.26E-5	3.82E-4	1.48E-13	8.96E-2
MF-AIR-LK	9.95E-1	9.73E-1	8.23E-1	9.89E-1	9.99E-1	2.12E-1	1.00E+0
MF-AR-LK	9.95E-1	9.74E-1	8.05E-1	9.89E-1	9.99E-1	1.41E-1	1.00E+0
MF-SV-A-FFD	2.51E-5	1.41E-4	5.28E-7	1.29E-5	2.51E-4	2.49E-8	1.95E-2
MF-SV-B-FFD	2.28E-4	1.17E-3	2.69E-6	7.75E-5	2.04E-3	2.18E-7	1.95E-1
MF-SV-C-FFD	2.28E-4	1.14E-3	2.75E-6	7.99E-5	1.95E-3	1.20E-7	1.92E-1
MF-SV-D-FFD	2.28E-4	1.30E-3	2.56E-6	7.81E-5	1.97E-3	1.08E-7	3.46E-1
MF-SV-E-FFD	2.28E-4	1.25E-3	2.48E-6	7.84E-5	1.92E-3	3.67E-8	3.41E-1
MF-VP-A-LK	2.51E-5	1.41E-4	5.28E-7	1.29E-5	2.51E-4	2.49E-8	1.95E-2
SV-B-C_CCF	1.37E-4	5.14E-4	2.15E-5	1.41E-4	1.17E-3	5.79E-6	3.06E-2
SV-D-E_CCF	1.37E-4	5.04E-4	2.12E-5	1.38E-4	1.17E-3	5.37E-6	2.50E-2

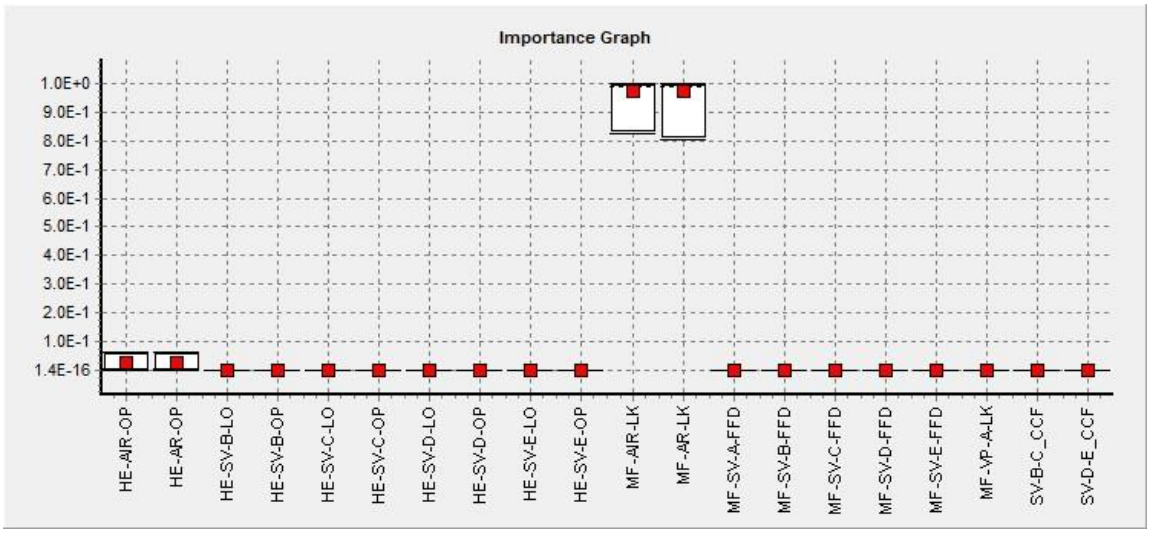


Figure 207: Importance graph for extended system w/ Bruce A fault rate and SV_OL.

Table 202: FV Results for Extended System w/ Bruce A Fault Rate and SV_OM

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	3.16E-3	1.27E-2	6.64E-6	1.88E-3	3.37E-2	5.03E-11	7.18E-1
HE-AR-OP	3.17E-3	1.26E-2	6.66E-6	1.92E-3	3.10E-2	3.93E-11	6.87E-1
HE-SV-B-LO	1.11E-3	2.21E-3	7.16E-7	2.34E-4	5.30E-3	3.83E-15	2.06E-1
HE-SV-B-OP	1.11E-3	2.21E-3	7.33E-7	2.57E-4	5.30E-3	5.71E-11	1.61E-1
HE-SV-C-LO	1.11E-3	2.33E-3	9.15E-7	2.54E-4	5.71E-3	2.06E-11	1.25E-1
HE-SV-C-OP	1.11E-3	2.24E-3	6.51E-7	2.48E-4	5.37E-3	7.71E-12	1.44E-1
HE-SV-D-LO	1.11E-3	2.13E-3	7.72E-7	2.40E-4	5.28E-3	7.22E-11	1.43E-1
HE-SV-D-OP	1.11E-3	2.18E-3	7.94E-7	2.43E-4	5.27E-3	4.53E-14	1.09E-1
HE-SV-E-LO	1.11E-3	2.08E-3	7.77E-7	2.20E-4	5.23E-3	1.01E-11	1.45E-1
HE-SV-E-OP	1.11E-3	2.12E-3	7.08E-7	2.46E-4	5.42E-3	9.73E-12	1.51E-1
MF-AIR-LK	6.40E-1	6.82E-1	7.13E-2	6.79E-1	9.75E-1	5.28E-3	9.99E-1
MF-AR-LK	6.40E-1	6.83E-1	6.91E-2	6.81E-1	9.77E-1	1.58E-3	1.00E+0
MF-SV-A-FFD	6.05E-4	1.95E-3	1.08E-5	2.99E-4	4.20E-3	8.56E-8	2.02E-1
MF-SV-B-FFD	3.80E-1	3.03E-1	4.35E-3	1.33E-1	7.70E-1	2.16E-4	9.95E-1
MF-SV-C-FFD	3.80E-1	3.03E-1	4.24E-3	1.34E-1	7.66E-1	1.67E-4	9.93E-1
MF-SV-D-FFD	3.80E-1	3.04E-1	3.96E-3	1.32E-1	7.70E-1	1.92E-4	9.96E-1
MF-SV-E-FFD	3.80E-1	3.04E-1	4.07E-3	1.32E-1	7.70E-1	1.66E-4	9.93E-1
MF-VP-A-LK	6.05E-4	1.95E-3	1.08E-5	2.99E-4	4.20E-3	8.56E-8	2.02E-1
SV-B-C_CCF	8.93E-5	2.42E-4	1.67E-5	8.93E-5	5.49E-4	4.14E-6	7.56E-3
SV-D-E_CCF	8.93E-5	2.37E-4	1.72E-5	8.70E-5	5.43E-4	4.53E-6	1.08E-2

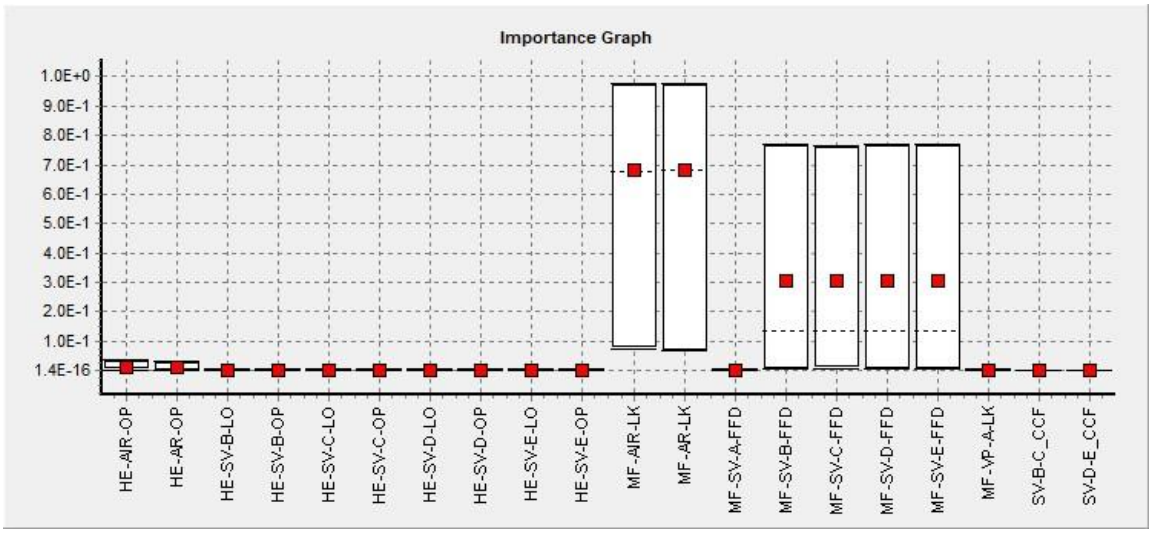


Figure 208: Importance graph for extended system w/ Bruce A fault rate and SV_OM.

Table 203: FV Results for Extended System w/ Bruce A Fault Rate and SV_OH

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	1.46E-3	5.55E-3	3.07E-6	9.02E-4	1.36E-2	1.36E-11	4.38E-1
HE-AR-OP	1.46E-3	5.49E-3	2.95E-6	9.14E-4	1.35E-2	1.13E-11	4.09E-1
HE-SV-B-LO	1.18E-3	1.97E-3	1.15E-6	3.22E-4	4.97E-3	2.36E-15	1.36E-1
HE-SV-B-OP	1.18E-3	1.98E-3	1.21E-6	3.69E-4	4.72E-3	6.91E-11	1.81E-1
HE-SV-C-LO	1.18E-3	2.04E-3	1.41E-6	3.44E-4	4.96E-3	1.11E-11	1.15E-1
HE-SV-C-OP	1.18E-3	1.97E-3	1.12E-6	3.43E-4	4.89E-3	2.47E-11	7.45E-2
HE-SV-D-LO	1.18E-3	1.92E-3	1.24E-6	3.29E-4	4.79E-3	1.40E-10	9.71E-2
HE-SV-D-OP	1.18E-3	1.98E-3	1.22E-6	3.33E-4	4.84E-3	4.62E-14	1.54E-1
HE-SV-E-LO	1.18E-3	1.89E-3	1.16E-6	3.20E-4	4.58E-3	2.84E-11	1.16E-1
HE-SV-E-OP	1.18E-3	1.91E-3	1.10E-6	3.33E-4	4.82E-3	2.98E-11	1.54E-1
MF-AIR-LK	2.90E-1	3.97E-1	1.88E-2	2.54E-1	8.40E-1	1.20E-3	9.96E-1
MF-AR-LK	2.90E-1	4.00E-1	1.97E-2	2.55E-1	8.47E-1	4.37E-4	9.98E-1
MF-SV-A-FFD	2.47E-4	9.69E-4	5.98E-6	1.74E-4	2.24E-3	6.21E-8	1.08E-1
MF-SV-B-FFD	8.56E-1	6.15E-1	5.11E-2	5.75E-1	9.51E-1	1.86E-3	9.99E-1
MF-SV-C-FFD	8.56E-1	6.15E-1	5.13E-2	5.78E-1	9.50E-1	1.68E-3	9.99E-1
MF-SV-D-FFD	8.56E-1	6.13E-1	4.75E-2	5.74E-1	9.50E-1	2.14E-3	9.99E-1
MF-SV-E-FFD	8.56E-1	6.14E-1	4.73E-2	5.76E-1	9.50E-1	2.09E-3	9.99E-1
MF-VP-A-LK	2.47E-4	9.69E-4	5.98E-6	1.74E-4	2.24E-3	6.21E-8	1.08E-1
SV-B-C_CCF	4.11E-5	1.01E-4	9.51E-6	4.22E-5	2.22E-4	2.39E-6	2.46E-3
SV-D-E_CCF	4.11E-5	1.00E-4	9.76E-6	4.08E-5	2.19E-4	2.62E-6	3.54E-3

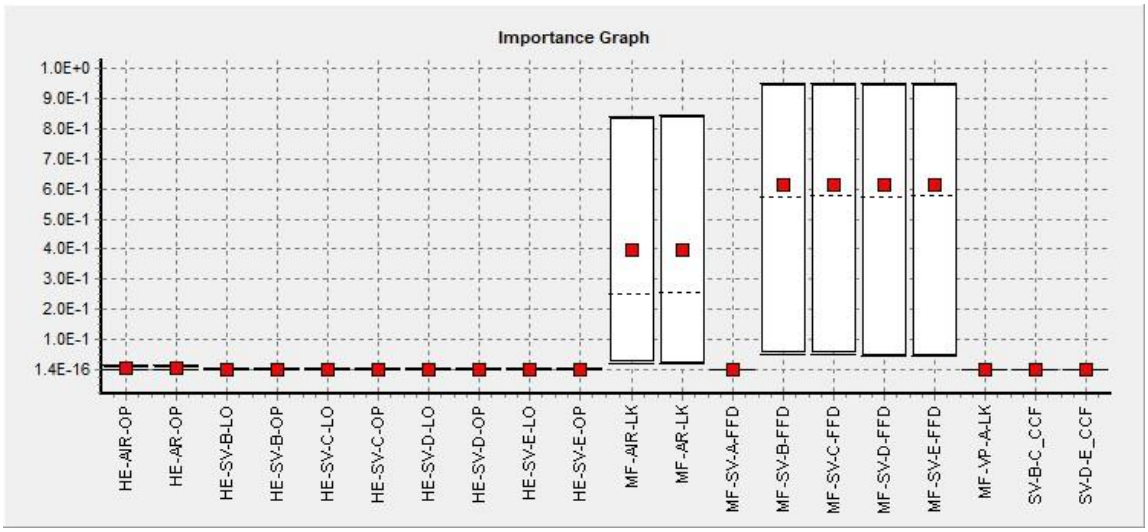


Figure 209: Importance graph for extended system w/ Bruce A fault rate and SV_OH.

Table 204: FV Results for Extended System w/ Bruce A Fault Rate and SV_DOW

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	4.84E-3	2.45E-2	9.30E-6	2.99E-3	6.50E-2	4.91E-10	7.74E-1
HE-AR-OP	4.84E-3	2.43E-2	1.07E-5	3.06E-3	6.10E-2	5.47E-11	8.55E-1
HE-SV-B-LO	3.94E-5	2.22E-4	3.67E-8	1.23E-5	3.94E-4	0.00E+0	7.64E-2
HE-SV-B-OP	3.94E-5	2.15E-4	3.53E-8	1.30E-5	4.04E-4	1.47E-12	2.97E-2
HE-SV-C-LO	3.94E-5	2.35E-4	4.29E-8	1.26E-5	4.20E-4	3.99E-12	6.64E-2
HE-SV-C-OP	3.94E-5	2.28E-4	3.30E-8	1.27E-5	4.16E-4	6.00E-13	7.25E-2
HE-SV-D-LO	3.94E-5	2.22E-4	3.56E-8	1.21E-5	3.86E-4	8.19E-12	6.55E-2
HE-SV-D-OP	3.94E-5	2.07E-4	4.16E-8	1.22E-5	3.98E-4	0.00E+0	2.97E-2
HE-SV-E-LO	3.94E-5	2.40E-4	3.79E-8	1.14E-5	3.97E-4	2.25E-13	9.66E-2
HE-SV-E-OP	3.94E-5	2.34E-4	3.43E-8	1.29E-5	3.89E-4	1.54E-13	9.15E-2
MF-AIR-LK	9.95E-1	9.73E-1	8.23E-1	9.89E-1	9.99E-1	2.12E-1	1.00E+0
MF-AR-LK	9.95E-1	9.73E-1	8.04E-1	9.89E-1	9.99E-1	1.41E-1	1.00E+0
MF-SV-A-FFD	2.60E-5	1.46E-4	5.46E-7	1.34E-5	2.60E-4	2.57E-8	2.02E-2
MF-SV-B-FFD	2.41E-4	1.23E-3	2.84E-6	8.15E-5	2.15E-3	2.27E-7	2.05E-1
MF-SV-C-FFD	2.41E-4	1.21E-3	2.90E-6	8.42E-5	2.06E-3	1.25E-7	2.02E-1
MF-SV-D-FFD	2.41E-4	1.37E-3	2.69E-6	8.26E-5	2.08E-3	1.15E-7	3.61E-1
MF-SV-E-FFD	2.41E-4	1.32E-3	2.61E-6	8.25E-5	2.03E-3	3.91E-8	3.55E-1
MF-VP-A-LK	2.60E-5	1.46E-4	5.46E-7	1.34E-5	2.60E-4	2.57E-8	2.02E-2
SV-B-C_CCF	1.37E-4	5.14E-4	2.15E-5	1.41E-4	1.17E-3	5.79E-6	3.06E-2
SV-D-E_CCF	1.37E-4	5.03E-4	2.12E-5	1.38E-4	1.17E-3	5.37E-6	2.49E-2

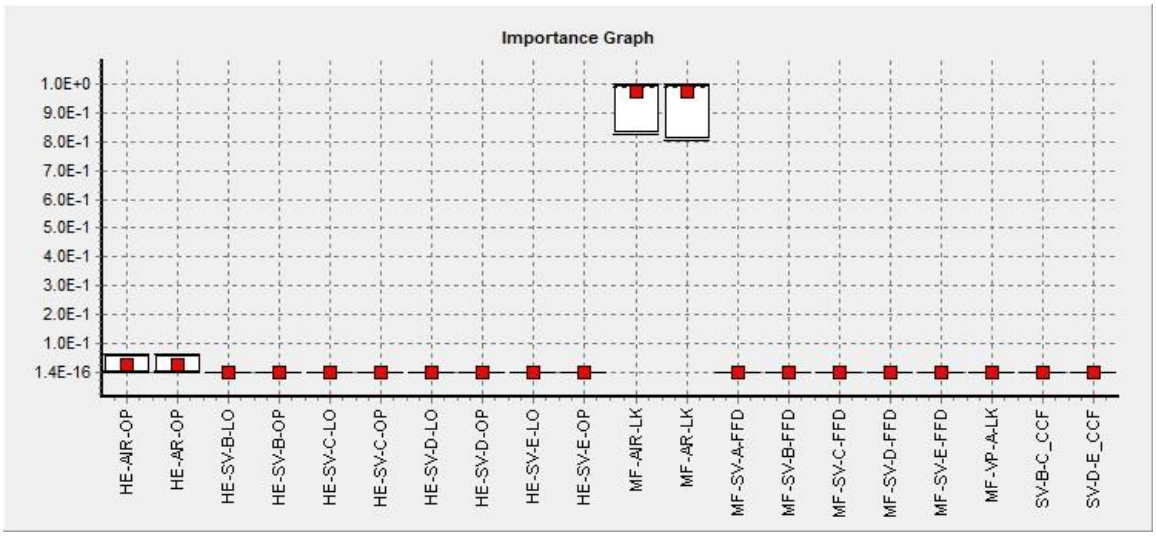


Figure 210: Importance graph for extended system w/ Bruce A fault rate and SV_DOW.

Table 205: FV Results for Extended System w/ Bruce A Fault Rate and SV_MAN

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	4.84E-3	2.46E-2	9.30E-6	3.00E-3	6.53E-2	4.91E-10	7.74E-1
HE-AR-OP	4.84E-3	2.45E-2	1.08E-5	3.06E-3	6.13E-2	5.47E-11	8.55E-1
HE-SV-B-LO	1.04E-5	6.31E-5	8.04E-9	3.57E-6	1.23E-4	0.00E+0	7.18E-3
HE-SV-B-OP	1.04E-5	5.89E-5	1.16E-8	3.79E-6	1.24E-4	2.84E-13	7.55E-3
HE-SV-C-LO	1.04E-5	6.18E-5	1.06E-8	3.76E-6	1.23E-4	6.79E-13	4.54E-3
HE-SV-C-OP	1.04E-5	6.10E-5	1.01E-8	3.63E-6	1.24E-4	3.80E-14	6.66E-3
HE-SV-D-LO	1.04E-5	5.87E-5	9.63E-9	3.56E-6	1.16E-4	7.21E-12	1.90E-2
HE-SV-D-OP	1.04E-5	5.85E-5	9.37E-9	3.55E-6	1.19E-4	0.00E+0	1.25E-2
HE-SV-E-LO	1.04E-5	6.09E-5	1.03E-8	3.35E-6	1.16E-4	7.87E-14	1.69E-2
HE-SV-E-OP	1.04E-5	5.75E-5	8.15E-9	3.65E-6	1.17E-4	1.02E-14	1.88E-2
MF-AIR-LK	9.95E-1	9.75E-1	8.30E-1	9.91E-1	1.00E+0	2.15E-1	1.00E+0
MF-AR-LK	9.95E-1	9.75E-1	8.12E-1	9.91E-1	1.00E+0	1.41E-1	1.00E+0
MF-SV-A-FFD	6.32E-7	3.62E-6	1.32E-8	3.24E-7	6.35E-6	6.23E-10	5.22E-4
MF-SV-B-FFD	1.55E-6	9.45E-6	1.74E-8	5.95E-7	1.65E-5	4.32E-10	2.84E-3
MF-SV-C-FFD	1.55E-6	8.67E-6	1.58E-8	5.87E-7	1.54E-5	1.06E-10	2.03E-3
MF-SV-D-FFD	1.55E-6	1.01E-5	1.74E-8	6.04E-7	1.47E-5	3.90E-10	4.72E-3
MF-SV-E-FFD	1.55E-6	8.84E-6	1.51E-8	5.95E-7	1.50E-5	1.25E-10	3.53E-3
MF-VP-A-LK	6.32E-7	3.62E-6	1.32E-8	3.24E-7	6.35E-6	6.23E-10	5.22E-4
SV-B-C_CCF	1.37E-4	5.17E-4	2.15E-5	1.41E-4	1.17E-3	5.79E-6	3.09E-2
SV-D-E_CCF	1.37E-4	5.07E-4	2.12E-5	1.38E-4	1.18E-3	5.37E-6	2.56E-2

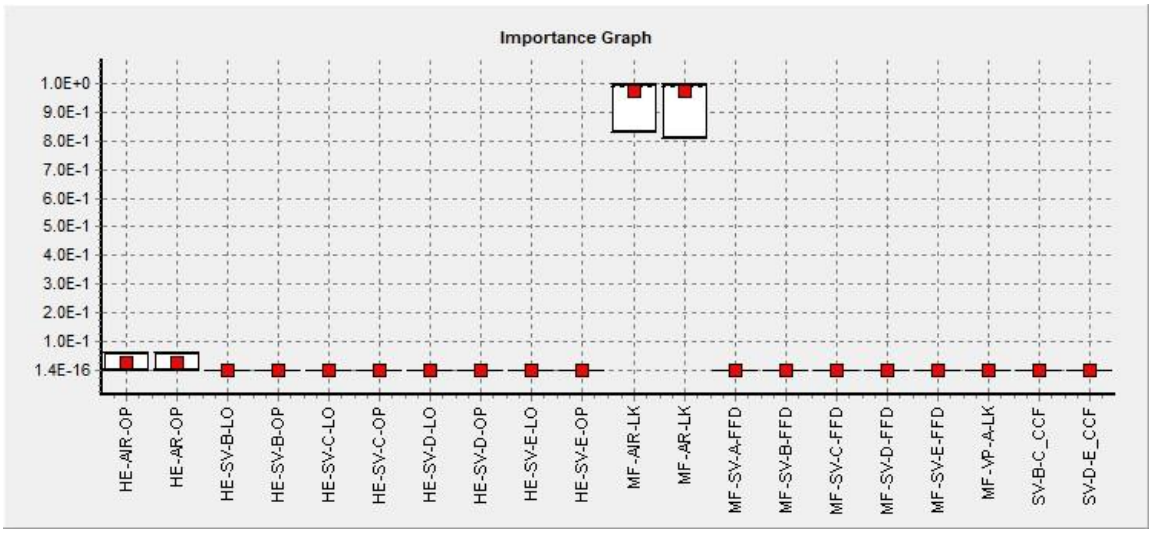


Figure 211: Importance graph for extended system w/ Bruce A fault rate and SV_MAN.

Table 206: FV Results for Extended System w/ Bruce A Fault Rate and SV_NRPD

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	4.47E-3	1.89E-2	8.74E-6	2.63E-3	5.02E-2	2.15E-10	7.58E-1
HE-AR-OP	4.48E-3	1.87E-2	9.73E-6	2.65E-3	4.75E-2	5.17E-11	8.29E-1
HE-SV-B-LO	6.11E-4	1.73E-3	3.49E-7	1.22E-4	3.77E-3	4.66E-15	2.93E-1
HE-SV-B-OP	6.11E-4	1.72E-3	3.46E-7	1.30E-4	3.89E-3	2.58E-11	1.25E-1
HE-SV-C-LO	6.11E-4	1.84E-3	4.33E-7	1.29E-4	4.04E-3	2.66E-11	1.75E-1
HE-SV-C-OP	6.11E-4	1.76E-3	2.95E-7	1.31E-4	4.12E-3	2.99E-12	1.79E-1
HE-SV-D-LO	6.11E-4	1.66E-3	3.59E-7	1.23E-4	3.90E-3	3.09E-11	1.24E-1
HE-SV-D-OP	6.11E-4	1.66E-3	4.00E-7	1.23E-4	3.87E-3	0.00E+0	1.22E-1
HE-SV-E-LO	6.11E-4	1.65E-3	3.77E-7	1.16E-4	3.89E-3	3.61E-12	2.19E-1
HE-SV-E-OP	6.11E-4	1.69E-3	3.20E-7	1.25E-4	3.79E-3	3.40E-12	2.14E-1
MF-AIR-LK	9.16E-1	8.59E-1	2.67E-1	9.12E-1	9.93E-1	1.36E-2	1.00E+0
MF-AR-LK	9.16E-1	8.60E-1	2.54E-1	9.13E-1	9.94E-1	8.96E-3	1.00E+0
MF-SV-A-FFD	4.83E-4	1.73E-3	8.98E-6	2.17E-4	3.50E-3	1.54E-7	1.62E-1
MF-SV-B-FFD	8.22E-2	1.17E-1	5.88E-4	2.13E-2	3.65E-1	4.04E-5	9.84E-1
MF-SV-C-FFD	8.22E-2	1.17E-1	5.82E-4	2.11E-2	3.65E-1	2.92E-5	9.81E-1
MF-SV-D-FFD	8.22E-2	1.18E-1	5.41E-4	2.09E-2	3.74E-1	2.84E-5	9.87E-1
MF-SV-E-FFD	8.22E-2	1.18E-1	5.56E-4	2.09E-2	3.73E-1	1.92E-5	9.85E-1
MF-VP-A-LK	4.83E-4	1.73E-3	8.98E-6	2.17E-4	3.50E-3	1.54E-7	1.62E-1
SV-B-C_CCF	1.26E-4	3.73E-4	2.07E-5	1.26E-4	8.63E-4	5.71E-6	1.27E-2
SV-D-E_CCF	1.26E-4	3.64E-4	2.04E-5	1.22E-4	8.55E-4	5.37E-6	1.55E-2

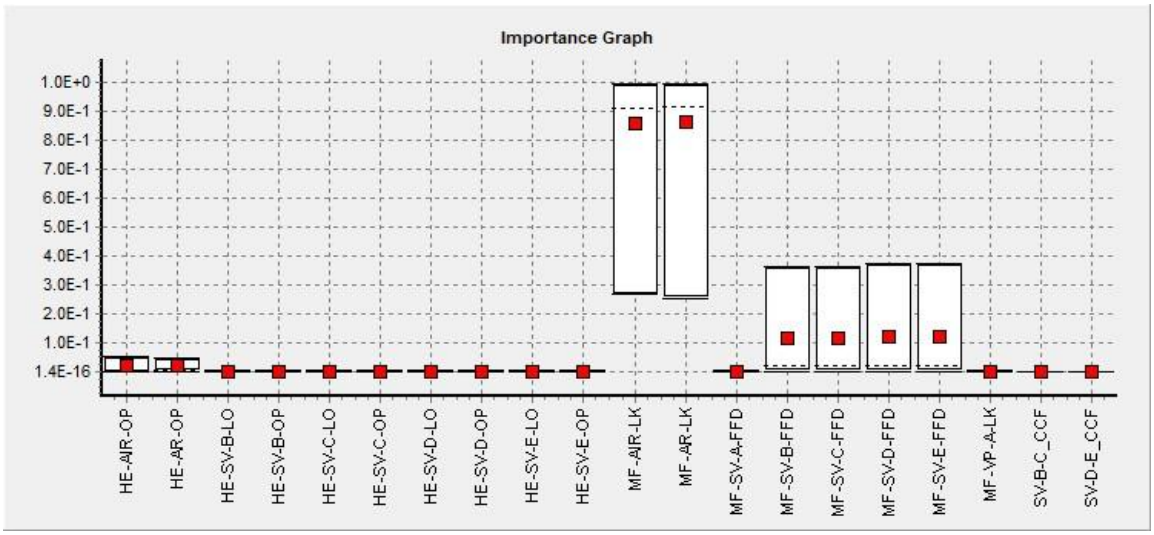


Figure 212: Importance graph for extended system w/ Bruce A fault rate and SV_NRPD.

Table 207: FV Results for Extended System w/ Bruce A Fault Rate and Diagnostic HE

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
HE-AIR-OP	3.67E-2	6.33E-2	3.48E-5	1.55E-2	1.77E-1	7.30E-10	7.38E-1
HE-AR-OP	3.67E-2	6.35E-2	4.68E-5	1.60E-2	1.75E-1	8.91E-9	7.71E-1
HE-SV-B-LO	1.07E-2	1.82E-2	1.23E-5	3.91E-3	5.09E-2	4.14E-10	4.02E-1
HE-SV-B-OP	1.07E-2	1.75E-2	1.06E-5	3.76E-3	4.69E-2	1.60E-10	4.24E-1
HE-SV-C-LO	1.07E-2	1.79E-2	9.28E-6	3.79E-3	4.94E-2	7.16E-10	4.06E-1
HE-SV-C-OP	1.07E-2	1.75E-2	1.29E-5	3.73E-3	4.79E-2	2.71E-12	4.34E-1
HE-SV-D-LO	1.07E-2	1.82E-2	1.06E-5	3.74E-3	4.89E-2	1.61E-9	3.38E-1
HE-SV-D-OP	1.07E-2	1.78E-2	1.09E-5	3.89E-3	4.80E-2	4.27E-12	3.97E-1
HE-SV-E-LO	1.07E-2	1.78E-2	1.15E-5	3.80E-3	4.86E-2	3.30E-13	3.10E-1
HE-SV-E-OP	1.07E-2	1.76E-2	1.29E-5	3.80E-3	4.76E-2	6.62E-10	4.00E-1
MF-AIR-LK	6.75E-1	4.92E-1	5.10E-2	4.07E-1	8.38E-1	5.49E-3	9.75E-1
MF-AR-LK	6.75E-1	4.97E-1	5.00E-2	4.15E-1	8.48E-1	4.77E-3	9.86E-1
MF-SV-A-FS	5.16E-4	7.87E-4	2.63E-5	2.87E-4	1.87E-3	1.55E-6	1.75E-2

Name	Point Est.	Mean	5th	50th	95th	Min	Max
MF-SV-A-LK	2.95E-5	4.84E-5	1.51E-6	1.58E-5	1.12E-4	1.03E-7	2.60E-3
MF-SV-A-RP	4.28E-6	6.47E-6	3.91E-8	9.62E-7	1.47E-5	7.11E-10	4.39E-4
MF-SV-B-FS	2.45E-1	3.56E-1	4.94E-2	2.70E-1	6.56E-1	7.31E-3	9.24E-1
MF-SV-B-LK	1.41E-2	2.45E-2	2.35E-3	1.33E-2	5.35E-2	4.84E-4	2.88E-1
MF-SV-B-RP	2.05E-3	3.44E-3	5.36E-5	7.69E-4	7.88E-3	3.18E-6	1.56E-1
MF-SV-C-FS	2.45E-1	3.57E-1	5.09E-2	2.69E-1	6.61E-1	9.45E-3	9.25E-1
MF-SV-C-LK	1.41E-2	2.43E-2	2.33E-3	1.32E-2	5.33E-2	5.15E-4	2.89E-1
MF-SV-C-RP	2.05E-3	3.51E-3	5.51E-5	7.51E-4	8.06E-3	2.54E-6	1.71E-1
MF-SV-D-FS	2.45E-1	3.52E-1	4.66E-2	2.62E-1	6.55E-1	7.69E-3	9.21E-1
MF-SV-D-LK	1.41E-2	2.39E-2	2.38E-3	1.27E-2	5.22E-2	3.05E-4	3.96E-1
MF-SV-D-RP	2.05E-3	3.37E-3	5.06E-5	7.06E-4	7.85E-3	2.35E-6	3.08E-1
MF-SV-E-FS	2.45E-1	3.52E-1	4.55E-2	2.64E-1	6.56E-1	6.51E-3	9.16E-1
MF-SV-E-LK	1.41E-2	2.42E-2	2.33E-3	1.31E-2	5.16E-2	4.51E-4	3.79E-1
MF-SV-E-RP	2.05E-3	3.65E-3	5.14E-5	7.35E-4	8.09E-3	1.86E-6	3.32E-1
MF-VP-A-LK	5.50E-4	8.42E-4	3.00E-5	3.14E-4	2.00E-3	1.91E-6	1.78E-2
SV-B-C_CCF	2.98E-2	3.52E-2	6.99E-3	2.69E-2	6.29E-2	1.90E-3	1.54E-1
SV-D-E_CCF	2.98E-2	3.52E-2	6.72E-3	2.68E-2	6.25E-2	1.63E-3	1.36E-1

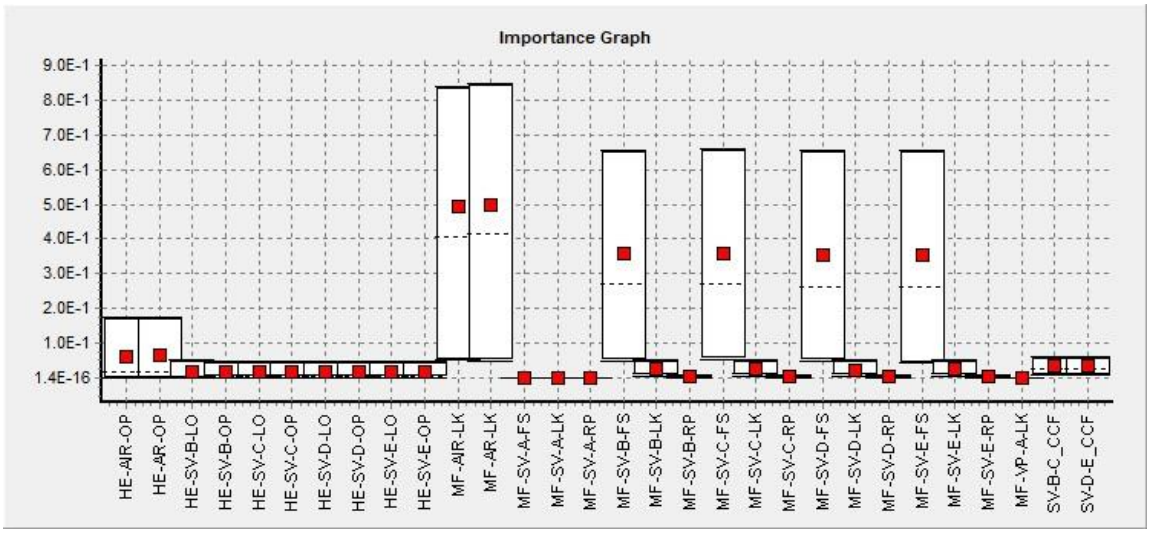


Figure 213: Importance graph for extended system w/ Bruce A fault rate and diagnostic HE component.

Table 208: FV Results for Extended System w/ Bruce A Fault Rate and Diagnostic HE and SV_OL

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	5.09E-2	1.38E-1	7.23E-5	3.03E-2	4.13E-1	3.54E-13	9.84E-1
HE-AR-OP	5.09E-2	1.38E-1	7.50E-5	3.25E-2	4.18E-1	6.65E-9	9.86E-1
HE-SV-B-LO	1.42E-3	6.08E-3	1.01E-6	4.73E-4	1.36E-2	1.56E-12	5.13E-1
HE-SV-B-OP	1.42E-3	5.83E-3	1.10E-6	4.42E-4	1.33E-2	1.13E-11	3.45E-1
HE-SV-C-LO	1.42E-3	5.77E-3	8.98E-7	4.39E-4	1.31E-2	5.88E-11	5.79E-1
HE-SV-C-OP	1.42E-3	6.10E-3	1.19E-6	4.45E-4	1.42E-2	8.25E-11	4.70E-1
HE-SV-D-LO	1.42E-3	5.51E-3	1.22E-6	4.52E-4	1.24E-2	8.62E-10	3.76E-1
HE-SV-D-OP	1.42E-3	5.77E-3	1.18E-6	4.53E-4	1.33E-2	2.10E-12	4.59E-1
HE-SV-E-LO	1.42E-3	5.38E-3	1.22E-6	4.93E-4	1.26E-2	5.82E-12	3.54E-1
HE-SV-E-OP	1.42E-3	5.80E-3	1.22E-6	4.63E-4	1.30E-2	7.55E-11	5.24E-1
MF-AIR-LK	9.48E-1	8.48E-1	2.64E-1	8.92E-1	9.94E-1	1.04E-2	1.00E+0
MF-AR-LK	9.48E-1	8.49E-1	2.82E-1	8.96E-1	9.94E-1	1.08E-2	1.00E+0
MF-SV-A-FFD	2.39E-5	1.00E-4	4.87E-7	1.10E-5	1.87E-4	2.06E-8	1.82E-2
MF-SV-B-FFD	7.66E-4	3.19E-3	8.56E-6	2.83E-4	6.17E-3	3.59E-8	7.36E-1
MF-SV-C-FFD	7.66E-4	3.22E-3	8.35E-6	2.93E-4	6.39E-3	3.62E-7	3.03E-1
MF-SV-D-FFD	7.66E-4	2.90E-3	9.23E-6	2.86E-4	5.95E-3	1.44E-7	5.43E-1
MF-SV-E-FFD	7.66E-4	3.00E-3	8.80E-6	2.83E-4	5.90E-3	1.72E-7	3.41E-1
MF-VP-A-LK	2.39E-5	1.00E-4	4.87E-7	1.10E-5	1.87E-4	2.06E-8	1.82E-2
SV-B-C_CCF	1.31E-4	3.76E-4	2.14E-5	1.26E-4	8.18E-4	5.83E-6	1.85E-2
SV-D-E_CCF	1.31E-4	3.79E-4	2.18E-5	1.28E-4	8.70E-4	5.21E-6	1.73E-2

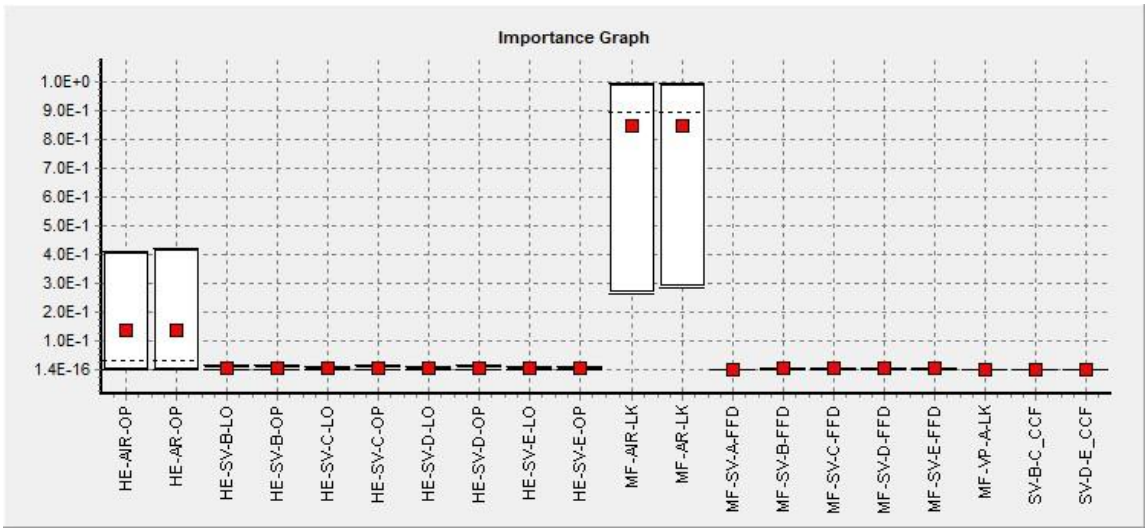


Figure 214: Importance graph for extended system w/ Bruce A fault rate and diagnostic HE component and SV_OL.

Table 209: FV Results for Extended System w/ Bruce A Fault Rate and Diagnostic HE and SV_OM

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	3.27E-2	8.42E-2	4.62E-5	1.80E-2	2.42E-1	3.49E-14	9.33E-1
HE-AR-OP	3.27E-2	8.56E-2	4.31E-5	1.94E-2	2.50E-1	6.89E-10	9.50E-1
HE-SV-B-LO	1.21E-2	2.01E-2	7.13E-6	2.90E-3	5.30E-2	3.87E-12	6.48E-1
HE-SV-B-OP	1.21E-2	2.00E-2	7.54E-6	2.93E-3	5.26E-2	4.37E-10	5.49E-1
HE-SV-C-LO	1.21E-2	1.95E-2	6.19E-6	2.64E-3	5.38E-2	2.82E-10	6.25E-1
HE-SV-C-OP	1.21E-2	1.93E-2	8.34E-6	2.68E-3	5.12E-2	2.86E-10	5.79E-1
HE-SV-D-LO	1.21E-2	1.94E-2	7.73E-6	2.65E-3	5.22E-2	6.28E-9	5.62E-1
HE-SV-D-OP	1.21E-2	2.00E-2	8.79E-6	2.75E-3	5.34E-2	1.15E-11	6.41E-1
HE-SV-E-LO	1.21E-2	1.88E-2	9.05E-6	2.86E-3	5.02E-2	7.13E-11	5.76E-1
HE-SV-E-OP	1.21E-2	1.95E-2	9.21E-6	2.78E-3	5.50E-2	1.25E-10	6.48E-1
MF-AIR-LK	5.99E-1	5.90E-1	5.22E-2	5.33E-1	9.36E-1	3.20E-3	9.98E-1
MF-AR-LK	6.00E-1	5.96E-1	5.60E-2	5.46E-1	9.35E-1	2.46E-3	9.99E-1
MF-SV-A-FFD	5.55E-4	1.38E-3	1.06E-5	2.69E-4	3.19E-3	2.17E-7	1.06E-1
MF-SV-B-FFD	3.76E-1	2.92E-1	5.61E-3	1.37E-1	7.14E-1	1.44E-4	9.83E-1
MF-SV-C-FFD	3.76E-1	2.93E-1	5.96E-3	1.40E-1	7.15E-1	9.97E-5	9.85E-1
MF-SV-D-FFD	3.76E-1	2.86E-1	5.63E-3	1.36E-1	7.10E-1	1.12E-4	9.83E-1
MF-SV-E-FFD	3.76E-1	2.87E-1	5.55E-3	1.37E-1	7.09E-1	7.80E-5	9.89E-1
MF-VP-A-LK	5.55E-4	1.38E-3	1.06E-5	2.69E-4	3.19E-3	2.17E-7	1.06E-1
SV-B-C_CCF	8.40E-5	1.84E-4	1.61E-5	7.84E-5	3.94E-4	4.58E-6	5.14E-3
SV-D-E_CCF	8.40E-5	1.91E-4	1.69E-5	7.99E-5	4.31E-4	3.71E-6	5.03E-3

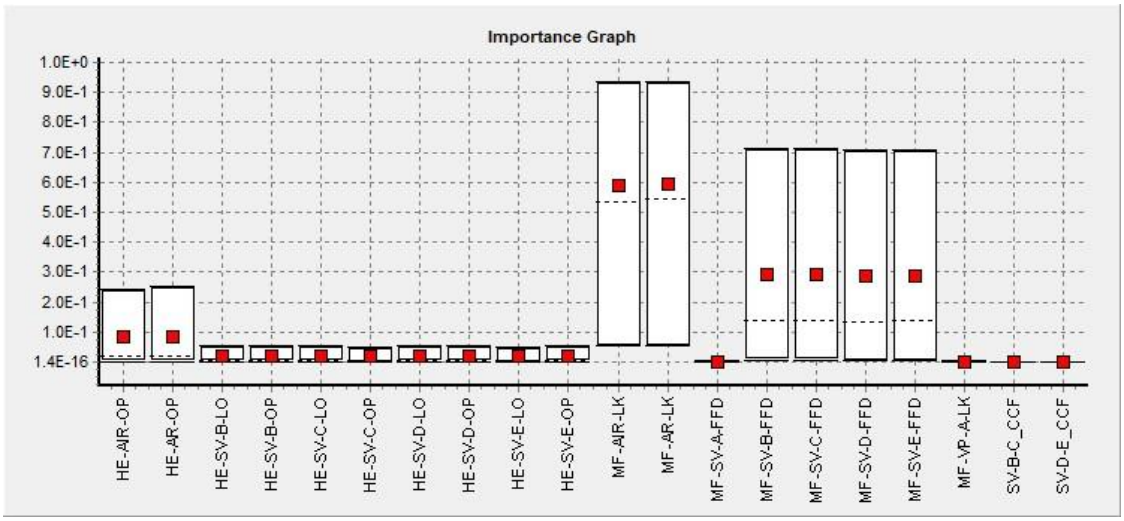


Figure 215: Importance graph for extended system w/ Bruce A fault rate and diagnostic HE component and SV_OM.

