

# Regulatory Effectiveness of the Station Blackout Rule

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**APPENDIX B**

**PLANT-SPECIFIC STATION BLACKOUT INFORMATION  
BY REACTOR TYPE AND OPERATING STATUS**

**Plant-Specific Station Blackout Information by Reactor Type and Operating Status**

**Table B-1 Operating pressurized-water reactors**

| Plant                       | Plant CDF | SBO CDF  | Percent SBO CDF of Plant CDF | Coping time in hours/EDG reliability/Aac access time in minutes/ extremely severe weather | Modification summary including dc load shed procedural modifications | SBO factors                         |   |         |      |  |          |
|-----------------------------|-----------|----------|------------------------------|---|--|-------------------------------------|---|---------|------|--|----------|
|                             |           |          |                              |   |  | PRA LOOP initiating event frequency | Number of LOOP events at power since commercial operation |         |      | LOOP event recovery times $\geq$ 240 minutes |          |
|                             |           |          |                              |   |  |                                     | Plant   | Weather | Grid | Power  | Shutdown |
| Arkansas Nuclear One Unit 1 | 4.67E-05  | 1.58E-05 | 33.8                         | 4/95/10/1   | Added 1 DG and crosstie  | 3.58E-02                            | 2   | 1       |      |  |          |
| Arkansas Nuclear One Unit 2 | 3.40E-05  | 1.23E-06 | 3.6                          | 4/95/10/1   | Added crosstie   | 5.84E-02                            | 1   | 1       |      |  |          |
| Beaver Valley Unit 1        | 2.14E-04  | 6.51E-05 | 30.4                         | 4/975/60/1  | Added crosstie   | 6.64E-02                            | 2   |         |      |  |          |
| Beaver Valley Unit 2        | 1.92E-04  | 4.86E-05 | 25.3                         | 4/975/60/1  | Added crosstie   | 7.44E-02                            | 1   |         |      |  |          |
| Braidwood Units 1&2         | 2.74E-05  | 6.20E-06 | 22.6                         | 4/95/10/1   |  | 4.53E-02                            | 2   |         |      |  |          |
| Bryon Units 1&2             | 3.09E-05  | 4.30E-06 | 13.9                         | 4/95/10/1   |  | 4.43E-02                            |   |         |      |  |          |
| Callaway                    | 5.85E-05  | 1.80E-05 | 30.8                         | 4/975/-/1   |  | 4.60E-02                            |   |         |      |  |          |
| Calvert Cliffs Units 1&2    | 2.40E-04  | 8.32E-06 | 3.4                          | 4/975/60/4  | Added 1 EDG and one 1 DG   | 1.36E-01                            | 3   |         |      |  |          |
| Catawba Units 1&2           | 5.80E-05  | 6.0E-07  | 10.3                         | 4/95/10/1   |  | 2.0E-03                             | 1   |         |      | 330  |          |
| Comanche Peak Units 1&2     | 5.72E-05  | 1.5E-05  | 26.2                         | 4/95/-/1  |  |                                     |   |         |      |  |          |

The battery capacity for each reactor is the first number provided in the 5th column of this table. For Arkansas Nuclear One Unit 1, the battery capacity is 4 hours. The fourth column shows fraction of overall risk from reactor core damage that station blackout represents. For example, station blackout represents 33.8% of the risk of reactor core damage at Arkansas Nuclear One Unit 1. NOTE: These risk values only consider the hazard of reactor core damage. The hazard of spent fuel pool accidents is neglected here.

**Plant-Specific Station Blackout Information by Reactor Type and Operating Status**

**Table B-1 Operating pressurized-water reactors (Cont.)**

| Plant                   | Plant CDF | SBO CDF  | Percent SBO CDF of Plant CDF | Coping time in hours/EDG reliability/Aac access time in minutes/ extremely severe weather | Modification summary including dc load shed procedural modifications | SBO factors                         |   |         |      |   |            |
|-------------------------|-----------|----------|------------------------------|---|--|-------------------------------------|---|---------|------|---|------------|
|                         |           |          |                              |   |  | PRA LOOP initiating event frequency | Number of LOOP events at power since commercial operation |         |      | LOOP event recovery times ≥ 240 minutes |            |
|                         |           |          |                              |   |  |                                     | Plant   | Weather | Grid | Power                                   | Shutdown   |
| Crystal River Unit 3    | 1.53E-05  | 3.28E-06 | 21.5                         | 4/.975/-/4  | dc load shed. Added nonclass 1E battery                              | 4.35E-01                            | 3   |         |      |   |            |
| Davis-Besse             | 6.6E-05   | 3.50E-05 | 53                           | 4/.95/10/2  | Added 1 DG   | 3.