Table 210: FV Results for Extended System w/ Bruce A Fault Rate and Diagnostic HE and SV_OH

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	1.60E-2	4.41E-2	2.28E-5	8.60E-3	1.18E-1	1.45E-14	8.54E-1
HE-AR-OP	1.60E-2	4.46E-2	2.12E-5	9.22E-3	1.21E-1	2.21E-10	8.76E-1
HE-SV-B-LO	1.33E-2	1.88E-2	1.00E-5	3.59E-3	5.11E-2	1.00E-11	5.60E-1
HE-SV-B-OP	1.33E-2	1.87E-2	1.07E-5	3.65E-3	4.86E-2	4.40E-10	5.18E-1
HE-SV-C-LO	1.33E-2	1.85E-2	8.92E-6	3.40E-3	4.94E-2	2.83E-10	4.40E-1
HE-SV-C-OP	1.33E-2	1.83E-2	1.14E-5	3.46E-3	4.76E-2	5.12E-10	4.34E-1
HE-SV-D-LO	1.33E-2	1.86E-2	1.05E-5	3.50E-3	4.95E-2	6.73E-9	4.75E-1
HE-SV-D-OP	1.33E-2	1.91E-2	1.16E-5	3.58E-3	5.09E-2	1.94E-11	5.89E-1
HE-SV-E-LO	1.33E-2	1.83E-2	1.33E-5	3.49E-3	4.81E-2	1.92E-10	5.68E-1
HE-SV-E-OP	1.33E-2	1.88E-2	1.29E-5	3.63E-3	4.98E-2	2.16E-10	6.55E-1
MF-AIR-LK	2.87E-1	3.57E-1	1.62E-2	2.20E-1	7.77E-1	1.19E-3	9.92E-1
MF-AR-LK	2.88E-1	3.62E-1	1.81E-2	2.26E-1	7.81E-1	1.39E-3	9.94E-1
MF-SV-A-FFD	2.46E-4	7.74E-4	7.04E-6	1.70E-4	1.83E-3	1.75E-7	2.96E-2
MF-SV-B-FFD	8.48E-1	5.92E-1	5.25E-2	5.42E-1	9.19E-1	2.07E-3	9.94E-1
MF-SV-C-FFD	8.48E-1	5.93E-1	5.51E-2	5.44E-1	9.20E-1	1.18E-3	9.94E-1
MF-SV-D-FFD	8.48E-1	5.87E-1	5.25E-2	5.36E-1	9.21E-1	1.28E-3	9.98E-1
MF-SV-E-FFD	8.48E-1	5.88E-1	5.23E-2	5.39E-1	9.23E-1	8.22E-4	9.98E-1
MF-VP-A-LK	2.46E-4	7.74E-4	7.04E-6	1.70E-4	1.83E-3	1.75E-7	2.96E-2
SV-B-C_CCF	4.11E-5	8.42E-5	9.63E-6	3.89E-5	1.82E-4	2.89E-6	2.38E-3
SV-D-E_CCF	4.11E-5	8.80E-5	9.73E-6	4.03E-5	1.92E-4	2.46E-6	4.17E-3

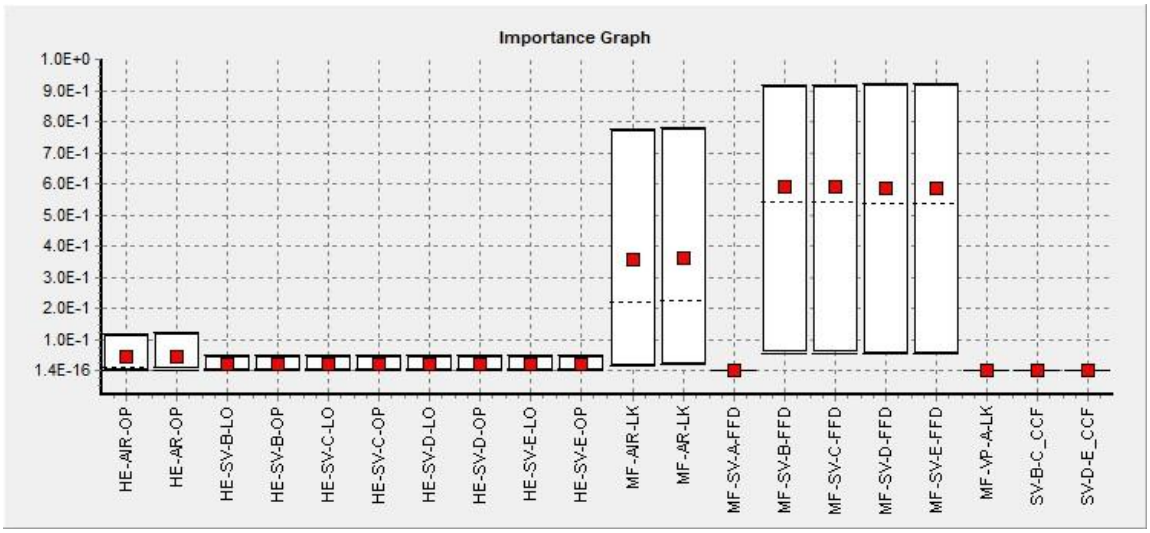


Figure 216: Importance graph for extended system w/ Bruce A fault rate and diagnostic HE component and SV_OH.

Table 211: FV Results for Extended System w/ Bruce A Fault Rate and Diagnostic HE and SV_DOW

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	5.09E-2	1.38E-1	7.23E-5	3.03E-2	4.13E-1	3.54E-13	9.84E-1
HE-AR-OP	5.09E-2	1.38E-1	7.50E-5	3.25E-2	4.18E-1	6.64E-9	9.86E-1
HE-SV-B-LO	1.43E-3	6.12E-3	1.02E-6	4.77E-4	1.37E-2	1.56E-12	5.12E-1
HE-SV-B-OP	1.43E-3	5.86E-3	1.11E-6	4.47E-4	1.34E-2	1.21E-11	3.42E-1
HE-SV-C-LO	1.43E-3	5.80E-3	8.99E-7	4.44E-4	1.32E-2	5.90E-11	5.81E-1
HE-SV-C-OP	1.43E-3	6.14E-3	1.20E-6	4.49E-4	1.43E-2	8.26E-11	4.70E-1
HE-SV-D-LO	1.43E-3	5.54E-3	1.23E-6	4.56E-4	1.25E-2	8.80E-10	3.76E-1
HE-SV-D-OP	1.43E-3	5.81E-3	1.20E-6	4.56E-4	1.34E-2	2.10E-12	4.63E-1
HE-SV-E-LO	1.43E-3	5.41E-3	1.23E-6	4.95E-4	1.27E-2	5.86E-12	3.58E-1
HE-SV-E-OP	1.43E-3	5.84E-3	1.23E-6	4.66E-4	1.31E-2	7.56E-11	5.28E-1
MF-AIR-LK	9.48E-1	8.47E-1	2.64E-1	8.92E-1	9.94E-1	1.04E-2	1.00E+0
MF-AR-LK	9.48E-1	8.49E-1	2.81E-1	8.95E-1	9.94E-1	1.08E-2	1.00E+0
MF-SV-A-FFD	2.47E-5	1.04E-4	5.04E-7	1.14E-5	1.93E-4	2.13E-8	1.87E-2
MF-SV-B-FFD	7.97E-4	3.31E-3	8.99E-6	2.95E-4	6.39E-3	3.81E-8	7.42E-1
MF-SV-C-FFD	7.97E-4	3.35E-3	8.66E-6	3.06E-4	6.66E-3	3.79E-7	3.09E-1
MF-SV-D-FFD	7.97E-4	3.01E-3	9.61E-6	2.98E-4	6.19E-3	1.54E-7	5.51E-1
MF-SV-E-FFD	7.97E-4	3.11E-3	9.18E-6	2.94E-4	6.13E-3	1.80E-7	3.49E-1
MF-VP-A-LK	2.47E-5	1.04E-4	5.04E-7	1.14E-5	1.93E-4	2.13E-8	1.87E-2
SV-B-C_CCF	1.31E-4	3.76E-4	2.14E-5	1.26E-4	8.18E-4	5.83E-6	1.85E-2
SV-D-E_CCF	1.31E-4	3.78E-4	2.18E-5	1.28E-4	8.70E-4	5.21E-6	1.73E-2

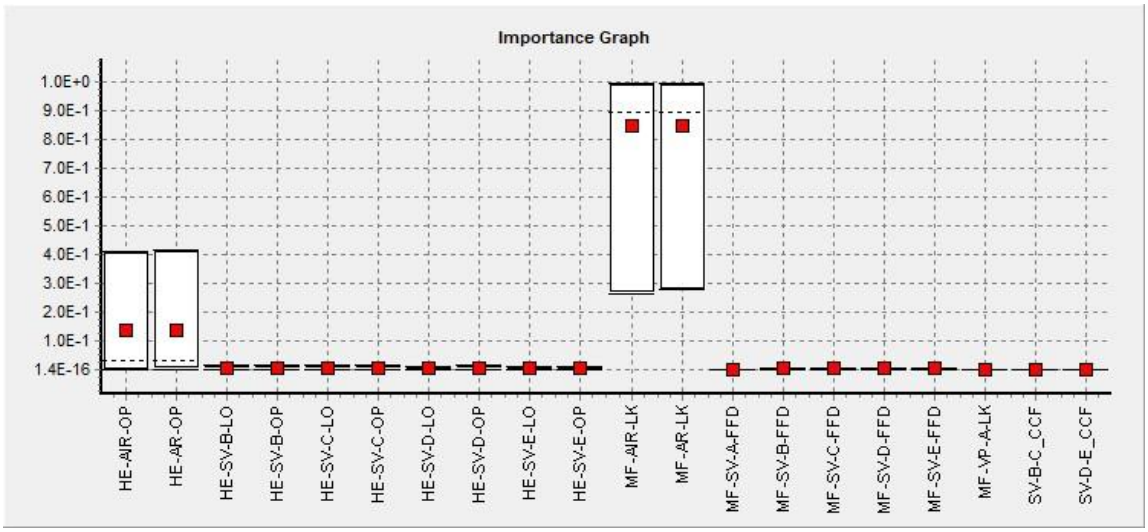


Figure 217: Importance graph for extended system w/ Bruce A fault rate and diagnostic HE component and SV_DOW.

Table 212: FV Results for Extended System w/ Bruce A Fault Rate and Diagnostic HE and SV_MAN

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	5.09E-2	1.39E-1	7.23E-5	3.05E-2	4.17E-1	3.67E-13	9.86E-1
HE-AR-OP	5.09E-2	1.39E-1	7.52E-5	3.26E-2	4.20E-1	6.92E-9	9.88E-1
HE-SV-B-LO	1.13E-3	4.95E-3	5.51E-7	3.11E-4	1.06E-2	1.52E-12	5.25E-1
HE-SV-B-OP	1.13E-3	4.73E-3	6.08E-7	2.96E-4	1.05E-2	3.51E-12	4.49E-1
HE-SV-C-LO	1.13E-3	4.61E-3	5.60E-7	2.94E-4	1.02E-2	3.62E-11	4.79E-1
HE-SV-C-OP	1.13E-3	5.09E-3	6.39E-7	3.01E-4	1.11E-2	7.89E-11	4.46E-1
HE-SV-D-LO	1.13E-3	4.46E-3	7.19E-7	2.98E-4	9.83E-3	3.41E-10	3.85E-1
HE-SV-D-OP	1.13E-3	4.71E-3	6.27E-7	3.03E-4	1.05E-2	1.94E-12	3.26E-1
HE-SV-E-LO	1.13E-3	4.39E-3	6.63E-7	3.20E-4	1.01E-2	4.87E-12	2.79E-1
HE-SV-E-OP	1.13E-3	4.77E-3	7.40E-7	3.19E-4	1.04E-2	7.48E-11	3.78E-1
MF-AIR-LK	9.49E-1	8.52E-1	2.68E-1	8.98E-1	9.96E-1	1.04E-2	1.00E+0
MF-AR-LK	9.49E-1	8.53E-1	2.85E-1	9.01E-1	9.96E-1	1.08E-2	1.00E+0
MF-SV-A-FFD	6.02E-7	2.61E-6	1.22E-8	2.78E-7	4.78E-6	5.17E-10	5.36E-4
MF-SV-B-FFD	1.53E-5	7.61E-5	1.00E-7	4.78E-6	1.23E-4	2.20E-10	6.77E-2
MF-SV-C-FFD	1.53E-5	6.92E-5	9.17E-8	5.00E-6	1.29E-4	1.45E-9	1.19E-2
MF-SV-D-FFD	1.53E-5	6.32E-5	1.01E-7	5.02E-6	1.17E-4	3.30E-10	2.91E-2
MF-SV-E-FFD	1.53E-5	6.50E-5	1.05E-7	4.85E-6	1.17E-4	1.70E-9	1.21E-2
MF-VP-A-LK	6.02E-7	2.61E-6	1.22E-8	2.78E-7	4.78E-6	5.17E-10	5.36E-4
SV-B-C_CCF	1.31E-4	3.82E-4	2.14E-5	1.26E-4	8.31E-4	5.83E-6	1.89E-2
SV-D-E_CCF	1.31E-4	3.85E-4	2.18E-5	1.29E-4	8.75E-4	5.21E-6	1.77E-2

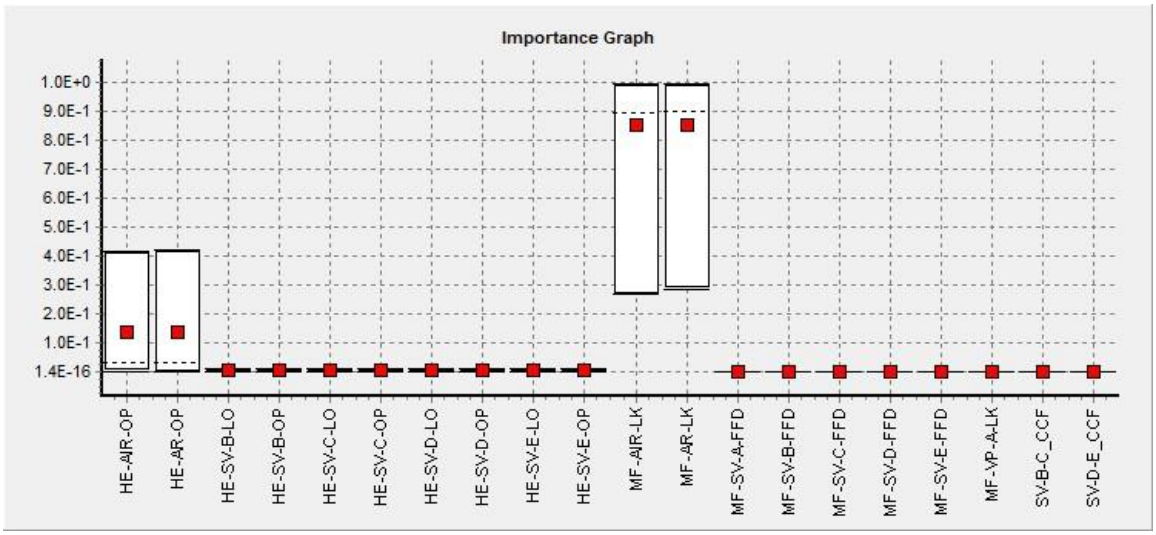


Figure 218: Importance graph for extended system w/ Bruce A fault rate and diagnostic HE component and SV_MAN.

Table 213: FV Results for Extended System w/ Bruce A Fault Rate and Diagnostic HE and SV_NRPD

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AIR-OP	4.62E-2	1.13E-1	5.97E-5	2.52E-2	3.30E-1	1.10E-13	9.71E-1
HE-AR-OP	4.62E-2	1.15E-1	6.23E-5	2.71E-2	3.36E-1	1.73E-9	9.77E-1
HE-SV-B-LO	7.24E-3	1.65E-2	4.13E-6	1.79E-3	4.22E-2	2.34E-12	7.03E-1
HE-SV-B-OP	7.24E-3	1.62E-2	4.96E-6	1.84E-3	4.26E-2	2.01E-10	5.35E-1
HE-SV-C-LO	7.24E-3	1.58E-2	3.77E-6	1.64E-3	4.09E-2	1.71E-10	6.19E-1
HE-SV-C-OP	7.24E-3	1.58E-2	5.29E-6	1.67E-3	4.18E-2	1.62E-10	5.55E-1
HE-SV-D-LO	7.24E-3	1.55E-2	4.46E-6	1.66E-3	4.04E-2	3.03E-9	5.81E-1
HE-SV-D-OP	7.24E-3	1.60E-2	5.41E-6	1.76E-3	4.19E-2	5.63E-12	5.59E-1
HE-SV-E-LO	7.24E-3	1.49E-2	5.23E-6	1.78E-3	3.97E-2	2.84E-11	5.40E-1
HE-SV-E-OP	7.24E-3	1.56E-2	5.22E-6	1.76E-3	4.13E-2	9.26E-11	7.76E-1
MF-AIR-LK	8.58E-1	7.37E-1	1.38E-1	7.53E-1	9.74E-1	9.52E-3	9.99E-1
MF-AR-LK	8.58E-1	7.42E-1	1.49E-1	7.57E-1	9.74E-1	4.63E-3	9.99E-1
MF-SV-A-FFD	4.45E-4	1.17E-3	8.44E-6	1.86E-4	2.57E-3	3.31E-7	1.59E-1
MF-SV-B-FFD	8.85E-2	1.18E-1	9.51E-4	2.73E-2	3.48E-1	1.66E-5	9.66E-1
MF-SV-C-FFD	8.85E-2	1.19E-1	1.00E-3	2.84E-2	3.54E-1	1.76E-5	9.70E-1
MF-SV-D-FFD	8.85E-2	1.15E-1	9.50E-4	2.75E-2	3.43E-1	2.07E-5	9.53E-1
MF-SV-E-FFD	8.85E-2	1.16E-1	9.54E-4	2.71E-2	3.43E-1	1.60E-5	9.63E-1
MF-VP-A-LK	4.45E-4	1.17E-3	8.44E-6	1.86E-4	2.57E-3	3.31E-7	1.59E-1
SV-B-C_CCF	1.19E-4	2.73E-4	1.97E-5	1.08E-4	5.91E-4	5.70E-6	1.17E-2
SV-D-E_CCF	1.19E-4	2.81E-4	2.07E-5	1.10E-4	6.38E-4	5.20E-6	9.22E-3

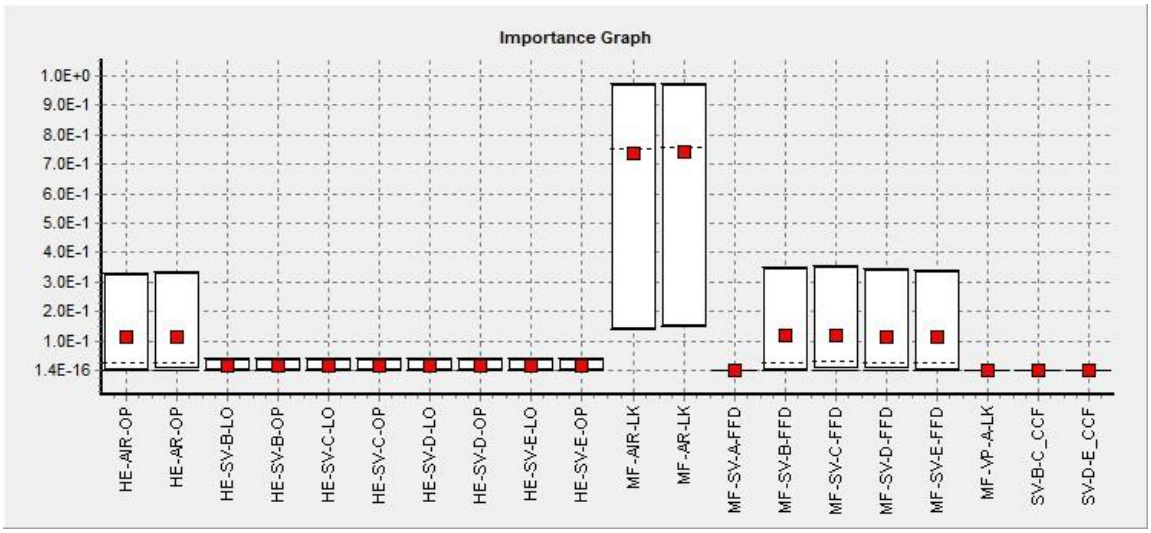


Figure 219: Importance graph for extended system w/ Bruce A fault rate and diagnostic HE component and SV_NRPD.

Table 214: FV Results for Extended System w/ Door Interlocks

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	3.91E-4	6.43E-4	1.11E-7	3.96E-5	1.33E-3	9.15E-13	9.00E-2
DI-AR	3.92E-4	6.29E-4	9.27E-8	4.09E-5	1.35E-3	2.10E-11	6.20E-2
HE-AIR-OP	3.91E-4	6.43E-4	1.11E-7	3.96E-5	1.33E-3	9.15E-13	9.00E-2
HE-AR-OP	3.92E-4	6.29E-4	9.27E-8	4.09E-5	1.35E-3	2.10E-11	6.20E-2
HE-SV-B-LO	2.13E-3	3.09E-3	1.78E-6	6.43E-4	8.20E-3	1.06E-9	9.68E-2
HE-SV-B-OP	2.13E-3	3.00E-3	2.34E-6	6.61E-4	7.87E-3	0.00E+0	6.59E-2
HE-SV-C-LO	2.13E-3	3.04E-3	2.48E-6	6.45E-4	8.17E-3	0.00E+0	7.68E-2
HE-SV-C-OP	2.13E-3	3.07E-3	2.03E-6	6.61E-4	8.29E-3	1.15E-11	8.85E-2
HE-SV-D-LO	2.13E-3	3.05E-3	2.40E-6	6.55E-4	8.43E-3	6.83E-12	8.17E-2
HE-SV-D-OP	2.13E-3	3.01E-3	1.66E-6	6.38E-4	8.25E-3	1.18E-12	7.26E-2
HE-SV-E-LO	2.13E-3	2.98E-3	2.42E-6	6.59E-4	8.34E-3	1.92E-13	9.83E-2
HE-SV-E-OP	2.13E-3	3.03E-3	2.42E-6	6.54E-4	8.04E-3	4.96E-10	7.90E-2
MF-AIR-LK	3.55E-1	3.02E-1	1.50E-2	1.70E-1	6.91E-1	8.86E-4	9.87E-1

Name	Point Est.	Mean	5th	50th	95th	Min	Max
MF-AR-LK	3.56E-1	3.06E-1	1.49E-2	1.71E-1	6.99E-1	6.81E-4	9.71E-1
MF-SV-A-FS	6.16E-4	8.85E-4	1.28E-5	2.27E-4	2.21E-3	2.62E-7	3.39E-2
MF-SV-A-LK	3.53E-5	5.51E-5	6.70E-7	1.26E-5	1.34E-4	1.04E-8	2.09E-3
MF-SV-A-RP	5.11E-6	8.01E-6	2.25E-8	7.88E-7	1.66E-5	1.27E-9	1.89E-3
MF-SV-B-FS	5.39E-1	5.78E-1	1.06E-1	5.54E-1	8.33E-1	9.38E-3	9.43E-1
MF-SV-B-LK	3.09E-2	4.29E-2	4.53E-3	2.46E-2	9.06E-2	6.03E-4	4.74E-1
MF-SV-B-RP	4.48E-3	6.18E-3	9.53E-5	1.36E-3	1.44E-2	4.80E-6	4.65E-1
MF-SV-C-FS	5.39E-1	5.79E-1	1.08E-1	5.56E-1	8.31E-1	9.43E-3	9.42E-1
MF-SV-C-LK	3.09E-2	4.23E-2	4.64E-3	2.43E-2	8.78E-2	4.24E-4	5.13E-1
MF-SV-C-RP	4.48E-3	5.91E-3	9.26E-5	1.35E-3	1.43E-2	2.22E-6	3.56E-1
MF-SV-D-FS	5.39E-1	5.76E-1	1.04E-1	5.52E-1	8.28E-1	1.88E-2	9.55E-1
MF-SV-D-LK	3.09E-2	4.20E-2	4.56E-3	2.45E-2	8.65E-2	7.72E-4	4.31E-1
MF-SV-D-RP	4.48E-3	6.04E-3	9.41E-5	1.41E-3	1.41E-2	3.74E-6	2.81E-1
MF-SV-E-FS	5.39E-1	5.75E-1	1.05E-1	5.48E-1	8.31E-1	1.96E-2	9.41E-1
MF-SV-E-LK	3.09E-2	4.28E-2	4.54E-3	2.39E-2	9.09E-2	4.91E-4	4.67E-1
MF-SV-E-RP	4.48E-3	6.13E-3	1.04E-4	1.36E-3	1.40E-2	1.05E-5	3.87E-1
MF-VP-A-LK	6.57E-4	9.48E-4	1.43E-5	2.49E-4	2.35E-3	2.74E-7	3.49E-2
SV-B-C_CCF	7.01E-2	6.58E-2	1.51E-2	5.62E-2	1.05E-1	2.29E-3	2.47E-1
SV-D-E_CCF	7.01E-2	6.58E-2	1.52E-2	5.60E-2	1.05E-1	3.32E-3	2.38E-1

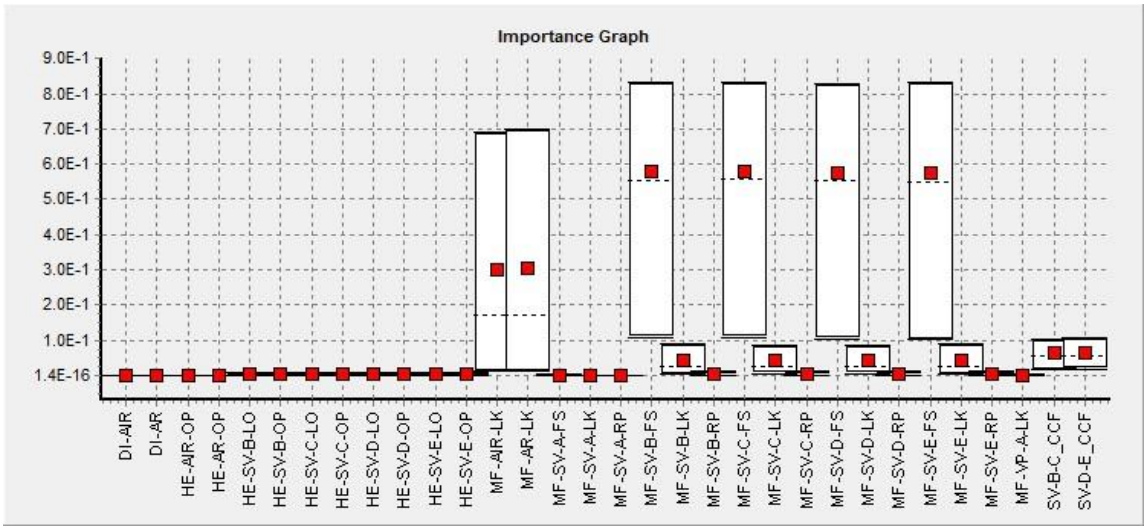


Figure 220: Importance graph for the extended system w/ door interlocks.

Table 215: FV Results for Extended System w/ Door Interlocks and SV_OL

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	1.09E-3	5.22E-3	4.97E-7	1.79E-4	9.12E-3	0.00E+0	7.58E-1
DI-AR	1.09E-3	5.60E-3	4.41E-7	1.97E-4	9.61E-3	2.49E-12	7.61E-1
HE-AIR-OP	1.09E-3	5.22E-3	4.97E-7	1.79E-4	9.12E-3	0.00E+0	7.58E-1
HE-AR-OP	1.09E-3	5.60E-3	4.41E-7	1.97E-4	9.61E-3	2.49E-12	7.61E-1
HE-SV-B-LO	1.74E-4	1.10E-3	1.33E-7	5.20E-5	2.04E-3	3.50E-14	1.52E-1
HE-SV-B-OP	1.74E-4	1.09E-3	1.39E-7	4.91E-5	1.86E-3	4.97E-12	4.17E-1
HE-SV-C-LO	1.74E-4	1.06E-3	1.24E-7	4.64E-5	1.86E-3	2.08E-13	2.26E-1
HE-SV-C-OP	1.74E-4	1.06E-3	1.16E-7	4.99E-5	1.84E-3	1.37E-11	1.07E-1
HE-SV-D-LO	1.74E-4	1.01E-3	1.23E-7	5.15E-5	1.84E-3	0.00E+0	1.82E-1
HE-SV-D-OP	1.74E-4	1.09E-3	1.46E-7	5.52E-5	1.91E-3	9.19E-13	5.20E-1
HE-SV-E-LO	1.74E-4	1.03E-3	1.13E-7	5.08E-5	1.95E-3	3.59E-13	1.96E-1
HE-SV-E-OP	1.74E-4	1.03E-3	1.66E-7	5.38E-5	1.93E-3	4.13E-12	1.36E-1
MF-AIR-LK	9.97E-1	9.84E-1	8.86E-1	9.94E-1	9.99E-1	9.22E-2	1.00E+0
MF-AR-LK	9.97E-1	9.84E-1	8.91E-1	9.94E-1	9.99E-1	1.97E-1	1.00E+0
MF-SV-A-FFD	1.14E-4	6.43E-4	1.53E-6	5.18E-5	1.20E-3	4.37E-8	8.31E-2
MF-SV-B-FFD	1.03E-3	5.73E-3	7.72E-6	3.30E-4	9.93E-3	1.09E-7	5.62E-1
MF-SV-C-FFD	1.03E-3	5.80E-3	8.01E-6	3.39E-4	9.77E-3	3.33E-7	8.88E-1
MF-SV-D-FFD	1.03E-3	5.39E-3	8.78E-6	3.55E-4	1.08E-2	3.73E-7	6.17E-1
MF-SV-E-FFD	1.03E-3	5.42E-3	9.40E-6	3.39E-4	9.79E-3	4.33E-7	6.47E-1
MF-VP-A-LK	1.14E-4	6.43E-4	1.53E-6	5.18E-5	1.20E-3	4.37E-8	8.31E-2
SV-B-C_CCF	6.20E-4	2.51E-3	4.88E-5	6.07E-4	5.90E-3	7.98E-6	1.84E-1
SV-D-E_CCF	6.20E-4	2.64E-3	5.15E-5	6.26E-4	5.96E-3	3.86E-6	3.57E-1

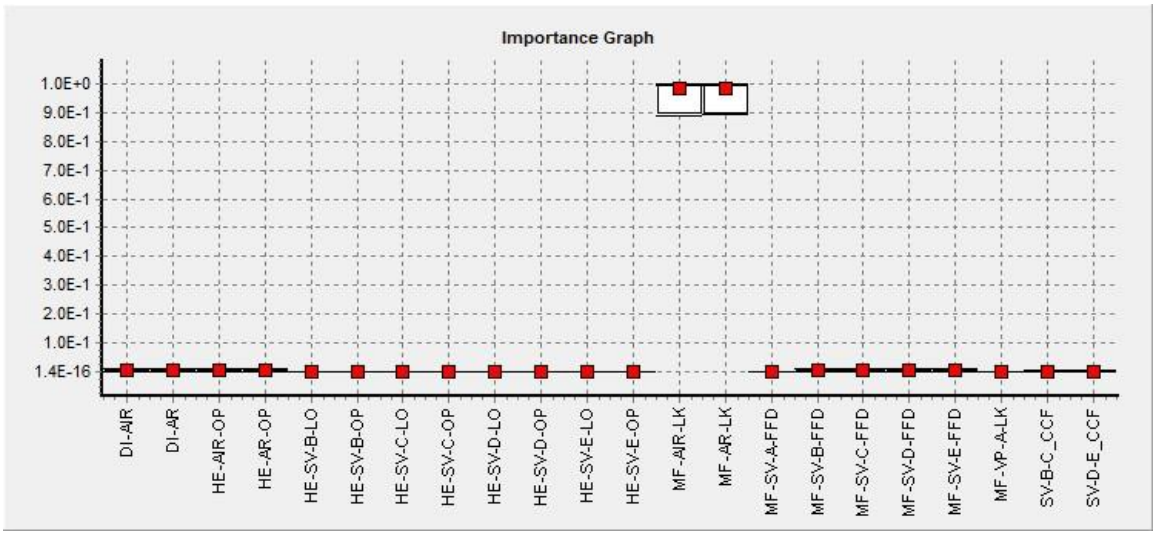


Figure 221: Importance graph for the extended system w/ door interlocks and SV_OL.

Table 216: FV Results for Extended System w/ Door Interlocks and SV_OM

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	3.00E-4	1.44E-3	1.71E-7	5.76E-5	2.37E-3	3.48E-13	4.91E-1
DI-AR	3.01E-4	1.59E-3	1.44E-7	6.46E-5	2.77E-3	8.00E-13	2.36E-1
HE-AIR-OP	3.00E-4	1.44E-3	1.71E-7	5.76E-5	2.37E-3	3.48E-13	4.91E-1
HE-AR-OP	3.01E-4	1.59E-3	1.44E-7	6.46E-5	2.77E-3	8.00E-13	2.36E-1
HE-SV-B-LO	2.10E-3	4.69E-3	1.77E-6	5.73E-4	1.13E-2	2.56E-13	3.15E-1
HE-SV-B-OP	2.10E-3	4.58E-3	1.76E-6	5.77E-4	1.13E-2	1.16E-11	2.35E-1
HE-SV-C-LO	2.10E-3	4.54E-3	1.49E-6	5.39E-4	1.09E-2	1.70E-11	3.31E-1
HE-SV-C-OP	2.10E-3	4.55E-3	1.59E-6	5.41E-4	1.08E-2	2.66E-10	4.42E-1
HE-SV-D-LO	2.10E-3	4.43E-3	1.71E-6	5.69E-4	1.09E-2	0.00E+0	4.61E-1
HE-SV-D-OP	2.10E-3	4.53E-3	2.16E-6	5.70E-4	1.11E-2	1.11E-11	3.69E-1
HE-SV-E-LO	2.10E-3	4.64E-3	1.58E-6	5.86E-4	1.14E-2	1.09E-11	2.21E-1
HE-SV-E-OP	2.10E-3	4.66E-3	2.26E-6	5.90E-4	1.13E-2	6.67E-11	2.39E-1
MF-AIR-LK	2.73E-1	4.79E-1	1.43E-2	3.24E-1	9.36E-1	3.21E-4	9.99E-1
MF-AR-LK	2.73E-1	4.77E-1	1.57E-2	3.27E-1	9.31E-1	1.71E-3	9.99E-1
MF-SV-A-FFD	4.97E-4	3.40E-3	5.01E-6	3.36E-4	7.34E-3	5.38E-8	2.67E-1
MF-SV-B-FFD	7.28E-1	5.07E-1	1.39E-2	3.84E-1	9.35E-1	2.44E-4	9.99E-1
MF-SV-C-FFD	7.28E-1	5.08E-1	1.38E-2	3.85E-1	9.35E-1	3.88E-4	9.99E-1
MF-SV-D-FFD	7.28E-1	5.13E-1	1.44E-2	3.93E-1	9.40E-1	8.95E-4	9.98E-1
MF-SV-E-FFD	7.28E-1	5.13E-1	1.52E-2	3.90E-1	9.40E-1	8.50E-4	9.98E-1
MF-VP-A-LK	4.97E-4	3.40E-3	5.01E-6	3.36E-4	7.34E-3	5.38E-8	2.67E-1
SV-B-C_CCF	1.70E-4	6.13E-4	2.53E-5	2.04E-4	1.41E-3	5.84E-6	3.25E-2
SV-D-E_CCF	1.70E-4	6.50E-4	2.50E-5	2.04E-4	1.50E-3	2.20E-6	6.69E-2

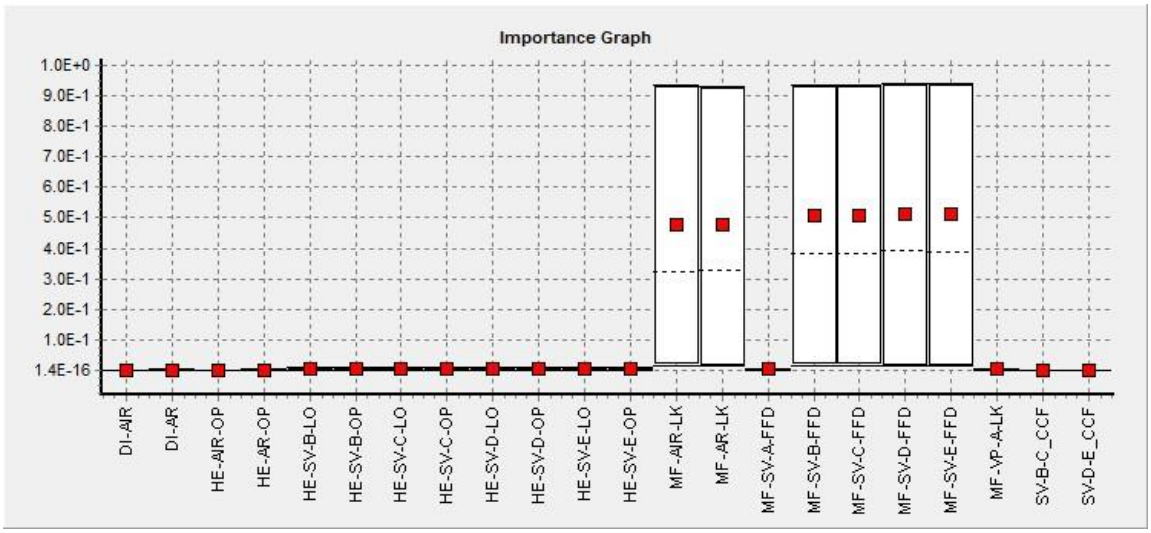


Figure 222: Importance graph for the extended system w/ door interlocks and SV_OM.

Table 217: FV Results for Extended System w/ Door Interlocks and SV_OH

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	7.53E-5	4.34E-4	5.61E-8	1.75E-5	6.72E-4	4.83E-14	1.52E-1
DI-AR	7.53E-5	4.45E-4	4.32E-8	1.87E-5	7.68E-4	1.70E-13	9.33E-2
HE-AIR-OP	7.53E-5	4.34E-4	5.61E-8	1.75E-5	6.72E-4	4.83E-14	1.52E-1
HE-AR-OP	7.53E-5	4.45E-4	4.32E-8	1.87E-5	7.68E-4	1.70E-13	9.33E-2
HE-SV-B-LO	1.23E-3	3.12E-3	1.89E-6	5.08E-4	7.12E-3	2.89E-13	4.87E-1
HE-SV-B-OP	1.23E-3	2.96E-3	1.69E-6	4.96E-4	7.22E-3	3.67E-12	1.77E-1
HE-SV-C-LO	1.23E-3	2.85E-3	1.32E-6	4.61E-4	6.80E-3	7.26E-12	1.78E-1
HE-SV-C-OP	1.23E-3	2.94E-3	1.57E-6	4.62E-4	7.12E-3	8.10E-11	4.36E-1
HE-SV-D-LO	1.23E-3	2.87E-3	1.50E-6	4.80E-4	6.84E-3	1.91E-13	2.26E-1
HE-SV-D-OP	1.23E-3	2.94E-3	2.01E-6	4.72E-4	7.02E-3	2.03E-11	1.74E-1
HE-SV-E-LO	1.23E-3	2.93E-3	1.48E-6	4.94E-4	7.11E-3	3.32E-11	1.01E-1
HE-SV-E-OP	1.23E-3	2.93E-3	2.22E-6	4.96E-4	7.11E-3	3.60E-11	2.71E-1
MF-AIR-LK	6.84E-2	2.11E-1	3.82E-3	6.69E-2	6.07E-1	1.82E-4	9.97E-1
MF-AR-LK	6.85E-2	2.04E-1	3.73E-3	6.74E-2	5.83E-1	3.91E-4	9.88E-1
MF-SV-A-FFD	6.91E-5	9.21E-4	1.40E-6	7.68E-5	1.78E-3	2.32E-8	1.78E-1
MF-SV-B-FFD	9.61E-1	7.89E-1	1.43E-1	8.40E-1	9.87E-1	3.18E-3	1.00E+0
MF-SV-C-FFD	9.61E-1	7.89E-1	1.43E-1	8.40E-1	9.87E-1	3.72E-3	1.00E+0
MF-SV-D-FFD	9.61E-1	7.97E-1	1.48E-1	8.44E-1	9.88E-1	1.20E-2	1.00E+0
MF-SV-E-FFD	9.61E-1	7.97E-1	1.49E-1	8.44E-1	9.88E-1	1.15E-2	1.00E+0
MF-VP-A-LK	6.91E-5	9.21E-4	1.40E-6	7.68E-5	1.78E-3	2.32E-8	1.78E-1
SV-B-C_CCF	4.26E-5	1.77E-4	1.07E-5	5.67E-5	3.87E-4	2.08E-6	8.14E-3
SV-D-E_CCF	4.26E-5	1.83E-4	1.08E-5	5.69E-5	3.99E-4	2.36E-6	2.13E-2

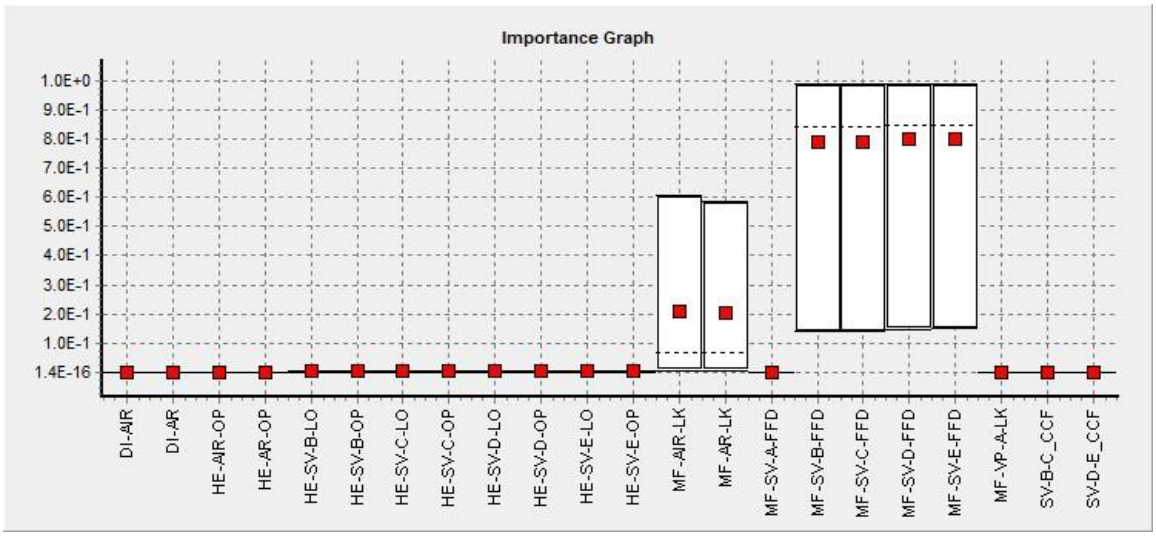


Figure 223: Importance graph for the extended system w/ door interlocks and SV_OH.

Table 218: FV Results for Extended System w/ Door Interlocks and SV_DOW

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	1.09E-3	5.22E-3	4.96E-7	1.79E-4	9.11E-3	0.00E+0	7.58E-1
DI-AR	1.09E-3	5.59E-3	4.41E-7	1.97E-4	9.61E-3	2.49E-12	7.60E-1
HE-AIR-OP	1.09E-3	5.22E-3	4.96E-7	1.79E-4	9.11E-3	0.00E+0	7.58E-1
HE-AR-OP	1.09E-3	5.59E-3	4.41E-7	1.97E-4	9.61E-3	2.49E-12	7.60E-1
HE-SV-B-LO	1.79E-4	1.12E-3	1.36E-7	5.32E-5	2.07E-3	3.50E-14	1.54E-1
HE-SV-B-OP	1.79E-4	1.11E-3	1.43E-7	5.02E-5	1.91E-3	5.15E-12	4.12E-1
HE-SV-C-LO	1.79E-4	1.08E-3	1.24E-7	4.70E-5	1.91E-3	2.08E-13	2.28E-1
HE-SV-C-OP	1.79E-4	1.08E-3	1.19E-7	5.07E-5	1.89E-3	1.41E-11	1.10E-1
HE-SV-D-LO	1.79E-4	1.03E-3	1.25E-7	5.24E-5	1.88E-3	0.00E+0	1.84E-1
HE-SV-D-OP	1.79E-4	1.11E-3	1.47E-7	5.61E-5	1.95E-3	9.19E-13	5.28E-1
HE-SV-E-LO	1.79E-4	1.06E-3	1.14E-7	5.19E-5	2.00E-3	3.59E-13	2.00E-1
HE-SV-E-OP	1.79E-4	1.05E-3	1.69E-7	5.47E-5	1.98E-3	4.36E-12	1.38E-1
MF-AIR-LK	9.97E-1	9.83E-1	8.83E-1	9.94E-1	9.99E-1	8.83E-2	1.00E+0
MF-AR-LK	9.97E-1	9.84E-1	8.89E-1	9.94E-1	9.99E-1	1.97E-1	1.00E+0
MF-SV-A-FFD	1.18E-4	6.63E-4	1.58E-6	5.36E-5	1.24E-3	4.52E-8	8.55E-2
MF-SV-B-FFD	1.10E-3	6.02E-3	8.13E-6	3.49E-4	1.04E-2	1.16E-7	5.77E-1
MF-SV-C-FFD	1.10E-3	6.09E-3	8.47E-6	3.56E-4	1.03E-2	3.54E-7	8.93E-1
MF-SV-D-FFD	1.10E-3	5.67E-3	9.18E-6	3.73E-4	1.14E-2	3.98E-7	6.31E-1
MF-SV-E-FFD	1.10E-3	5.70E-3	9.85E-6	3.59E-4	1.03E-2	4.53E-7	6.61E-1
MF-VP-A-LK	1.18E-4	6.63E-4	1.58E-6	5.36E-5	1.24E-3	4.52E-8	8.55E-2
SV-B-C_CCF	6.20E-4	2.51E-3	4.88E-5	6.07E-4	5.88E-3	7.98E-6	1.83E-1
SV-D-E_CCF	6.20E-4	2.64E-3	5.15E-5	6.26E-4	5.95E-3	3.86E-6	3.56E-1

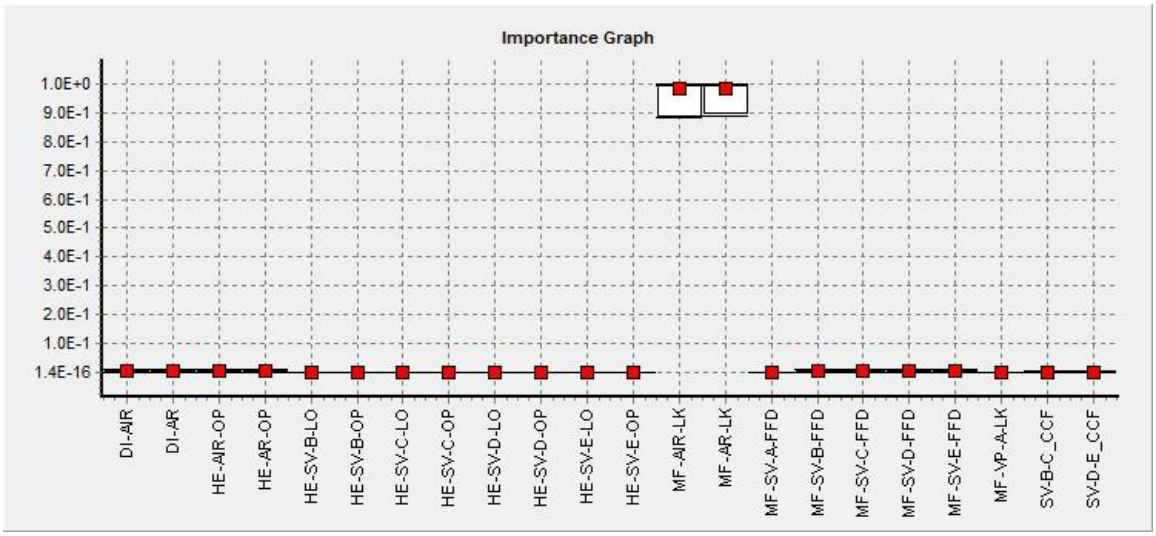


Figure 224: Importance graph for the extended system w/ door interlocks and SV_DOW.

Table 219: FV Results for Extended System w/ Door Interlocks and SV_MAN

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	1.10E-3	5.34E-3	5.00E-7	1.79E-4	9.28E-3	0.00E+0	7.63E-1
DI-AR	1.10E-3	5.69E-3	4.41E-7	1.99E-4	9.74E-3	2.50E-12	7.89E-1
HE-AIR-OP	1.10E-3	5.34E-3	5.00E-7	1.79E-4	9.28E-3	0.00E+0	7.63E-1
HE-AR-OP	1.10E-3	5.69E-3	4.41E-7	1.99E-4	9.74E-3	2.50E-12	7.89E-1
HE-SV-B-LO	4.73E-5	3.31E-4	3.78E-8	1.42E-5	6.31E-4	3.52E-14	9.46E-2
HE-SV-B-OP	4.73E-5	3.34E-4	3.68E-8	1.48E-5	5.77E-4	0.00E+0	1.26E-1
HE-SV-C-LO	4.73E-5	3.24E-4	3.51E-8	1.43E-5	5.87E-4	0.00E+0	5.07E-2
HE-SV-C-OP	4.73E-5	3.28E-4	3.20E-8	1.43E-5	5.88E-4	7.13E-13	5.97E-2
HE-SV-D-LO	4.73E-5	3.06E-4	3.37E-8	1.47E-5	6.02E-4	0.00E+0	5.19E-2
HE-SV-D-OP	4.73E-5	3.08E-4	3.88E-8	1.54E-5	5.95E-4	6.64E-13	6.24E-2
HE-SV-E-LO	4.73E-5	3.05E-4	2.92E-8	1.45E-5	6.22E-4	0.00E+0	3.87E-2
HE-SV-E-OP	4.73E-5	3.05E-4	3.98E-8	1.55E-5	6.02E-4	5.94E-13	9.02E-2
MF-AIR-LK	9.98E-1	9.91E-1	9.39E-1	9.97E-1	1.00E+0	2.26E-1	1.00E+0
MF-AR-LK	9.98E-1	9.91E-1	9.36E-1	9.97E-1	1.00E+0	2.05E-1	1.00E+0
MF-SV-A-FFD	2.87E-6	1.72E-5	3.86E-8	1.32E-6	3.09E-5	1.09E-9	2.48E-3
MF-SV-B-FFD	7.04E-6	4.62E-5	4.55E-8	2.47E-6	7.67E-5	3.88E-10	8.94E-3
MF-SV-C-FFD	7.04E-6	6.01E-5	5.01E-8	2.57E-6	7.85E-5	1.91E-9	1.06E-1
MF-SV-D-FFD	7.04E-6	4.48E-5	5.33E-8	2.60E-6	8.04E-5	8.97E-10	7.54E-3
MF-SV-E-FFD	7.04E-6	4.81E-5	5.68E-8	2.69E-6	7.50E-5	1.94E-9	2.83E-2
MF-VP-A-LK	2.87E-6	1.72E-5	3.86E-8	1.32E-6	3.09E-5	1.09E-9	2.48E-3
SV-B-C_CCF	6.21E-4	2.60E-3	4.88E-5	6.08E-4	5.99E-3	7.98E-6	2.12E-1
SV-D-E_CCF	6.21E-4	2.72E-3	5.16E-5	6.27E-4	6.03E-3	3.86E-6	3.81E-1

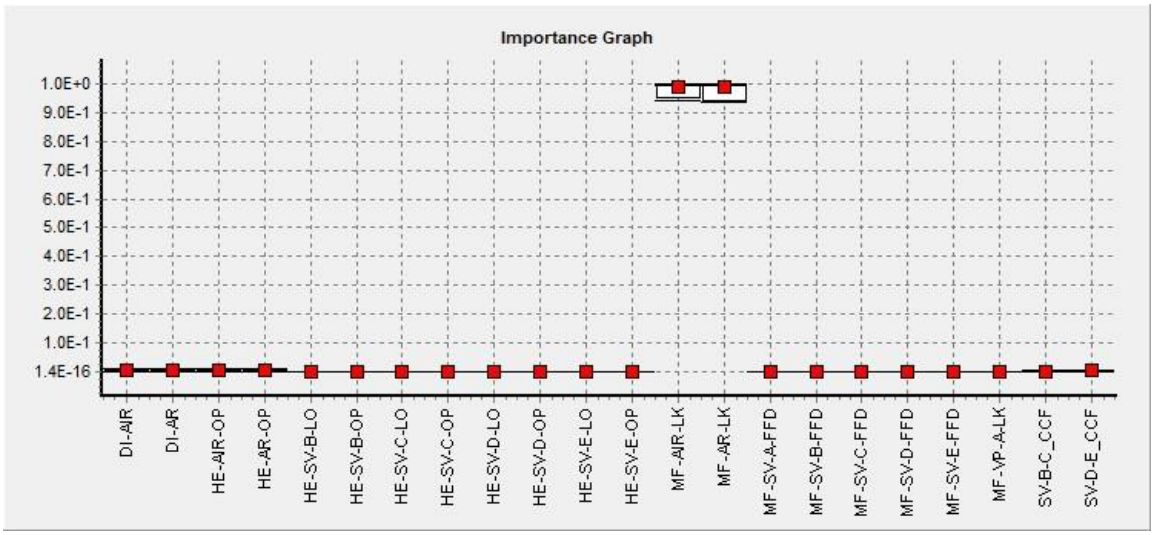


Figure 225: Importance graph for the extended system w/ door interlocks and SV_MAN.

Table 220: FV Results for Extended System w/ Door Interlocks and SV_NRPD

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	8.05E-6	6.37E-6	2.39E-9	6.97E-7	1.54E-5	1.75E-14	5.60E-4
DI-AR	8.07E-6	6.78E-6	1.98E-9	7.85E-7	1.54E-5	4.05E-13	4.54E-4
HE-AIR-OP	4.49E-6	3.23E-6	1.90E-8	4.41E-7	7.18E-6	5.43E-10	2.73E-4
HE-AR-OP	4.50E-6	3.64E-6	1.98E-8	4.76E-7	7.53E-6	8.35E-10	5.55E-4
HE-SV-B-LO	1.23E-5	8.03E-6	7.51E-8	1.36E-6	1.87E-5	5.25E-9	1.11E-3
HE-SV-B-OP	1.23E-5	8.03E-6	7.51E-8	1.36E-6	1.87E-5	5.25E-9	1.10E-3
HE-SV-C-LO	1.23E-5	8.38E-6	7.80E-8	1.37E-6	1.87E-5	7.53E-9	8.19E-4
HE-SV-C-OP	1.23E-5	8.38E-6	7.80E-8	1.37E-6	1.87E-5	7.53E-9	8.19E-4
HE-SV-D-LO	1.23E-5	8.58E-6	7.66E-8	1.38E-6	1.90E-5	2.33E-9	8.00E-4
HE-SV-D-OP	1.23E-5	8.58E-6	7.66E-8	1.38E-6	1.90E-5	2.33E-9	8.01E-4
HE-SV-E-LO	1.23E-5	8.09E-6	8.21E-8	1.39E-6	1.94E-5	3.82E-9	4.46E-4
HE-SV-E-OP	1.23E-5	8.09E-6	8.21E-8	1.39E-6	1.94E-5	3.82E-9	4.46E-4
MF-AIR-LK	7.24E-3	6.01E-3	3.32E-4	2.28E-3	1.38E-2	2.87E-5	1.13E-1
MF-AR-LK	7.25E-3	6.09E-3	3.27E-4	2.35E-3	1.44E-2	5.66E-5	1.14E-1
MF-SV-A-FFD	1.41E-5	1.25E-5	2.03E-7	2.90E-6	2.96E-5	9.20E-9	7.69E-4
MF-SV-B-FFD	3.11E-3	2.04E-3	1.90E-5	3.43E-4	4.72E-3	1.33E-6	2.79E-1
MF-SV-C-FFD	3.11E-3	2.13E-3	1.97E-5	3.47E-4	4.73E-3	1.90E-6	2.07E-1
MF-SV-D-FFD	3.11E-3	2.18E-3	1.93E-5	3.49E-4	4.80E-3	5.88E-7	2.04E-1
MF-SV-E-FFD	3.11E-3	2.05E-3	2.07E-5	3.52E-4	4.91E-3	9.63E-7	1.15E-1
MF-VP-A-LK	4.00E-6	2.88E-6	1.13E-8	3.46E-7	6.21E-6	3.30E-10	2.06E-4
SV-B-C_CCF	6.40E-7	5.29E-7	2.94E-8	2.02E-7	1.21E-6	2.54E-9	9.55E-6
SV-D-E_CCF	6.40E-7	5.35E-7	2.79E-8	2.08E-7	1.27E-6	2.54E-9	9.65E-6

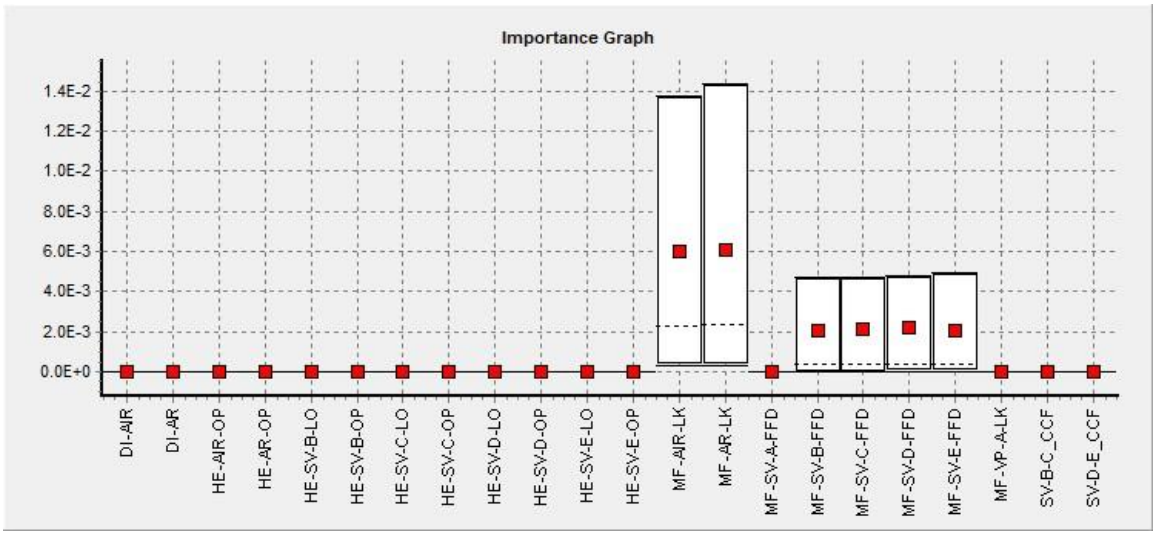


Figure 226: Importance graph for the extended system w/ door interlocks and SV_NRPD.

Table 221: FV Results for the Extended System w/Door Interlocks and Diagnostic HE

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
DI-AIR	3.95E-3	5.61E-3	7.93E-7	4.11E-4	1.24E-2	1.10E-11	2.95E-1
DI-AR	3.95E-3	5.76E-3	7.93E-7	3.91E-4	1.29E-2	3.26E-12	4.62E-1
HE-AIR-OP	3.95E-3	5.61E-3	7.93E-7	4.11E-4	1.24E-2	1.10E-11	2.95E-1
HE-AR-OP	3.95E-3	5.76E-3	7.93E-7	3.91E-4	1.29E-2	3.26E-12	4.62E-1
HE-SV-B-LO	2.31E-2	3.04E-2	2.10E-5	7.04E-3	8.43E-2	6.07E-9	4.59E-1
HE-SV-B-OP	2.31E-2	3.02E-2	2.42E-5	7.26E-3	8.34E-2	4.51E-13	5.76E-1
HE-SV-C-LO	2.31E-2	2.85E-2	2.00E-5	6.97E-3	7.69E-2	1.60E-9	4.67E-1
HE-SV-C-OP	2.31E-2	3.01E-2	2.29E-5	7.14E-3	8.30E-2	8.02E-10	4.53E-1
HE-SV-D-LO	2.31E-2	2.89E-2	1.59E-5	6.69E-3	8.16E-2	3.21E-14	4.37E-1
HE-SV-D-OP	2.31E-2	2.90E-2	2.08E-5	6.84E-3	7.99E-2	4.74E-11	5.77E-1
HE-SV-E-LO	2.31E-2	2.84E-2	1.76E-5	7.15E-3	7.91E-2	4.81E-9	5.25E-1
HE-SV-E-OP	2.31E-2	2.98E-2	1.62E-5	6.93E-3	8.09E-2	4.53E-10	4.62E-1
MF-AIR-LK	3.26E-1	2.78E-1	1.31E-2	1.50E-1	6.50E-1	1.61E-3	9.82E-1
MF-AR-LK	3.27E-1	2.84E-1	1.26E-2	1.53E-1	6.59E-1	7.58E-4	9.72E-1

Name	Point Est.	Mean	5th	50th	95th	Min	Max
MF-SV-A-FS	5.24E-4	7.44E-4	9.98E-6	1.95E-4	1.84E-3	2.97E-7	2.43E-2
MF-SV-A-LK	3.00E-5	4.67E-5	5.54E-7	1.10E-5	1.10E-4	5.42E-9	3.71E-3
MF-SV-A-RP	4.34E-6	5.96E-6	1.60E-8	6.50E-7	1.27E-5	5.57E-10	8.20E-4
MF-SV-B-FS	5.30E-1	5.54E-1	1.15E-1	5.23E-1	8.03E-1	1.23E-2	9.43E-1
MF-SV-B-LK	3.05E-2	4.07E-2	4.98E-3	2.40E-2	8.29E-2	8.67E-4	5.18E-1
MF-SV-B-RP	4.41E-3	5.56E-3	9.73E-5	1.36E-3	1.28E-2	1.08E-5	4.88E-1
MF-SV-C-FS	5.30E-1	5.57E-1	1.16E-1	5.25E-1	8.05E-1	1.30E-2	9.42E-1
MF-SV-C-LK	3.05E-2	3.98E-2	4.68E-3	2.38E-2	8.18E-2	2.99E-4	5.64E-1
MF-SV-C-RP	4.41E-3	5.90E-3	9.77E-5	1.33E-3	1.36E-2	2.52E-6	3.39E-1
MF-SV-D-FS	5.30E-1	5.52E-1	1.09E-1	5.22E-1	8.04E-1	2.16E-2	9.55E-1
MF-SV-D-LK	3.05E-2	4.04E-2	4.87E-3	2.39E-2	8.47E-2	5.24E-4	3.96E-1
MF-SV-D-RP	4.41E-3	5.62E-3	9.89E-5	1.32E-3	1.33E-2	6.67E-6	3.41E-1
MF-SV-E-FS	5.30E-1	5.51E-1	1.09E-1	5.19E-1	8.04E-1	1.44E-2	9.35E-1
MF-SV-E-LK	3.05E-2	4.09E-2	4.94E-3	2.33E-2	8.70E-2	8.03E-4	5.31E-1
MF-SV-E-RP	4.41E-3	5.77E-3	9.69E-5	1.32E-3	1.34E-2	5.77E-6	7.02E-1
MF-VP-A-LK	5.58E-4	7.97E-4	1.13E-5	2.14E-4	1.97E-3	3.03E-7	2.47E-2
SV-B-C_CCF	6.43E-2	5.79E-2	1.43E-2	5.00E-2	9.00E-2	2.26E-3	2.05E-1
SV-D-E_CCF	6.43E-2	5.76E-2	1.40E-2	4.97E-2	9.02E-2	3.24E-3	1.78E-1

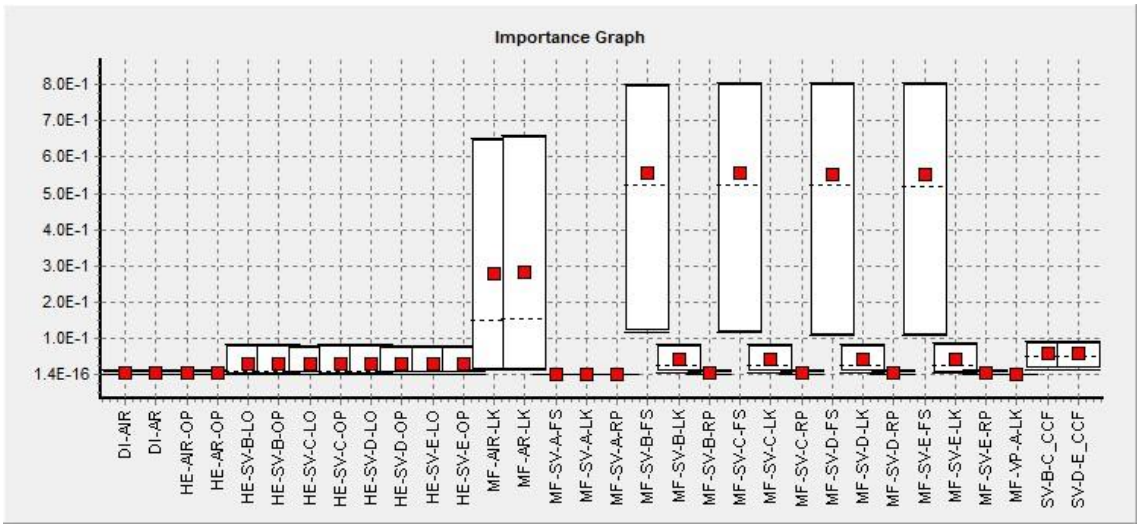


Figure 227: Importance graph for extended system w/ door interlocks and diagnostic HE

Table 222: FV Results for the Extended System w/Door Interlocks and Diagnostic HE and SV_OL

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
DI-AIR	1.17E-2	3.52E-2	3.23E-6	1.97E-3	8.64E-2	4.54E-12	9.52E-1
DI-AR	1.17E-2	3.53E-2	3.99E-6	1.94E-3	9.03E-2	3.74E-10	9.74E-1
HE-AIR-OP	1.17E-2	3.52E-2	3.23E-6	1.97E-3	8.64E-2	4.54E-12	9.52E-1
HE-AR-OP	1.17E-2	3.53E-2	3.99E-6	1.94E-3	9.03E-2	3.74E-10	9.74E-1
HE-SV-B-LO	6.58E-3	2.46E-2	4.19E-6	2.02E-3	6.58E-2	7.30E-11	8.47E-1
HE-SV-B-OP	6.58E-3	2.44E-2	5.36E-6	2.09E-3	6.66E-2	8.52E-11	8.86E-1
HE-SV-C-LO	6.58E-3	2.51E-2	4.54E-6	2.00E-3	6.67E-2	2.45E-13	7.09E-1
HE-SV-C-OP	6.58E-3	2.45E-2	4.86E-6	2.04E-3	6.57E-2	3.25E-11	7.26E-1
HE-SV-D-LO	6.58E-3	2.56E-2	4.48E-6	1.96E-3	6.75E-2	8.80E-11	8.17E-1
HE-SV-D-OP	6.58E-3	2.43E-2	4.42E-6	2.01E-3	6.33E-2	4.69E-11	9.22E-1
HE-SV-E-LO	6.58E-3	2.44E-2	5.21E-6	2.05E-3	6.51E-2	2.94E-11	7.36E-1
HE-SV-E-OP	6.58E-3	2.48E-2	4.55E-6	2.00E-3	6.65E-2	0.00E+0	8.73E-1
MF-AIR-LK	9.71E-1	8.99E-1	4.11E-1	9.43E-1	9.96E-1	4.52E-2	1.00E+0

Name	Point Est.	Mean	5th	50th	95th	Min	Max
MF-AR-LK	9.71E-1	9.00E-1	4.11E-1	9.43E-1	9.96E-1	2.11E-2	1.00E+0
MF-SV-A-FFD	1.09E-4	5.18E-4	1.39E-6	4.49E-5	9.79E-4	5.44E-8	1.19E-1
MF-SV-B-FFD	3.55E-3	1.39E-2	2.85E-5	1.32E-3	3.08E-2	4.24E-7	7.20E-1
MF-SV-C-FFD	3.55E-3	1.34E-2	3.07E-5	1.32E-3	3.09E-2	9.21E-7	7.86E-1
MF-SV-D-FFD	3.55E-3	1.28E-2	3.30E-5	1.32E-3	3.07E-2	2.92E-7	7.84E-1
MF-SV-E-FFD	3.55E-3	1.36E-2	2.89E-5	1.29E-3	3.01E-2	7.06E-7	8.90E-1
MF-VP-A-LK	1.09E-4	5.18E-4	1.39E-6	4.49E-5	9.79E-4	5.44E-8	1.19E-1
SV-B-C_CCF	6.04E-4	1.91E-3	5.13E-5	5.68E-4	4.48E-3	7.42E-6	9.01E-2
SV-D-E_CCF	6.04E-4	1.99E-3	5.05E-5	5.64E-4	4.75E-3	3.86E-6	1.23E-1

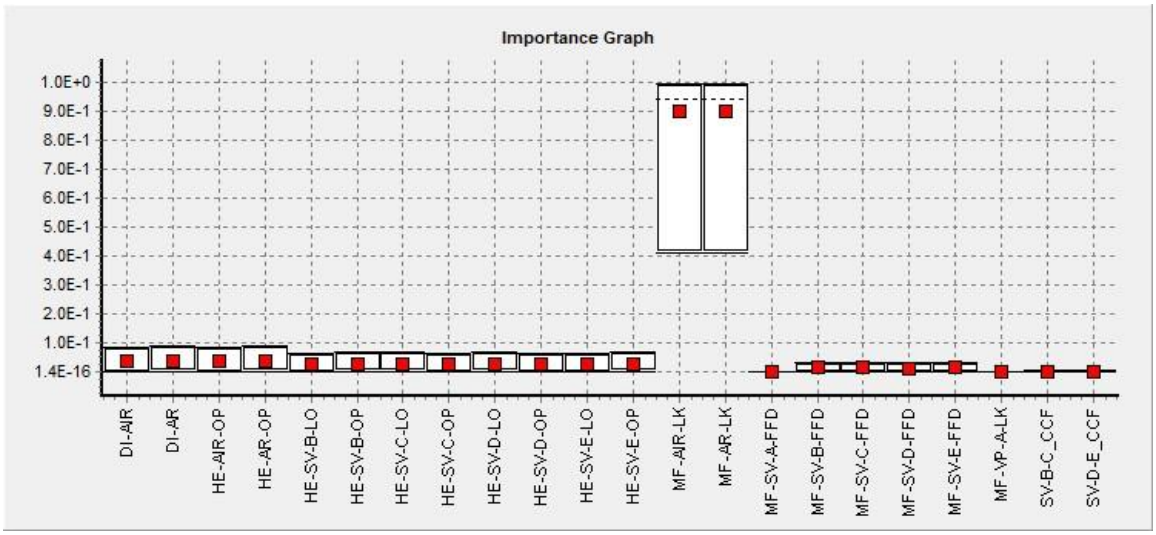


Figure 228: Importance graph for extended system w/ door interlocks and diagnostic HE and SV_OL.

Table 223: FV Results for the Extended System w/Door Interlocks and Diagnostic HE and SV_OM

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	3.04E-3	1.12E-2	9.67E-7	5.91E-4	2.29E-2	1.01E-12	7.28E-1
DI-AR	3.05E-3	1.12E-2	1.12E-6	5.90E-4	2.43E-2	3.36E-10	8.38E-1
HE-AIR-OP	3.04E-3	1.12E-2	9.67E-7	5.91E-4	2.29E-2	1.01E-12	7.28E-1
HE-AR-OP	3.05E-3	1.12E-2	1.12E-6	5.90E-4	2.43E-2	3.36E-10	8.38E-1
HE-SV-B-LO	2.25E-2	3.75E-2	1.85E-5	6.56E-3	1.01E-1	1.93E-10	8.35E-1
HE-SV-B-OP	2.25E-2	3.90E-2	2.03E-5	6.73E-3	1.08E-1	7.04E-10	8.31E-1
HE-SV-C-LO	2.25E-2	3.96E-2	1.95E-5	6.44E-3	1.11E-1	1.86E-12	7.71E-1
HE-SV-C-OP	2.25E-2	3.90E-2	1.99E-5	6.37E-3	1.09E-1	3.36E-10	8.27E-1
HE-SV-D-LO	2.25E-2	3.89E-2	1.62E-5	6.56E-3	1.08E-1	4.32E-10	7.65E-1
HE-SV-D-OP	2.25E-2	3.81E-2	1.81E-5	6.33E-3	1.02E-1	1.78E-11	8.61E-1
HE-SV-E-LO	2.25E-2	3.84E-2	1.83E-5	6.45E-3	1.05E-1	9.52E-11	7.38E-1
HE-SV-E-OP	2.25E-2	3.87E-2	1.66E-5	6.40E-3	1.07E-1	0.00E+0	7.80E-1
MF-AIR-LK	2.51E-1	4.15E-1	1.30E-2	2.53E-1	8.78E-1	7.34E-4	9.99E-1
MF-AR-LK	2.52E-1	4.18E-1	1.31E-2	2.63E-1	8.83E-1	2.78E-4	9.99E-1
MF-SV-A-FFD	4.25E-4	2.21E-3	5.15E-6	2.60E-4	5.07E-3	7.81E-8	1.86E-1
MF-SV-B-FFD	7.07E-1	4.96E-1	1.78E-2	3.94E-1	9.00E-1	6.42E-4	9.95E-1
MF-SV-C-FFD	7.07E-1	4.94E-1	1.91E-2	3.84E-1	9.00E-1	8.83E-4	9.97E-1
MF-SV-D-FFD	7.07E-1	4.95E-1	1.95E-2	3.88E-1	8.97E-1	3.98E-4	9.97E-1
MF-SV-E-FFD	7.07E-1	4.95E-1	1.98E-2	3.88E-1	9.00E-1	5.23E-4	9.96E-1
MF-VP-A-LK	4.25E-4	2.21E-3	5.15E-6	2.60E-4	5.07E-3	7.81E-8	1.86E-1
SV-B-C_CCF	1.57E-4	4.59E-4	2.45E-5	1.71E-4	1.07E-3	2.91E-6	2.07E-2
SV-D-E_CCF	1.57E-4	4.91E-4	2.31E-5	1.73E-4	1.13E-3	2.21E-6	2.62E-2

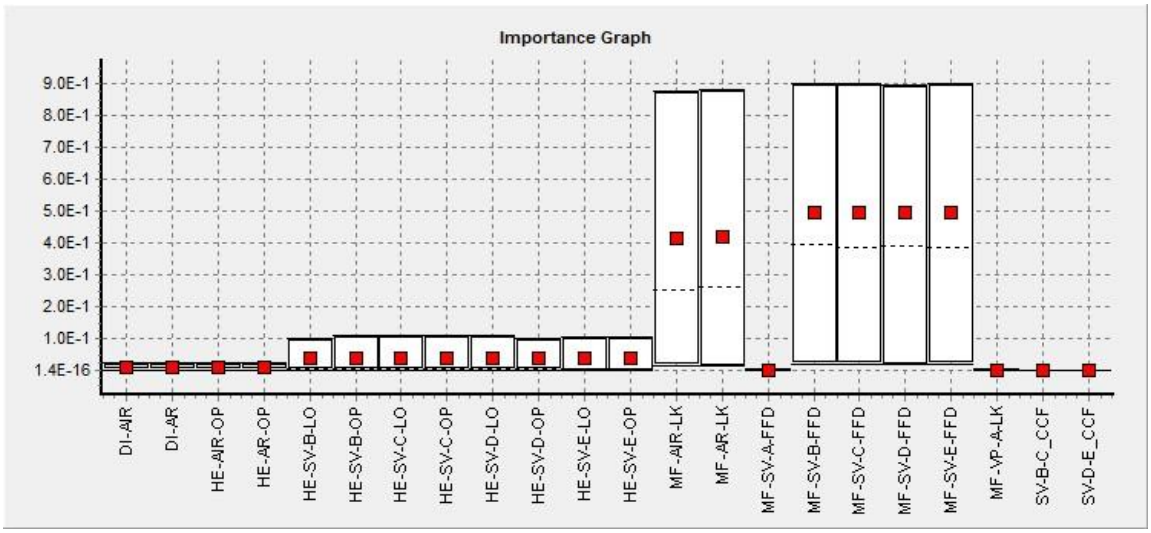


Figure 229: Importance graph for extended system w/ door interlocks and diagnostic HE and SV_OM.

Table 224: FV Results for the Extended System w/Door Interlocks and Diagnostic HE and SV_OH

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	8.23E-4	3.82E-3	3.10E-7	1.91E-4	7.05E-3	3.48E-13	5.65E-1
DI-AR	8.23E-4	3.79E-3	4.16E-7	1.83E-4	7.25E-3	8.57E-11	5.51E-1
HE-AIR-OP	8.23E-4	3.82E-3	3.10E-7	1.91E-4	7.05E-3	3.48E-13	5.65E-1
HE-AR-OP	8.23E-4	3.79E-3	4.16E-7	1.83E-4	7.25E-3	8.57E-11	5.51E-1
HE-SV-B-LO	1.37E-2	2.60E-2	1.56E-5	5.09E-3	6.68E-2	7.36E-11	8.99E-1
HE-SV-B-OP	1.37E-2	2.68E-2	1.58E-5	5.26E-3	6.99E-2	3.55E-10	7.49E-1
HE-SV-C-LO	1.37E-2	2.70E-2	1.64E-5	5.09E-3	7.10E-2	1.77E-12	7.61E-1
HE-SV-C-OP	1.37E-2	2.70E-2	1.54E-5	4.89E-3	7.12E-2	5.10E-10	7.58E-1
HE-SV-D-LO	1.37E-2	2.69E-2	1.28E-5	5.19E-3	6.90E-2	2.39E-10	6.20E-1
HE-SV-D-OP	1.37E-2	2.66E-2	1.57E-5	4.91E-3	6.66E-2	1.90E-11	7.29E-1
HE-SV-E-LO	1.37E-2	2.65E-2	1.45E-5	5.05E-3	7.08E-2	2.29E-10	6.31E-1
HE-SV-E-OP	1.37E-2	2.65E-2	1.30E-5	5.14E-3	6.94E-2	2.25E-14	7.57E-1
MF-AIR-LK	6.79E-2	1.87E-1	3.66E-3	6.12E-2	5.38E-1	3.34E-4	9.90E-1

Name	Point Est.	Mean	5th	50th	95th	Min	Max
MF-AR-LK	6.79E-2	1.87E-1	3.64E-3	6.09E-2	5.36E-1	8.21E-5	9.93E-1
MF-SV-A-FFD	6.63E-5	6.55E-4	1.52E-6	6.45E-5	1.40E-3	1.85E-8	7.22E-2
MF-SV-B-FFD	9.49E-1	7.67E-1	1.48E-1	8.03E-1	9.73E-1	6.72E-3	1.00E+0
MF-SV-C-FFD	9.49E-1	7.65E-1	1.58E-1	7.97E-1	9.72E-1	8.34E-3	1.00E+0
MF-SV-D-FFD	9.49E-1	7.66E-1	1.57E-1	8.02E-1	9.71E-1	4.10E-3	1.00E+0
MF-SV-E-FFD	9.49E-1	7.67E-1	1.55E-1	8.04E-1	9.72E-1	5.85E-3	1.00E+0
MF-VP-A-LK	6.63E-5	6.55E-4	1.52E-6	6.45E-5	1.40E-3	1.85E-8	7.22E-2
SV-B-C_CCF	4.24E-5	1.40E-4	1.05E-5	5.22E-5	3.15E-4	2.17E-6	4.76E-3
SV-D-E_CCF	4.24E-5	1.50E-4	1.03E-5	5.16E-5	3.34E-4	2.40E-6	9.09E-3

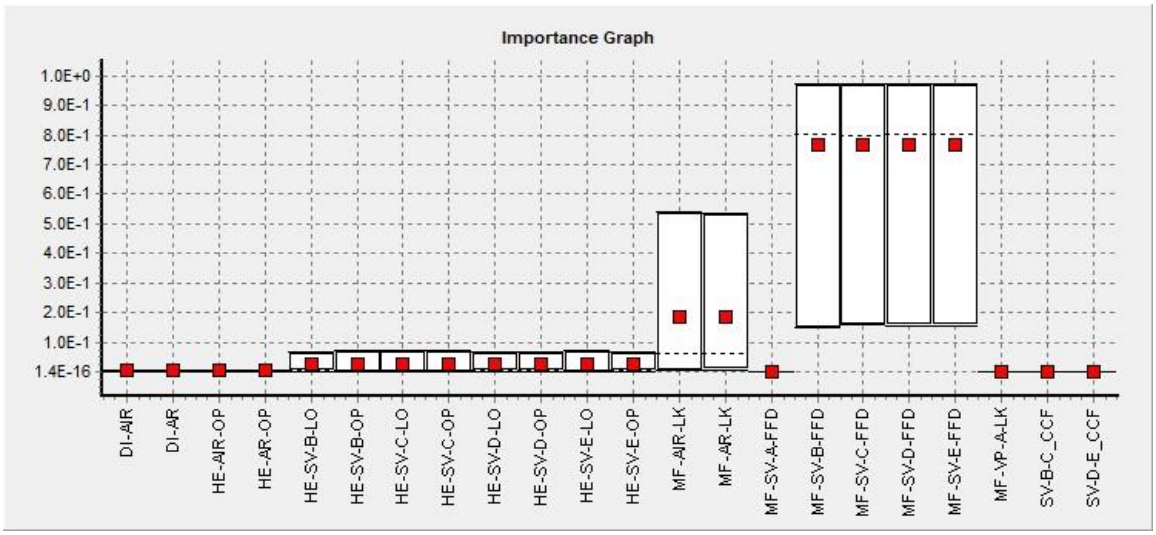


Figure 230: Importance graph for extended system w/ door interlocks and diagnostic HE and SV_OH.

Table 225: FV Results for the Extended System w/Door Interlocks and Diagnostic HE and SV_DOW

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	1.17E-2	3.52E-2	3.23E-6	1.96E-3	8.63E-2	4.53E-12	9.52E-1
DI-AR	1.17E-2	3.53E-2	3.99E-6	1.94E-3	9.02E-2	3.74E-10	9.73E-1
HE-AIR-OP	1.17E-2	3.52E-2	3.23E-6	1.96E-3	8.63E-2	4.53E-12	9.52E-1
HE-AR-OP	1.17E-2	3.53E-2	3.99E-6	1.94E-3	9.02E-2	3.74E-10	9.73E-1
HE-SV-B-LO	6.62E-3	2.47E-2	4.23E-6	2.03E-3	6.64E-2	7.40E-11	8.46E-1
HE-SV-B-OP	6.62E-3	2.46E-2	5.44E-6	2.10E-3	6.73E-2	8.57E-11	8.86E-1
HE-SV-C-LO	6.62E-3	2.52E-2	4.56E-6	2.01E-3	6.68E-2	2.45E-13	7.10E-1
HE-SV-C-OP	6.62E-3	2.46E-2	4.88E-6	2.06E-3	6.62E-2	3.27E-11	7.27E-1
HE-SV-D-LO	6.62E-3	2.58E-2	4.49E-6	1.98E-3	6.75E-2	8.90E-11	8.17E-1
HE-SV-D-OP	6.62E-3	2.44E-2	4.48E-6	2.02E-3	6.38E-2	4.67E-11	9.24E-1
HE-SV-E-LO	6.62E-3	2.45E-2	5.26E-6	2.07E-3	6.52E-2	2.94E-11	7.36E-1
HE-SV-E-OP	6.62E-3	2.49E-2	4.60E-6	2.02E-3	6.68E-2	0.00E+0	8.73E-1
MF-AIR-LK	9.71E-1	8.99E-1	4.10E-1	9.42E-1	9.96E-1	4.52E-2	1.00E+0
MF-AR-LK	9.71E-1	8.99E-1	4.09E-1	9.42E-1	9.96E-1	2.11E-2	1.00E+0
MF-SV-A-FFD	1.13E-4	5.33E-4	1.43E-6	4.63E-5	1.01E-3	5.62E-8	1.22E-1
MF-SV-B-FFD	3.69E-3	1.44E-2	2.99E-5	1.38E-3	3.20E-2	4.50E-7	7.28E-1
MF-SV-C-FFD	3.69E-3	1.39E-2	3.22E-5	1.37E-3	3.21E-2	9.77E-7	7.92E-1
MF-SV-D-FFD	3.69E-3	1.33E-2	3.48E-5	1.37E-3	3.21E-2	3.08E-7	7.89E-1
MF-SV-E-FFD	3.69E-3	1.40E-2	3.05E-5	1.35E-3	3.13E-2	7.51E-7	8.93E-1
MF-VP-A-LK	1.13E-4	5.33E-4	1.43E-6	4.63E-5	1.01E-3	5.62E-8	1.22E-1
SV-B-C_CCF	6.04E-4	1.91E-3	5.13E-5	5.68E-4	4.47E-3	7.42E-6	8.95E-2
SV-D-E_CCF	6.04E-4	1.99E-3	5.05E-5	5.64E-4	4.74E-3	3.86E-6	1.22E-1

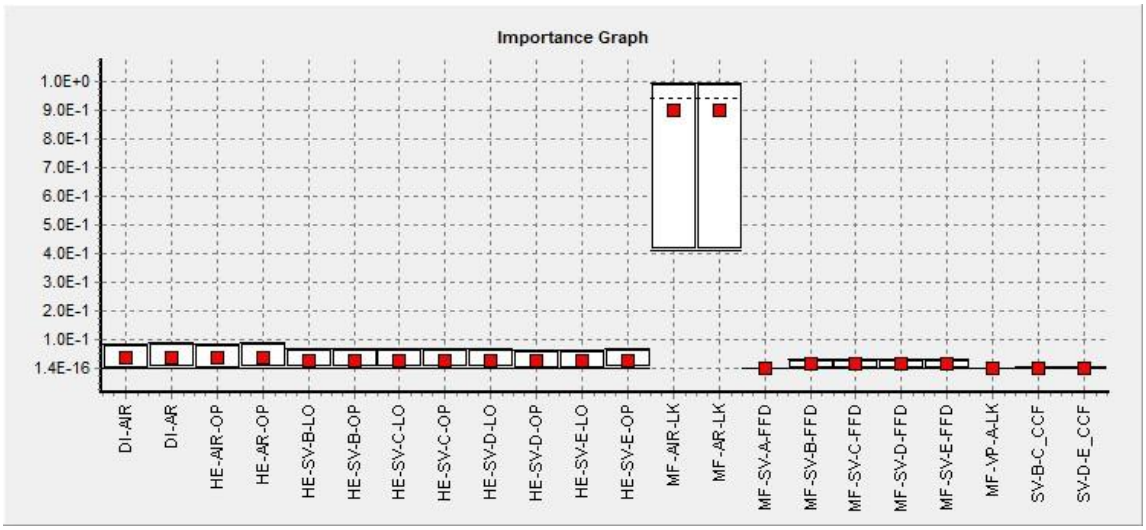


Figure 231: Importance graph for extended system w/ door interlocks and diagnostic HE and SV_DOW.

Table 226: FV Results for the Extended System w/Door Interlocks and Diagnostic HE and SV_MAN

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	1.18E-2	3.67E-2	3.24E-6	2.01E-3	9.10E-2	4.59E-12	9.54E-1
DI-AR	1.18E-2	3.66E-2	4.00E-6	1.98E-3	9.32E-2	3.75E-10	9.78E-1
HE-AIR-OP	1.18E-2	3.67E-2	3.24E-6	2.01E-3	9.10E-2	4.59E-12	9.54E-1
HE-AR-OP	1.18E-2	3.66E-2	4.00E-6	1.98E-3	9.32E-2	3.75E-10	9.78E-1
HE-SV-B-LO	5.25E-3	2.11E-2	2.91E-6	1.32E-3	5.39E-2	4.39E-11	8.50E-1
HE-SV-B-OP	5.25E-3	2.08E-2	2.85E-6	1.38E-3	5.37E-2	7.35E-11	8.56E-1
HE-SV-C-LO	5.25E-3	2.11E-2	2.66E-6	1.35E-3	5.42E-2	2.54E-13	7.81E-1
HE-SV-C-OP	5.25E-3	2.08E-2	2.86E-6	1.37E-3	5.23E-2	2.68E-11	7.59E-1
HE-SV-D-LO	5.25E-3	2.20E-2	2.30E-6	1.31E-3	5.67E-2	5.90E-11	9.04E-1
HE-SV-D-OP	5.25E-3	2.04E-2	2.38E-6	1.37E-3	5.08E-2	2.80E-11	7.61E-1
HE-SV-E-LO	5.25E-3	2.08E-2	2.49E-6	1.35E-3	5.37E-2	2.85E-11	7.37E-1
HE-SV-E-OP	5.25E-3	2.15E-2	2.44E-6	1.33E-3	5.37E-2	0.00E+0	8.71E-1
MF-AIR-LK	9.77E-1	9.19E-1	4.77E-1	9.59E-1	9.98E-1	4.52E-2	1.00E+0
MF-AR-LK	9.77E-1	9.19E-1	4.71E-1	9.60E-1	9.98E-1	2.12E-2	1.00E+0
MF-SV-A-FFD	2.78E-6	1.47E-5	3.66E-8	1.18E-6	2.66E-5	1.37E-9	3.80E-3
MF-SV-B-FFD	7.10E-5	3.48E-4	3.31E-7	2.19E-5	6.32E-4	2.14E-9	4.86E-2
MF-SV-C-FFD	7.10E-5	3.26E-4	3.95E-7	2.22E-5	6.55E-4	1.27E-9	8.26E-2
MF-SV-D-FFD	7.10E-5	3.16E-4	4.19E-7	2.27E-5	6.25E-4	2.40E-9	8.92E-2
MF-SV-E-FFD	7.10E-5	3.75E-4	3.93E-7	2.20E-5	6.17E-4	2.62E-9	1.75E-1
MF-VP-A-LK	2.78E-6	1.47E-5	3.66E-8	1.18E-6	2.66E-5	1.37E-9	3.80E-3
SV-B-C_CCF	6.08E-4	2.05E-3	5.13E-5	5.77E-4	4.77E-3	7.42E-6	1.09E-1
SV-D-E_CCF	6.08E-4	2.12E-3	5.08E-5	5.70E-4	5.07E-3	3.86E-6	1.39E-1

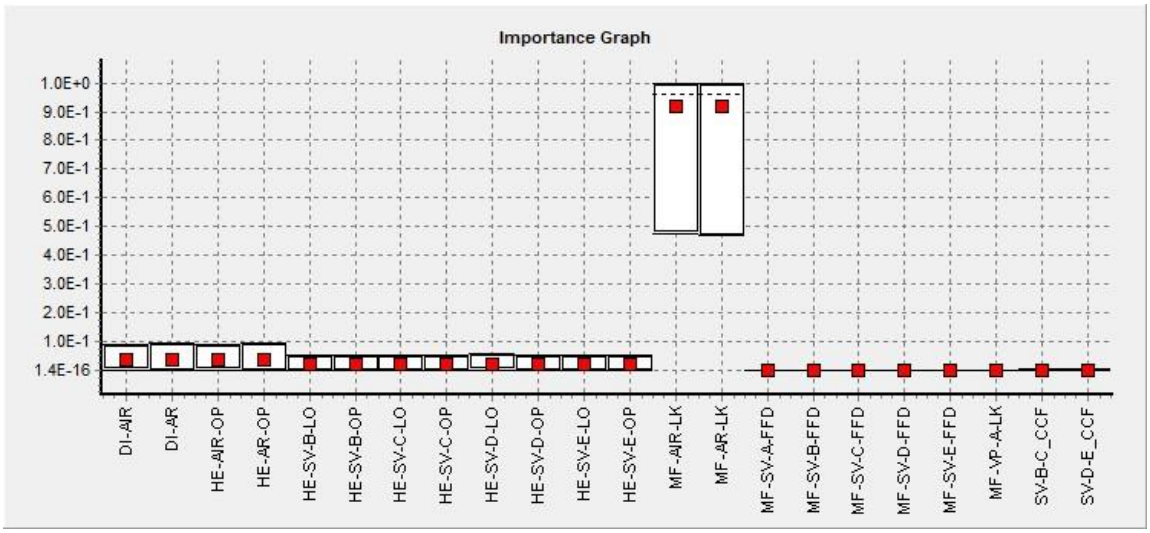


Figure 232: Importance graph for extended system w/ door interlocks and diagnostic HE and SV_MAN.

Table 227: FV Results for the Extended System w/Door Interlocks and Diagnostic HE and SV_NRPD

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	7.78E-3	2.02E-2	1.85E-6	1.15E-3	4.38E-2	2.62E-12	8.32E-1
DI-AR	7.80E-3	2.03E-2	2.27E-6	1.18E-3	4.65E-2	3.63E-10	8.85E-1
HE-AIR-OP	7.78E-3	2.02E-2	1.85E-6	1.15E-3	4.38E-2	2.62E-12	8.32E-1
HE-AR-OP	7.80E-3	2.03E-2	2.27E-6	1.18E-3	4.65E-2	3.63E-10	8.85E-1
HE-SV-B-LO	2.45E-2	4.01E-2	1.53E-5	5.87E-3	1.15E-1	3.22E-10	7.91E-1
HE-SV-B-OP	2.45E-2	4.15E-2	1.68E-5	6.07E-3	1.21E-1	3.58E-10	9.08E-1
HE-SV-C-LO	2.45E-2	4.20E-2	1.56E-5	5.73E-3	1.18E-1	1.07E-12	8.15E-1
HE-SV-C-OP	2.45E-2	4.10E-2	1.63E-5	5.63E-3	1.14E-1	1.59E-10	7.90E-1
HE-SV-D-LO	2.45E-2	4.13E-2	1.31E-5	5.73E-3	1.16E-1	4.85E-10	8.49E-1
HE-SV-D-OP	2.45E-2	4.03E-2	1.40E-5	5.70E-3	1.11E-1	2.09E-11	9.42E-1
HE-SV-E-LO	2.45E-2	4.07E-2	1.60E-5	5.74E-3	1.13E-1	5.12E-11	8.56E-1
HE-SV-E-OP	2.45E-2	4.12E-2	1.37E-5	5.69E-3	1.16E-1	0.00E+0	8.58E-1
MF-AIR-LK	6.44E-1	6.29E-1	4.81E-2	5.86E-1	9.65E-1	2.10E-3	1.00E+0
MF-AR-LK	6.45E-1	6.33E-1	5.04E-2	6.00E-1	9.66E-1	1.33E-3	9.99E-1
MF-SV-A-FFD	1.09E-3	2.99E-3	9.51E-6	3.80E-4	6.81E-3	1.08E-7	1.61E-1
MF-SV-B-FFD	2.99E-1	2.66E-1	3.12E-3	1.10E-1	6.95E-1	8.42E-5	9.89E-1
MF-SV-C-FFD	2.99E-1	2.65E-1	3.38E-3	1.06E-1	6.93E-1	1.45E-4	9.91E-1
MF-SV-D-FFD	2.99E-1	2.65E-1	3.40E-3	1.08E-1	6.90E-1	7.66E-5	9.93E-1
MF-SV-E-FFD	2.99E-1	2.64E-1	3.37E-3	1.07E-1	6.95E-1	9.38E-5	9.95E-1
MF-VP-A-LK	1.09E-3	2.99E-3	9.51E-6	3.80E-4	6.81E-3	1.08E-7	1.61E-1
SV-B-C_CCF	4.01E-4	9.17E-4	4.21E-5	3.40E-4	2.11E-3	6.00E-6	2.95E-2
SV-D-E_CCF	4.01E-4	9.66E-4	4.26E-5	3.40E-4	2.22E-3	3.01E-6	5.59E-2

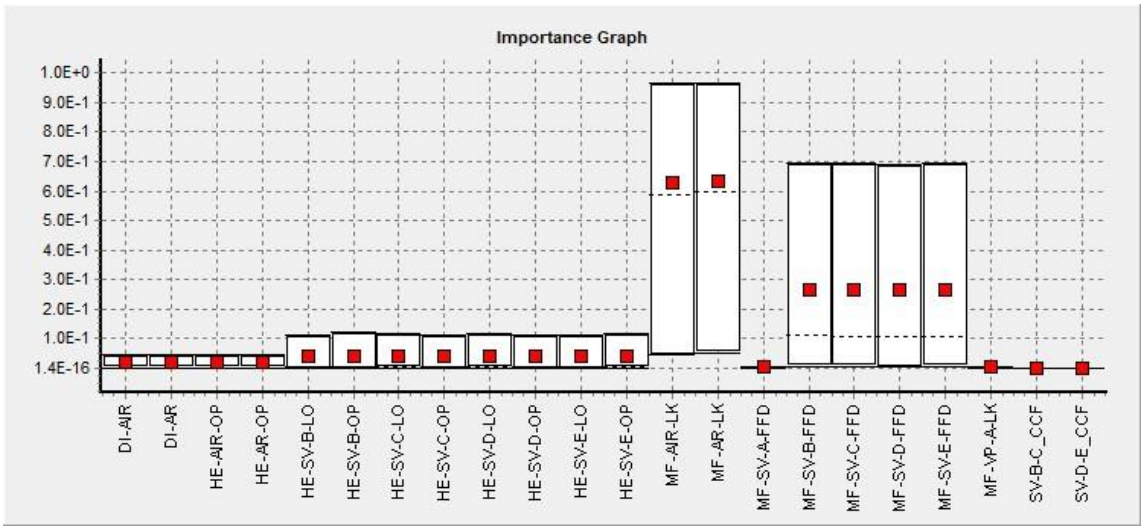


Figure 233: Importance graph for extended system w/ door interlocks and diagnostic HE and SV_NRPD.

Table 228: FV Results for Extended System w/ Door Interlocks and Bruce B Fault Rate

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	6.57E-5	1.75E-4	3.37E-8	1.32E-5	3.89E-4	1.71E-11	1.77E-2
DI-AR	6.57E-5	2.08E-4	3.37E-8	1.31E-5	4.11E-4	8.61E-12	9.41E-2
HE-AIR-OP	6.57E-5	1.75E-4	3.37E-8	1.32E-5	3.89E-4	1.71E-11	1.77E-2
HE-AR-OP	6.57E-5	2.08E-4	3.37E-8	1.31E-5	4.11E-4	8.61E-12	9.41E-2
HE-SV-B-LO	3.59E-4	1.02E-3	7.30E-7	1.93E-4	2.54E-3	1.00E-14	5.06E-2
HE-SV-B-OP	3.59E-4	1.00E-3	5.75E-7	1.97E-4	2.62E-3	1.18E-15	3.41E-2
HE-SV-C-LO	3.59E-4	9.90E-4	6.85E-7	1.94E-4	2.48E-3	3.80E-11	4.58E-2
HE-SV-C-OP	3.59E-4	1.00E-3	6.56E-7	1.98E-4	2.62E-3	4.47E-12	3.41E-2
HE-SV-D-LO	3.59E-4	9.93E-4	7.07E-7	1.91E-4	2.61E-3	5.87E-11	3.32E-2
HE-SV-D-OP	3.59E-4	9.63E-4	8.08E-7	1.86E-4	2.45E-3	1.50E-13	3.66E-2
HE-SV-E-LO	3.59E-4	9.57E-4	6.34E-7	1.89E-4	2.45E-3	9.40E-13	5.07E-2
HE-SV-E-OP	3.59E-4	9.85E-4	6.18E-7	1.86E-4	2.52E-3	3.39E-11	4.05E-2
MF-AIR-LK	9.59E-1	7.64E-1	2.61E-1	7.80E-1	9.47E-1	2.76E-2	9.89E-1
MF-AR-LK	9.59E-1	7.63E-1	2.68E-1	7.79E-1	9.43E-1	2.70E-2	9.92E-1
MF-SV-A-FS	2.64E-4	6.73E-4	3.82E-5	2.64E-4	1.47E-3	1.66E-6	2.50E-2

Name	Point Est.	Mean	5th	50th	95th	Min	Max
MF-SV-A-LK	1.51E-5	3.99E-5	2.18E-6	1.48E-5	9.07E-5	2.19E-7	1.26E-3
MF-SV-A-RP	2.19E-6	5.87E-6	4.82E-8	8.77E-7	1.24E-5	2.31E-9	2.05E-3
MF-SV-B-FS	9.00E-2	2.13E-1	2.53E-2	1.27E-1	4.68E-1	5.83E-3	8.97E-1
MF-SV-B-LK	5.19E-3	1.43E-2	1.35E-3	6.87E-3	3.16E-2	2.97E-4	3.28E-1
MF-SV-B-RP	7.53E-4	2.02E-3	2.76E-5	4.25E-4	4.59E-3	1.24E-6	2.23E-1
MF-SV-C-FS	9.00E-2	2.13E-1	2.53E-2	1.26E-1	4.70E-1	5.18E-3	8.90E-1
MF-SV-C-LK	5.19E-3	1.43E-2	1.31E-3	6.82E-3	3.18E-2	2.76E-4	2.85E-1
MF-SV-C-RP	7.53E-4	2.02E-3	2.75E-5	4.00E-4	4.76E-3	1.35E-6	1.19E-1
MF-SV-D-FS	9.00E-2	2.14E-1	2.76E-2	1.30E-1	4.67E-1	5.07E-3	8.96E-1
MF-SV-D-LK	5.19E-3	1.46E-2	1.28E-3	6.97E-3	3.15E-2	3.41E-4	2.98E-1
MF-SV-D-RP	7.53E-4	2.04E-3	2.84E-5	4.03E-4	4.65E-3	2.08E-6	1.31E-1
MF-SV-E-FS	9.00E-2	2.14E-1	2.75E-2	1.29E-1	4.67E-1	3.13E-3	8.97E-1
MF-SV-E-LK	5.19E-3	1.45E-2	1.41E-3	7.06E-3	3.19E-2	1.20E-4	2.61E-1
MF-SV-E-RP	7.53E-4	2.19E-3	3.03E-5	4.31E-4	4.78E-3	9.58E-7	4.97E-1
MF-VP-A-LK	2.81E-4	7.19E-4	4.43E-5	2.88E-4	1.56E-3	2.95E-6	2.57E-2
SV-B-C_CCF	1.18E-2	2.22E-2	4.55E-3	1.43E-2	4.53E-2	2.09E-3	1.34E-1
SV-D-E_CCF	1.18E-2	2.22E-2	4.79E-3	1.46E-2	4.40E-2	1.47E-3	1.37E-1

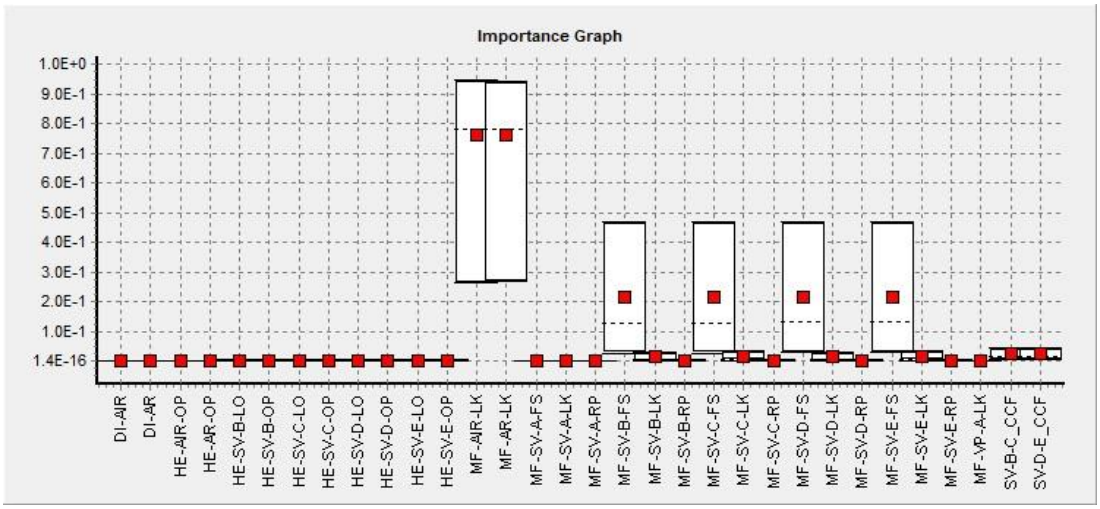


Figure 234: Importance graph for extended system w/ Door Interlocks and Bruce B fault rate.

Table 229: FV Results for Extended System w/ Door Interlocks and Bruce B Fault Rate and SV_OL

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	6.45E-5	3.06E-4	4.02E-8	1.68E-5	5.51E-4	1.35E-13	6.15E-2
DI-AR	6.45E-5	3.29E-4	3.49E-8	1.73E-5	5.47E-4	0.00E+0	1.08E-1
HE-AIR-OP	6.45E-5	3.06E-4	4.02E-8	1.68E-5	5.51E-4	1.35E-13	6.15E-2
HE-AR-OP	6.45E-5	3.29E-4	3.49E-8	1.73E-5	5.47E-4	0.00E+0	1.08E-1
HE-SV-B-LO	1.03E-5	5.78E-5	1.48E-8	4.69E-6	1.10E-4	4.72E-12	1.36E-2
HE-SV-B-OP	1.03E-5	5.99E-5	1.18E-8	4.35E-6	1.13E-4	0.00E+0	2.19E-2
HE-SV-C-LO	1.03E-5	5.58E-5	1.15E-8	4.34E-6	1.02E-4	5.79E-14	1.45E-2
HE-SV-C-OP	1.03E-5	5.72E-5	1.11E-8	4.40E-6	1.10E-4	4.91E-14	2.12E-2
HE-SV-D-LO	1.03E-5	6.78E-5	1.65E-8	4.15E-6	1.16E-4	1.11E-13	4.92E-2
HE-SV-D-OP	1.03E-5	6.42E-5	1.77E-8	4.45E-6	1.10E-4	3.49E-12	1.66E-2
HE-SV-E-LO	1.03E-5	6.34E-5	1.31E-8	4.57E-6	1.11E-4	0.00E+0	1.05E-2
HE-SV-E-OP	1.03E-5	6.23E-5	1.32E-8	4.67E-6	1.15E-4	1.53E-13	1.41E-2
MF-AIR-LK	1.00E+0	9.99E-1	9.95E-1	1.00E+0	1.00E+0	8.49E-1	1.00E+0
MF-AR-LK	1.00E+0	9.99E-1	9.95E-1	1.00E+0	1.00E+0	6.57E-1	1.00E+0
MF-SV-A-FFD	6.72E-6	3.55E-5	2.29E-7	4.42E-6	6.92E-5	9.08E-9	5.72E-3
MF-SV-B-FFD	6.09E-5	2.99E-4	1.13E-6	2.75E-5	5.52E-4	4.21E-8	1.44E-1
MF-SV-C-FFD	6.09E-5	3.04E-4	1.08E-6	2.93E-5	5.59E-4	3.07E-9	1.10E-1
MF-SV-D-FFD	6.09E-5	3.69E-4	1.21E-6	2.99E-5	6.16E-4	4.60E-8	2.83E-1
MF-SV-E-FFD	6.09E-5	3.76E-4	1.30E-6	2.90E-5	6.07E-4	6.69E-8	3.29E-1
MF-VP-A-LK	6.72E-6	3.55E-5	2.29E-7	4.42E-6	6.92E-5	9.08E-9	5.72E-3
SV-B-C_CCF	3.65E-5	1.37E-4	1.35E-5	5.02E-5	2.82E-4	4.76E-6	2.07E-2

Name	Point Est.	Mean	5th	50th	95th	Min	Max
SV-D-E_CCF	3.65E-5	1.36E-4	1.33E-5	5.03E-5	2.80E-4	3.65E-6	1.59E-2

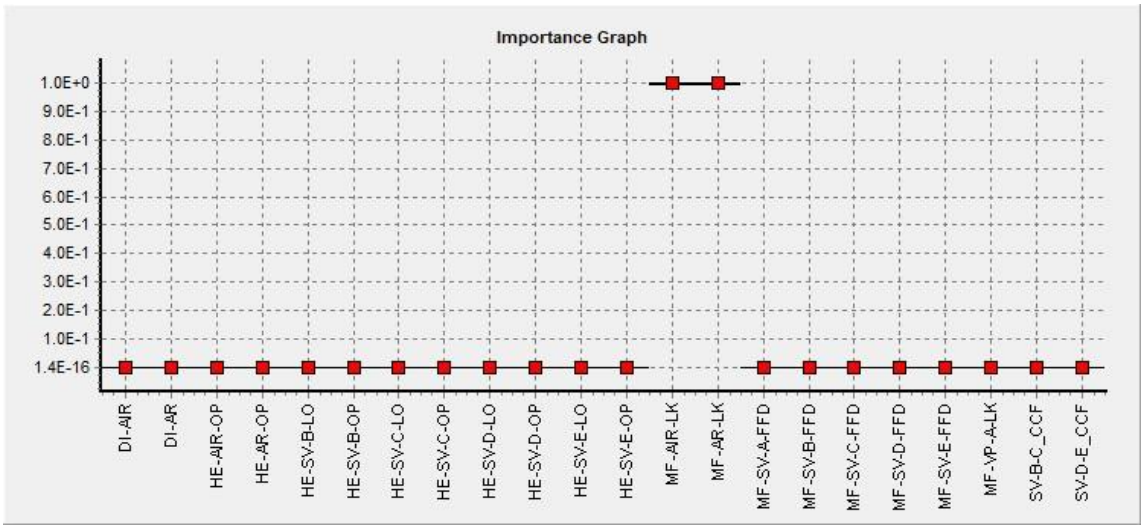


Figure 235: Importance graph for extended system w/ Door Interlocks and Bruce B fault rate and SV_OL.

Table 230: FV Results for Extended System w/ Door Interlocks and Bruce B Fault Rate and SV_OM

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	6.61E-5	2.23E-4	3.06E-8	1.38E-5	4.19E-4	1.21E-13	2.84E-2
DI-AR	6.61E-5	2.28E-4	2.92E-8	1.42E-5	4.22E-4	0.00E+0	6.46E-2
HE-AIR-OP	6.61E-5	2.23E-4	3.06E-8	1.38E-5	4.19E-4	1.21E-13	2.84E-2
HE-AR-OP	6.61E-5	2.28E-4	2.92E-8	1.42E-5	4.22E-4	0.00E+0	6.46E-2
HE-SV-B-LO	4.64E-4	1.05E-3	3.85E-7	1.15E-4	2.55E-3	1.22E-11	7.45E-2
HE-SV-B-OP	4.64E-4	1.05E-3	2.75E-7	1.13E-4	2.48E-3	1.37E-15	1.14E-1
HE-SV-C-LO	4.64E-4	1.00E-3	2.94E-7	1.06E-4	2.35E-3	1.24E-12	1.05E-1
HE-SV-C-OP	4.64E-4	1.03E-3	2.53E-7	1.12E-4	2.53E-3	3.24E-12	5.87E-2
HE-SV-D-LO	4.64E-4	1.01E-3	4.39E-7	1.06E-4	2.50E-3	5.53E-12	8.09E-2
HE-SV-D-OP	4.64E-4	1.06E-3	4.01E-7	1.10E-4	2.37E-3	4.67E-11	1.99E-1
HE-SV-E-LO	4.64E-4	1.05E-3	3.28E-7	1.15E-4	2.57E-3	1.20E-15	7.28E-2
HE-SV-E-OP	4.64E-4	1.06E-3	3.20E-7	1.17E-4	2.55E-3	8.42E-12	8.09E-2
MF-AIR-LK	9.41E-1	8.37E-1	2.75E-1	8.78E-1	9.93E-1	5.84E-3	1.00E+0
MF-AR-LK	9.42E-1	8.34E-1	2.59E-1	8.80E-1	9.93E-1	6.27E-3	1.00E+0
MF-SV-A-FFD	3.49E-4	8.44E-4	1.06E-5	1.89E-4	2.03E-3	4.01E-7	5.03E-2
MF-SV-B-FFD	1.59E-1	1.71E-1	1.97E-3	5.37E-2	4.92E-1	2.71E-5	9.94E-1
MF-SV-C-FFD	1.59E-1	1.72E-1	1.89E-3	5.37E-2	4.94E-1	1.36E-6	9.90E-1
MF-SV-D-FFD	1.59E-1	1.75E-1	2.17E-3	5.54E-2	5.10E-1	7.58E-5	9.90E-1
MF-SV-E-FFD	1.59E-1	1.75E-1	2.07E-3	5.53E-2	5.11E-1	7.37E-5	9.91E-1
MF-VP-A-LK	3.49E-4	8.44E-4	1.06E-5	1.89E-4	2.03E-3	4.01E-7	5.03E-2
SV-B-C_CCF	3.75E-5	9.53E-5	1.16E-5	4.32E-5	2.01E-4	3.61E-6	6.46E-3
SV-D-E_CCF	3.75E-5	9.16E-5	1.14E-5	4.32E-5	1.95E-4	3.66E-6	3.28E-3

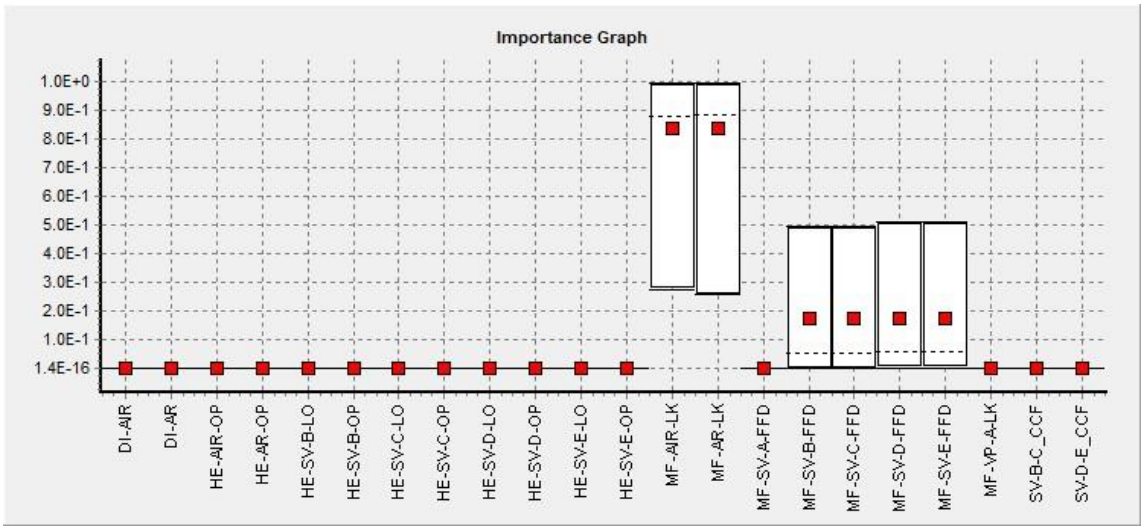


Figure 236: Importance graph for extended system w/ Bruce B fault rate and SV_OM.

Table 231: FV Results for Extended System w/ Door Interlocks and Bruce B Fault Rate and SV_OH

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	7.55E-5	1.34E-4	2.13E-8	9.36E-6	2.69E-4	9.19E-14	1.44E-2
DI-AR	7.55E-5	1.36E-4	1.92E-8	9.23E-6	2.78E-4	0.00E+0	3.77E-2
HE-AIR-OP	7.55E-5	1.34E-4	2.13E-8	9.36E-6	2.69E-4	9.19E-14	1.44E-2
HE-AR-OP	7.55E-5	1.36E-4	1.92E-8	9.23E-6	2.78E-4	0.00E+0	3.77E-2
HE-SV-B-LO	1.23E-3	1.29E-3	8.46E-7	2.31E-4	3.31E-3	1.46E-11	4.40E-2
HE-SV-B-OP	1.23E-3	1.27E-3	6.07E-7	2.21E-4	3.32E-3	1.41E-15	4.42E-2
HE-SV-C-LO	1.23E-3	1.23E-3	6.42E-7	2.10E-4	3.13E-3	2.91E-12	9.02E-2
HE-SV-C-OP	1.23E-3	1.26E-3	5.28E-7	2.22E-4	3.30E-3	1.08E-11	5.09E-2
HE-SV-D-LO	1.23E-3	1.22E-3	9.75E-7	2.13E-4	3.12E-3	1.74E-11	6.43E-2
HE-SV-D-OP	1.23E-3	1.28E-3	9.44E-7	2.21E-4	3.09E-3	1.69E-10	2.26E-1
HE-SV-E-LO	1.23E-3	1.27E-3	7.06E-7	2.18E-4	3.29E-3	2.59E-15	6.12E-2
HE-SV-E-OP	1.23E-3	1.29E-3	6.63E-7	2.28E-4	3.28E-3	9.32E-12	5.33E-2
MF-AIR-LK	8.48E-1	5.99E-1	8.90E-2	5.35E-1	9.37E-1	2.67E-3	1.00E+0
MF-AR-LK	8.48E-1	5.98E-1	8.77E-2	5.38E-1	9.33E-1	4.03E-3	9.99E-1
MF-SV-A-FFD	5.80E-4	7.44E-4	1.28E-5	2.36E-4	1.71E-3	2.40E-7	3.72E-2
MF-SV-B-FFD	7.61E-1	4.53E-1	2.43E-2	3.41E-1	8.47E-1	1.25E-4	9.99E-1
MF-SV-C-FFD	7.61E-1	4.53E-1	2.40E-2	3.41E-1	8.48E-1	1.92E-5	9.98E-1
MF-SV-D-FFD	7.61E-1	4.56E-1	2.57E-2	3.47E-1	8.52E-1	9.62E-4	9.95E-1
MF-SV-E-FFD	7.61E-1	4.56E-1	2.56E-2	3.46E-1	8.53E-1	9.54E-4	9.94E-1
MF-VP-A-LK	5.80E-4	7.44E-4	1.28E-5	2.36E-4	1.71E-3	2.40E-7	3.72E-2
SV-B-C_CCF	4.28E-5	5.62E-5	8.35E-6	2.96E-5	1.14E-4	2.25E-6	1.50E-3
SV-D-E_CCF	4.28E-5	5.44E-5	8.18E-6	3.00E-5	1.12E-4	2.39E-6	1.02E-3

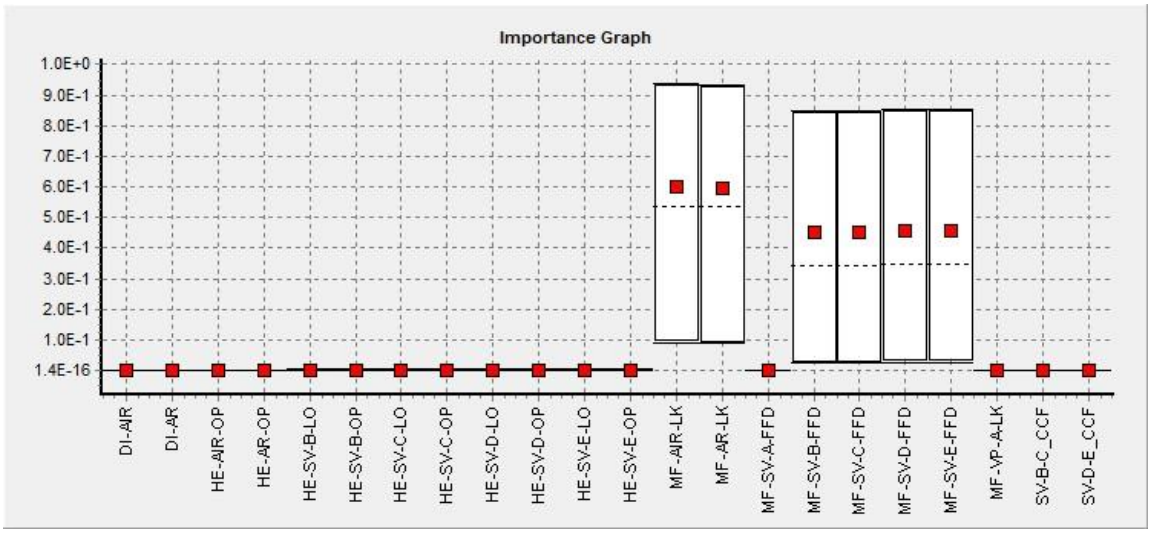


Figure 237: Importance graph for extended system w/ Door Interlocks and Bruce B fault rate and SV_OH.

Table 232: FV Results for Extended System w/ Door Interlocks and Bruce B Fault Rate and SV_DOW

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	6.45E-5	3.06E-4	4.02E-8	1.68E-5	5.51E-4	1.35E-13	6.15E-2
DI-AR	6.45E-5	3.29E-4	3.49E-8	1.73E-5	5.47E-4	0.00E+0	1.08E-1
HE-AIR-OP	6.45E-5	3.06E-4	4.02E-8	1.68E-5	5.51E-4	1.35E-13	6.15E-2
HE-AR-OP	6.45E-5	3.29E-4	3.49E-8	1.73E-5	5.47E-4	0.00E+0	1.08E-1
HE-SV-B-LO	1.05E-5	5.92E-5	1.51E-8	4.80E-6	1.12E-4	4.80E-12	1.40E-2
HE-SV-B-OP	1.05E-5	6.14E-5	1.20E-8	4.44E-6	1.16E-4	0.00E+0	2.26E-2
HE-SV-C-LO	1.05E-5	5.71E-5	1.16E-8	4.43E-6	1.05E-4	5.79E-14	1.48E-2
HE-SV-C-OP	1.05E-5	5.86E-5	1.13E-8	4.49E-6	1.13E-4	5.05E-14	2.17E-2
HE-SV-D-LO	1.05E-5	6.93E-5	1.69E-8	4.22E-6	1.19E-4	1.13E-13	4.97E-2
HE-SV-D-OP	1.05E-5	6.58E-5	1.81E-8	4.51E-6	1.13E-4	3.52E-12	1.71E-2
HE-SV-E-LO	1.05E-5	6.49E-5	1.35E-8	4.63E-6	1.14E-4	0.00E+0	1.08E-2
HE-SV-E-OP	1.05E-5	6.38E-5	1.34E-8	4.77E-6	1.17E-4	1.53E-13	1.46E-2
MF-AIR-LK	1.00E+0	9.99E-1	9.95E-1	1.00E+0	1.00E+0	8.42E-1	1.00E+0
MF-AR-LK	1.00E+0	9.99E-1	9.95E-1	1.00E+0	1.00E+0	6.44E-1	1.00E+0
MF-SV-A-FFD	6.95E-6	3.67E-5	2.37E-7	4.57E-6	7.16E-5	9.39E-9	5.90E-3
MF-SV-B-FFD	6.45E-5	3.16E-4	1.19E-6	2.90E-5	5.81E-4	4.43E-8	1.51E-1
MF-SV-C-FFD	6.45E-5	3.21E-4	1.13E-6	3.09E-5	5.91E-4	3.19E-9	1.16E-1
MF-SV-D-FFD	6.45E-5	3.90E-4	1.28E-6	3.15E-5	6.48E-4	4.91E-8	2.95E-1
MF-SV-E-FFD	6.45E-5	3.97E-4	1.37E-6	3.07E-5	6.40E-4	7.02E-8	3.43E-1
MF-VP-A-LK	6.95E-6	3.67E-5	2.37E-7	4.57E-6	7.16E-5	9.39E-9	5.90E-3
SV-B-C_CCF	3.65E-5	1.37E-4	1.35E-5	5.02E-5	2.82E-4	4.76E-6	2.07E-2

Name	Point Est.	Mean	5th	50th	95th	Min	Max
SV-D-E_CCF	3.65E-5	1.36E-4	1.33E-5	5.03E-5	2.80E-4	3.65E-6	1.59E-2

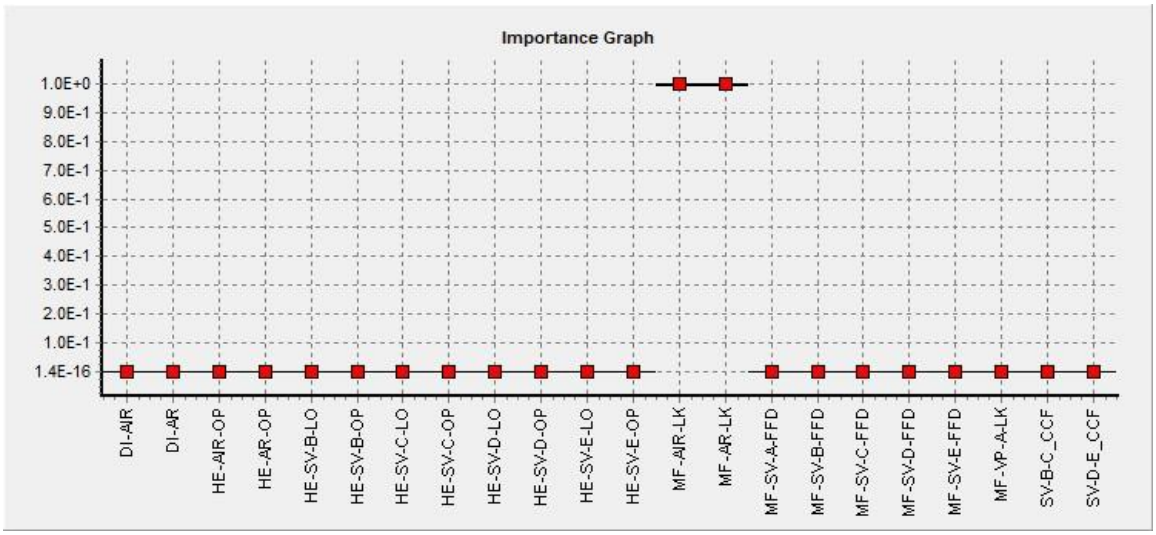


Figure 238: Importance graph for extended system w/ Door Interlocks and Bruce B fault rate and SV_DOW.

Table 233: FV Results for Extended System w/ Door Interlocks and Bruce B Fault Rate and SV_MAN

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	6.45E-5	3.06E-4	4.02E-8	1.68E-5	5.52E-4	1.35E-13	6.16E-2
DI-AR	6.45E-5	3.29E-4	3.49E-8	1.74E-5	5.48E-4	0.00E+0	1.09E-1
HE-AIR-OP	6.45E-5	3.06E-4	4.02E-8	1.68E-5	5.52E-4	1.35E-13	6.16E-2
HE-AR-OP	6.45E-5	3.29E-4	3.49E-8	1.74E-5	5.48E-4	0.00E+0	1.09E-1
HE-SV-B-LO	2.78E-6	1.69E-5	4.03E-9	1.36E-6	3.37E-5	6.68E-13	5.09E-3
HE-SV-B-OP	2.78E-6	1.65E-5	3.01E-9	1.22E-6	3.46E-5	0.00E+0	3.28E-3
HE-SV-C-LO	2.78E-6	1.65E-5	3.29E-9	1.31E-6	3.26E-5	2.00E-14	3.40E-3
HE-SV-C-OP	2.78E-6	1.68E-5	3.20E-9	1.33E-6	3.36E-5	3.98E-15	4.91E-3
HE-SV-D-LO	2.78E-6	1.78E-5	4.12E-9	1.28E-6	3.21E-5	3.25E-14	3.70E-3
HE-SV-D-OP	2.78E-6	1.75E-5	4.73E-9	1.32E-6	3.29E-5	6.42E-13	3.08E-3

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-SV-E-OP	2.78E-6	1.75E-5	3.47E-9	1.33E-6	3.40E-5	0.00E+0	3.29E-3
MF-AIR-LK	1.00E+0	1.00E+0	9.97E-1	1.00E+0	1.00E+0	9.35E-1	1.00E+0
MF-AR-LK	1.00E+0	1.00E+0	9.97E-1	1.00E+0	1.00E+0	8.91E-1	1.00E+0
MF-SV-A-FFD	1.69E-7	9.07E-7	5.74E-9	1.11E-7	1.74E-6	2.27E-10	1.47E-4
MF-SV-B-FFD	4.14E-7	2.24E-6	7.00E-9	2.04E-7	4.28E-6	2.28E-10	1.13E-3
MF-SV-C-FFD	4.14E-7	2.36E-6	6.91E-9	2.22E-7	4.33E-6	7.17E-11	6.45E-4
MF-SV-D-FFD	4.14E-7	2.59E-6	6.90E-9	2.20E-7	4.66E-6	7.05E-11	5.62E-4
MF-SV-E-FFD	4.14E-7	2.84E-6	7.17E-9	2.09E-7	4.43E-6	4.01E-10	2.43E-3
MF-VP-A-LK	1.69E-7	9.07E-7	5.74E-9	1.11E-7	1.74E-6	2.27E-10	1.47E-4
SV-B-C_CCF	3.65E-5	1.37E-4	1.35E-5	5.02E-5	2.82E-4	4.76E-6	2.09E-2
SV-D-E_CCF	3.65E-5	1.36E-4	1.33E-5	5.03E-5	2.80E-4	3.65E-6	1.60E-2

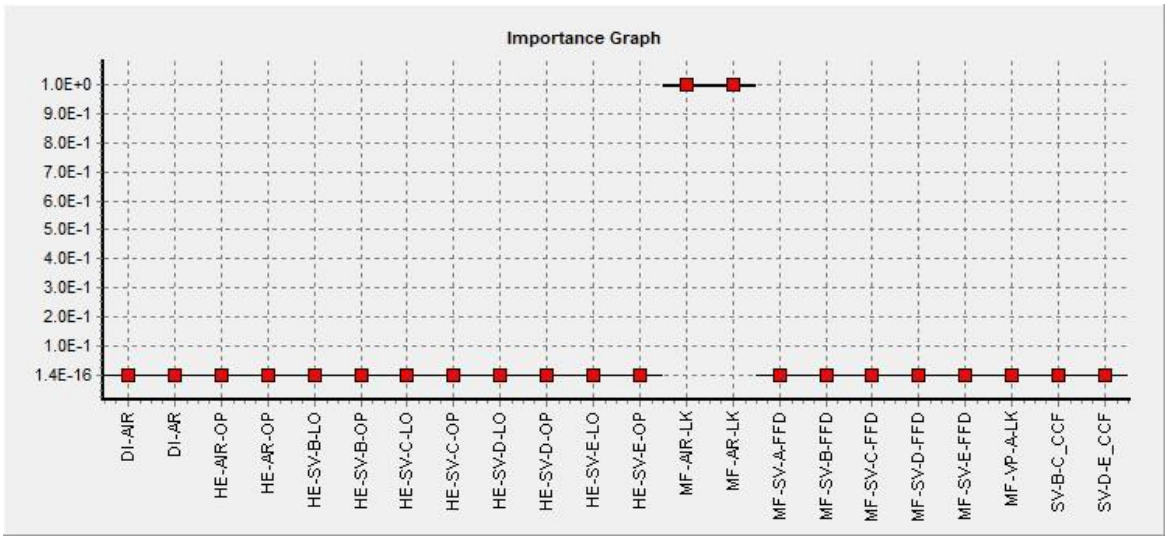


Figure 239: Importance graph for extended system w/ Door Interlocks and Bruce B fault rate and SV_MAN.

Table 234: FV Results for Extended System w/ Door Interlocks and Bruce B Fault Rate and SV_NRPD

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	6.48E-5	2.78E-4	3.57E-8	1.61E-5	5.08E-4	1.33E-13	4.85E-2
DI-AR	6.48E-5	2.86E-4	3.34E-8	1.65E-5	5.03E-4	0.00E+0	7.45E-2
HE-AIR-OP	6.48E-5	2.78E-4	3.57E-8	1.61E-5	5.08E-4	1.33E-13	4.85E-2
HE-AR-OP	6.48E-5	2.86E-4	3.34E-8	1.65E-5	5.03E-4	0.00E+0	7.45E-2
HE-SV-B-LO	1.78E-4	6.45E-4	1.57E-7	4.91E-5	1.42E-3	1.16E-11	1.17E-1
HE-SV-B-OP	1.78E-4	6.68E-4	1.15E-7	4.87E-5	1.36E-3	9.82E-16	1.68E-1
HE-SV-C-LO	1.78E-4	6.20E-4	1.20E-7	4.62E-5	1.31E-3	4.70E-13	8.27E-2
HE-SV-C-OP	1.78E-4	6.32E-4	1.07E-7	4.82E-5	1.45E-3	1.12E-12	5.93E-2
HE-SV-D-LO	1.78E-4	6.44E-4	1.80E-7	4.58E-5	1.46E-3	1.94E-12	8.98E-2
HE-SV-D-OP	1.78E-4	6.67E-4	1.71E-7	4.85E-5	1.38E-3	1.78E-11	1.00E-1
HE-SV-E-LO	1.78E-4	6.69E-4	1.38E-7	4.95E-5	1.43E-3	0.00E+0	5.68E-2
HE-SV-E-OP	1.78E-4	6.66E-4	1.42E-7	5.05E-5	1.44E-3	3.64E-12	7.26E-2
MF-AIR-LK	9.90E-1	9.49E-1	6.41E-1	9.78E-1	9.99E-1	2.13E-2	1.00E+0
MF-AR-LK	9.90E-1	9.47E-1	6.14E-1	9.79E-1	9.99E-1	1.44E-2	1.00E+0
MF-SV-A-FFD	1.50E-4	5.52E-4	5.07E-6	9.44E-5	1.24E-3	2.11E-7	4.37E-2
MF-SV-B-FFD	2.39E-2	5.14E-2	2.55E-4	7.68E-3	1.44E-1	8.67E-6	9.78E-1
MF-SV-C-FFD	2.39E-2	5.15E-2	2.51E-4	7.75E-3	1.44E-1	1.98E-7	9.65E-1
MF-SV-D-FFD	2.39E-2	5.45E-2	2.88E-4	7.98E-3	1.56E-1	1.21E-5	9.77E-1
MF-SV-E-FFD	2.39E-2	5.45E-2	2.82E-4	8.00E-3	1.56E-1	1.13E-5	9.83E-1
MF-VP-A-LK	1.50E-4	5.52E-4	5.07E-6	9.44E-5	1.24E-3	2.11E-7	4.37E-2
SV-B-C_CCF	3.67E-5	1.21E-4	1.31E-5	4.86E-5	2.51E-4	4.51E-6	1.48E-2
SV-D-E_CCF	3.67E-5	1.17E-4	1.29E-5	4.85E-5	2.48E-4	3.64E-6	8.16E-3

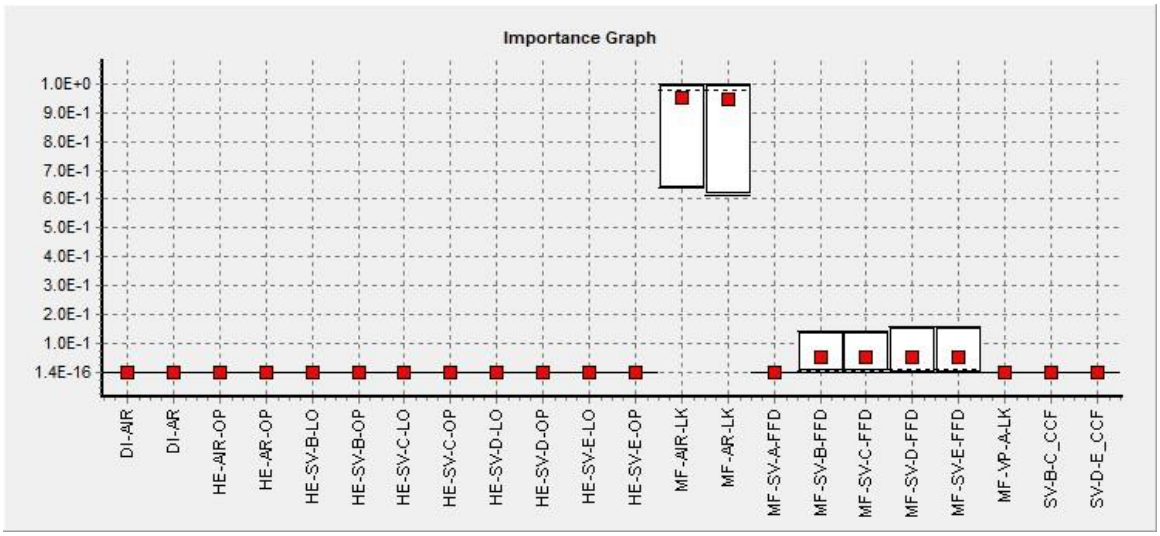


Figure 240: Importance graph for extended system w/ Door Interlocks and Bruce B fault rate and SV_NRPD.

Table 235: FV Results for Extended System w/ Door Interlocks and Bruce B Fault Rate and Diagnostic HE

Name	**Point Est.**	**Mean**	**5th**	**50th**	**95th**	**Min**	**Max**
DI-AIR	7.25E-4	2.04E-3	3.11E-7	1.45E-4	4.43E-3	9.83E-13	2.78E-1
DI-AR	7.25E-4	2.09E-3	2.69E-7	1.31E-4	4.23E-3	2.95E-10	5.05E-1
HE-AIR-OP	7.25E-4	2.04E-3	3.11E-7	1.45E-4	4.43E-3	9.83E-13	2.78E-1
HE-AR-OP	7.25E-4	2.09E-3	2.69E-7	1.31E-4	4.23E-3	2.95E-10	5.05E-1
HE-SV-B-LO	4.24E-3	1.07E-2	7.05E-6	2.19E-3	2.90E-2	4.39E-14	4.70E-1
HE-SV-B-OP	4.24E-3	1.10E-2	6.34E-6	2.20E-3	2.99E-2	3.05E-11	2.62E-1
HE-SV-C-LO	4.24E-3	1.08E-2	6.39E-6	2.14E-3	2.86E-2	1.88E-10	2.60E-1
HE-SV-C-OP	4.24E-3	1.14E-2	7.56E-6	2.26E-3	3.06E-2	6.89E-11	3.35E-1
HE-SV-D-LO	4.24E-3	1.10E-2	6.43E-6	2.21E-3	2.92E-2	4.59E-11	2.39E-1
HE-SV-D-OP	4.24E-3	1.10E-2	6.36E-6	2.22E-3	2.88E-2	4.84E-13	2.84E-1
HE-SV-E-LO	4.24E-3	1.09E-2	6.04E-6	2.20E-3	2.92E-2	9.24E-11	4.53E-1
HE-SV-E-OP	4.24E-3	1.12E-2	6.51E-6	2.29E-3	2.93E-2	3.21E-10	3.12E-1
MF-AIR-LK	9.54E-1	7.37E-1	2.35E-1	7.46E-1	9.33E-1	1.98E-2	9.91E-1

Name	Point Est.	Mean	5th	50th	95th	Min	Max
MF-AR-LK	9.54E-1	7.41E-1	2.42E-1	7.51E-1	9.33E-1	3.51E-2	9.86E-1
MF-SV-A-FS	2.61E-4	6.19E-4	3.37E-5	2.48E-4	1.41E-3	4.49E-6	1.74E-2
MF-SV-A-LK	1.50E-5	3.66E-5	1.87E-6	1.39E-5	8.42E-5	7.97E-8	1.29E-3
MF-SV-A-RP	2.17E-6	5.39E-6	4.34E-8	8.58E-7	1.14E-5	2.54E-9	1.05E-3
MF-SV-B-FS	9.65E-2	2.22E-1	3.05E-2	1.40E-1	4.72E-1	5.93E-3	9.34E-1
MF-SV-B-LK	5.59E-3	1.46E-2	1.47E-3	7.52E-3	3.14E-2	3.27E-4	2.35E-1
MF-SV-B-RP	8.11E-4	2.11E-3	2.88E-5	4.41E-4	4.90E-3	1.61E-6	1.22E-1
MF-SV-C-FS	9.65E-2	2.22E-1	2.96E-2	1.39E-1	4.70E-1	7.53E-3	9.25E-1
MF-SV-C-LK	5.59E-3	1.49E-2	1.49E-3	7.49E-3	3.26E-2	3.46E-4	2.80E-1
MF-SV-C-RP	8.11E-4	2.14E-3	3.00E-5	4.34E-4	4.74E-3	1.46E-6	2.45E-1
MF-SV-D-FS	9.65E-2	2.19E-1	3.05E-2	1.38E-1	4.59E-1	7.41E-3	8.87E-1
MF-SV-D-LK	5.59E-3	1.48E-2	1.51E-3	7.40E-3	3.18E-2	3.90E-4	2.79E-1
MF-SV-D-RP	8.11E-4	2.14E-3	3.18E-5	4.21E-4	4.86E-3	1.54E-6	2.44E-1
MF-SV-E-FS	9.65E-2	2.19E-1	3.02E-2	1.35E-1	4.61E-1	7.29E-3	8.97E-1
MF-SV-E-LK	5.59E-3	1.48E-2	1.57E-3	7.36E-3	3.22E-2	4.07E-4	2.69E-1
MF-SV-E-RP	8.11E-4	2.28E-3	3.12E-5	4.48E-4	4.88E-3	2.69E-6	4.36E-1
MF-VP-A-LK	2.79E-4	6.61E-4	3.98E-5	2.72E-4	1.49E-3	4.89E-6	1.80E-2
SV-B-C_CCF	1.18E-2	2.13E-2	4.50E-3	1.45E-2	4.17E-2	1.41E-3	1.11E-1
SV-D-E_CCF	1.18E-2	2.11E-2	4.76E-3	1.43E-2	4.08E-2	1.49E-3	1.22E-1

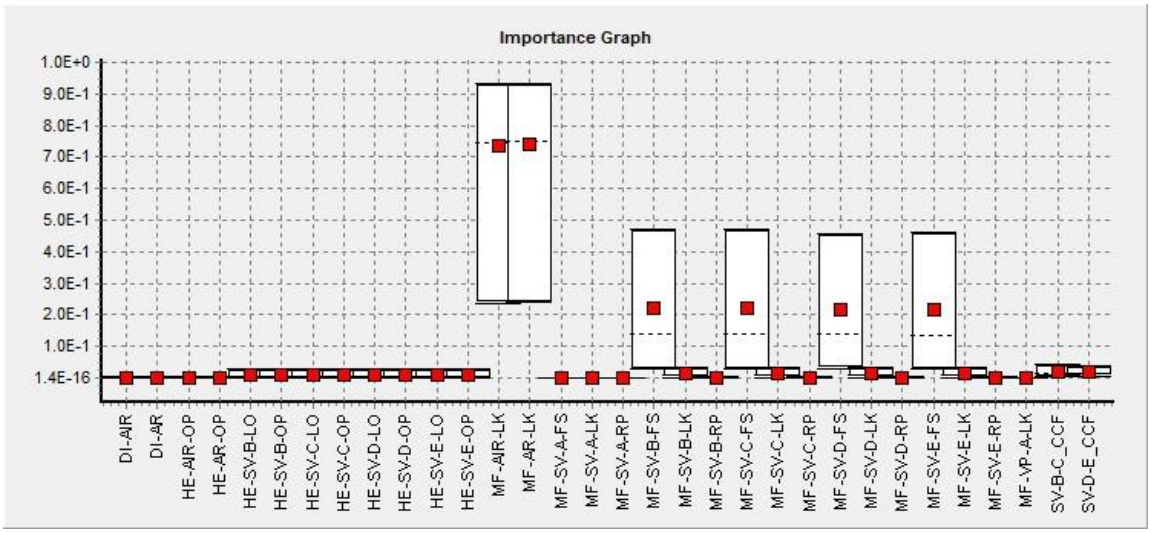


Figure 241: Importance graph for extended system w/ door interlocks and Bruce B fault rate and diagnostic HE.

Table 236: FV Results for Extended System w/ Door Interlocks and Bruce B Fault Rate and Diagnostic HE and SV_OL

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	7.10E-4	3.33E-3	4.29E-7	1.82E-4	6.06E-3	9.10E-13	5.14E-1
DI-AR	7.10E-4	3.41E-3	3.89E-7	1.79E-4	6.37E-3	1.68E-12	4.84E-1
HE-AIR-OP	7.10E-4	3.33E-3	4.29E-7	1.82E-4	6.06E-3	9.10E-13	5.14E-1
HE-AR-OP	7.10E-4	3.41E-3	3.89E-7	1.79E-4	6.37E-3	1.68E-12	4.84E-1
HE-SV-B-LO	3.98E-4	2.26E-3	5.13E-7	1.94E-4	4.86E-3	9.03E-15	4.09E-1
HE-SV-B-OP	3.98E-4	2.18E-3	5.09E-7	1.83E-4	5.02E-3	1.58E-15	1.29E-1
HE-SV-C-LO	3.98E-4	2.21E-3	4.56E-7	1.88E-4	4.91E-3	1.57E-12	1.54E-1
HE-SV-C-OP	3.98E-4	2.21E-3	4.61E-7	1.91E-4	4.88E-3	7.22E-14	4.02E-1
HE-SV-D-LO	3.98E-4	2.19E-3	5.61E-7	1.96E-4	4.65E-3	2.43E-11	3.88E-1
HE-SV-D-OP	3.98E-4	2.07E-3	4.68E-7	2.04E-4	4.61E-3	2.99E-12	2.80E-1
HE-SV-E-LO	3.98E-4	2.05E-3	6.00E-7	2.01E-4	4.73E-3	2.44E-12	1.94E-1
HE-SV-E-OP	3.98E-4	2.16E-3	5.31E-7	1.93E-4	4.71E-3	5.52E-11	2.60E-1
MF-AIR-LK	9.99E-1	9.91E-1	9.45E-1	9.96E-1	1.00E+0	4.75E-1	1.00E+0

Name	Point Est.	Mean	5th	50th	95th	Min	Max
MF-AR-LK	9.99E-1	9.91E-1	9.49E-1	9.96E-1	1.00E+0	3.64E-1	1.00E+0
MF-SV-A-FFD	6.72E-6	3.70E-5	2.36E-7	4.53E-6	6.86E-5	1.74E-8	8.85E-3
MF-SV-B-FFD	2.15E-4	1.10E-3	4.15E-6	1.11E-4	2.26E-3	2.25E-7	1.34E-1
MF-SV-C-FFD	2.15E-4	1.14E-3	4.56E-6	1.21E-4	2.19E-3	8.24E-8	2.36E-1
MF-SV-D-FFD	2.15E-4	1.07E-3	4.45E-6	1.13E-4	2.17E-3	3.29E-8	1.96E-1
MF-SV-E-FFD	2.15E-4	1.12E-3	4.39E-6	1.19E-4	2.14E-3	1.26E-7	4.94E-1
MF-VP-A-LK	6.72E-6	3.70E-5	2.36E-7	4.53E-6	6.86E-5	1.74E-8	8.85E-3
SV-B-C_CCF	3.66E-5	1.37E-4	1.33E-5	5.08E-5	2.83E-4	3.55E-6	1.03E-2
SV-D-E_CCF	3.66E-5	1.31E-4	1.32E-5	5.04E-5	2.82E-4	2.84E-6	4.90E-3

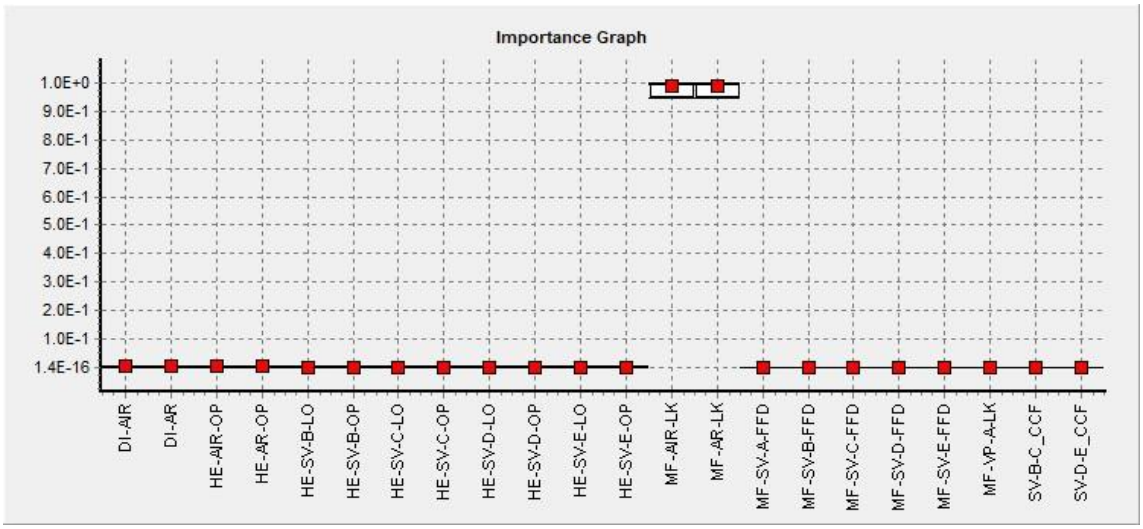


Figure 242: Importance graph for extended system w/ door interlocks and Bruce B fault rate and diagnostic HE and SV_OL.

Table 237: FV Results for Extended System w/ Door Interlocks and Bruce B Fault Rate and Diagnostic HE and SV_OM

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	7.30E-4	2.28E-3	3.61E-7	1.41E-4	4.44E-3	8.21E-13	4.30E-1
DI-AR	7.30E-4	2.41E-3	3.43E-7	1.42E-4	4.75E-3	1.67E-12	4.07E-1
HE-AIR-OP	7.30E-4	2.28E-3	3.61E-7	1.41E-4	4.44E-3	8.21E-13	4.30E-1
HE-AR-OP	7.30E-4	2.41E-3	3.43E-7	1.42E-4	4.75E-3	1.67E-12	4.07E-1
HE-SV-B-LO	5.41E-3	1.12E-2	4.57E-6	1.48E-3	2.87E-2	8.67E-15	4.78E-1
HE-SV-B-OP	5.41E-3	1.08E-2	3.48E-6	1.47E-3	2.97E-2	9.06E-15	3.76E-1
HE-SV-C-LO	5.41E-3	1.10E-2	4.23E-6	1.40E-3	2.84E-2	2.09E-11	5.74E-1
HE-SV-C-OP	5.41E-3	1.08E-2	3.45E-6	1.37E-3	2.87E-2	5.29E-14	4.07E-1
HE-SV-D-LO	5.41E-3	1.07E-2	4.23E-6	1.43E-3	2.82E-2	4.40E-11	3.51E-1
HE-SV-D-OP	5.41E-3	1.10E-2	3.83E-6	1.46E-3	2.93E-2	3.84E-11	5.09E-1
HE-SV-E-LO	5.41E-3	1.06E-2	4.77E-6	1.48E-3	2.86E-2	8.22E-12	4.54E-1
HE-SV-E-OP	5.41E-3	1.09E-2	4.51E-6	1.45E-3	2.75E-2	2.03E-10	4.26E-1
MF-AIR-LK	9.36E-1	8.09E-1	2.32E-1	8.49E-1	9.85E-1	1.48E-2	9.99E-1
MF-AR-LK	9.36E-1	8.11E-1	2.48E-1	8.47E-1	9.85E-1	5.86E-3	1.00E+0
MF-SV-A-FFD	3.44E-4	7.97E-4	9.33E-6	1.83E-4	1.94E-3	6.31E-7	5.84E-2
MF-SV-B-FFD	1.67E-1	1.80E-1	3.04E-3	6.19E-2	5.04E-1	1.28E-4	9.86E-1
MF-SV-C-FFD	1.67E-1	1.80E-1	3.08E-3	6.20E-2	5.02E-1	8.69E-5	9.75E-1
MF-SV-D-FFD	1.67E-1	1.80E-1	2.95E-3	6.29E-2	5.01E-1	1.51E-4	9.71E-1
MF-SV-E-FFD	1.67E-1	1.80E-1	2.92E-3	6.39E-2	5.05E-1	1.98E-4	9.68E-1
MF-VP-A-LK	3.44E-4	7.97E-4	9.33E-6	1.83E-4	1.94E-3	6.31E-7	5.84E-2
SV-B-C_CCF	3.76E-5	9.00E-5	1.16E-5	4.23E-5	1.85E-4	3.50E-6	2.50E-3
SV-D-E_CCF	3.76E-5	8.87E-5	1.11E-5	4.24E-5	1.87E-4	2.75E-6	2.93E-3

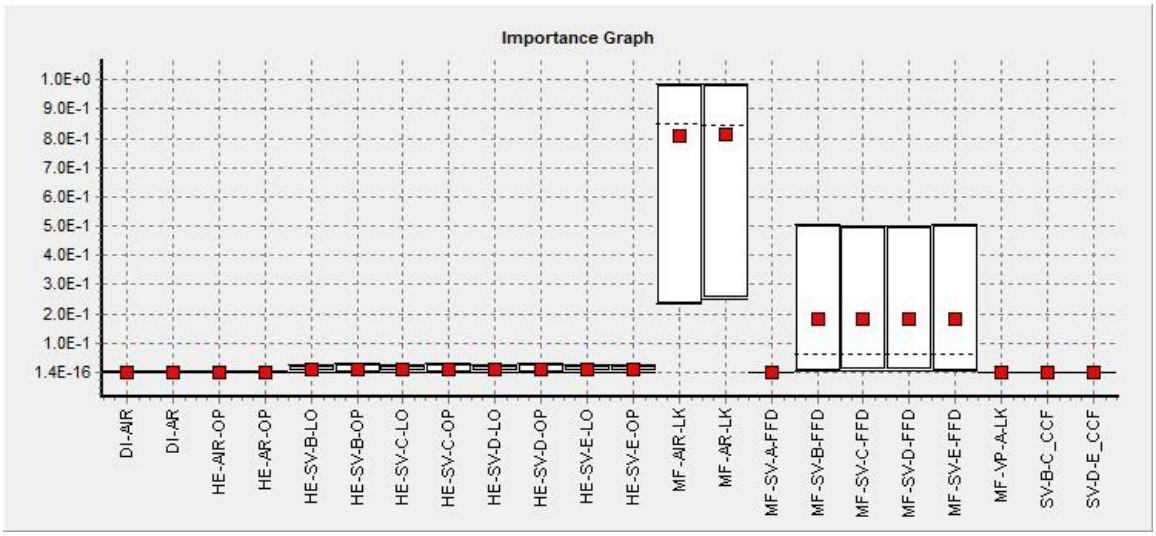


Figure 243: Importance graph for extended system w/ door interlocks and Bruce B fault rate and diagnostic HE and SV_OM.

Table 238: FV Results for Extended System w/ Door Interlocks and Bruce B Fault Rate and Diagnostic HE and SV_OH

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	8.45E-4	1.41E-3	2.25E-7	9.60E-5	2.87E-3	6.28E-13	3.04E-1
DI-AR	8.45E-4	1.51E-3	2.13E-7	9.60E-5	3.03E-3	1.55E-12	3.33E-1
HE-AIR-OP	8.45E-4	1.41E-3	2.25E-7	9.60E-5	2.87E-3	6.28E-13	3.04E-1
HE-AR-OP	8.45E-4	1.51E-3	2.13E-7	9.60E-5	3.03E-3	1.55E-12	3.33E-1
HE-SV-B-LO	1.40E-2	1.36E-2	8.58E-6	2.54E-3	3.60E-2	9.96E-15	3.96E-1
HE-SV-B-OP	1.40E-2	1.33E-2	6.98E-6	2.52E-3	3.57E-2	1.05E-14	2.79E-1
HE-SV-C-LO	1.40E-2	1.32E-2	8.36E-6	2.38E-3	3.52E-2	5.66E-11	5.37E-1
HE-SV-C-OP	1.40E-2	1.32E-2	6.24E-6	2.46E-3	3.58E-2	3.75E-14	3.70E-1
HE-SV-D-LO	1.40E-2	1.30E-2	7.48E-6	2.51E-3	3.54E-2	9.28E-11	3.52E-1
HE-SV-D-OP	1.40E-2	1.33E-2	7.03E-6	2.50E-3	3.65E-2	1.17E-10	4.66E-1
HE-SV-E-LO	1.40E-2	1.30E-2	8.89E-6	2.55E-3	3.55E-2	2.09E-11	4.03E-1
HE-SV-E-OP	1.40E-2	1.32E-2	7.53E-6	2.54E-3	3.45E-2	4.58E-10	4.48E-1
MF-AIR-LK	8.49E-1	5.81E-1	8.14E-2	5.22E-1	9.16E-1	5.43E-3	9.97E-1
MF-AR-LK	8.49E-1	5.81E-1	8.40E-2	5.21E-1	9.15E-1	3.87E-3	9.98E-1
MF-SV-A-FFD	5.77E-4	7.05E-4	1.18E-5	2.20E-4	1.69E-3	7.74E-7	2.96E-2
MF-SV-B-FFD	7.70E-1	4.54E-1	3.02E-2	3.45E-1	8.42E-1	1.62E-3	9.97E-1
MF-SV-C-FFD	7.70E-1	4.54E-1	3.12E-2	3.46E-1	8.44E-1	9.81E-4	9.96E-1
MF-SV-D-FFD	7.70E-1	4.55E-1	2.92E-2	3.47E-1	8.40E-1	1.51E-3	9.97E-1
MF-SV-E-FFD	7.70E-1	4.55E-1	2.82E-2	3.47E-1	8.39E-1	1.44E-3	9.98E-1
MF-VP-A-LK	5.77E-4	7.05E-4	1.18E-5	2.20E-4	1.69E-3	7.74E-7	2.96E-2
SV-B-C_CCF	4.35E-5	5.38E-5	8.32E-6	2.91E-5	1.10E-4	3.00E-6	1.41E-3
SV-D-E_CCF	4.35E-5	5.35E-5	8.08E-6	2.93E-5	1.07E-4	2.25E-6	2.36E-3

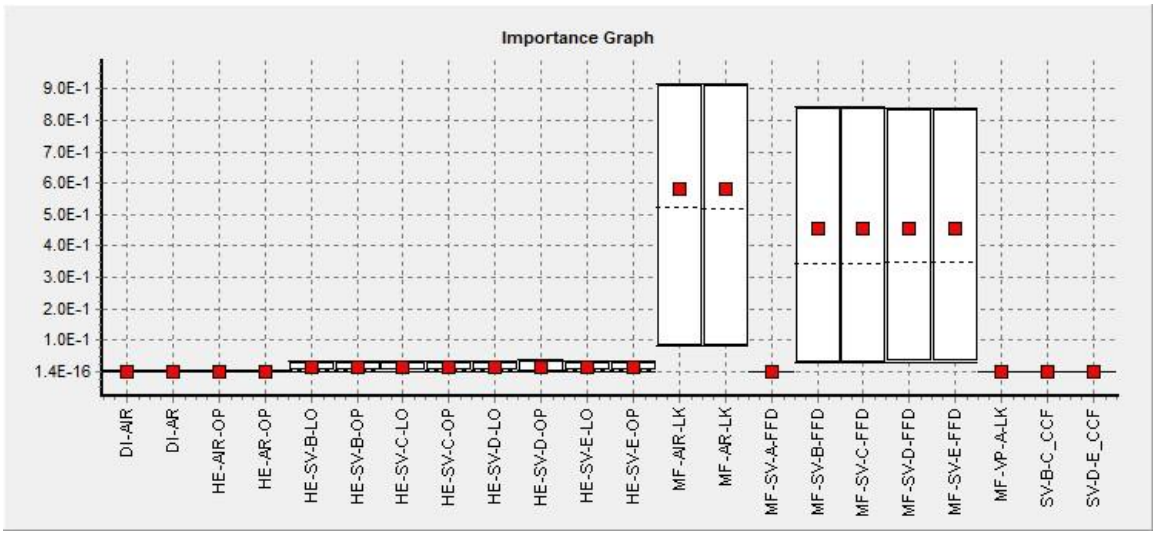


Figure 244: Importance graph for extended system w/ door interlocks and Bruce B fault rate and diagnostic HE and SV_OH.

Table 239: FV Results for Extended System w/ Door Interlocks and Bruce B Fault Rate and Diagnostic HE and SV_DOW

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	7.10E-4	3.33E-3	4.29E-7	1.82E-4	6.06E-3	9.09E-13	5.14E-1
DI-AR	7.10E-4	3.41E-3	3.89E-7	1.79E-4	6.37E-3	1.68E-12	4.84E-1
HE-AIR-OP	7.10E-4	3.33E-3	4.29E-7	1.82E-4	6.06E-3	9.09E-13	5.14E-1
HE-AR-OP	7.10E-4	3.41E-3	3.89E-7	1.79E-4	6.37E-3	1.68E-12	4.84E-1
HE-SV-B-LO	4.01E-4	2.28E-3	5.17E-7	1.96E-4	4.89E-3	9.03E-15	4.08E-1
HE-SV-B-OP	4.01E-4	2.20E-3	5.13E-7	1.84E-4	5.04E-3	1.58E-15	1.29E-1
HE-SV-C-LO	4.01E-4	2.22E-3	4.60E-7	1.90E-4	4.96E-3	1.58E-12	1.56E-1
HE-SV-C-OP	4.01E-4	2.22E-3	4.65E-7	1.93E-4	4.91E-3	7.22E-14	4.02E-1
HE-SV-D-LO	4.01E-4	2.20E-3	5.72E-7	1.97E-4	4.66E-3	2.43E-11	3.88E-1
HE-SV-D-OP	4.01E-4	2.08E-3	4.72E-7	2.06E-4	4.65E-3	3.00E-12	2.80E-1
HE-SV-E-LO	4.01E-4	2.07E-3	6.09E-7	2.03E-4	4.76E-3	2.45E-12	1.94E-1
HE-SV-E-OP	4.01E-4	2.17E-3	5.40E-7	1.95E-4	4.74E-3	5.53E-11	2.60E-1
MF-AIR-LK	9.99E-1	9.91E-1	9.44E-1	9.96E-1	1.00E+0	4.75E-1	1.00E+0

Name	Point Est.	Mean	5th	50th	95th	Min	Max
MF-AR-LK	9.99E-1	9.91E-1	9.48E-1	9.96E-1	1.00E+0	3.56E-1	1.00E+0
MF-SV-A-FFD	6.95E-6	3.82E-5	2.44E-7	4.68E-6	7.09E-5	1.79E-8	9.09E-3
MF-SV-B-FFD	2.23E-4	1.15E-3	4.35E-6	1.15E-4	2.34E-3	2.34E-7	1.38E-1
MF-SV-C-FFD	2.23E-4	1.18E-3	4.77E-6	1.25E-4	2.28E-3	8.58E-8	2.41E-1
MF-SV-D-FFD	2.23E-4	1.11E-3	4.72E-6	1.18E-4	2.26E-3	3.51E-8	2.03E-1
MF-SV-E-FFD	2.23E-4	1.17E-3	4.62E-6	1.24E-4	2.23E-3	1.32E-7	5.04E-1
MF-VP-A-LK	6.95E-6	3.82E-5	2.44E-7	4.68E-6	7.09E-5	1.79E-8	9.09E-3
SV-B-C_CCF	3.66E-5	1.37E-4	1.33E-5	5.08E-5	2.83E-4	3.55E-6	1.03E-2
SV-D-E_CCF	3.66E-5	1.31E-4	1.32E-5	5.04E-5	2.82E-4	2.84E-6	4.90E-3

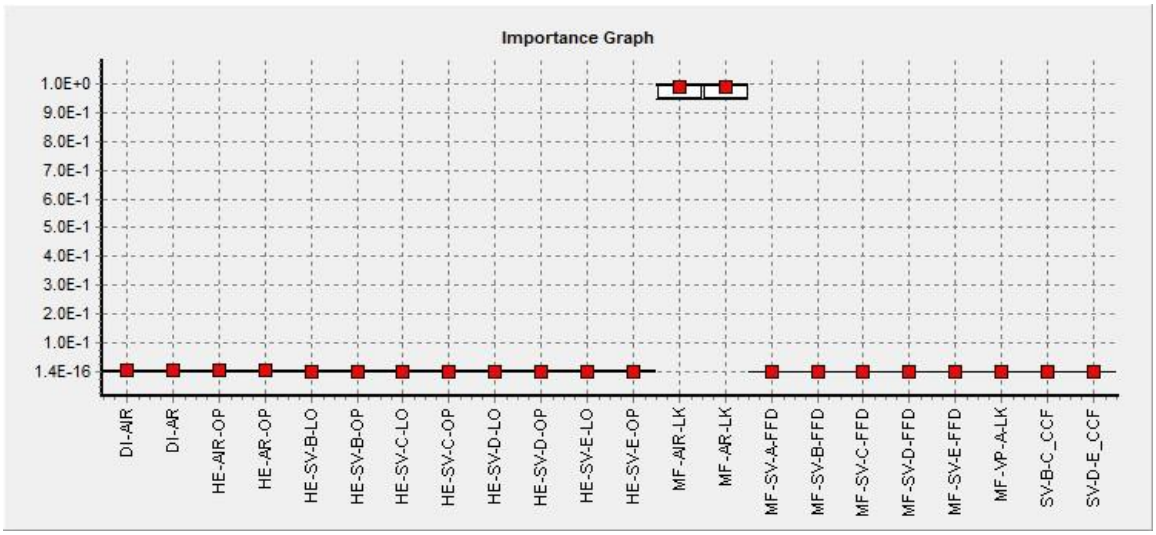


Figure 245: Importance graph for extended system w/ door interlocks and Bruce B fault rate and diagnostic HE and SV_DOW.

Table 240: FV Results for Extended System w/ Door Interlocks and Bruce B Fault Rate and Diagnostic HE and SV_MAN

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	7.10E-4	3.34E-3	4.29E-7	1.83E-4	6.07E-3	9.09E-13	5.15E-1
DI-AR	7.10E-4	3.42E-3	3.91E-7	1.80E-4	6.38E-3	1.68E-12	4.84E-1

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AR-OP	7.10E-4	3.42E-3	3.91E-7	1.80E-4	6.38E-3	1.68E-12	4.84E-1
HE-SV-B-LO	3.16E-4	1.82E-3	2.63E-7	1.32E-4	3.84E-3	9.03E-15	4.16E-1
HE-SV-B-OP	3.16E-4	1.78E-3	2.69E-7	1.17E-4	4.01E-3	1.59E-15	1.29E-1
HE-SV-C-LO	3.16E-4	1.79E-3	2.54E-7	1.22E-4	3.82E-3	1.29E-12	1.38E-1
HE-SV-C-OP	3.16E-4	1.82E-3	2.78E-7	1.26E-4	3.85E-3	7.35E-14	3.92E-1
HE-SV-D-LO	3.16E-4	1.78E-3	2.94E-7	1.28E-4	3.62E-3	1.56E-11	2.80E-1
HE-SV-D-OP	3.16E-4	1.67E-3	2.33E-7	1.34E-4	3.68E-3	2.48E-12	2.62E-1
HE-SV-E-LO	3.16E-4	1.68E-3	3.07E-7	1.31E-4	3.70E-3	1.70E-12	1.92E-1
HE-SV-E-OP	3.16E-4	1.78E-3	3.21E-7	1.24E-4	3.70E-3	6.21E-12	2.73E-1
MF-AIR-LK	9.99E-1	9.93E-1	9.56E-1	9.97E-1	1.00E+0	4.76E-1	1.00E+0
MF-AR-LK	9.99E-1	9.93E-1	9.58E-1	9.97E-1	1.00E+0	5.16E-1	1.00E+0
MF-SV-A-FFD	1.69E-7	9.60E-7	5.93E-9	1.14E-7	1.74E-6	4.35E-10	2.71E-4
MF-SV-B-FFD	4.27E-6	2.25E-5	4.66E-8	1.91E-6	4.47E-5	7.49E-10	3.81E-3
MF-SV-C-FFD	4.27E-6	2.37E-5	4.78E-8	2.10E-6	4.23E-5	7.85E-10	9.01E-3
MF-SV-D-FFD	4.27E-6	2.16E-5	4.81E-8	1.99E-6	4.32E-5	1.02E-10	2.50E-3
MF-SV-E-FFD	4.27E-6	2.41E-5	4.67E-8	2.04E-6	4.24E-5	7.05E-10	1.95E-2
MF-VP-A-LK	1.69E-7	9.60E-7	5.93E-9	1.14E-7	1.74E-6	4.35E-10	2.71E-4
SV-B-C_CCF	3.66E-5	1.38E-4	1.33E-5	5.09E-5	2.84E-4	3.55E-6	1.04E-2
SV-D-E_CCF	3.66E-5	1.32E-4	1.32E-5	5.04E-5	2.83E-4	2.84E-6	5.93E-3

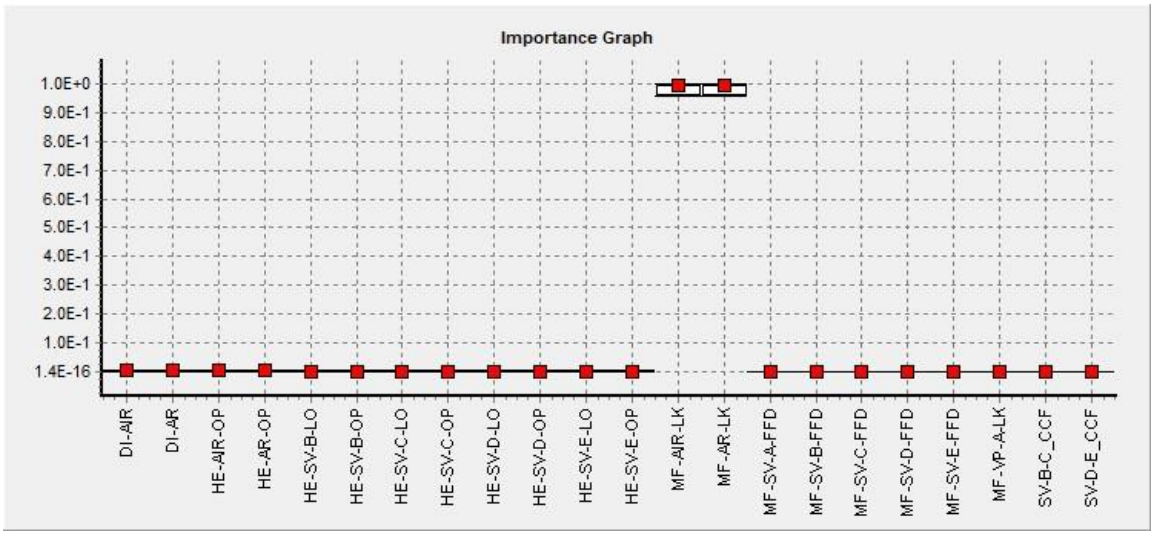


Figure 246: Importance graph for extended system w/ door interlocks and Bruce B fault rate and diagnostic HE and SV_MAN.

Table 241: FV Results for Extended System w/ Door Interlocks and Bruce B Fault Rate and Diagnostic HE and SV_NRPD

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	7.14E-4	2.87E-3	4.01E-7	1.68E-4	5.47E-3	9.01E-13	4.82E-1
DI-AR	7.14E-4	2.97E-3	3.70E-7	1.68E-4	5.76E-3	1.68E-12	4.34E-1
HE-AIR-OP	7.14E-4	2.87E-3	4.01E-7	1.68E-4	5.47E-3	9.01E-13	4.82E-1
HE-AR-OP	7.14E-4	2.97E-3	3.70E-7	1.68E-4	5.76E-3	1.68E-12	4.34E-1
HE-SV-B-LO	2.24E-3	7.63E-3	2.43E-6	7.90E-4	1.82E-2	8.94E-15	5.94E-1
HE-SV-B-OP	2.24E-3	7.37E-3	1.84E-6	7.97E-4	1.86E-2	9.24E-15	3.62E-1
HE-SV-C-LO	2.24E-3	7.59E-3	2.16E-6	7.66E-4	1.83E-2	8.22E-12	4.57E-1
HE-SV-C-OP	2.24E-3	7.40E-3	1.83E-6	7.60E-4	1.85E-2	7.40E-14	4.76E-1
HE-SV-D-LO	2.24E-3	7.24E-3	2.25E-6	7.69E-4	1.80E-2	3.09E-11	3.72E-1
HE-SV-D-OP	2.24E-3	7.39E-3	2.03E-6	8.15E-4	1.83E-2	1.49E-11	4.87E-1
HE-SV-E-LO	2.24E-3	7.20E-3	2.82E-6	7.93E-4	1.82E-2	4.43E-12	3.45E-1
HE-SV-E-OP	2.24E-3	7.35E-3	2.36E-6	7.84E-4	1.79E-2	1.06E-10	3.47E-1

Name	Point Est.	Mean	5th	50th	95th	Min	Max
MF-AIR-LK	9.87E-1	9.24E-1	5.42E-1	9.60E-1	9.96E-1	5.04E-2	1.00E+0
MF-AR-LK	9.87E-1	9.27E-1	5.56E-1	9.59E-1	9.96E-1	1.27E-2	1.00E+0
MF-SV-A-FFD	1.49E-4	5.27E-4	4.67E-6	9.32E-5	1.19E-3	4.01E-7	3.61E-2
MF-SV-B-FFD	2.74E-2	6.11E-2	5.07E-4	1.12E-2	1.71E-1	1.79E-5	9.53E-1
MF-SV-C-FFD	2.74E-2	6.11E-2	5.29E-4	1.12E-2	1.70E-1	1.08E-5	9.30E-1
MF-SV-D-FFD	2.74E-2	6.01E-2	4.94E-4	1.13E-2	1.67E-1	1.75E-5	9.00E-1
MF-SV-E-FFD	2.74E-2	6.01E-2	4.97E-4	1.16E-2	1.70E-1	2.81E-5	9.53E-1
MF-VP-A-LK	1.49E-4	5.27E-4	4.67E-6	9.32E-5	1.19E-3	4.01E-7	3.61E-2
SV-B-C_CCF	3.68E-5	1.16E-4	1.28E-5	4.83E-5	2.40E-4	3.54E-6	6.17E-3
SV-D-E_CCF	3.68E-5	1.12E-4	1.28E-5	4.82E-5	2.45E-4	2.83E-6	3.75E-3

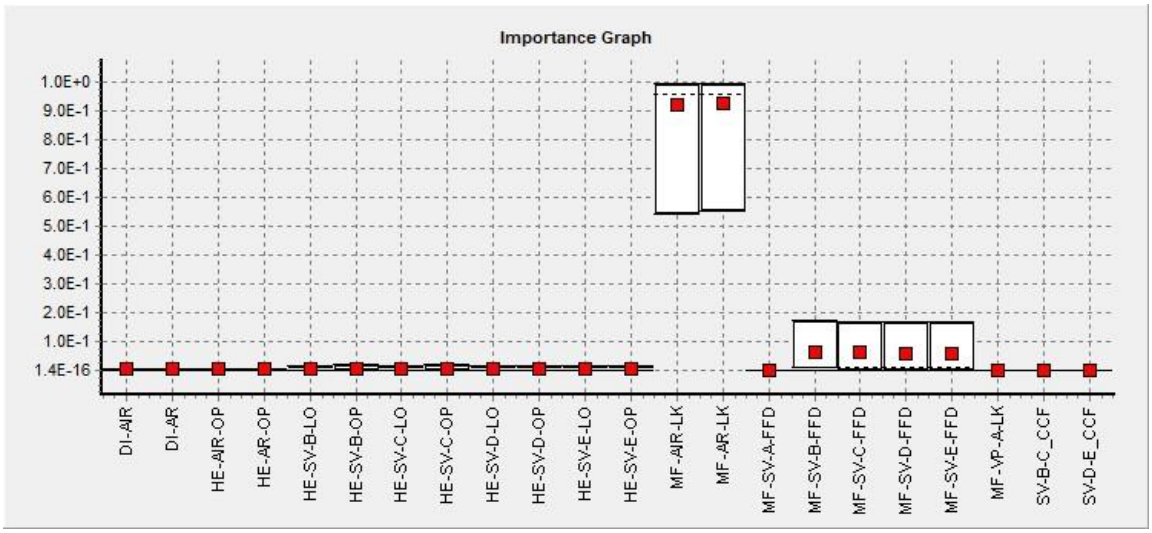


Figure 247: Importance graph for extended system w/ door interlocks and Bruce B fault rate and diagnostic HE and SV_NRPD.

Table 242: FV Results for Extended System w/ Door Interlocks and Bruce A Fault Rate

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	1.78E-4	3.86E-4	6.35E-8	2.40E-5	7.94E-4	4.72E-13	4.83E-2
DI-AR	1.78E-4	3.64E-4	4.90E-8	2.34E-5	7.73E-4	9.20E-13	7.07E-2
HE-AIR-OP	1.78E-4	3.86E-4	6.35E-8	2.40E-5	7.94E-4	4.72E-13	4.83E-2
HE-AR-OP	1.78E-4	3.64E-4	4.90E-8	2.34E-5	7.73E-4	9.20E-13	7.07E-2
HE-SV-B-LO	9.70E-4	1.89E-3	1.05E-6	3.59E-4	5.05E-3	5.71E-12	5.92E-2
HE-SV-B-OP	9.70E-4	1.89E-3	1.44E-6	3.65E-4	4.91E-3	3.93E-14	5.29E-2
HE-SV-C-LO	9.70E-4	1.89E-3	1.44E-6	3.50E-4	5.05E-3	7.12E-11	4.57E-2
HE-SV-C-OP	9.70E-4	1.84E-3	1.35E-6	3.54E-4	4.82E-3	9.77E-11	6.99E-2
HE-SV-D-LO	9.70E-4	1.88E-3	1.40E-6	3.68E-4	5.06E-3	1.62E-11	4.48E-2
HE-SV-D-OP	9.70E-4	1.84E-3	1.10E-6	3.42E-4	4.86E-3	4.97E-11	6.26E-2
HE-SV-E-LO	9.70E-4	1.89E-3	1.54E-6	3.69E-4	4.96E-3	3.11E-13	8.03E-2
HE-SV-E-OP	9.70E-4	1.90E-3	1.24E-6	3.47E-4	5.05E-3	1.66E-11	5.40E-2
MF-AIR-LK	7.23E-1	5.51E-1	6.68E-2	4.84E-1	8.85E-1	4.38E-3	9.90E-1
MF-AR-LK	7.24E-1	5.52E-1	6.58E-2	4.86E-1	8.86E-1	3.38E-3	9.90E-1
MF-SV-A-FS	5.64E-4	9.71E-4	2.75E-5	3.24E-4	2.26E-3	1.32E-6	3.43E-2
MF-SV-A-LK	3.23E-5	5.95E-5	1.43E-6	1.78E-5	1.37E-4	1.06E-7	2.59E-3
MF-SV-A-RP	4.68E-6	8.66E-6	3.87E-8	1.05E-6	1.72E-5	1.33E-9	1.78E-3
MF-SV-B-FS	2.44E-1	3.80E-1	4.36E-2	2.80E-1	7.14E-1	6.43E-3	9.38E-1
MF-SV-B-LK	1.40E-2	2.66E-2	2.24E-3	1.35E-2	5.82E-2	4.02E-4	3.56E-1
MF-SV-B-RP	2.04E-3	3.82E-3	4.91E-5	7.80E-4	8.55E-3	2.15E-6	3.21E-1
MF-SV-C-FS	2.44E-1	3.79E-1	4.34E-2	2.79E-1	7.15E-1	7.75E-3	9.36E-1
MF-SV-C-LK	1.40E-2	2.70E-2	2.32E-3	1.37E-2	6.02E-2	4.18E-4	3.37E-1

Name	Point Est.	Mean	5th	50th	95th	Min	Max
MF-SV-C-RP	2.04E-3	3.82E-3	4.81E-5	8.04E-4	9.18E-3	3.55E-6	1.86E-1
MF-SV-D-FS	2.44E-1	3.80E-1	4.25E-2	2.78E-1	7.12E-1	7.21E-3	9.46E-1
MF-SV-D-LK	1.40E-2	2.66E-2	2.20E-3	1.36E-2	5.87E-2	3.16E-4	3.71E-1
MF-SV-D-RP	2.04E-3	3.70E-3	4.95E-5	7.68E-4	8.54E-3	1.13E-6	3.86E-1
MF-SV-E-FS	2.44E-1	3.80E-1	4.34E-2	2.80E-1	7.14E-1	5.98E-3	9.32E-1
MF-SV-E-LK	1.40E-2	2.64E-2	2.19E-3	1.33E-2	5.82E-2	5.46E-4	4.11E-1
MF-SV-E-RP	2.04E-3	3.77E-3	4.90E-5	7.71E-4	8.41E-3	1.51E-6	3.36E-1
MF-VP-A-LK	6.01E-4	1.04E-3	3.11E-5	3.56E-4	2.42E-3	1.67E-6	3.55E-2
SV-B-C_CCF	3.19E-2	4.15E-2	6.97E-3	3.08E-2	7.65E-2	2.20E-3	2.13E-1
SV-D-E_CCF	3.19E-2	4.13E-2	6.83E-3	3.06E-2	7.59E-2	1.96E-3	2.15E-1

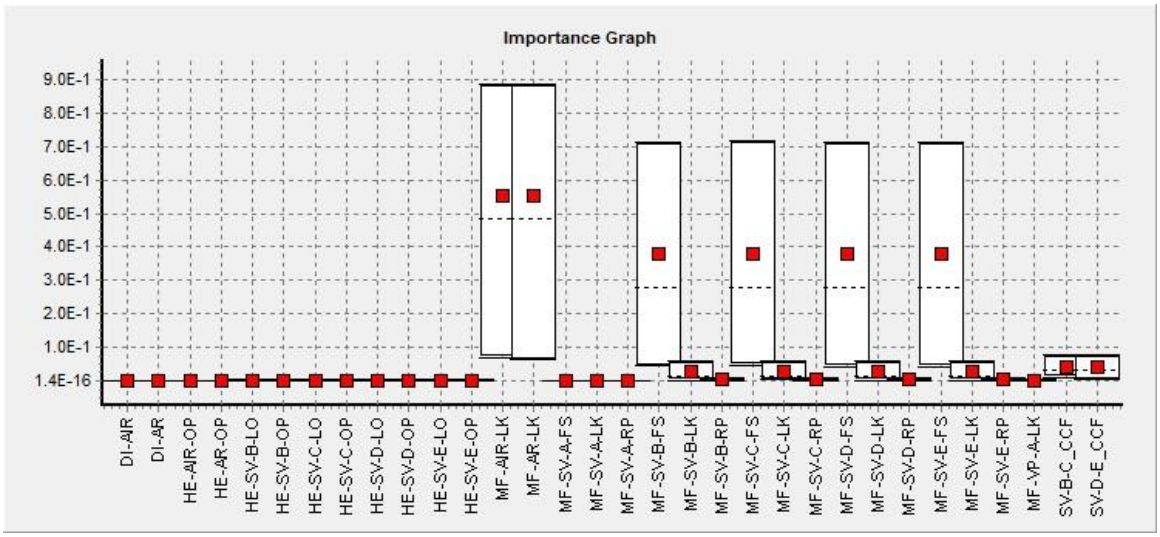


Figure 248: Importance graph for extended system w/ door interlocks and Bruce A fault rate.

Table 243: FV Results for Extended System w/ Door Interlocks and Bruce A Fault Rate and SV_OL

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	2.42E-4	1.35E-3	1.27E-7	4.53E-5	2.17E-3	3.43E-13	3.63E-1
DI-AR	2.42E-4	1.31E-3	1.33E-7	5.09E-5	2.19E-3	0.00E+0	3.12E-1
HE-AIR-OP	2.42E-4	1.35E-3	1.27E-7	4.53E-5	2.17E-3	3.43E-13	3.63E-1
HE-AR-OP	2.42E-4	1.31E-3	1.33E-7	5.09E-5	2.19E-3	0.00E+0	3.12E-1
HE-SV-B-LO	3.86E-5	2.48E-4	4.01E-8	1.27E-5	4.54E-4	1.89E-13	5.24E-2
HE-SV-B-OP	3.86E-5	2.80E-4	4.75E-8	1.33E-5	4.42E-4	5.63E-13	9.50E-2
HE-SV-C-LO	3.86E-5	2.60E-4	4.02E-8	1.19E-5	4.28E-4	0.00E+0	4.98E-2
HE-SV-C-OP	3.86E-5	2.59E-4	3.75E-8	1.23E-5	4.26E-4	3.44E-13	5.31E-2
HE-SV-D-LO	3.86E-5	2.37E-4	3.40E-8	1.34E-5	4.25E-4	2.54E-12	5.59E-2
HE-SV-D-OP	3.86E-5	2.24E-4	4.28E-8	1.30E-5	4.24E-4	4.02E-13	5.17E-2
HE-SV-E-LO	3.86E-5	2.52E-4	2.67E-8	1.21E-5	4.18E-4	5.38E-13	9.44E-2
HE-SV-E-OP	3.86E-5	2.36E-4	3.70E-8	1.29E-5	4.05E-4	8.57E-13	6.12E-2
MF-AIR-LK	9.99E-1	9.96E-1	9.73E-1	9.99E-1	1.00E+0	5.54E-1	1.00E+0
MF-AR-LK	9.99E-1	9.96E-1	9.76E-1	9.99E-1	1.00E+0	6.83E-1	1.00E+0
MF-SV-A-FFD	2.52E-5	1.65E-4	5.15E-7	1.33E-5	3.08E-4	1.37E-8	3.24E-2
MF-SV-B-FFD	2.29E-4	1.46E-3	2.59E-6	8.43E-5	2.29E-3	9.76E-8	2.60E-1
MF-SV-C-FFD	2.29E-4	1.47E-3	2.82E-6	8.28E-5	2.24E-3	1.79E-7	2.75E-1
MF-SV-D-FFD	2.29E-4	1.27E-3	2.64E-6	8.24E-5	2.09E-3	1.73E-7	2.00E-1
MF-SV-E-FFD	2.29E-4	1.24E-3	2.74E-6	8.31E-5	2.08E-3	6.16E-8	1.96E-1
MF-VP-A-LK	2.52E-5	1.65E-4	5.15E-7	1.33E-5	3.08E-4	1.37E-8	3.24E-2
SV-B-C_CCF	1.37E-4	6.06E-4	2.17E-5	1.45E-4	1.32E-3	4.63E-6	1.15E-1
SV-D-E_CCF	1.37E-4	5.56E-4	2.08E-5	1.46E-4	1.28E-3	5.04E-6	3.17E-2

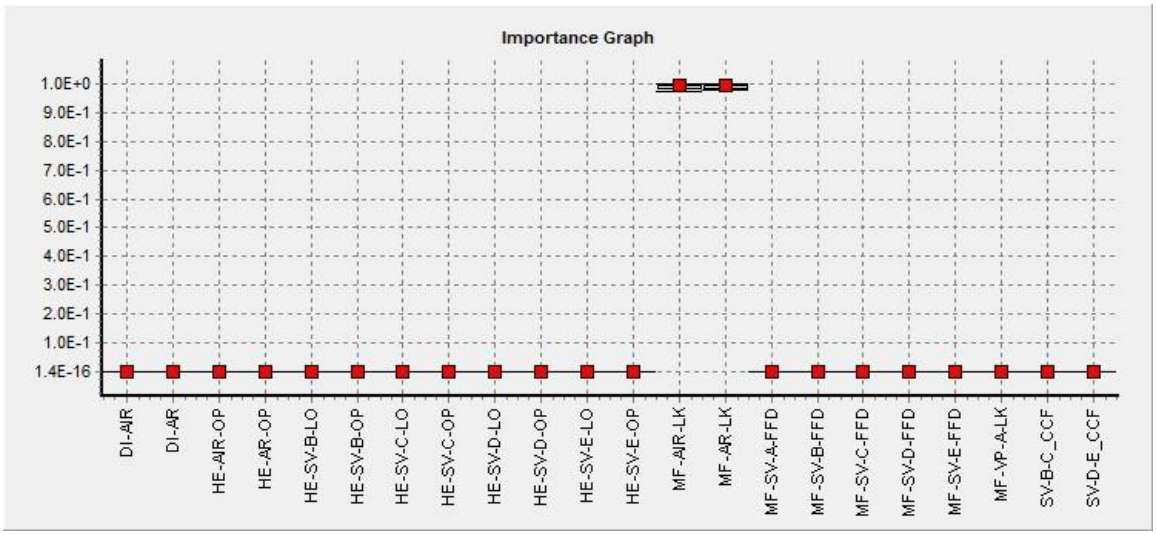


Figure 249: Importance graph for extended system w/ door interlocks and Bruce A fault rate and SV_OL.

Table 244: FV Results for Extended System w/ Door Interlocks and Bruce A Fault Rate and SV_OM

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	1.58E-4	6.27E-4	7.44E-8	2.75E-5	1.07E-3	2.05E-13	1.28E-1
DI-AR	1.58E-4	6.55E-4	8.68E-8	3.09E-5	1.16E-3	0.00E+0	2.01E-1
HE-AIR-OP	1.58E-4	6.27E-4	7.44E-8	2.75E-5	1.07E-3	2.05E-13	1.28E-1
HE-AR-OP	1.58E-4	6.55E-4	8.68E-8	3.09E-5	1.16E-3	0.00E+0	2.01E-1
HE-SV-B-LO	1.11E-3	2.29E-3	8.21E-7	2.57E-4	5.64E-3	3.38E-12	1.94E-1
HE-SV-B-OP	1.11E-3	2.34E-3	8.98E-7	2.73E-4	5.71E-3	3.06E-12	1.88E-1
HE-SV-C-LO	1.11E-3	2.32E-3	7.15E-7	2.38E-4	5.56E-3	1.08E-13	2.24E-1
HE-SV-C-OP	1.11E-3	2.33E-3	6.80E-7	2.36E-4	5.66E-3	2.05E-12	1.76E-1
HE-SV-D-LO	1.11E-3	2.28E-3	6.29E-7	2.61E-4	5.63E-3	2.05E-11	1.00E-1
HE-SV-D-OP	1.11E-3	2.22E-3	8.74E-7	2.49E-4	5.49E-3	2.51E-12	1.17E-1
HE-SV-E-LO	1.11E-3	2.18E-3	5.82E-7	2.53E-4	5.28E-3	1.96E-11	1.66E-1
HE-SV-E-OP	1.11E-3	2.26E-3	7.76E-7	2.58E-4	5.36E-3	1.74E-11	1.16E-1
MF-AIR-LK	6.41E-1	6.82E-1	6.46E-2	6.73E-1	9.80E-1	2.67E-3	1.00E+0

Name	Point Est.	Mean	5th	50th	95th	Min	Max
MF-AR-LK	6.42E-1	6.89E-1	6.69E-2	6.90E-1	9.81E-1	2.33E-3	1.00E+0
MF-SV-A-FFD	6.05E-4	2.10E-3	9.55E-6	3.05E-4	4.54E-3	3.33E-7	1.88E-1
MF-SV-B-FFD	3.81E-1	3.14E-1	4.32E-3	1.42E-1	7.86E-1	1.59E-4	9.95E-1
MF-SV-C-FFD	3.81E-1	3.14E-1	4.59E-3	1.42E-1	7.85E-1	1.22E-4	9.96E-1
MF-SV-D-FFD	3.81E-1	3.10E-1	4.48E-3	1.38E-1	7.78E-1	2.10E-4	9.97E-1
MF-SV-E-FFD	3.81E-1	3.10E-1	4.49E-3	1.38E-1	7.79E-1	2.10E-4	9.95E-1
MF-VP-A-LK	6.05E-4	2.10E-3	9.55E-6	3.05E-4	4.54E-3	3.33E-7	1.88E-1
SV-B-C_CCF	8.95E-5	2.64E-4	1.65E-5	9.04E-5	5.82E-4	4.24E-6	1.37E-2
SV-D-E_CCF	8.95E-5	2.54E-4	1.60E-5	8.99E-5	5.83E-4	2.71E-6	1.88E-2

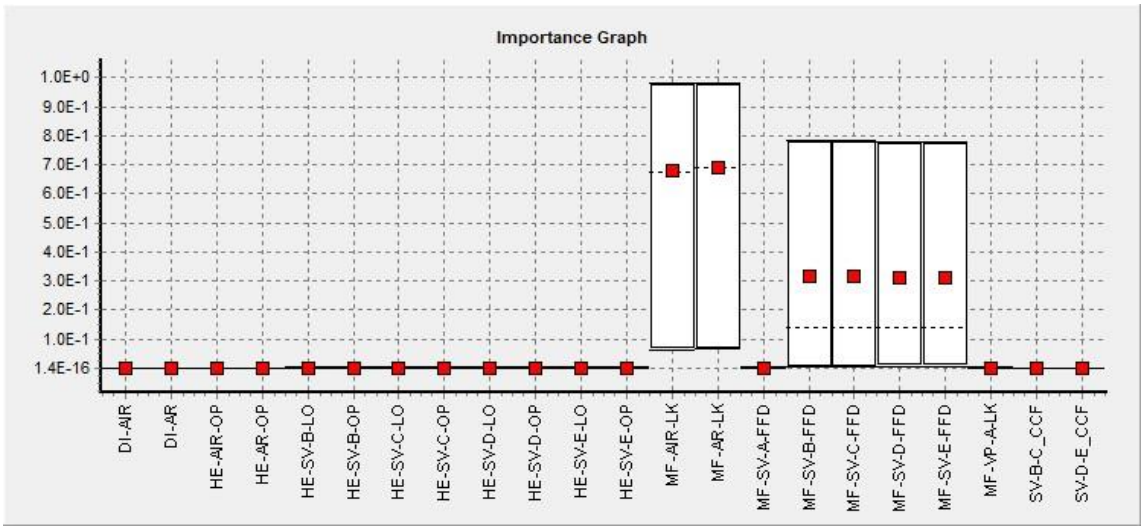


Figure 250: Importance graph for extended system w/ door interlocks and Bruce A fault rate and SV_OM.

Table 245: FV Results for Extended System w/ Door Interlocks and Bruce A Fault Rate and SV_OH

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	7.26E-5	2.54E-4	3.47E-8	1.26E-5	4.46E-4	4.47E-14	4.68E-2
DI-AR	7.27E-5	2.72E-4	3.81E-8	1.42E-5	4.92E-4	0.00E+0	1.01E-1
HE-AIR-OP	7.26E-5	2.54E-4	3.47E-8	1.26E-5	4.46E-4	4.47E-14	4.68E-2
HE-AR-OP	7.27E-5	2.72E-4	3.81E-8	1.42E-5	4.92E-4	0.00E+0	1.01E-1
HE-SV-B-LO	1.18E-3	1.98E-3	1.24E-6	3.47E-4	4.77E-3	2.68E-12	1.54E-1
HE-SV-B-OP	1.18E-3	1.99E-3	1.60E-6	3.64E-4	4.98E-3	8.70E-12	1.04E-1
HE-SV-C-LO	1.18E-3	1.96E-3	1.12E-6	3.19E-4	4.82E-3	2.67E-13	9.51E-2
HE-SV-C-OP	1.18E-3	1.98E-3	1.05E-6	3.24E-4	5.07E-3	3.11E-12	7.14E-2
HE-SV-D-LO	1.18E-3	2.03E-3	1.02E-6	3.51E-4	5.10E-3	5.25E-11	7.82E-2
HE-SV-D-OP	1.18E-3	1.92E-3	1.30E-6	3.30E-4	5.01E-3	8.17E-12	1.37E-1
HE-SV-E-LO	1.18E-3	1.91E-3	9.01E-7	3.47E-4	4.73E-3	2.62E-11	8.40E-2
HE-SV-E-OP	1.18E-3	1.99E-3	1.19E-6	3.46E-4	4.90E-3	3.74E-11	1.15E-1
MF-AIR-LK	2.90E-1	3.94E-1	1.79E-2	2.45E-1	8.43E-1	1.02E-3	9.99E-1
MF-AR-LK	2.90E-1	3.98E-1	1.86E-2	2.54E-1	8.45E-1	7.47E-4	9.99E-1
MF-SV-A-FFD	2.46E-4	1.00E-3	5.30E-6	1.79E-4	2.21E-3	1.54E-7	8.32E-2
MF-SV-B-FFD	8.56E-1	6.23E-1	5.04E-2	5.85E-1	9.54E-1	1.83E-3	1.00E+0
MF-SV-C-FFD	8.56E-1	6.23E-1	5.11E-2	5.85E-1	9.54E-1	1.51E-3	1.00E+0
MF-SV-D-FFD	8.56E-1	6.21E-1	5.19E-2	5.81E-1	9.53E-1	2.98E-3	9.99E-1
MF-SV-E-FFD	8.56E-1	6.21E-1	5.21E-2	5.82E-1	9.53E-1	2.98E-3	9.99E-1
MF-VP-A-LK	2.46E-4	1.00E-3	5.30E-6	1.79E-4	2.21E-3	1.54E-7	8.32E-2
SV-B-C_CCF	4.11E-5	1.05E-4	9.49E-6	4.21E-5	2.21E-4	2.18E-6	4.48E-3
SV-D-E_CCF	4.11E-5	1.06E-4	9.60E-6	4.20E-5	2.28E-4	1.61E-6	1.17E-2

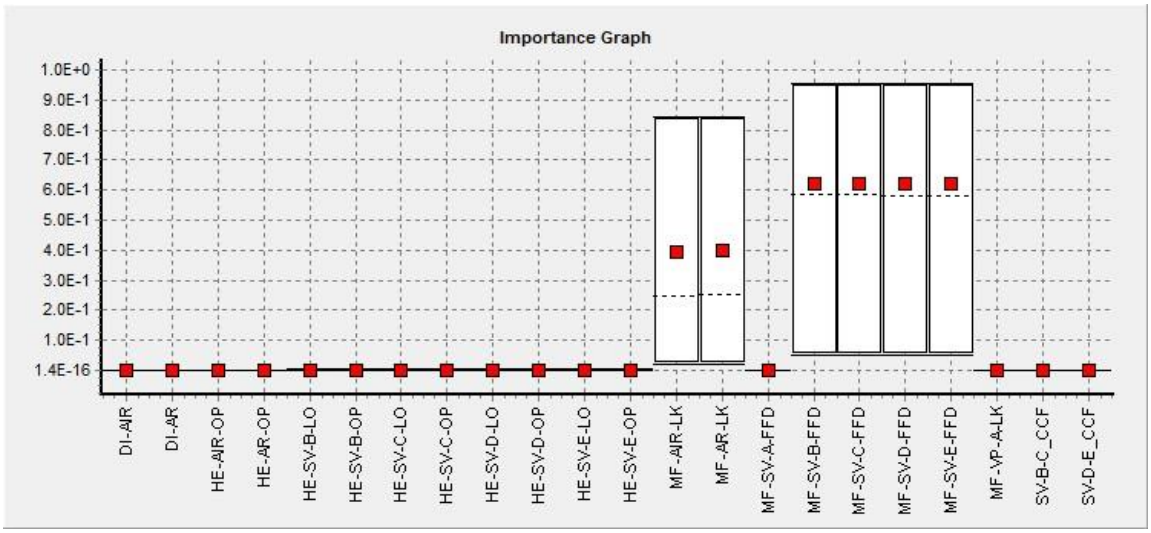


Figure 251: Importance graph for extended system w/ door interlocks and Bruce A fault rate and SV_OH.

Table 246: FV Results for Extended System w/ Door Interlocks and Bruce A Fault Rate and SV_DOW

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	2.42E-4	1.35E-3	1.27E-7	4.53E-5	2.17E-3	3.43E-13	3.62E-1
DI-AR	2.42E-4	1.31E-3	1.33E-7	5.08E-5	2.19E-3	0.00E+0	3.12E-1
HE-AIR-OP	2.42E-4	1.35E-3	1.27E-7	4.53E-5	2.17E-3	3.43E-13	3.62E-1
HE-AR-OP	2.42E-4	1.31E-3	1.33E-7	5.08E-5	2.19E-3	0.00E+0	3.12E-1
HE-SV-B-LO	3.95E-5	2.53E-4	4.11E-8	1.30E-5	4.63E-4	2.00E-13	5.33E-2
HE-SV-B-OP	3.95E-5	2.87E-4	4.85E-8	1.36E-5	4.50E-4	5.63E-13	9.70E-2
HE-SV-C-LO	3.95E-5	2.66E-4	4.08E-8	1.21E-5	4.38E-4	0.00E+0	5.11E-2
HE-SV-C-OP	3.95E-5	2.65E-4	3.80E-8	1.24E-5	4.36E-4	3.44E-13	5.45E-2
HE-SV-D-LO	3.95E-5	2.43E-4	3.43E-8	1.37E-5	4.33E-4	2.54E-12	5.72E-2
HE-SV-D-OP	3.95E-5	2.30E-4	4.36E-8	1.32E-5	4.33E-4	4.02E-13	5.33E-2
HE-SV-E-LO	3.95E-5	2.58E-4	2.69E-8	1.23E-5	4.29E-4	5.70E-13	9.68E-2
HE-SV-E-OP	3.95E-5	2.42E-4	3.75E-8	1.31E-5	4.14E-4	8.68E-13	6.21E-2
MF-AIR-LK	9.99E-1	9.96E-1	9.72E-1	9.99E-1	1.00E+0	5.52E-1	1.00E+0
MF-AR-LK	9.99E-1	9.96E-1	9.76E-1	9.99E-1	1.00E+0	6.83E-1	1.00E+0

Name	Point Est.	Mean	5th	50th	95th	Min	Max
MF-SV-A-FFD	2.61E-5	1.70E-4	5.32E-7	1.38E-5	3.19E-4	1.42E-8	3.34E-2
MF-SV-B-FFD	2.42E-4	1.54E-3	2.72E-6	8.90E-5	2.43E-3	1.03E-7	2.72E-1
MF-SV-C-FFD	2.42E-4	1.55E-3	2.98E-6	8.71E-5	2.36E-3	1.88E-7	2.86E-1
MF-SV-D-FFD	2.42E-4	1.34E-3	2.79E-6	8.68E-5	2.21E-3	1.80E-7	2.10E-1
MF-SV-E-FFD	2.42E-4	1.31E-3	2.89E-6	8.77E-5	2.19E-3	6.54E-8	2.06E-1
MF-VP-A-LK	2.61E-5	1.70E-4	5.32E-7	1.38E-5	3.19E-4	1.42E-8	3.34E-2
SV-B-C_CCF	1.37E-4	6.05E-4	2.17E-5	1.45E-4	1.32E-3	4.63E-6	1.15E-1
SV-D-E_CCF	1.37E-4	5.56E-4	2.08E-5	1.46E-4	1.28E-3	5.04E-6	3.17E-2

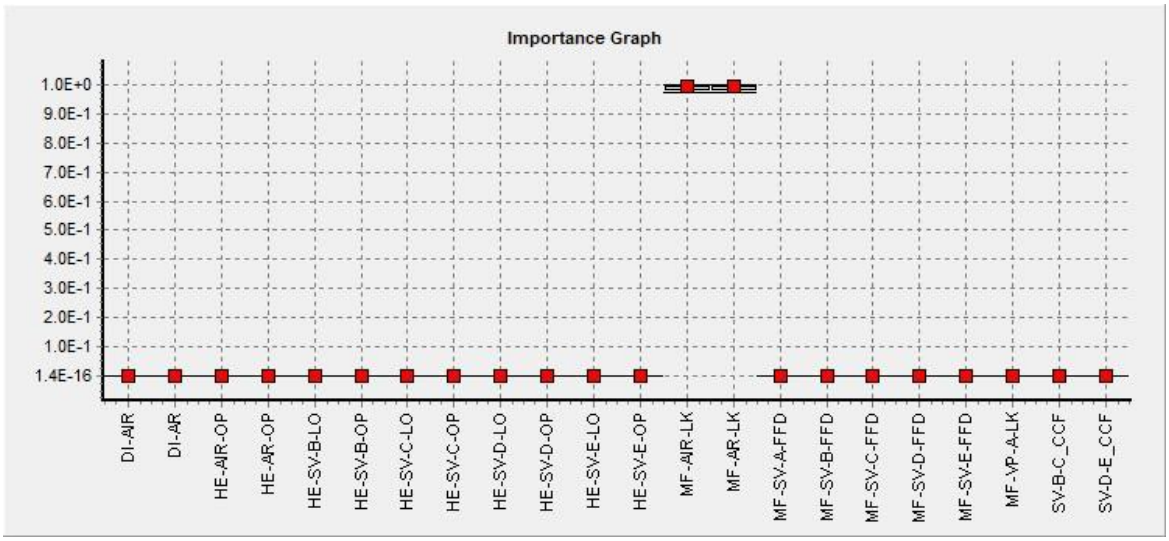


Figure 252: Importance graph for extended system w/ door interlocks and Bruce A fault rate and SV_DOW.

Table 247: FV Results for Extended System w/ Door Interlocks and Bruce A Fault Rate and SV_MAN

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	2.42E-4	1.37E-3	1.27E-7	4.54E-5	2.17E-3	3.45E-13	3.92E-1
DI-AR	2.42E-4	1.32E-3	1.33E-7	5.09E-5	2.20E-3	0.00E+0	3.12E-1
HE-AIR-OP	2.42E-4	1.37E-3	1.27E-7	4.54E-5	2.17E-3	3.45E-13	3.92E-1

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-AR-OP	2.42E-4	1.32E-3	1.33E-7	5.09E-5	2.20E-3	0.00E+0	3.12E-1
HE-SV-B-LO	1.05E-5	7.49E-5	1.12E-8	3.71E-6	1.33E-4	1.37E-13	2.40E-2
HE-SV-B-OP	1.05E-5	7.36E-5	1.21E-8	3.74E-6	1.31E-4	5.24E-13	1.12E-2
HE-SV-C-LO	1.05E-5	7.46E-5	1.26E-8	3.54E-6	1.26E-4	0.00E+0	9.15E-3
HE-SV-C-OP	1.05E-5	7.36E-5	1.00E-8	3.76E-6	1.30E-4	1.57E-13	1.50E-2
HE-SV-D-LO	1.05E-5	7.18E-5	8.51E-9	3.91E-6	1.27E-4	6.74E-13	3.67E-2
HE-SV-D-OP	1.05E-5	6.35E-5	9.66E-9	3.71E-6	1.29E-4	3.70E-13	9.21E-3
HE-SV-E-LO	1.05E-5	6.98E-5	6.74E-9	3.56E-6	1.31E-4	6.35E-14	1.52E-2
HE-SV-E-OP	1.05E-5	6.62E-5	1.02E-8	4.01E-6	1.26E-4	6.14E-13	3.20E-2
MF-AIR-LK	1.00E+0	9.98E-1	9.85E-1	9.99E-1	1.00E+0	5.97E-1	1.00E+0
MF-AR-LK	1.00E+0	9.98E-1	9.87E-1	9.99E-1	1.00E+0	6.84E-1	1.00E+0
MF-SV-A-FFD	6.34E-7	4.23E-6	1.29E-8	3.35E-7	7.80E-6	3.43E-10	8.61E-4
MF-SV-B-FFD	1.56E-6	1.08E-5	1.54E-8	6.28E-7	1.76E-5	1.35E-10	2.54E-3
MF-SV-C-FFD	1.56E-6	1.11E-5	1.70E-8	6.27E-7	1.75E-5	4.97E-10	4.20E-3
MF-SV-D-FFD	1.56E-6	1.00E-5	1.67E-8	5.94E-7	1.59E-5	2.53E-10	2.33E-3
MF-SV-E-FFD	1.56E-6	9.33E-6	1.63E-8	6.58E-7	1.74E-5	3.88E-10	1.91E-3
MF-VP-A-LK	6.34E-7	4.23E-6	1.29E-8	3.35E-7	7.80E-6	3.43E-10	8.61E-4
SV-B-C_CCF	1.37E-4	6.12E-4	2.17E-5	1.45E-4	1.33E-3	4.63E-6	1.21E-1
SV-D-E_CCF	1.37E-4	5.60E-4	2.08E-5	1.46E-4	1.29E-3	5.05E-6	3.23E-2

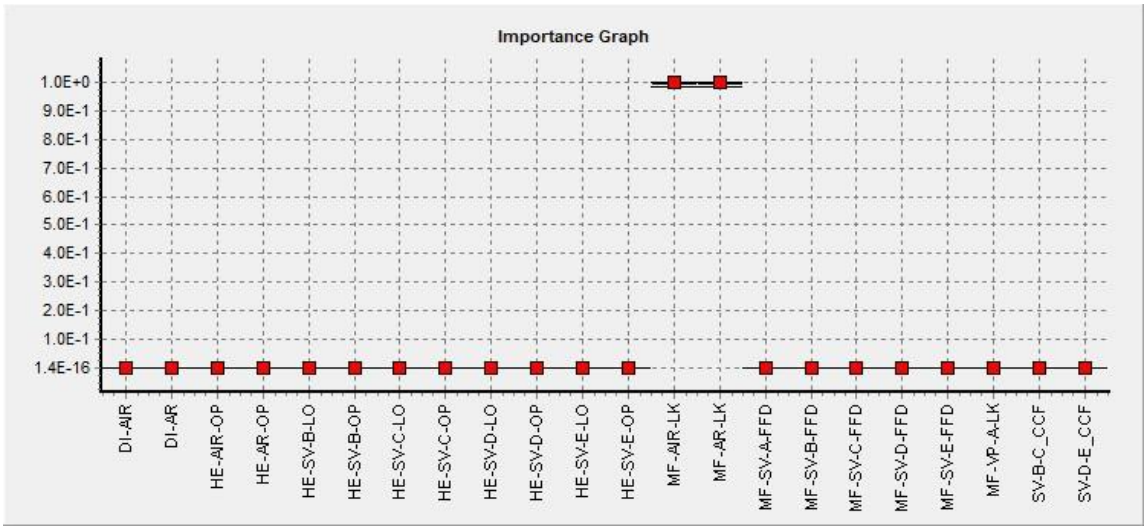


Figure 253: Importance graph for extended system w/ door interlocks and Bruce A fault rate and SV_NRPD.

Table 248: FV Results for Extended System w/ Door Interlocks and Bruce A Fault Rate and SV_NRPD

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	2.24E-4	9.80E-4	1.02E-7	3.87E-5	1.65E-3	3.16E-13	1.93E-1
DI-AR	2.24E-4	9.84E-4	1.21E-7	4.39E-5	1.74E-3	0.00E+0	2.81E-1
HE-AIR-OP	2.24E-4	9.80E-4	1.02E-7	3.87E-5	1.65E-3	3.16E-13	1.93E-1
HE-AR-OP	2.24E-4	9.84E-4	1.21E-7	4.39E-5	1.74E-3	0.00E+0	2.81E-1
HE-SV-B-LO	6.13E-4	1.82E-3	3.66E-7	1.30E-4	4.26E-3	1.47E-12	1.67E-1
HE-SV-B-OP	6.13E-4	1.94E-3	3.99E-7	1.40E-4	4.22E-3	1.40E-12	2.45E-1
HE-SV-C-LO	6.13E-4	1.91E-3	3.58E-7	1.23E-4	4.01E-3	3.25E-14	3.10E-1
HE-SV-C-OP	6.13E-4	1.89E-3	3.37E-7	1.23E-4	4.17E-3	1.27E-12	1.91E-1
HE-SV-D-LO	6.13E-4	1.81E-3	2.99E-7	1.37E-4	4.29E-3	8.72E-12	1.32E-1
HE-SV-D-OP	6.13E-4	1.78E-3	4.27E-7	1.30E-4	4.05E-3	1.10E-12	1.88E-1
HE-SV-E-LO	6.13E-4	1.81E-3	2.65E-7	1.28E-4	4.05E-3	7.13E-12	2.66E-1
HE-SV-E-OP	6.13E-4	1.84E-3	3.72E-7	1.33E-4	3.86E-3	6.68E-12	1.50E-1
MF-AIR-LK	9.19E-1	8.69E-1	2.42E-1	9.27E-1	9.96E-1	1.06E-2	1.00E+0

Name	Point Est.	Mean	5th	50th	95th	Min	Max
MF-AR-LK	9.20E-1	8.74E-1	2.57E-1	9.33E-1	9.97E-1	1.19E-2	1.00E+0
MF-SV-A-FFD	4.85E-4	1.92E-3	8.74E-6	2.24E-4	4.17E-3	3.26E-7	1.90E-1
MF-SV-B-FFD	8.25E-2	1.25E-1	5.50E-4	2.26E-2	3.97E-1	2.35E-5	9.84E-1
MF-SV-C-FFD	8.25E-2	1.25E-1	6.05E-4	2.28E-2	3.92E-1	2.01E-5	9.87E-1
MF-SV-D-FFD	8.25E-2	1.22E-1	5.90E-4	2.21E-2	3.88E-1	2.63E-5	9.87E-1
MF-SV-E-FFD	8.25E-2	1.22E-1	6.20E-4	2.21E-2	3.85E-1	2.34E-5	9.86E-1
MF-VP-A-LK	4.85E-4	1.92E-3	8.74E-6	2.24E-4	4.17E-3	3.26E-7	1.90E-1
SV-B-C_CCF	1.27E-4	4.21E-4	2.09E-5	1.26E-4	9.58E-4	4.55E-6	3.58E-2
SV-D-E_CCF	1.27E-4	3.95E-4	1.99E-5	1.27E-4	9.28E-4	4.96E-6	1.99E-2

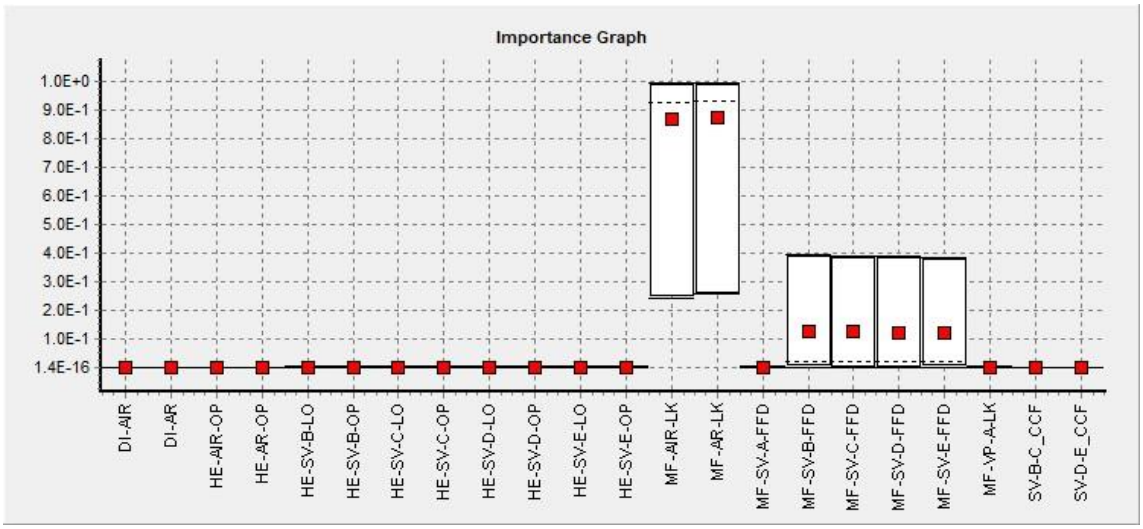


Figure 254: Importance graph for extended system w/ door interlocks and Bruce A fault rate and SV_NRPD.

Table 249: FV Results for Extended System w/ Door Interlocks and Bruce A Fault Rate and Diagnostic HE

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	1.89E-3	3.62E-3	6.12E-7	2.34E-4	7.79E-3	5.53E-12	3.16E-1
DI-AR	1.89E-3	3.43E-3	5.11E-7	2.49E-4	7.84E-3	3.88E-12	2.39E-1
HE-AIR-OP	1.89E-3	3.62E-3	6.12E-7	2.34E-4	7.79E-3	5.53E-12	3.16E-1
HE-AR-OP	1.89E-3	3.43E-3	5.11E-7	2.49E-4	7.84E-3	3.88E-12	2.39E-1
HE-SV-B-LO	1.10E-2	1.98E-2	1.15E-5	4.08E-3	5.39E-2	6.75E-11	4.86E-1
HE-SV-B-OP	1.10E-2	1.97E-2	1.13E-5	4.01E-3	5.57E-2	2.11E-13	4.39E-1
HE-SV-C-LO	1.10E-2	1.98E-2	1.05E-5	4.06E-3	5.30E-2	7.13E-10	4.17E-1
HE-SV-C-OP	1.10E-2	1.97E-2	1.15E-5	4.19E-3	5.42E-2	7.05E-10	4.28E-1
HE-SV-D-LO	1.10E-2	1.94E-2	1.09E-5	4.00E-3	5.36E-2	2.32E-14	3.52E-1
HE-SV-D-OP	1.10E-2	1.96E-2	1.22E-5	4.01E-3	5.50E-2	1.36E-9	4.78E-1
HE-SV-E-LO	1.10E-2	1.92E-2	1.24E-5	4.20E-3	5.13E-2	9.40E-14	4.77E-1
HE-SV-E-OP	1.10E-2	1.89E-2	1.12E-5	3.93E-3	5.23E-2	2.05E-9	3.62E-1
MF-AIR-LK	6.97E-1	5.27E-1	6.25E-2	4.55E-1	8.68E-1	5.05E-3	9.83E-1
MF-AR-LK	6.97E-1	5.20E-1	5.60E-2	4.44E-1	8.70E-1	3.24E-3	9.91E-1
MF-SV-A-FS	5.24E-4	8.30E-4	2.12E-5	2.69E-4	1.96E-3	9.34E-7	4.41E-2
MF-SV-A-LK	3.00E-5	5.05E-5	1.15E-6	1.51E-5	1.18E-4	3.43E-8	2.25E-3
MF-SV-A-RP	4.35E-6	7.17E-6	3.46E-8	8.86E-7	1.51E-5	4.77E-10	1.62E-3
MF-SV-B-FS	2.53E-1	3.72E-1	4.84E-2	2.80E-1	6.84E-1	9.48E-3	9.16E-1
MF-SV-B-LK	1.46E-2	2.63E-2	2.40E-3	1.38E-2	5.76E-2	4.03E-4	3.22E-1
MF-SV-B-RP	2.11E-3	3.61E-3	5.20E-5	7.83E-4	8.55E-3	4.49E-6	1.58E-1
MF-SV-C-FS	2.53E-1	3.72E-1	4.85E-2	2.80E-1	6.88E-1	8.78E-3	9.24E-1

Name	Point Est.	Mean	5th	50th	95th	Min	Max
MF-SV-C-RP	2.11E-3	3.90E-3	5.09E-5	7.64E-4	9.10E-3	3.89E-6	3.34E-1
MF-SV-D-FS	2.53E-1	3.79E-1	4.82E-2	2.90E-1	6.97E-1	6.52E-3	9.46E-1
MF-SV-D-LK	1.46E-2	2.62E-2	2.35E-3	1.39E-2	5.71E-2	3.71E-4	3.44E-1
MF-SV-D-RP	2.11E-3	3.75E-3	5.47E-5	7.65E-4	8.57E-3	1.73E-6	4.25E-1
MF-SV-E-FS	2.53E-1	3.79E-1	4.79E-2	2.90E-1	6.97E-1	6.27E-3	9.22E-1
MF-SV-E-LK	1.46E-2	2.67E-2	2.45E-3	1.42E-2	5.72E-2	2.70E-4	4.59E-1
MF-SV-E-RP	2.11E-3	3.82E-3	5.05E-5	8.11E-4	8.59E-3	4.27E-6	3.79E-1
MF-VP-A-LK	5.58E-4	8.88E-4	2.42E-5	2.95E-4	2.09E-3	1.02E-6	4.56E-2
SV-B-C_CCF	3.07E-2	3.71E-2	6.86E-3	2.82E-2	6.67E-2	1.22E-3	1.58E-1
SV-D-E_CCF	3.07E-2	3.81E-2	6.85E-3	2.91E-2	6.85E-2	1.96E-3	1.60E-1

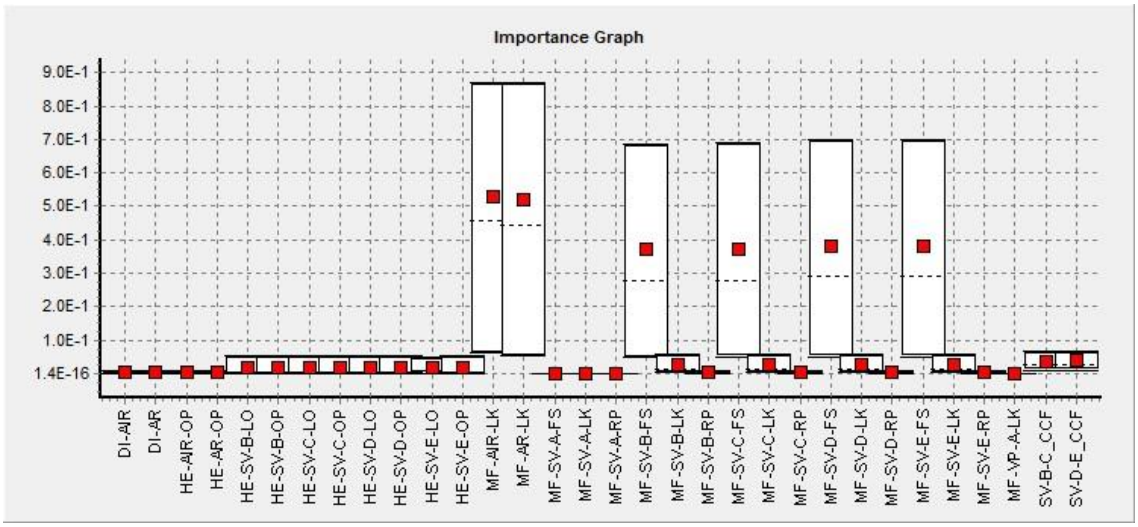


Figure 255: Importance graph for extended system w/ door interlocks and Bruce A fault rate and diagnostic HE component.

Table 250: FV Results for Extended System w/ Door Interlocks and Bruce A Fault Rate and Diagnostic HE and SV_OL

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	2.65E-3	1.16E-2	1.22E-6	4.99E-4	2.26E-2	5.94E-11	8.09E-1
DI-AR	2.65E-3	1.16E-2	1.15E-6	4.69E-4	2.21E-2	4.50E-14	6.96E-1
HE-AIR-OP	2.65E-3	1.16E-2	1.22E-6	4.99E-4	2.26E-2	5.94E-11	8.09E-1
HE-AR-OP	2.65E-3	1.16E-2	1.15E-6	4.69E-4	2.21E-2	4.50E-14	6.96E-1
HE-SV-B-LO	1.49E-3	7.74E-3	1.24E-6	5.33E-4	1.78E-2	1.08E-11	5.82E-1
HE-SV-B-OP	1.49E-3	7.67E-3	1.54E-6	5.59E-4	1.75E-2	1.29E-10	5.58E-1
HE-SV-C-LO	1.49E-3	8.01E-3	1.23E-6	5.27E-4	1.76E-2	1.62E-11	4.44E-1
HE-SV-C-OP	1.49E-3	7.48E-3	1.42E-6	5.51E-4	1.74E-2	1.92E-14	4.82E-1
HE-SV-D-LO	1.49E-3	7.49E-3	1.13E-6	5.22E-4	1.70E-2	1.40E-11	6.29E-1
HE-SV-D-OP	1.49E-3	7.27E-3	1.10E-6	5.31E-4	1.69E-2	1.13E-11	6.81E-1
HE-SV-E-LO	1.49E-3	7.28E-3	1.06E-6	5.24E-4	1.65E-2	6.93E-12	4.58E-1
HE-SV-E-OP	1.49E-3	7.16E-3	1.29E-6	5.32E-4	1.63E-2	5.24E-15	5.85E-1
MF-AIR-LK	9.94E-1	9.68E-1	7.76E-1	9.86E-1	9.99E-1	1.90E-1	1.00E+0
MF-AR-LK	9.94E-1	9.70E-1	7.83E-1	9.87E-1	9.99E-1	8.19E-2	1.00E+0
MF-SV-A-FFD	2.50E-5	1.35E-4	4.95E-7	1.21E-5	2.67E-4	1.37E-8	3.13E-2
MF-SV-B-FFD	8.01E-4	4.28E-3	9.74E-6	3.36E-4	8.00E-3	3.44E-7	4.53E-1
MF-SV-C-FFD	8.01E-4	4.20E-3	1.01E-5	3.38E-4	8.21E-3	2.13E-7	4.59E-1
MF-SV-D-FFD	8.01E-4	3.68E-3	1.00E-5	3.16E-4	7.74E-3	6.48E-7	5.05E-1
MF-SV-E-FFD	8.01E-4	4.01E-3	9.33E-6	3.28E-4	7.71E-3	4.11E-7	7.13E-1
MF-VP-A-LK	2.50E-5	1.35E-4	4.95E-7	1.21E-5	2.67E-4	1.37E-8	3.13E-2

Name	Point Est.	Mean	5th	50th	95th	Min	Max
SV-B-C_CCF	1.37E-4	5.11E-4	2.08E-5	1.42E-4	1.22E-3	4.61E-6	2.65E-2
SV-D-E_CCF	1.37E-4	5.08E-4	1.99E-5	1.39E-4	1.18E-3	4.29E-6	4.64E-2

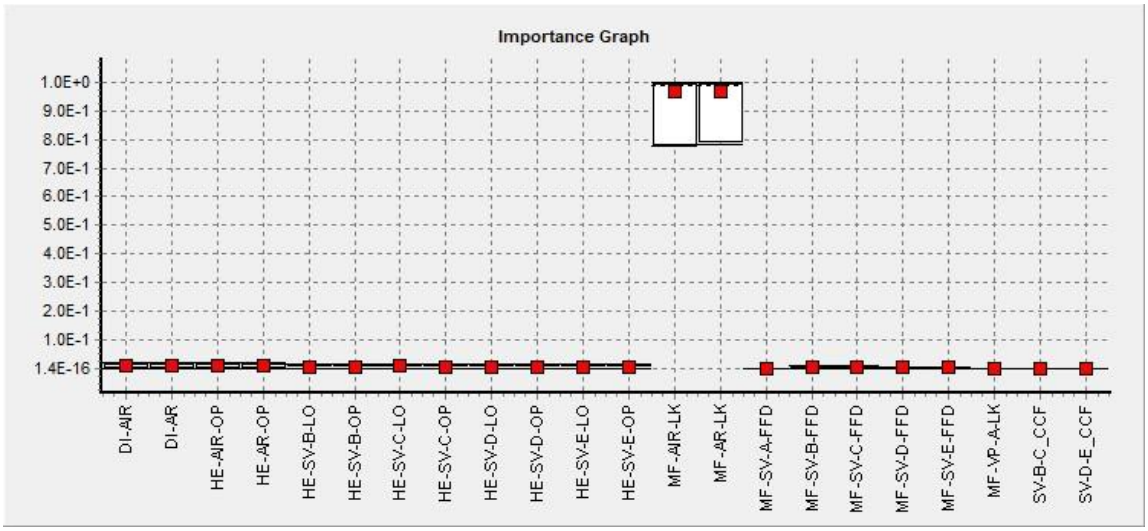


Figure 256: Importance graph for extended system w/ door interlocks and Bruce A fault rate and diagnostic HE component and SV_OL.

Table 251: FV Results for Extended System w/ Door Interlocks and Bruce A Fault Rate and Diagnostic HE and SV_OM

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	1.67E-3	5.77E-3	6.71E-7	2.77E-4	1.05E-2	3.58E-11	5.63E-1
DI-AR	1.67E-3	5.66E-3	6.64E-7	2.82E-4	1.13E-2	3.83E-14	4.80E-1
HE-AIR-OP	1.67E-3	5.77E-3	6.71E-7	2.77E-4	1.05E-2	3.58E-11	5.63E-1
HE-AR-OP	1.67E-3	5.66E-3	6.64E-7	2.82E-4	1.13E-2	3.83E-14	4.80E-1
HE-SV-B-LO	1.24E-2	2.21E-2	9.18E-6	3.16E-3	5.95E-2	4.97E-11	5.74E-1
HE-SV-B-OP	1.24E-2	2.24E-2	9.24E-6	3.30E-3	6.00E-2	5.66E-10	6.66E-1
HE-SV-C-LO	1.24E-2	2.23E-2	7.71E-6	3.05E-3	6.11E-2	1.66E-10	6.48E-1
HE-SV-C-OP	1.24E-2	2.18E-2	1.01E-5	3.02E-3	5.82E-2	3.14E-13	6.80E-1
HE-SV-D-LO	1.24E-2	2.14E-2	6.97E-6	3.00E-3	5.70E-2	3.38E-11	5.86E-1

Name	Point Est.	Mean	5th	50th	95th	Min	Max
HE-SV-D-OP	1.24E-2	2.19E-2	8.31E-6	2.96E-3	5.88E-2	1.26E-11	8.51E-1
HE-SV-E-LO	1.24E-2	2.12E-2	5.90E-6	3.04E-3	5.66E-2	2.32E-11	7.16E-1
HE-SV-E-OP	1.24E-2	2.13E-2	8.21E-6	3.09E-3	5.64E-2	1.27E-14	6.02E-1
MF-AIR-LK	6.16E-1	6.36E-1	6.20E-2	6.02E-1	9.62E-1	2.25E-3	9.99E-1
MF-AR-LK	6.16E-1	6.49E-1	6.70E-2	6.23E-1	9.65E-1	9.15E-4	9.99E-1
MF-SV-A-FFD	5.59E-4	1.59E-3	8.33E-6	2.60E-4	3.63E-3	3.43E-7	1.09E-1
MF-SV-B-FFD	3.87E-1	3.17E-1	6.22E-3	1.58E-1	7.54E-1	2.04E-4	9.97E-1
MF-SV-C-FFD	3.87E-1	3.18E-1	6.81E-3	1.58E-1	7.56E-1	4.78E-4	9.91E-1
MF-SV-D-FFD	3.87E-1	3.08E-1	6.02E-3	1.50E-1	7.44E-1	2.56E-4	9.93E-1
MF-SV-E-FFD	3.87E-1	3.08E-1	6.03E-3	1.50E-1	7.46E-1	1.81E-4	9.96E-1
MF-VP-A-LK	5.59E-4	1.59E-3	8.33E-6	2.60E-4	3.63E-3	3.43E-7	1.09E-1
SV-B-C_CCF	8.62E-5	2.19E-4	1.59E-5	8.34E-5	5.01E-4	2.73E-6	1.06E-2
SV-D-E_CCF	8.62E-5	2.21E-4	1.54E-5	8.35E-5	5.05E-4	4.03E-6	1.17E-2

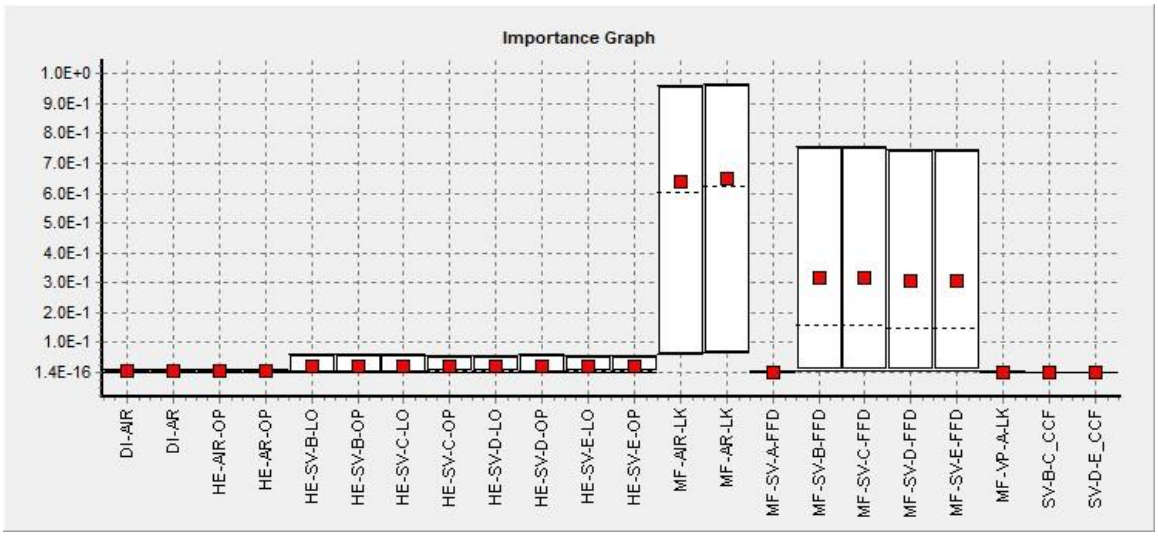


Figure 257: Importance graph for extended system w/ door interlocks and Bruce A fault rate and diagnostic HE component and SV_OM.

Table 252: FV Results for Extended System w/ Door Interlocks and Bruce A Fault Rate and Diagnostic HE and SV_OH

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	7.98E-4	2.58E-3	3.12E-7	1.40E-4	4.58E-3	2.37E-11	3.39E-1
DI-AR	7.99E-4	2.55E-3	3.04E-7	1.31E-4	4.85E-3	2.98E-14	2.84E-1
HE-AIR-OP	7.98E-4	2.58E-3	3.12E-7	1.40E-4	4.58E-3	2.37E-11	3.39E-1
HE-AR-OP	7.99E-4	2.55E-3	3.04E-7	1.31E-4	4.85E-3	2.98E-14	2.84E-1
HE-SV-B-LO	1.33E-2	1.98E-2	1.17E-5	3.83E-3	5.27E-2	3.92E-11	7.53E-1
HE-SV-B-OP	1.33E-2	1.98E-2	1.14E-5	3.89E-3	5.27E-2	3.56E-10	6.68E-1
HE-SV-C-LO	1.33E-2	1.96E-2	1.05E-5	3.71E-3	5.20E-2	1.37E-10	5.19E-1
HE-SV-C-OP	1.33E-2	1.95E-2	1.25E-5	3.59E-3	5.24E-2	4.54E-13	4.67E-1
HE-SV-D-LO	1.33E-2	1.94E-2	9.01E-6	3.68E-3	5.11E-2	2.09E-11	5.24E-1
HE-SV-D-OP	1.33E-2	1.98E-2	1.14E-5	3.62E-3	5.18E-2	1.66E-11	8.07E-1
HE-SV-E-LO	1.33E-2	1.89E-2	7.58E-6	3.78E-3	4.91E-2	6.42E-11	5.03E-1
HE-SV-E-OP	1.33E-2	1.93E-2	1.00E-5	3.76E-3	4.91E-2	2.47E-14	5.57E-1
MF-AIR-LK	2.88E-1	3.70E-1	1.79E-2	2.25E-1	8.10E-1	7.06E-4	9.97E-1
MF-AR-LK	2.88E-1	3.81E-1	1.90E-2	2.37E-1	8.13E-1	5.84E-4	9.97E-1
MF-SV-A-FFD	2.37E-4	8.00E-4	5.29E-6	1.58E-4	1.84E-3	1.58E-7	4.68E-2
MF-SV-B-FFD	8.52E-1	6.15E-1	5.95E-2	5.78E-1	9.33E-1	2.08E-3	9.98E-1
MF-SV-C-FFD	8.52E-1	6.15E-1	6.22E-2	5.77E-1	9.35E-1	3.42E-3	9.98E-1
MF-SV-D-FFD	8.52E-1	6.06E-1	5.45E-2	5.66E-1	9.30E-1	2.59E-3	9.97E-1
MF-SV-E-FFD	8.52E-1	6.07E-1	5.42E-2	5.67E-1	9.30E-1	2.29E-3	9.98E-1
MF-VP-A-LK	2.37E-4	8.00E-4	5.29E-6	1.58E-4	1.84E-3	1.58E-7	4.68E-2
SV-B-C_CCF	4.11E-5	9.12E-5	9.42E-6	4.02E-5	2.02E-4	2.16E-6	4.41E-3
SV-D-E_CCF	4.11E-5	9.40E-5	9.31E-6	4.01E-5	2.04E-4	2.83E-6	2.75E-3

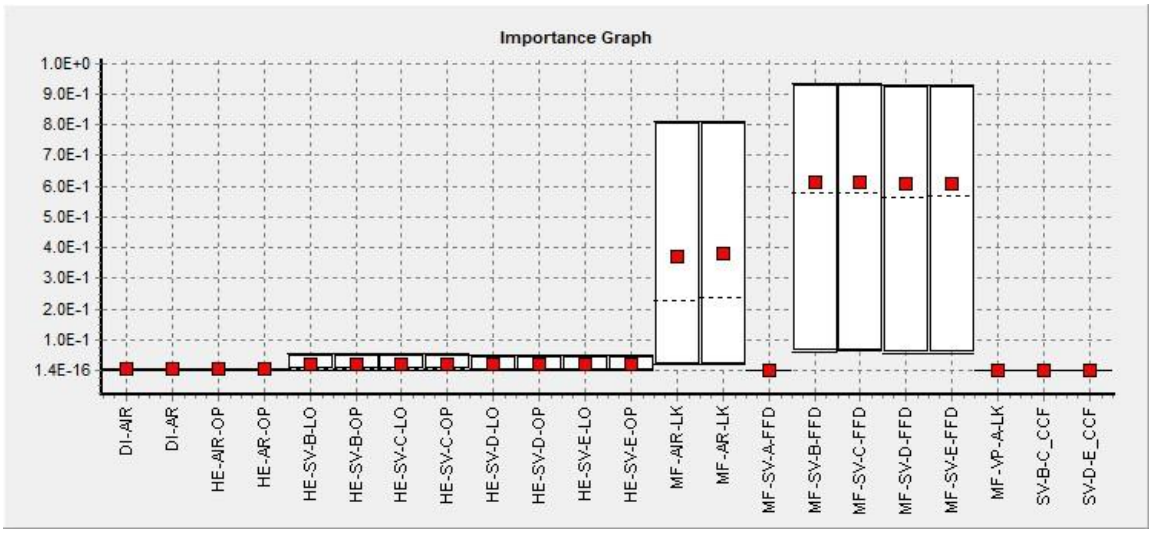


Figure 258: Importance graph for extended system w/ door interlocks and Bruce A fault rate and diagnostic HE component and SV_OH.

Table 253: FV Results for Extended System w/ Door Interlocks and Bruce A Fault Rate and Diagnostic HE and SV_DOW

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	2.65E-3	1.16E-2	1.22E-6	4.99E-4	2.26E-2	5.94E-11	8.09E-1
DI-AR	2.65E-3	1.16E-2	1.15E-6	4.68E-4	2.21E-2	4.50E-14	6.96E-1
HE-AIR-OP	2.65E-3	1.16E-2	1.22E-6	4.99E-4	2.26E-2	5.94E-11	8.09E-1
HE-AR-OP	2.65E-3	1.16E-2	1.15E-6	4.68E-4	2.21E-2	4.50E-14	6.96E-1
HE-SV-B-LO	1.50E-3	7.78E-3	1.25E-6	5.38E-4	1.79E-2	1.08E-11	5.82E-1
HE-SV-B-OP	1.50E-3	7.72E-3	1.55E-6	5.65E-4	1.77E-2	1.30E-10	5.59E-1
HE-SV-C-LO	1.50E-3	8.06E-3	1.23E-6	5.31E-4	1.77E-2	1.64E-11	4.45E-1
HE-SV-C-OP	1.50E-3	7.52E-3	1.43E-6	5.57E-4	1.75E-2	1.92E-14	4.81E-1
HE-SV-D-LO	1.50E-3	7.53E-3	1.16E-6	5.23E-4	1.71E-2	1.40E-11	6.28E-1
HE-SV-D-OP	1.50E-3	7.32E-3	1.13E-6	5.34E-4	1.71E-2	1.13E-11	6.81E-1
HE-SV-E-LO	1.50E-3	7.32E-3	1.06E-6	5.33E-4	1.67E-2	6.93E-12	4.61E-1
HE-SV-E-OP	1.50E-3	7.20E-3	1.30E-6	5.35E-4	1.65E-2	5.24E-15	5.84E-1
MF-AIR-LK	9.94E-1	9.68E-1	7.74E-1	9.86E-1	9.99E-1	1.90E-1	1.00E+0

Name	Point Est.	Mean	5th	50th	95th	Min	Max
MF-AR-LK	9.94E-1	9.69E-1	7.80E-1	9.87E-1	9.99E-1	7.93E-2	1.00E+0
MF-SV-A-FFD	2.59E-5	1.39E-4	5.12E-7	1.25E-5	2.76E-4	1.42E-8	3.22E-2
MF-SV-B-FFD	8.34E-4	4.44E-3	1.02E-5	3.51E-4	8.34E-3	3.66E-7	4.64E-1
MF-SV-C-FFD	8.34E-4	4.36E-3	1.05E-5	3.53E-4	8.55E-3	2.26E-7	4.68E-1
MF-SV-D-FFD	8.34E-4	3.82E-3	1.06E-5	3.28E-4	8.03E-3	6.78E-7	5.13E-1
MF-SV-E-FFD	8.34E-4	4.15E-3	9.80E-6	3.43E-4	8.04E-3	4.28E-7	7.20E-1
MF-VP-A-LK	2.59E-5	1.39E-4	5.12E-7	1.25E-5	2.76E-4	1.42E-8	3.22E-2
SV-B-C_CCF	1.37E-4	5.11E-4	2.08E-5	1.42E-4	1.22E-3	4.61E-6	2.63E-2
SV-D-E_CCF	1.37E-4	5.08E-4	1.99E-5	1.39E-4	1.18E-3	4.29E-6	4.64E-2

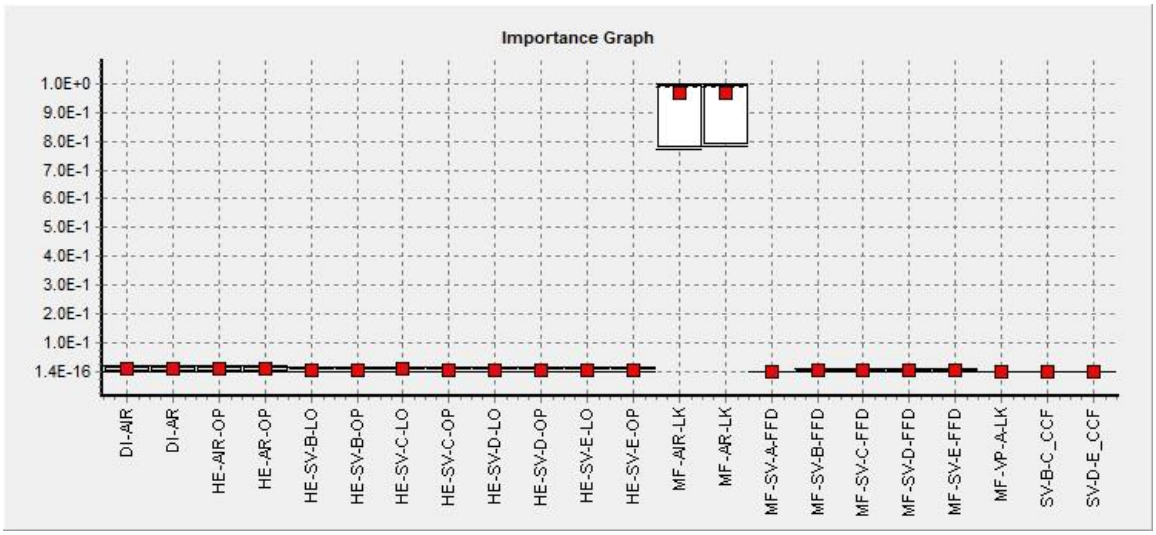


Figure 259: Importance graph for extended system w/ door interlocks and Bruce A fault rate and diagnostic HE component and SV_DOW.

Table 254: FV Results for Extended System w/ Door Interlocks and Bruce A Fault Rate and Diagnostic HE and SV_MAN

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	2.65E-3	1.18E-2	1.22E-6	5.01E-4	2.29E-2	5.95E-11	8.10E-1
DI-AR	2.65E-3	1.18E-2	1.15E-6	4.71E-4	2.23E-2	4.51E-14	7.06E-1
HE-AIR-OP	2.65E-3	1.18E-2	1.22E-6	5.01E-4	2.29E-2	5.95E-11	8.10E-1
HE-AR-OP	2.65E-3	1.18E-2	1.15E-6	4.71E-4	2.23E-2	4.51E-14	7.06E-1
HE-SV-B-LO	1.18E-3	6.36E-3	7.29E-7	3.50E-4	1.44E-2	9.03E-12	5.72E-1
HE-SV-B-OP	1.18E-3	6.24E-3	8.30E-7	3.72E-4	1.35E-2	5.32E-11	4.82E-1
HE-SV-C-LO	1.18E-3	6.48E-3	8.17E-7	3.60E-4	1.39E-2	1.11E-11	4.77E-1
HE-SV-C-OP	1.18E-3	6.12E-3	8.16E-7	3.73E-4	1.34E-2	9.60E-15	4.89E-1
HE-SV-D-LO	1.18E-3	6.19E-3	6.71E-7	3.29E-4	1.31E-2	1.33E-11	6.54E-1
HE-SV-D-OP	1.18E-3	5.87E-3	6.71E-7	3.38E-4	1.39E-2	1.13E-11	6.66E-1
HE-SV-E-LO	1.18E-3	6.08E-3	5.53E-7	3.43E-4	1.34E-2	6.70E-12	4.39E-1
HE-SV-E-OP	1.18E-3	5.97E-3	7.10E-7	3.55E-4	1.31E-2	5.25E-15	5.91E-1
MF-AIR-LK	9.95E-1	9.75E-1	8.21E-1	9.90E-1	9.99E-1	1.90E-1	1.00E+0
MF-AR-LK	9.95E-1	9.76E-1	8.17E-1	9.91E-1	9.99E-1	2.22E-1	1.00E+0
MF-SV-A-FFD	6.30E-7	3.54E-6	1.25E-8	3.09E-7	6.82E-6	3.43E-10	8.44E-4
MF-SV-B-FFD	1.60E-5	9.63E-5	1.24E-7	5.73E-6	1.62E-4	1.27E-9	1.51E-2
MF-SV-C-FFD	1.60E-5	9.26E-5	1.14E-7	5.95E-6	1.65E-4	1.21E-9	2.02E-2
MF-SV-D-FFD	1.60E-5	7.99E-5	1.18E-7	5.38E-6	1.48E-4	1.63E-9	2.67E-2
MF-SV-E-FFD	1.60E-5	9.39E-5	1.03E-7	5.61E-6	1.54E-4	3.46E-9	5.55E-2
MF-VP-A-LK	6.30E-7	3.54E-6	1.25E-8	3.09E-7	6.82E-6	3.43E-10	8.44E-4
SV-B-C_CCF	1.37E-4	5.26E-4	2.09E-5	1.43E-4	1.23E-3	4.62E-6	3.33E-2
SV-D-E_CCF	1.37E-4	5.21E-4	2.00E-5	1.39E-4	1.20E-3	4.29E-6	4.86E-2

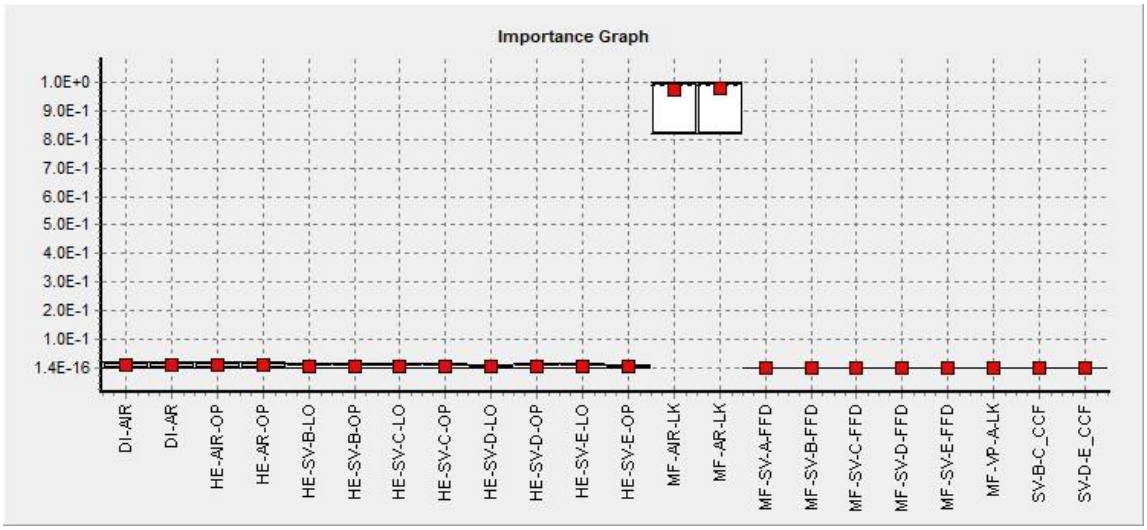


Figure 260: Importance graph for extended system w/ door interlocks and Bruce A fault rate and diagnostic HE component and SV_MAN.

Table 255: FV Results for Extended System w/ Door Interlocks and Bruce A Fault Rate and Diagnostic HE and SV_NRPD

Name	Point Est.	Mean	5th	50th	95th	Min	Max
DI-AIR	2.40E-3	8.58E-3	9.82E-7	4.06E-4	1.65E-2	5.16E-11	7.20E-1
DI-AR	2.40E-3	8.46E-3	9.69E-7	3.88E-4	1.70E-2	4.27E-14	5.45E-1
HE-AIR-OP	2.40E-3	8.58E-3	9.82E-7	4.06E-4	1.65E-2	5.16E-11	7.20E-1
HE-AR-OP	2.40E-3	8.46E-3	9.69E-7	3.88E-4	1.70E-2	4.27E-14	5.45E-1
HE-SV-B-LO	7.54E-3	1.89E-2	5.43E-6	2.04E-3	5.21E-2	4.11E-11	6.39E-1
HE-SV-B-OP	7.54E-3	1.92E-2	5.70E-6	2.12E-3	5.09E-2	3.44E-10	6.51E-1
HE-SV-C-LO	7.54E-3	1.92E-2	5.07E-6	1.93E-3	5.00E-2	1.10E-10	6.62E-1
HE-SV-C-OP	7.54E-3	1.84E-2	6.04E-6	1.93E-3	4.84E-2	1.33E-13	7.35E-1
HE-SV-D-LO	7.54E-3	1.82E-2	4.15E-6	1.92E-3	4.82E-2	2.55E-11	6.29E-1
HE-SV-D-OP	7.54E-3	1.85E-2	4.89E-6	1.94E-3	4.71E-2	1.13E-11	7.79E-1
HE-SV-E-LO	7.54E-3	1.81E-2	4.28E-6	1.90E-3	4.62E-2	1.24E-11	8.03E-1
HE-SV-E-OP	7.54E-3	1.78E-2	4.77E-6	1.96E-3	4.61E-2	9.93E-15	6.10E-1
MF-AIR-LK	8.95E-1	8.18E-1	2.03E-1	8.61E-1	9.89E-1	6.93E-3	1.00E+0

Name	Point Est.	Mean	5th	50th	95th	Min	Max
MF-SV-A-FFD	4.61E-4	1.45E-3	7.56E-6	1.88E-4	3.32E-3	3.19E-7	1.66E-1
MF-SV-B-FFD	9.21E-2	1.36E-1	1.03E-3	3.22E-2	4.02E-1	3.80E-5	9.90E-1
MF-SV-C-FFD	9.21E-2	1.36E-1	1.09E-3	3.28E-2	4.05E-1	7.42E-5	9.68E-1
MF-SV-D-FFD	9.21E-2	1.30E-1	1.04E-3	3.00E-2	3.93E-1	5.44E-5	9.80E-1
MF-SV-E-FFD	9.21E-2	1.30E-1	1.01E-3	3.05E-2	3.92E-1	2.92E-5	9.90E-1
MF-VP-A-LK	4.61E-4	1.45E-3	7.56E-6	1.88E-4	3.32E-3	3.19E-7	1.66E-1
SV-B-C_CCF	1.24E-4	3.43E-4	1.93E-5	1.20E-4	8.08E-4	4.47E-6	1.32E-2
SV-D-E_CCF	1.24E-4	3.46E-4	1.88E-5	1.17E-4	8.08E-4	4.23E-6	2.21E-2

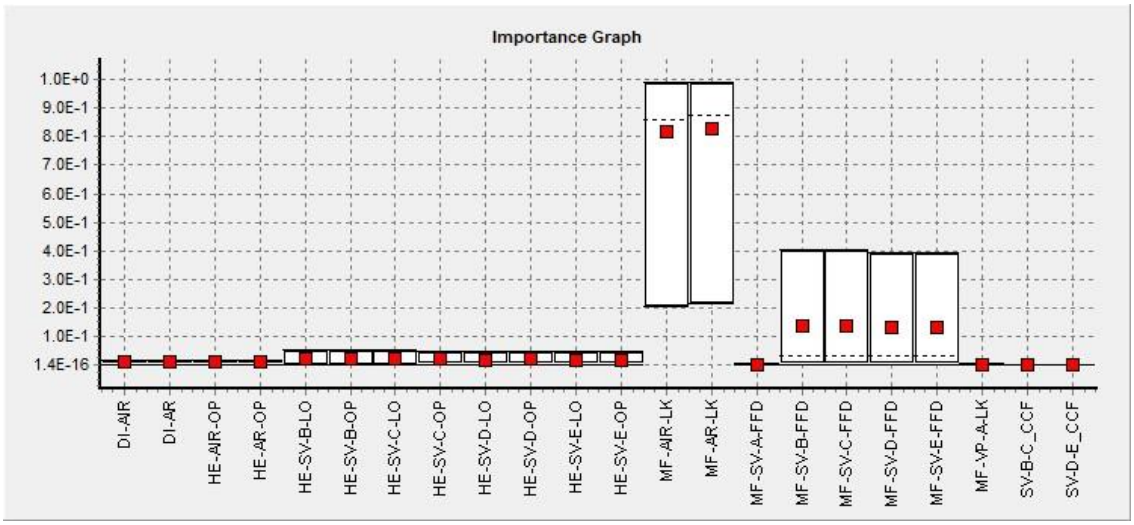


Figure 261: Importance graph for extended system w/ door interlocks and Bruce A fault rate and diagnostic HE component and SV_NRPD.

Appendix D – Mechanical Failure System Cut Sets

Table 256: MF Cut Sets for Basic System

#	Case	Prob/Freq	Total %	Cut Set
Total		9.69E-2	100	Displaying 20 Cut Sets. (20 Original)
1	C	6.41E-2	66.18	MF-FS-SV-1,MF-FS-SV-3
2	C	1.15E-2	11.86	MF-AR-CELL-LK,MF-FS-SV-1
3	C	1.15E-2	11.86	MF-AIR-CELL-LK,MF-FS-SV-3
4	C	3.67E-3	3.79	MF-FS-SV-3,MF-LK-SV-1
5	C	3.67E-3	3.79	MF-FS-SV-1,MF-LK-SV-3
6	C	2.06E-3	2.12	MF-AIR-CELL-LK,MF-AR-CELL-LK
7	C	6.58E-4	0.68	MF-AR-CELL-LK,MF-LK-SV-1
8	C	6.58E-4	0.68	MF-AIR-CELL-LK,MF-LK-SV-3
9	C	5.32E-4	0.55	MF-FS-SV-3,MF-RP-SV-1
10	C	5.32E-4	0.55	MF-FS-SV-1,MF-RP-SV-3
11	C	2.22E-4	0.23	MF-FS-SV-3,MF-VP-1-LK
12	C	2.10E-4	0.22	MF-LK-SV-1,MF-LK-SV-3
13	C	9.53E-5	0.10	MF-AR-CELL-LK,MF-RP-SV-1
14	C	9.53E-5	0.10	MF-AIR-CELL-LK,MF-RP-SV-3
15	C	3.97E-5	0.04	MF-AR-CELL-LK,MF-VP-1-LK
16	C	3.04E-5	0.03	MF-LK-SV-3,MF-RP-SV-1
17	C	3.04E-5	0.03	MF-LK-SV-1,MF-RP-SV-3
18	C	1.27E-5	0.01	MF-LK-SV-3,MF-VP-1-LK
19	C	4.41E-6	< 0.01	MF-RP-SV-1,MF-RP-SV-3
20	C	1.84E-6	< 0.01	MF-RP-SV-3,MF-VP-1-LK

Table 257: MF Cut Sets for Basic System w/ SV_OL

#	Case	Prob/Freq	Total %	Cut Set
Total		2.67E-3	100	Displaying 6 Cut Sets. (6 Original)
1	C	2.06E-3	76.94	MF-AIR-CELL-LK,MF-AR-CELL-LK
2	C	2.69E-4	10.06	MF-AR-CELL-LK,MF-SV-1-FFD
3	C	2.69E-4	10.06	MF-AIR-CELL-LK,MF-FFD-SV-3
4	C	3.97E-5	1.49	MF-AR-CELL-LK,MF-VP-1-LK
5	C	3.52E-5	1.31	MF-FFD-SV-3,MF-SV-1-FFD
6	C	5.19E-6	0.19	MF-FFD-SV-3,MF-VP-1-LK

Table 258: MF Cut Sets for Basic System w/ SV_OM

#	Case	Prob/Freq	Total %	Cut Set
Total		1.50E-1	100	Displaying 6 Cut Sets. (6 Original)
1	C	1.21E-1	80.33	MF-FFD-SV-3,MF-SV-1-FFD
2	C	1.58E-2	10.49	MF-AR-CELL-LK,MF-SV-1-FFD
3	C	1.58E-2	10.49	MF-AIR-CELL-LK,MF-FFD-SV-3
4	C	2.06E-3	1.37	MF-AIR-CELL-LK,MF-AR-CELL-LK
5	C	3.04E-4	0.20	MF-FFD-SV-3,MF-VP-1-LK
6	C	3.97E-5	0.03	MF-AR-CELL-LK,MF-VP-1-LK

Table 259: MF Cut Sets for Basic System w/ SV_OH

#	Case	Prob/Freq	Total %	Cut Set
Total		6.80E-1	100	Displaying 6 Cut Sets. (6 Original)
1	C	6.55E-1	96.21	MF-FFD-SV-3,MF-SV-1-FFD
2	C	3.67E-2	5.39	MF-AR-CELL-LK,MF-SV-1-FFD
3	C	3.67E-2	5.39	MF-AIR-CELL-LK,MF-FFD-SV-3
4	C	2.06E-3	0.30	MF-AIR-CELL-LK,MF-AR-CELL-LK
5	C	7.08E-4	0.10	MF-FFD-SV-3,MF-VP-1-LK
6	C	3.97E-5	< 0.01	MF-AR-CELL-LK,MF-VP-1-LK

Table 260: MF Cut Sets for Basic System w/ SV_DOW

#	Case	Prob/Freq	Total %	Cut Set
Total		2.70E-3	100	Displaying 6 Cut Sets. (6 Original)
1	C	2.06E-3	76.35	MF-AIR-CELL-LK,MF-AR-CELL-LK
2	C	2.78E-4	10.32	MF-AR-CELL-LK,MF-SV-1-FFD
3	C	2.78E-4	10.32	MF-AIR-CELL-LK,MF-FFD-SV-3
4	C	3.97E-5	1.47	MF-AR-CELL-LK,MF-VP-1-LK
5	C	3.76E-5	1.39	MF-FFD-SV-3,MF-SV-1-FFD
6	C	5.37E-6	0.20	MF-FFD-SV-3,MF-VP-1-LK

Table 261: MF Cut Sets for Basic System w/ SV_MAN

#	Case	Prob/Freq	Total %	Cut Set
Total		2.11E-3	100	Displaying 6 Cut Sets. (6 Original)
1	C	2.06E-3	97.48	MF-AIR-CELL-LK,MF-AR-CELL-LK
2	C	3.97E-5	1.88	MF-AR-CELL-LK,MF-VP-1-LK
3	C	6.76E-6	0.32	MF-AR-CELL-LK,MF-SV-1-FFD
4	C	6.76E-6	0.32	MF-AIR-CELL-LK,MF-FFD-SV-3
5	C	1.30E-7	< 0.01	MF-FFD-SV-3,MF-VP-1-LK
6	C	2.22E-8	< 0.01	MF-FFD-SV-3,MF-SV-1-FFD

Table 262: MF Cut Sets for Basic System w/ SV_NRPD

#	Case	Prob/Freq	Total %	Cut Set
Total		3.28E-2	100	Displaying 6 Cut Sets. (6 Original)
1	C	1.85E-2	56.55	MF-FFD-SV-3,MF-SV-1-FFD
2	C	6.17E-3	18.85	MF-AR-CELL-LK,MF-SV-1-FFD
3	C	6.17E-3	18.85	MF-AIR-CELL-LK,MF-FFD-SV-3
4	C	2.06E-3	6.28	MF-AIR-CELL-LK,MF-AR-CELL-LK
5	C	1.19E-4	0.36	MF-FFD-SV-3,MF-VP-1-LK
6	C	3.97E-5	0.12	MF-AR-CELL-LK,MF-VP-1-LK

Table 263: MF Cut Sets for Basic System w/ Bruce B Fault Rate

#	Case	Prob/Freq	Total %	Cut Set
Total		7.64E-1	100	Displaying 20 Cut Sets. (20 Original)
1	C	5.97E-1	78.06	MF-AIR-CELL-LK,MF-AR-CELL-LK
2	C	1.96E-1	25.59	MF-AR-CELL-LK,MF-FS-SV-1
3	C	1.96E-1	25.59	MF-AIR-CELL-LK,MF-FS-SV-3
4	C	6.41E-2	8.39	MF-FS-SV-1,MF-FS-SV-3
5	C	1.12E-2	1.46	MF-AR-CELL-LK,MF-LK-SV-1
6	C	1.12E-2	1.46	MF-AIR-CELL-LK,MF-LK-SV-3
7	C	3.67E-3	0.48	MF-FS-SV-3,MF-LK-SV-1
8	C	3.67E-3	0.48	MF-FS-SV-1,MF-LK-SV-3
9	C	1.62E-3	0.21	MF-AR-CELL-LK,MF-RP-SV-1
10	C	1.62E-3	0.21	MF-AIR-CELL-LK,MF-RP-SV-3
11	C	6.76E-4	0.09	MF-AR-CELL-LK,MF-VP-1-LK
12	C	5.32E-4	0.07	MF-FS-SV-3,MF-RP-SV-1
13	C	5.32E-4	0.07	MF-FS-SV-1,MF-RP-SV-3
14	C	2.22E-4	0.03	MF-FS-SV-3,MF-VP-1-LK
15	C	2.10E-4	0.03	MF-LK-SV-1,MF-LK-SV-3
16	C	3.04E-5	< 0.01	MF-LK-SV-3,MF-RP-SV-1
17	C	3.04E-5	< 0.01	MF-LK-SV-1,MF-RP-SV-3
18	C	1.27E-5	< 0.01	MF-LK-SV-3,MF-VP-1-LK
19	C	4.41E-6	< 0.01	MF-RP-SV-1,MF-RP-SV-3
20	C	1.84E-6	< 0.01	MF-RP-SV-3,MF-VP-1-LK

Table 264: MF Cut Sets for Basic System w/ Bruce B Fault Rate and SV_OL

#	Case	Prob/Freq	Total %	Cut Set
Total		6.01E-1	100	Displaying 6 Cut Sets. (6 Original)
1	C	5.97E-1	99.34	MF-AIR-CELL-LK,MF-AR-CELL-LK
2	C	4.58E-3	0.76	MF-AR-CELL-LK,MF-SV-1-FFD
3	C	4.58E-3	0.76	MF-AIR-CELL-LK,MF-FFD-SV-3
4	C	6.76E-4	0.11	MF-AR-CELL-LK,MF-VP-1-LK
5	C	3.52E-5	< 0.01	MF-FFD-SV-3,MF-SV-1-FFD
6	C	5.19E-6	< 0.01	MF-FFD-SV-3,MF-VP-1-LK

Table 265: MF Cut Sets for Basic System w/ Bruce B Fault Rate and SV_OM

#	Case	Prob/Freq	Total %	Cut Set
Total		8.10E-1	100	Displaying 6 Cut Sets. (6 Original)
1	C	5.97E-1	73.63	MF-AIR-CELL-LK,MF-AR-CELL-LK
2	C	2.68E-1	33.11	MF-AR-CELL-LK,MF-SV-1-FFD
3	C	2.68E-1	33.11	MF-AIR-CELL-LK,MF-FFD-SV-3
4	C	1.21E-1	14.89	MF-FFD-SV-3,MF-SV-1-FFD
5	C	6.76E-4	0.08	MF-AR-CELL-LK,MF-VP-1-LK
6	C	3.04E-4	0.04	MF-FFD-SV-3,MF-VP-1-LK

Table 266: MF Cut Sets for Basic System w/ Bruce B Fault Rate and SV_OH.

#	Case	Prob/Freq	Total %	Cut Set
Total		9.80E-1	100	Displaying 6 Cut Sets. (6 Original)
1	C	6.55E-1	66.76	MF-FFD-SV-3,MF-SV-1-FFD
2	C	6.25E-1	63.73	MF-AR-CELL-LK,MF-SV-1-FFD
3	C	6.25E-1	63.73	MF-AIR-CELL-LK,MF-FFD-SV-3
4	C	5.97E-1	60.85	MF-AIR-CELL-LK,MF-AR-CELL-LK
5	C	7.08E-4	0.07	MF-FFD-SV-3,MF-VP-1-LK
6	C	6.76E-4	0.07	MF-AR-CELL-LK,MF-VP-1-LK

Table 267: MF Cut Sets for Basic System w/ Bruce B Fault Rate and SV_DOW

#	Case	Prob/Freq	Total %	Cut Set
Total		6.01E-1	100	Displaying 6 Cut Sets. (6 Original)
1	C	5.97E-1	99.32	MF-AIR-CELL-LK,MF-AR-CELL-LK
2	C	4.74E-3	0.79	MF-AR-CELL-LK,MF-SV-1-FFD
3	C	4.74E-3	0.79	MF-AIR-CELL-LK,MF-FFD-SV-3
4	C	6.76E-4	0.11	MF-AR-CELL-LK,MF-VP-1-LK
5	C	3.76E-5	< 0.01	MF-FFD-SV-3,MF-SV-1-FFD
6	C	5.37E-6	< 0.01	MF-FFD-SV-3,MF-VP-1-LK

Table 268: MF Cut Sets for Basic System w/ Bruce B Fault Rate and SV_MAN

#	Case	Prob/Freq	Total %	Cut Set
Total		5.97E-1	100	Displaying 6 Cut Sets. (6 Original)
1	C	5.97E-1	99.94	MF-AIR-CELL-LK,MF-AR-CELL-LK
2	C	6.76E-4	0.11	MF-AR-CELL-LK,MF-VP-1-LK
3	C	1.15E-4	0.02	MF-AR-CELL-LK,MF-SV-1-FFD
4	C	1.15E-4	0.02	MF-AIR-CELL-LK,MF-FFD-SV-3
5	C	1.30E-7	< 0.01	MF-FFD-SV-3,MF-VP-1-LK
6	C	2.22E-8	< 0.01	MF-FFD-SV-3,MF-SV-1-FFD

Table 269: MF Cut Sets for Basic System w/ Bruce B Fault Rate and SV_NRPD

#	Case	Prob/Freq	Total %	Cut Set
Total		6.83E-1	100	Displaying 6 Cut Sets. (6 Original)
1	C	5.97E-1	87.32	MF-AIR-CELL-LK,MF-AR-CELL-LK
2	C	1.05E-1	15.39	MF-AR-CELL-LK,MF-SV-1-FFD
3	C	1.05E-1	15.39	MF-AIR-CELL-LK,MF-FFD-SV-3
4	C	1.85E-2	2.71	MF-FFD-SV-3,MF-SV-1-FFD
5	C	6.76E-4	0.10	MF-AR-CELL-LK,MF-VP-1-LK
6	C	1.19E-4	0.02	MF-FFD-SV-3,MF-VP-1-LK

Table 270: MF Cut Sets for Basic System w/ Bruce A Fault Rate

#	Case	Prob/Freq	Total %	Cut Set
Total		2.07E-1	100	Displaying 20 Cut Sets. (20 Original)
1	C	6.41E-2	30.95	MF-FS-SV-1,MF-FS-SV-3
2	C	5.20E-2	25.11	MF-AR-CELL-LK,MF-FS-SV-1
3	C	5.20E-2	25.11	MF-AIR-CELL-LK,MF-FS-SV-3
4	C	4.22E-2	20.37	MF-AIR-CELL-LK,MF-AR-CELL-LK
5	C	3.67E-3	1.77	MF-FS-SV-3,MF-LK-SV-1
6	C	3.67E-3	1.77	MF-FS-SV-1,MF-LK-SV-3
7	C	2.98E-3	1.44	MF-AR-CELL-LK,MF-LK-SV-1
8	C	2.98E-3	1.44	MF-AIR-CELL-LK,MF-LK-SV-3
9	C	5.32E-4	0.26	MF-FS-SV-3,MF-RP-SV-1
10	C	5.32E-4	0.26	MF-FS-SV-1,MF-RP-SV-3
11	C	4.32E-4	0.21	MF-AR-CELL-LK,MF-RP-SV-1
12	C	4.32E-4	0.21	MF-AIR-CELL-LK,MF-RP-SV-3
13	C	2.22E-4	0.11	MF-FS-SV-3,MF-VP-1-LK
14	C	2.10E-4	0.10	MF-LK-SV-1,MF-LK-SV-3
15	C	1.80E-4	0.09	MF-AR-CELL-LK,MF-VP-1-LK
16	C	3.04E-5	0.01	MF-LK-SV-3,MF-RP-SV-1
17	C	3.04E-5	0.01	MF-LK-SV-1,MF-RP-SV-3
18	C	1.27E-5	< 0.01	MF-LK-SV-3,MF-VP-1-LK
19	C	4.41E-6	< 0.01	MF-RP-SV-1,MF-RP-SV-3
20	C	1.84E-6	< 0.01	MF-RP-SV-3,MF-VP-1-LK

Table 271: MF Cut Sets for Basic System w/ Bruce A Fault Rate and SV_OL

#	Case	Prob/Freq	Total %	Cut Set
Total		4.48E-2	100	Displaying 6 Cut Sets. (6 Original)
1	C	4.22E-2	94.32	MF-AIR-CELL-LK,MF-AR-CELL-LK
2	C	1.22E-3	2.72	MF-AR-CELL-LK,MF-SV-1-FFD
3	C	1.22E-3	2.72	MF-AIR-CELL-LK,MF-FFD-SV-3
4	C	1.80E-4	0.40	MF-AR-CELL-LK,MF-VP-1-LK
5	C	3.52E-5	0.08	MF-FFD-SV-3,MF-SV-1-FFD
6	C	5.19E-6	0.01	MF-FFD-SV-3,MF-VP-1-LK

Table 272: MF Cut Sets for Basic System w/ Bruce A Fault Rate and SV_OM

#	Case	Prob/Freq	Total %	Cut Set
Total		2.74E-1	100	Displaying 6 Cut Sets. (6 Original)
1	C	1.21E-1	44.02	MF-FFD-SV-3,MF-SV-1-FFD
2	C	7.14E-2	26.04	MF-AR-CELL-LK,MF-SV-1-FFD
3	C	7.14E-2	26.04	MF-AIR-CELL-LK,MF-FFD-SV-3
4	C	4.22E-2	15.41	MF-AIR-CELL-LK,MF-AR-CELL-LK
5	C	3.04E-4	0.11	MF-FFD-SV-3,MF-VP-1-LK
6	C	1.80E-4	0.07	MF-AR-CELL-LK,MF-VP-1-LK

Table 273: MF Cut Sets for Basic System w/ Bruce A Fault Rate and SV_OH

#	Case	Prob/Freq	Total %	Cut Set
Total		7.70E-1	100	Displaying 6 Cut Sets. (6 Original)
1	C	6.55E-1	84.98	MF-FFD-SV-3,MF-SV-1-FFD
2	C	1.66E-1	21.58	MF-AR-CELL-LK,MF-SV-1-FFD
3	C	1.66E-1	21.58	MF-AIR-CELL-LK,MF-FFD-SV-3
4	C	4.22E-2	5.48	MF-AIR-CELL-LK,MF-AR-CELL-LK
5	C	7.08E-4	0.09	MF-FFD-SV-3,MF-VP-1-LK
6	C	1.80E-4	0.02	MF-AR-CELL-LK,MF-VP-1-LK

Table 274: MF Cut Sets for Basic System w/ Bruce A Fault Rate and SV_DOW

#	Case	Prob/Freq	Total %	Cut Set
Total		4.48E-2	100	Displaying 6 Cut Sets. (6 Original)
1	C	4.22E-2	94.15	MF-AIR-CELL-LK,MF-AR-CELL-LK
2	C	1.26E-3	2.81	MF-AR-CELL-LK,MF-SV-1-FFD
3	C	1.26E-3	2.81	MF-AIR-CELL-LK,MF-FFD-SV-3
4	C	1.80E-4	0.40	MF-AR-CELL-LK,MF-VP-1-LK
5	C	3.76E-5	0.08	MF-FFD-SV-3,MF-SV-1-FFD
6	C	5.37E-6	0.01	MF-FFD-SV-3,MF-VP-1-LK

Table 275: MF Cut Sets for Basic System w/ Bruce A Fault Rate and SV_MAN

#	Case	Prob/Freq	Total %	Cut Set
Total		4.24E-2	100	Displaying 6 Cut Sets. (6 Original)
1	C	4.22E-2	99.46	MF-AIR-CELL-LK,MF-AR-CELL-LK
2	C	1.80E-4	0.42	MF-AR-CELL-LK,MF-VP-1-LK
3	C	3.06E-5	0.07	MF-AR-CELL-LK,MF-SV-1-FFD
4	C	3.06E-5	0.07	MF-AIR-CELL-LK,MF-FFD-SV-3
5	C	1.30E-7	< 0.01	MF-FFD-SV-3,MF-VP-1-LK
6	C	2.22E-8	< 0.01	MF-FFD-SV-3,MF-SV-1-FFD

Table 276: MF Cut Sets for Basic System w/ Bruce A Fault Rate and SV_NRPD

#	Case	Prob/Freq	Total %	Cut Set
Total		1.12E-1	100	Displaying 6 Cut Sets. (6 Original)
1	C	4.22E-2	37.67	MF-AIR-CELL-LK,MF-AR-CELL-LK
2	C	2.80E-2	24.95	MF-AR-CELL-LK,MF-SV-1-FFD
3	C	2.80E-2	24.95	MF-AIR-CELL-LK,MF-FFD-SV-3
4	C	1.85E-2	16.53	MF-FFD-SV-3,MF-SV-1-FFD
5	C	1.80E-4	0.16	MF-AR-CELL-LK,MF-VP-1-LK
6	C	1.19E-4	0.11	MF-FFD-SV-3,MF-VP-1-LK

Table 277: MF Cut Sets for Extended System

#	Case	Prob/Freq	Total %	Cut Set
Total		1.61E-2	100	Displaying 124 Cut Sets. (124 Original)
1	C	4.11E-3	25.61	MF-SV-B-FS,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-FS
2	C	2.91E-3	18.12	MF-AIR-LK,MF-SV-D-FS,MF-SV-E-FS
3	C	2.91E-3	18.12	MF-AR-LK,MF-SV-B-FS,MF-SV-C-FS
4	C	2.06E-3	12.82	MF-AIR-LK,MF-AR-LK
5	C	5.73E-4	3.57	MF-SV-B-FS,MF-SV-C-FS,SV-D-E_CCF
6	C	5.73E-4	3.57	MF-SV-D-FS,MF-SV-E-FS,SV-B-C_CCF
7	C	4.06E-4	2.53	MF-AIR-LK,SV-D-E_CCF
8	C	4.06E-4	2.53	MF-AR-LK,SV-B-C_CCF
9	C	2.35E-4	1.47	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-FS
10	C	2.35E-4	1.47	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-FS
11	C	2.35E-4	1.47	MF-SV-B-FS,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-LK

#	Case	Prob/Freq	Total %	Cut Set
12	C	2.35E-4	1.47	MF-SV-B-FS,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-FS
13	C	1.67E-4	1.04	MF-AIR-LK,MF-SV-D-FS,MF-SV-E-LK
14	C	1.67E-4	1.04	MF-AIR-LK,MF-SV-D-LK,MF-SV-E-FS
15	C	1.67E-4	1.04	MF-AR-LK,MF-SV-B-FS,MF-SV-C-LK
16	C	1.67E-4	1.04	MF-AR-LK,MF-SV-B-LK,MF-SV-C-FS
17	C	7.99E-5	0.50	SV-B-C_CCF,SV-D-E_CCF
18	C	3.41E-5	0.21	MF-SV-B-FS,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-RP
19	C	3.41E-5	0.21	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-FS
20	C	3.41E-5	0.21	MF-SV-B-FS,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-FS
21	C	3.41E-5	0.21	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-FS
22	C	3.28E-5	0.20	MF-SV-B-LK,MF-SV-C-FS,SV-D-E_CCF
23	C	3.28E-5	0.20	MF-SV-B-FS,MF-SV-C-LK,SV-D-E_CCF
24	C	3.28E-5	0.20	MF-SV-D-LK,MF-SV-E-FS,SV-B-C_CCF
25	C	3.28E-5	0.20	MF-SV-D-FS,MF-SV-E-LK,SV-B-C_CCF
26	C	2.41E-5	0.15	MF-AIR-LK,MF-SV-D-FS,MF-SV-E-RP
27	C	2.41E-5	0.15	MF-AIR-LK,MF-SV-D-RP,MF-SV-E-FS
28	C	2.41E-5	0.15	MF-AR-LK,MF-SV-B-FS,MF-SV-C-RP
29	C	2.41E-5	0.15	MF-AR-LK,MF-SV-B-RP,MF-SV-C-FS
30	C	1.35E-5	0.08	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-FS
31	C	1.35E-5	0.08	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-LK
32	C	1.35E-5	0.08	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-FS
33	C	1.35E-5	0.08	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-FS
34	C	1.35E-5	0.08	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-LK
35	C	1.35E-5	0.08	MF-SV-B-FS,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-LK
36	C	1.01E-5	0.06	MF-AR-LK,MF-SV-A-FS,MF-VP-A-LK
37	C	9.53E-6	0.06	MF-AIR-LK,MF-SV-D-LK,MF-SV-E-LK
38	C	9.53E-6	0.06	MF-AR-LK,MF-SV-B-LK,MF-SV-C-LK
39	C	4.75E-6	0.03	MF-SV-B-RP,MF-SV-C-FS,SV-D-E_CCF
40	C	4.75E-6	0.03	MF-SV-B-FS,MF-SV-C-RP,SV-D-E_CCF
41	C	4.75E-6	0.03	MF-SV-D-RP,MF-SV-E-FS,SV-B-C_CCF

#	Case	Prob/Freq	Total %	Cut Set
42	C	4.75E-6	0.03	MF-SV-D-FS,MF-SV-E-RP,SV-B-C_CCF
43	C	1.95E-6	0.01	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-RP
44	C	1.95E-6	0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-FS
45	C	1.95E-6	0.01	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-FS
46	C	1.95E-6	0.01	MF-SV-B-FS,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-RP
47	C	1.95E-6	0.01	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-RP
48	C	1.95E-6	0.01	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-FS
49	C	1.95E-6	0.01	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-LK
50	C	1.95E-6	0.01	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-FS
51	C	1.95E-6	0.01	MF-SV-B-FS,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-LK
52	C	1.95E-6	0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-FS
53	C	1.95E-6	0.01	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-LK
54	C	1.95E-6	0.01	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-FS
55	C	1.88E-6	0.01	MF-SV-B-LK,MF-SV-C-LK,SV-D-E_CCF
56	C	1.88E-6	0.01	MF-SV-D-LK,MF-SV-E-LK,SV-B-C_CCF
57	C	1.38E-6	< 0.01	MF-AIR-LK,MF-SV-D-LK,MF-SV-E-RP
58	C	1.38E-6	< 0.01	MF-AIR-LK,MF-SV-D-RP,MF-SV-E-LK
59	C	1.38E-6	< 0.01	MF-AR-LK,MF-SV-B-LK,MF-SV-C-RP
60	C	1.38E-6	< 0.01	MF-AR-LK,MF-SV-B-RP,MF-SV-C-LK
61	C	7.71E-7	< 0.01	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-FS
62	C	7.71E-7	< 0.01	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-LK
63	C	7.71E-7	< 0.01	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-LK
64	C	7.71E-7	< 0.01	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-LK
65	C	5.76E-7	< 0.01	MF-AR-LK,MF-SV-A-LK,MF-VP-A-LK
66	C	2.83E-7	< 0.01	MF-SV-B-FS,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-RP

#	Case	Prob/Freq	Total %	Cut Set
67	C	2.83E-7	< 0.01	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-RP
68	C	2.83E-7	< 0.01	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-FS
69	C	2.83E-7	< 0.01	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-RP
70	C	2.83E-7	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-FS
71	C	2.83E-7	< 0.01	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-FS
72	C	2.72E-7	< 0.01	MF-SV-B-RP,MF-SV-C-LK,SV-D-E_CCF
73	C	2.72E-7	< 0.01	MF-SV-B-LK,MF-SV-C-RP,SV-D-E_CCF
74	C	2.72E-7	< 0.01	MF-SV-D-RP,MF-SV-E-LK,SV-B-C_CCF
75	C	2.72E-7	< 0.01	MF-SV-D-LK,MF-SV-E-RP,SV-B-C_CCF
76	C	2.00E-7	< 0.01	MF-AIR-LK,MF-SV-D-RP,MF-SV-E-RP
77	C	2.00E-7	< 0.01	MF-AR-LK,MF-SV-B-RP,MF-SV-C-RP
78	C	1.12E-7	< 0.01	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-RP
79	C	1.12E-7	< 0.01	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-RP
80	C	1.12E-7	< 0.01	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-FS
81	C	1.12E-7	< 0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-LK
82	C	1.12E-7	< 0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-FS
83	C	1.12E-7	< 0.01	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-LK
84	C	1.12E-7	< 0.01	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-RP
85	C	1.12E-7	< 0.01	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-LK
86	C	1.12E-7	< 0.01	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-LK
87	C	1.12E-7	< 0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-FS
88	C	1.12E-7	< 0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-LK
89	C	1.12E-7	< 0.01	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-LK
90	C	8.34E-8	< 0.01	MF-AR-LK,MF-SV-A-RP,MF-VP-A-LK

#	Case	Prob/Freq	Total %	Cut Set
91	C	4.41E-8	< 0.01	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-LK
92	C	3.94E-8	< 0.01	MF-SV-B-RP,MF-SV-C-RP,SV-D-E_CCF
93	C	3.94E-8	< 0.01	MF-SV-D-RP,MF-SV-E-RP,SV-B-C_CCF
94	C	1.62E-8	< 0.01	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-RP
95	C	1.62E-8	< 0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-RP
96	C	1.62E-8	< 0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-FS
97	C	1.62E-8	< 0.01	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-RP
98	C	1.62E-8	< 0.01	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-RP
99	C	1.62E-8	< 0.01	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-LK
100	C	1.62E-8	< 0.01	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-RP
101	C	1.62E-8	< 0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-RP
102	C	1.62E-8	< 0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-FS
103	C	1.62E-8	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-LK
104	C	1.62E-8	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-FS
105	C	1.62E-8	< 0.01	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-LK
106	C	6.39E-9	< 0.01	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-RP
107	C	6.39E-9	< 0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-LK
108	C	6.39E-9	< 0.01	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-LK
109	C	6.39E-9	< 0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-LK
110	C	2.35E-9	< 0.01	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-RP
111	C	2.35E-9	< 0.01	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-RP
112	C	2.35E-9	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-RP

#	Case	Prob/Freq	Total %	Cut Set
113	C	2.35E-9	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-FS
114	C	9.27E-10	< 0.01	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-RP
115	C	9.27E-10	< 0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-RP
116	C	9.27E-10	< 0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-LK
117	C	9.27E-10	< 0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-RP
118	C	9.27E-10	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-LK
119	C	9.27E-10	< 0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-LK
120	C	1.34E-10	< 0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-RP
121	C	1.34E-10	< 0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-RP
122	C	1.34E-10	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-RP
123	C	1.34E-10	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-LK
124	C	1.95E-11	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-RP

Table 278: MF Cut Sets for Extended System and SV_OL

#	Case	Prob/Freq	Total %	Cut Set
Total		2.06E-3	100	Displaying 10 Cut Sets. (10 Original)
1	C	2.06E-3	99.71	MF-AIR-LK,MF-AR-LK
2	C	1.60E-6	0.08	MF-AIR-LK,MF-SV-D-FFD,MF-SV-E-FFD
3	C	1.60E-6	0.08	MF-AR-LK,MF-SV-B-FFD,MF-SV-C-FFD
4	C	1.28E-6	0.06	MF-AIR-LK,SV-D-E_CCF
5	C	1.28E-6	0.06	MF-AR-LK,SV-B-C_CCF
6	C	2.36E-7	0.01	MF-AR-LK,MF-SV-A-FFD,MF-VP-A-LK
7	C	1.24E-9	< 0.01	MF-SV-B-FFD,MF-SV-C-FFD,MF-SV-D-FFD,MF-SV-E-FFD
8	C	9.93E-10	< 0.01	MF-SV-B-FFD,MF-SV-C-FFD,SV-D-E_CCF
9	C	9.93E-10	< 0.01	MF-SV-D-FFD,MF-SV-E-FFD,SV-B-C_CCF
10	C	7.97E-10	< 0.01	SV-B-C_CCF,SV-D-E_CCF

Table 279: MF Cut Sets for Extended System and SV_OM

#	Case	Prob/Freq	Total %	Cut Set
Total		2.73E-2	100	Displaying 10 Cut Sets. (10 Original)
1	C	1.45E-2	53.23	MF-SV-B-FFD,MF-SV-C-FFD,MF-SV-D-FFD,MF-SV-E-FFD
2	C	5.47E-3	20.02	MF-AIR-LK,MF-SV-D-FFD,MF-SV-E-FFD
3	C	5.47E-3	20.02	MF-AR-LK,MF-SV-B-FFD,MF-SV-C-FFD
4	C	2.06E-3	7.53	MF-AIR-LK,MF-AR-LK
5	C	1.38E-5	0.05	MF-AR-LK,MF-SV-A-FFD,MF-VP-A-LK
6	C	3.40E-6	0.01	MF-SV-B-FFD,MF-SV-C-FFD,SV-D-E_CCF
7	C	3.40E-6	0.01	MF-SV-D-FFD,MF-SV-E-FFD,SV-B-C_CCF
8	C	1.28E-6	< 0.01	MF-AIR-LK,SV-D-E_CCF
9	C	1.28E-6	< 0.01	MF-AR-LK,SV-B-C_CCF
10	C	7.97E-10	< 0.01	SV-B-C_CCF,SV-D-E_CCF

Table 280: MF Cut Sets for Extended System and SV_OH

#	Case	Prob/Freq	Total %	Cut Set
Total		4.63E-1	100	Displaying 10 Cut Sets. (10 Original)
1	C	4.28E-1	92.53	MF-SV-B-FFD,MF-SV-C-FFD,MF-SV-D-FFD,MF-SV-E-FFD
2	C	2.97E-2	6.41	MF-AIR-LK,MF-SV-D-FFD,MF-SV-E-FFD
3	C	2.97E-2	6.41	MF-AR-LK,MF-SV-B-FFD,MF-SV-C-FFD
4	C	2.06E-3	0.44	MF-AIR-LK,MF-AR-LK
5	C	3.21E-5	< 0.01	MF-AR-LK,MF-SV-A-FFD,MF-VP-A-LK
6	C	1.85E-5	< 0.01	MF-SV-B-FFD,MF-SV-C-FFD,SV-D-E_CCF
7	C	1.85E-5	< 0.01	MF-SV-D-FFD,MF-SV-E-FFD,SV-B-C_CCF
8	C	1.28E-6	< 0.01	MF-AIR-LK,SV-D-E_CCF
9	C	1.28E-6	< 0.01	MF-AR-LK,SV-B-C_CCF
10	C	7.97E-10	< 0.01	SV-B-C_CCF,SV-D-E_CCF

Table 281: MF Cut Sets for Extended System and SV_DOW

#	Case	Prob/Freq	Total %	Cut Set
Total		2.06E-3	100	Displaying 10 Cut Sets. (10 Original)
1	C	2.06E-3	99.70	MF-AIR-LK,MF-AR-LK
2	C	1.71E-6	0.08	MF-AIR-LK,MF-SV-D-FFD,MF-SV-E-FFD
3	C	1.71E-6	0.08	MF-AR-LK,MF-SV-B-FFD,MF-SV-C-FFD
4	C	1.28E-6	0.06	MF-AIR-LK,SV-D-E_CCF
5	C	1.28E-6	0.06	MF-AR-LK,SV-B-C_CCF
6	C	2.44E-7	0.01	MF-AR-LK,MF-SV-A-FFD,MF-VP-A-LK
7	C	1.41E-9	< 0.01	MF-SV-B-FFD,MF-SV-C-FFD,MF-SV-D-FFD,MF-SV-E-FFD
8	C	1.06E-9	< 0.01	MF-SV-B-FFD,MF-SV-C-FFD,SV-D-E_CCF
9	C	1.06E-9	< 0.01	MF-SV-D-FFD,MF-SV-E-FFD,SV-B-C_CCF
10	C	7.97E-10	< 0.01	SV-B-C_CCF,SV-D-E_CCF

Table 282: MF Cut Sets for Extended System and SV_MAN

#	Case	Prob/Freq	Total %	Cut Set
Total		2.06E-3	100	Displaying 9 Cut Sets. (9 Original)
1	C	2.06E-3	99.88	MF-AIR-LK,MF-AR-LK
2	C	1.28E-6	0.06	MF-AIR-LK,SV-D-E_CCF
3	C	1.28E-6	0.06	MF-AR-LK,SV-B-C_CCF
4	C	5.92E-9	< 0.01	MF-AR-LK,MF-SV-A-FFD,MF-VP-A-LK
5	C	1.01E-9	< 0.01	MF-AIR-LK,MF-SV-D-FFD,MF-SV-E-FFD
6	C	1.01E-9	< 0.01	MF-AR-LK,MF-SV-B-FFD,MF-SV-C-FFD
7	C	7.97E-10	< 0.01	SV-B-C_CCF,SV-D-E_CCF
8	C	6.26E-13	< 0.01	MF-SV-B-FFD,MF-SV-C-FFD,SV-D-E_CCF
9	C	6.26E-13	< 0.01	MF-SV-D-FFD,MF-SV-E-FFD,SV-B-C_CCF

Table 283: MF Cut Sets for Extended System and SV_NRPD

#	Case	Prob/Freq	Total %	Cut Set
Total		4.03E-3	100	Displaying 10 Cut Sets. (10 Original)
1	C	2.06E-3	51.03	MF-AIR-LK,MF-AR-LK
2	C	8.22E-4	20.37	MF-AIR-LK,MF-SV-D-FFD,MF-SV-E-FFD
3	C	8.22E-4	20.37	MF-AR-LK,MF-SV-B-FFD,MF-SV-C-FFD
4	C	3.28E-4	8.13	MF-SV-B-FFD,MF-SV-C-FFD,MF-SV-D-FFD,MF-SV-E-FFD
5	C	5.35E-6	0.13	MF-AR-LK,MF-SV-A-FFD,MF-VP-A-LK
6	C	1.28E-6	0.03	MF-AIR-LK,SV-D-E_CCF
7	C	1.28E-6	0.03	MF-AR-LK,SV-B-C_CCF
8	C	5.11E-7	0.01	MF-SV-B-FFD,MF-SV-C-FFD,SV-D-E_CCF
9	C	5.11E-7	0.01	MF-SV-D-FFD,MF-SV-E-FFD,SV-B-C_CCF
10	C	7.97E-10	< 0.01	SV-B-C_CCF,SV-D-E_CCF

Table 284: MF Cut Sets for Extended System w/ Bruce B Fault Rate

#	Case	Prob/Freq	Total %	Cut Set
Total		6.48E-1	100	Displaying 124 Cut Sets. (124 Original)
1	C	5.97E-1	92.09	MF-AIR-LK,MF-AR-LK
2	C	4.95E-2	7.65	MF-AIR-LK,MF-SV-D-FS,MF-SV-E-FS
3	C	4.95E-2	7.65	MF-AR-LK,MF-SV-B-FS,MF-SV-C-FS
4	C	6.90E-3	1.07	MF-AIR-LK,SV-D-E_CCF
5	C	6.90E-3	1.07	MF-AR-LK,SV-B-C_CCF
6	C	4.11E-3	0.63	MF-SV-B-FS,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-FS
7	C	2.83E-3	0.44	MF-AIR-LK,MF-SV-D-FS,MF-SV-E-LK
8	C	2.83E-3	0.44	MF-AIR-LK,MF-SV-D-LK,MF-SV-E-FS
9	C	2.83E-3	0.44	MF-AR-LK,MF-SV-B-FS,MF-SV-C-LK
10	C	2.83E-3	0.44	MF-AR-LK,MF-SV-B-LK,MF-SV-C-FS
11	C	5.73E-4	0.09	MF-SV-B-FS,MF-SV-C-FS,SV-D-E_CCF
12	C	5.73E-4	0.09	MF-SV-D-FS,MF-SV-E-FS,SV-B-C_CCF
13	C	4.11E-4	0.06	MF-AIR-LK,MF-SV-D-FS,MF-SV-E-RP
14	C	4.11E-4	0.06	MF-AIR-LK,MF-SV-D-RP,MF-SV-E-FS
15	C	4.11E-4	0.06	MF-AR-LK,MF-SV-B-FS,MF-SV-C-RP

#	Case	Prob/Freq	Total %	Cut Set
16	C	4.11E-4	0.06	MF-AR-LK,MF-SV-B-RP,MF-SV-C-FS
17	C	2.35E-4	0.04	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-FS
18	C	2.35E-4	0.04	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-FS
19	C	2.35E-4	0.04	MF-SV-B-FS,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-LK
20	C	2.35E-4	0.04	MF-SV-B-FS,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-FS
21	C	1.71E-4	0.03	MF-AR-LK,MF-SV-A-FS,MF-VP-A-LK
22	C	1.62E-4	0.03	MF-AIR-LK,MF-SV-D-LK,MF-SV-E-LK
23	C	1.62E-4	0.03	MF-AR-LK,MF-SV-B-LK,MF-SV-C-LK
24	C	7.99E-5	0.01	SV-B-C_CCF,SV-D-E_CCF
25	C	3.41E-5	< 0.01	MF-SV-B-FS,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-RP
26	C	3.41E-5	< 0.01	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-FS
27	C	3.41E-5	< 0.01	MF-SV-B-FS,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-FS
28	C	3.41E-5	< 0.01	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-FS
29	C	3.28E-5	< 0.01	MF-SV-B-LK,MF-SV-C-FS,SV-D-E_CCF
30	C	3.28E-5	< 0.01	MF-SV-B-FS,MF-SV-C-LK,SV-D-E_CCF
31	C	3.28E-5	< 0.01	MF-SV-D-LK,MF-SV-E-FS,SV-B-C_CCF
32	C	3.28E-5	< 0.01	MF-SV-D-FS,MF-SV-E-LK,SV-B-C_CCF
33	C	2.35E-5	< 0.01	MF-AIR-LK,MF-SV-D-LK,MF-SV-E-RP
34	C	2.35E-5	< 0.01	MF-AIR-LK,MF-SV-D-RP,MF-SV-E-LK
35	C	2.35E-5	< 0.01	MF-AR-LK,MF-SV-B-LK,MF-SV-C-RP
36	C	2.35E-5	< 0.01	MF-AR-LK,MF-SV-B-RP,MF-SV-C-LK
37	C	1.35E-5	< 0.01	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-FS
38	C	1.35E-5	< 0.01	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-LK
39	C	1.35E-5	< 0.01	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-FS
40	C	1.35E-5	< 0.01	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-FS
41	C	1.35E-5	< 0.01	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-LK
42	C	1.35E-5	< 0.01	MF-SV-B-FS,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-LK

#	Case	Prob/Freq	Total %	Cut Set
43	C	9.80E-6	< 0.01	MF-AR-LK,MF-SV-A-LK,MF-VP-A-LK
44	C	4.75E-6	< 0.01	MF-SV-B-RP,MF-SV-C-FS,SV-D-E_CCF
45	C	4.75E-6	< 0.01	MF-SV-B-FS,MF-SV-C-RP,SV-D-E_CCF
46	C	4.75E-6	< 0.01	MF-SV-D-RP,MF-SV-E-FS,SV-B-C_CCF
47	C	4.75E-6	< 0.01	MF-SV-D-FS,MF-SV-E-RP,SV-B-C_CCF
48	C	3.41E-6	< 0.01	MF-AIR-LK,MF-SV-D-RP,MF-SV-E-RP
49	C	3.41E-6	< 0.01	MF-AR-LK,MF-SV-B-RP,MF-SV-C-RP
50	C	1.95E-6	< 0.01	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-RP
51	C	1.95E-6	< 0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-FS
52	C	1.95E-6	< 0.01	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-FS
53	C	1.95E-6	< 0.01	MF-SV-B-FS,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-RP
54	C	1.95E-6	< 0.01	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-RP
55	C	1.95E-6	< 0.01	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-FS
56	C	1.95E-6	< 0.01	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-LK
57	C	1.95E-6	< 0.01	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-FS
58	C	1.95E-6	< 0.01	MF-SV-B-FS,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-LK
59	C	1.95E-6	< 0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-FS
60	C	1.95E-6	< 0.01	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-LK
61	C	1.95E-6	< 0.01	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-FS
62	C	1.88E-6	< 0.01	MF-SV-B-LK,MF-SV-C-LK,SV-D-E_CCF
63	C	1.88E-6	< 0.01	MF-SV-D-LK,MF-SV-E-LK,SV-B-C_CCF
64	C	1.42E-6	< 0.01	MF-AR-LK,MF-SV-A-RP,MF-VP-A-LK
65	C	7.71E-7	< 0.01	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-FS
66	C	7.71E-7	< 0.01	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-LK
67	C	7.71E-7	< 0.01	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-LK
68	C	7.71E-7	< 0.01	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-LK

#	Case	Prob/Freq	Total %	Cut Set
70	C	2.83E-7	< 0.01	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-RP
71	C	2.83E-7	< 0.01	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-FS
72	C	2.83E-7	< 0.01	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-RP
73	C	2.83E-7	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-FS
74	C	2.83E-7	< 0.01	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-FS
75	C	2.72E-7	< 0.01	MF-SV-B-RP,MF-SV-C-LK,SV-D-E_CCF
76	C	2.72E-7	< 0.01	MF-SV-B-LK,MF-SV-C-RP,SV-D-E_CCF
77	C	2.72E-7	< 0.01	MF-SV-D-RP,MF-SV-E-LK,SV-B-C_CCF
78	C	2.72E-7	< 0.01	MF-SV-D-LK,MF-SV-E-RP,SV-B-C_CCF
79	C	1.12E-7	< 0.01	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-RP
80	C	1.12E-7	< 0.01	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-RP
81	C	1.12E-7	< 0.01	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-FS
82	C	1.12E-7	< 0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-LK
83	C	1.12E-7	< 0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-FS
84	C	1.12E-7	< 0.01	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-LK
85	C	1.12E-7	< 0.01	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-RP
86	C	1.12E-7	< 0.01	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-LK
87	C	1.12E-7	< 0.01	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-LK
88	C	1.12E-7	< 0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-FS
89	C	1.12E-7	< 0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-LK
90	C	1.12E-7	< 0.01	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-LK
91	C	4.41E-8	< 0.01	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-LK
92	C	3.94E-8	< 0.01	MF-SV-B-RP,MF-SV-C-RP,SV-D-E_CCF
93	C	3.94E-8	< 0.01	MF-SV-D-RP,MF-SV-E-RP,SV-B-C_CCF

#	Case	Prob/Freq	Total %	Cut Set
94	C	1.62E-8	< 0.01	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-RP
95	C	1.62E-8	< 0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-RP
96	C	1.62E-8	< 0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-FS
97	C	1.62E-8	< 0.01	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-RP
98	C	1.62E-8	< 0.01	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-RP
99	C	1.62E-8	< 0.01	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-LK
100	C	1.62E-8	< 0.01	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-RP
101	C	1.62E-8	< 0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-RP
102	C	1.62E-8	< 0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-FS
103	C	1.62E-8	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-LK
104	C	1.62E-8	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-FS
105	C	1.62E-8	< 0.01	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-LK
106	C	6.39E-9	< 0.01	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-RP
107	C	6.39E-9	< 0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-LK
108	C	6.39E-9	< 0.01	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-LK
109	C	6.39E-9	< 0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-LK
110	C	2.35E-9	< 0.01	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-RP
111	C	2.35E-9	< 0.01	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-RP
112	C	2.35E-9	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-RP
113	C	2.35E-9	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-FS
114	C	9.27E-10	< 0.01	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-RP
115	C	9.27E-10	< 0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-RP

#	Case	Prob/Freq	Total %	Cut Set
116	C	9.27E-10	< 0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-LK
117	C	9.27E-10	< 0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-RP
118	C	9.27E-10	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-LK
119	C	9.27E-10	< 0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-LK
120	C	1.34E-10	< 0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-RP
121	C	1.34E-10	< 0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-RP
122	C	1.34E-10	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-RP
123	C	1.34E-10	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-LK
124	C	1.95E-11	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-RP

Table 285: MF Cut Sets for Extended System w/ Bruce B Fault Rate and SV_OL

#	Case	Prob/Freq	Total %	Cut Set
Total		5.97E-1	100	Displaying 10 Cut Sets. (10 Original)
1	C	5.97E-1	99.99	MF-AIR-LK,MF-AR-LK
2	C	2.72E-5	< 0.01	MF-AIR-LK,MF-SV-D-FFD,MF-SV-E-FFD
3	C	2.72E-5	< 0.01	MF-AR-LK,MF-SV-B-FFD,MF-SV-C-FFD
4	C	2.18E-5	< 0.01	MF-AIR-LK,SV-D-E_CCF
5	C	2.18E-5	< 0.01	MF-AR-LK,SV-B-C_CCF
6	C	4.01E-6	< 0.01	MF-AR-LK,MF-SV-A-FFD,MF-VP-A-LK
7	C	1.24E-9	< 0.01	MF-SV-B-FFD,MF-SV-C-FFD,MF-SV-D-FFD,MF-SV-E-FFD
8	C	9.93E-10	< 0.01	MF-SV-B-FFD,MF-SV-C-FFD,SV-D-E_CCF
9	C	9.93E-10	< 0.01	MF-SV-D-FFD,MF-SV-E-FFD,SV-B-C_CCF
10	C	7.97E-10	< 0.01	SV-B-C_CCF,SV-D-E_CCF

Table 286: MF Cut Sets for Extended System w/ Bruce B Fault Rate and SV_OM

#	Case	Prob/Freq	Total %	Cut Set
Total		6.73E-1	100	Displaying 10 Cut Sets. (10 Original)
1	C	5.97E-1	88.62	MF-AIR-LK,MF-AR-LK
2	C	9.32E-2	13.84	MF-AIR-LK,MF-SV-D-FFD,MF-SV-E-FFD
3	C	9.32E-2	13.84	MF-AR-LK,MF-SV-B-FFD,MF-SV-C-FFD
4	C	1.45E-2	2.16	MF-SV-B-FFD,MF-SV-C-FFD,MF-SV-D-FFD,MF-SV-E-FFD
5	C	2.35E-4	0.03	MF-AR-LK,MF-SV-A-FFD,MF-VP-A-LK
6	C	2.18E-5	< 0.01	MF-AIR-LK,SV-D-E_CCF
7	C	2.18E-5	< 0.01	MF-AR-LK,SV-B-C_CCF
8	C	3.40E-6	< 0.01	MF-SV-B-FFD,MF-SV-C-FFD,SV-D-E_CCF
9	C	3.40E-6	< 0.01	MF-SV-D-FFD,MF-SV-E-FFD,SV-B-C_CCF
10	C	7.97E-10	< 0.01	SV-B-C_CCF,SV-D-E_CCF

Table 287: MF Cut Sets for Extended System w/ Bruce B Fault Rate and SV_OH

#	Case	Prob/Freq	Total %	Cut Set
Total		9.44E-1	100	Displaying 10 Cut Sets. (10 Original)
1	C	5.97E-1	63.22	MF-AIR-LK,MF-AR-LK
2	C	5.06E-1	53.57	MF-AIR-LK,MF-SV-D-FFD,MF-SV-E-FFD
3	C	5.06E-1	53.57	MF-AR-LK,MF-SV-B-FFD,MF-SV-C-FFD
4	C	4.28E-1	45.40	MF-SV-B-FFD,MF-SV-C-FFD,MF-SV-D-FFD,MF-SV-E-FFD
5	C	5.47E-4	0.06	MF-AR-LK,MF-SV-A-FFD,MF-VP-A-LK
6	C	2.18E-5	< 0.01	MF-AIR-LK,SV-D-E_CCF
7	C	2.18E-5	< 0.01	MF-AR-LK,SV-B-C_CCF
8	C	1.85E-5	< 0.01	MF-SV-B-FFD,MF-SV-C-FFD,SV-D-E_CCF
9	C	1.85E-5	< 0.01	MF-SV-D-FFD,MF-SV-E-FFD,SV-B-C_CCF
10	C	7.97E-10	< 0.01	SV-B-C_CCF,SV-D-E_CCF

Table 288: MF Cut Sets for Extended System w/ Bruce B Fault Rate and SV_DOW

#	Case	Prob/Freq	Total %	Cut Set
Total		5.97E-1	100	Displaying 10 Cut Sets. (10 Original)
1	C	5.97E-1	99.99	MF-AIR-LK,MF-AR-LK
2	C	2.90E-5	< 0.01	MF-AIR-LK,MF-SV-D-FFD,MF-SV-E-FFD
3	C	2.90E-5	< 0.01	MF-AR-LK,MF-SV-B-FFD,MF-SV-C-FFD
4	C	2.18E-5	< 0.01	MF-AIR-LK,SV-D-E_CCF
5	C	2.18E-5	< 0.01	MF-AR-LK,SV-B-C_CCF
6	C	4.15E-6	< 0.01	MF-AR-LK,MF-SV-A-FFD,MF-VP-A-LK
7	C	1.41E-9	< 0.01	MF-SV-B-FFD,MF-SV-C-FFD,MF-SV-D-FFD,MF-SV-E-FFD
8	C	1.06E-9	< 0.01	MF-SV-B-FFD,MF-SV-C-FFD,SV-D-E_CCF
9	C	1.06E-9	< 0.01	MF-SV-D-FFD,MF-SV-E-FFD,SV-B-C_CCF
10	C	7.97E-10	< 0.01	SV-B-C_CCF,SV-D-E_CCF

Table 289: MF Cut Sets for Extended System w/ Bruce B Fault Rate and SV_MAN

#	Case	Prob/Freq	Total %	Cut Set
Total		5.97E-1	100	Displaying 9 Cut Sets. (9 Original)
1	C	5.97E-1	100.00	MF-AIR-LK,MF-AR-LK
2	C	2.18E-5	< 0.01	MF-AIR-LK,SV-D-E_CCF
3	C	2.18E-5	< 0.01	MF-AR-LK,SV-B-C_CCF
4	C	1.01E-7	< 0.01	MF-AR-LK,MF-SV-A-FFD,MF-VP-A-LK
5	C	1.71E-8	< 0.01	MF-AIR-LK,MF-SV-D-FFD,MF-SV-E-FFD
6	C	1.71E-8	< 0.01	MF-AR-LK,MF-SV-B-FFD,MF-SV-C-FFD
7	C	7.97E-10	< 0.01	SV-B-C_CCF,SV-D-E_CCF
8	C	6.26E-13	< 0.01	MF-SV-B-FFD,MF-SV-C-FFD,SV-D-E_CCF
9	C	6.26E-13	< 0.01	MF-SV-D-FFD,MF-SV-E-FFD,SV-B-C_CCF

Table 290: MF Cut Sets for Extended System w/ Bruce B Fault Rate and SV_NRPD

#	Case	Prob/Freq	Total %	Cut Set
Total		6.08E-1	100	Displaying 10 Cut Sets. (10 Original)
1	C	5.97E-1	98.13	MF-AIR-LK,MF-AR-LK
2	C	1.40E-2	2.30	MF-AIR-LK,MF-SV-D-FFD,MF-SV-E-FFD
3	C	1.40E-2	2.30	MF-AR-LK,MF-SV-B-FFD,MF-SV-C-FFD
4	C	3.28E-4	0.05	MF-SV-B-FFD,MF-SV-C-FFD,MF-SV-D-FFD,MF-SV-E-FFD
5	C	9.10E-5	0.01	MF-AR-LK,MF-SV-A-FFD,MF-VP-A-LK
6	C	2.18E-5	< 0.01	MF-AIR-LK,SV-D-E_CCF
7	C	2.18E-5	< 0.01	MF-AR-LK,SV-B-C_CCF
8	C	5.11E-7	< 0.01	MF-SV-B-FFD,MF-SV-C-FFD,SV-D-E_CCF
9	C	5.11E-7	< 0.01	MF-SV-D-FFD,MF-SV-E-FFD,SV-B-C_CCF
10	C	7.97E-10	< 0.01	SV-B-C_CCF,SV-D-E_CCF

Table 291: MF Cut Sets for Extended System w/ Bruce A Fault Rate

#	Case	Prob/Freq	Total %	Cut Set
Total		8.02E-2	100	Displaying 124 Cut Sets. (124 Original)
1	C	4.22E-2	52.61	MF-AIR-LK,MF-AR-LK
2	C	1.32E-2	16.42	MF-AIR-LK,MF-SV-D-FS,MF-SV-E-FS
3	C	1.32E-2	16.42	MF-AR-LK,MF-SV-B-FS,MF-SV-C-FS
4	C	4.11E-3	5.12	MF-SV-B-FS,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-FS
5	C	1.84E-3	2.29	MF-AIR-LK,SV-D-E_CCF
6	C	1.84E-3	2.29	MF-AR-LK,SV-B-C_CCF
7	C	7.54E-4	0.94	MF-AIR-LK,MF-SV-D-FS,MF-SV-E-LK
8	C	7.54E-4	0.94	MF-AIR-LK,MF-SV-D-LK,MF-SV-E-FS
9	C	7.54E-4	0.94	MF-AR-LK,MF-SV-B-FS,MF-SV-C-LK
10	C	7.54E-4	0.94	MF-AR-LK,MF-SV-B-LK,MF-SV-C-FS
11	C	5.73E-4	0.71	MF-SV-B-FS,MF-SV-C-FS,SV-D-E_CCF
12	C	5.73E-4	0.71	MF-SV-D-FS,MF-SV-E-FS,SV-B-C_CCF
13	C	2.35E-4	0.29	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-FS
14	C	2.35E-4	0.29	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-FS
15	C	2.35E-4	0.29	MF-SV-B-FS,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-LK
17	C	1.09E-4	0.14	MF-AIR-LK,MF-SV-D-FS,MF-SV-E-RP

#	Case	Prob/Freq	Total %	Cut Set
18	C	1.09E-4	0.14	MF-AIR-LK,MF-SV-D-RP,MF-SV-E-FS
19	C	1.09E-4	0.14	MF-AR-LK,MF-SV-B-FS,MF-SV-C-RP
20	C	1.09E-4	0.14	MF-AR-LK,MF-SV-B-RP,MF-SV-C-FS
21	C	7.99E-5	0.10	SV-B-C_CCF,SV-D-E_CCF
22	C	4.56E-5	0.06	MF-AR-LK,MF-SV-A-FS,MF-VP-A-LK
23	C	4.32E-5	0.05	MF-AIR-LK,MF-SV-D-LK,MF-SV-E-LK
24	C	4.32E-5	0.05	MF-AR-LK,MF-SV-B-LK,MF-SV-C-LK
25	C	3.41E-5	0.04	MF-SV-B-FS,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-RP
26	C	3.41E-5	0.04	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-FS
27	C	3.41E-5	0.04	MF-SV-B-FS,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-FS
28	C	3.41E-5	0.04	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-FS
29	C	3.28E-5	0.04	MF-SV-B-LK,MF-SV-C-FS,SV-D-E_CCF
30	C	3.28E-5	0.04	MF-SV-B-FS,MF-SV-C-LK,SV-D-E_CCF
31	C	3.28E-5	0.04	MF-SV-D-LK,MF-SV-E-FS,SV-B-C_CCF
32	C	3.28E-5	0.04	MF-SV-D-FS,MF-SV-E-LK,SV-B-C_CCF
33	C	1.35E-5	0.02	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-FS
34	C	1.35E-5	0.02	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-LK
35	C	1.35E-5	0.02	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-FS
36	C	1.35E-5	0.02	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-FS
37	C	1.35E-5	0.02	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-LK
38	C	1.35E-5	0.02	MF-SV-B-FS,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-LK
39	C	6.25E-6	< 0.01	MF-AIR-LK,MF-SV-D-LK,MF-SV-E-RP
40	C	6.25E-6	< 0.01	MF-AIR-LK,MF-SV-D-RP,MF-SV-E-LK
41	C	6.25E-6	< 0.01	MF-AR-LK,MF-SV-B-LK,MF-SV-C-RP
42	C	6.25E-6	< 0.01	MF-AR-LK,MF-SV-B-RP,MF-SV-C-LK
43	C	4.75E-6	< 0.01	MF-SV-B-RP,MF-SV-C-FS,SV-D-E_CCF
44	C	4.75E-6	< 0.01	MF-SV-B-FS,MF-SV-C-RP,SV-D-E_CCF
45	C	4.75E-6	< 0.01	MF-SV-D-RP,MF-SV-E-FS,SV-B-C_CCF
46	C	4.75E-6	< 0.01	MF-SV-D-FS,MF-SV-E-RP,SV-B-C_CCF
47	C	2.61E-6	< 0.01	MF-AR-LK,MF-SV-A-LK,MF-VP-A-LK
48	C	1.95E-6	< 0.01	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-RP

#	Case	Prob/Freq	Total %	Cut Set
49	C	1.95E-6	< 0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-FS
50	C	1.95E-6	< 0.01	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-FS
51	C	1.95E-6	< 0.01	MF-SV-B-FS,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-RP
52	C	1.95E-6	< 0.01	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-RP
53	C	1.95E-6	< 0.01	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-FS
54	C	1.95E-6	< 0.01	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-LK
55	C	1.95E-6	< 0.01	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-FS
56	C	1.95E-6	< 0.01	MF-SV-B-FS,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-LK
57	C	1.95E-6	< 0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-FS
58	C	1.95E-6	< 0.01	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-LK
59	C	1.95E-6	< 0.01	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-FS
60	C	1.88E-6	< 0.01	MF-SV-B-LK,MF-SV-C-LK,SV-D-E_CCF
61	C	1.88E-6	< 0.01	MF-SV-D-LK,MF-SV-E-LK,SV-B-C_CCF
62	C	9.06E-7	< 0.01	MF-AIR-LK,MF-SV-D-RP,MF-SV-E-RP
63	C	9.06E-7	< 0.01	MF-AR-LK,MF-SV-B-RP,MF-SV-C-RP
64	C	7.71E-7	< 0.01	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-FS
65	C	7.71E-7	< 0.01	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-LK
66	C	7.71E-7	< 0.01	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-LK
67	C	7.71E-7	< 0.01	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-LK
68	C	3.78E-7	< 0.01	MF-AR-LK,MF-SV-A-RP,MF-VP-A-LK
69	C	2.83E-7	< 0.01	MF-SV-B-FS,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-RP
70	C	2.83E-7	< 0.01	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-FS,MF-SV-E-RP
71	C	2.83E-7	< 0.01	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-FS
72	C	2.83E-7	< 0.01	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-RP

#	Case	Prob/Freq	Total %	Cut Set
73	C	2.83E-7	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-FS
74	C	2.83E-7	< 0.01	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-FS
75	C	2.72E-7	< 0.01	MF-SV-B-RP,MF-SV-C-LK,SV-D-E_CCF
76	C	2.72E-7	< 0.01	MF-SV-B-LK,MF-SV-C-RP,SV-D-E_CCF
77	C	2.72E-7	< 0.01	MF-SV-D-RP,MF-SV-E-LK,SV-B-C_CCF
78	C	2.72E-7	< 0.01	MF-SV-D-LK,MF-SV-E-RP,SV-B-C_CCF
79	C	1.12E-7	< 0.01	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-RP
80	C	1.12E-7	< 0.01	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-RP
81	C	1.12E-7	< 0.01	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-FS
82	C	1.12E-7	< 0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-LK
83	C	1.12E-7	< 0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-FS
84	C	1.12E-7	< 0.01	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-LK
85	C	1.12E-7	< 0.01	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-RP
86	C	1.12E-7	< 0.01	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-LK
87	C	1.12E-7	< 0.01	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-LK
88	C	1.12E-7	< 0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-FS
89	C	1.12E-7	< 0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-LK
90	C	1.12E-7	< 0.01	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-LK
91	C	4.41E-8	< 0.01	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-LK
92	C	3.94E-8	< 0.01	MF-SV-B-RP,MF-SV-C-RP,SV-D-E_CCF
93	C	3.94E-8	< 0.01	MF-SV-D-RP,MF-SV-E-RP,SV-B-C_CCF
94	C	1.62E-8	< 0.01	MF-SV-B-FS,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-RP
95	C	1.62E-8	< 0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-FS,MF-SV-E-RP
96	C	1.62E-8	< 0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-FS
97	C	1.62E-8	< 0.01	MF-SV-B-LK,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-RP

#	Case	Prob/Freq	Total %	Cut Set
98	C	1.62E-8	< 0.01	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-LK,MF-SV-E-RP
99	C	1.62E-8	< 0.01	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-LK
100	C	1.62E-8	< 0.01	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-RP
101	C	1.62E-8	< 0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-RP
102	C	1.62E-8	< 0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-FS
103	C	1.62E-8	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-LK
104	C	1.62E-8	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-FS
105	C	1.62E-8	< 0.01	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-LK
106	C	6.39E-9	< 0.01	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-RP
107	C	6.39E-9	< 0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-LK
108	C	6.39E-9	< 0.01	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-LK
109	C	6.39E-9	< 0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-LK
110	C	2.35E-9	< 0.01	MF-SV-B-RP,MF-SV-C-FS,MF-SV-D-RP,MF-SV-E-RP
111	C	2.35E-9	< 0.01	MF-SV-B-FS,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-RP
112	C	2.35E-9	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-FS,MF-SV-E-RP
113	C	2.35E-9	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-FS
114	C	9.27E-10	< 0.01	MF-SV-B-LK,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-RP
115	C	9.27E-10	< 0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-LK,MF-SV-E-RP
116	C	9.27E-10	< 0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-LK
117	C	9.27E-10	< 0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-RP
118	C	9.27E-10	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-LK
119	C	9.27E-10	< 0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-LK

#	Case	Prob/Freq	Total %	Cut Set
120	C	1.34E-10	< 0.01	MF-SV-B-RP,MF-SV-C-LK,MF-SV-D-RP,MF-SV-E-RP
121	C	1.34E-10	< 0.01	MF-SV-B-LK,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-RP
122	C	1.34E-10	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-LK,MF-SV-E-RP
123	C	1.34E-10	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-LK
124	C	1.95E-11	< 0.01	MF-SV-B-RP,MF-SV-C-RP,MF-SV-D-RP,MF-SV-E-RP

Table 292: MF Cut Sets for Extended System w/ Bruce A Fault Rate and SV_OL

#	Case	Prob/Freq	Total %	Cut Set
Total		4.22E-2	100	Displaying 10 Cut Sets. (10 Original)
1	C	4.22E-2	99.94	MF-AIR-LK,MF-AR-LK
2	C	7.23E-6	0.02	MF-AIR-LK,MF-SV-D-FFD,MF-SV-E-FFD
3	C	7.23E-6	0.02	MF-AR-LK,MF-SV-B-FFD,MF-SV-C-FFD
4	C	5.80E-6	0.01	MF-AIR-LK,SV-D-E_CCF
5	C	5.80E-6	0.01	MF-AR-LK,SV-B-C_CCF
6	C	1.07E-6	< 0.01	MF-AR-LK,MF-SV-A-FFD,MF-VP-A-LK
7	C	1.24E-9	< 0.01	MF-SV-B-FFD,MF-SV-C-FFD,MF-SV-D-FFD,MF-SV-E-FFD
8	C	9.93E-10	< 0.01	MF-SV-B-FFD,MF-SV-C-FFD,SV-D-E_CCF
9	C	9.93E-10	< 0.01	MF-SV-D-FFD,MF-SV-E-FFD,SV-B-C_CCF
10	C	7.97E-10	< 0.01	SV-B-C_CCF,SV-D-E_CCF

Table 293: MF Cut Sets for Extended System w/ Bruce A Fault Rate and SV_OM

#	Case	Prob/Freq	Total %	Cut Set
Total		1.02E-1	100	Displaying 10 Cut Sets. (10 Original)
1	C	4.22E-2	41.22	MF-AIR-LK,MF-AR-LK
2	C	2.48E-2	24.20	MF-AIR-LK,MF-SV-D-FFD,MF-SV-E-FFD
3	C	2.48E-2	24.20	MF-AR-LK,MF-SV-B-FFD,MF-SV-C-FFD
4	C	1.45E-2	14.20	MF-SV-B-FFD,MF-SV-C-FFD,MF-SV-D-FFD,MF-SV-E-FFD
5	C	6.25E-5	0.06	MF-AR-LK,MF-SV-A-FFD,MF-VP-A-LK
6	C	5.80E-6	< 0.01	MF-AIR-LK,SV-D-E_CCF
7	C	5.80E-6	< 0.01	MF-AR-LK,SV-B-C_CCF
8	C	3.40E-6	< 0.01	MF-SV-B-FFD,MF-SV-C-FFD,SV-D-E_CCF
9	C	3.40E-6	< 0.01	MF-SV-D-FFD,MF-SV-E-FFD,SV-B-C_CCF
10	C	7.97E-10	< 0.01	SV-B-C_CCF,SV-D-E_CCF

Table 294: MF Cut Sets for Extended System w/ Bruce A Fault Rate and SV_OH

#	Case	Prob/Freq	Total %	Cut Set
Total		5.90E-1	100	Displaying 10 Cut Sets. (10 Original)
1	C	4.28E-1	72.62	MF-SV-B-FFD,MF-SV-C-FFD,MF-SV-D-FFD,MF-SV-E-FFD
2	C	1.34E-1	22.80	MF-AIR-LK,MF-SV-D-FFD,MF-SV-E-FFD
3	C	1.34E-1	22.80	MF-AR-LK,MF-SV-B-FFD,MF-SV-C-FFD
4	C	4.22E-2	7.16	MF-AIR-LK,MF-AR-LK
5	C	1.46E-4	0.02	MF-AR-LK,MF-SV-A-FFD,MF-VP-A-LK
6	C	1.85E-5	< 0.01	MF-SV-B-FFD,MF-SV-C-FFD,SV-D-E_CCF
7	C	1.85E-5	< 0.01	MF-SV-D-FFD,MF-SV-E-FFD,SV-B-C_CCF
8	C	5.80E-6	< 0.01	MF-AIR-LK,SV-D-E_CCF
9	C	5.80E-6	< 0.01	MF-AR-LK,SV-B-C_CCF
10	C	7.97E-10	< 0.01	SV-B-C_CCF,SV-D-E_CCF

Table 295: MF Cut Sets for Extended System w/ Bruce A Fault Rate and SV_DOW

#	Case	Prob/Freq	Total %	Cut Set
Total		4.22E-2	100	Displaying 10 Cut Sets. (10 Original)
1	C	4.22E-2	99.94	MF-AIR-LK,MF-AR-LK
2	C	7.72E-6	0.02	MF-AIR-LK,MF-SV-D-FFD,MF-SV-E-FFD
3	C	7.72E-6	0.02	MF-AR-LK,MF-SV-B-FFD,MF-SV-C-FFD
4	C	5.80E-6	0.01	MF-AIR-LK,SV-D-E_CCF
5	C	5.80E-6	0.01	MF-AR-LK,SV-B-C_CCF
6	C	1.10E-6	< 0.01	MF-AR-LK,MF-SV-A-FFD,MF-VP-A-LK
7	C	1.41E-9	< 0.01	MF-SV-B-FFD,MF-SV-C-FFD,MF-SV-D-FFD,MF-SV-E-FFD
8	C	1.06E-9	< 0.01	MF-SV-B-FFD,MF-SV-C-FFD,SV-D-E_CCF
9	C	1.06E-9	< 0.01	MF-SV-D-FFD,MF-SV-E-FFD,SV-B-C_CCF
10	C	7.97E-10	< 0.01	SV-B-C_CCF,SV-D-E_CCF

Table 296: MF Cut Sets for Extended System w/ Bruce A Fault Rate and SV_MAN

#	Case	Prob/Freq	Total %	Cut Set
Total		4.22E-2	100	Displaying 9 Cut Sets. (9 Original)
1	C	4.22E-2	99.97	MF-AIR-LK,MF-AR-LK
2	C	5.80E-6	0.01	MF-AIR-LK,SV-D-E_CCF
3	C	5.80E-6	0.01	MF-AR-LK,SV-B-C_CCF
4	C	2.68E-8	< 0.01	MF-AR-LK,MF-SV-A-FFD,MF-VP-A-LK
5	C	4.56E-9	< 0.01	MF-AIR-LK,MF-SV-D-FFD,MF-SV-E-FFD
6	C	4.56E-9	< 0.01	MF-AR-LK,MF-SV-B-FFD,MF-SV-C-FFD
7	C	7.97E-10	< 0.01	SV-B-C_CCF,SV-D-E_CCF
8	C	6.26E-13	< 0.01	MF-SV-B-FFD,MF-SV-C-FFD,SV-D-E_CCF
9	C	6.26E-13	< 0.01	MF-SV-D-FFD,MF-SV-E-FFD,SV-B-C_CCF

Table 297: MF Cut Sets for Extended System w/ Bruce A Fault Rate and SV_NRPD

#	Case	Prob/Freq	Total %	Cut Set
Total		4.97E-2	100	Displaying 10 Cut Sets. (10 Original)
1	C	4.22E-2	84.98	MF-AIR-LK,MF-AR-LK
2	C	3.72E-3	7.49	MF-AIR-LK,MF-SV-D-FFD,MF-SV-E-FFD
3	C	3.72E-3	7.49	MF-AR-LK,MF-SV-B-FFD,MF-SV-C-FFD
4	C	3.28E-4	0.66	MF-SV-B-FFD,MF-SV-C-FFD,MF-SV-D-FFD,MF-SV-E-FFD
5	C	2.42E-5	0.05	MF-AR-LK,MF-SV-A-FFD,MF-VP-A-LK
6	C	5.80E-6	0.01	MF-AIR-LK,SV-D-E_CCF
7	C	5.80E-6	0.01	MF-AR-LK,SV-B-C_CCF
8	C	5.11E-7	< 0.01	MF-SV-B-FFD,MF-SV-C-FFD,SV-D-E_CCF
9	C	5.11E-7	< 0.01	MF-SV-D-FFD,MF-SV-E-FFD,SV-B-C_CCF
10	C	7.97E-10	< 0.01	SV-B-C_CCF,SV-D-E_CCF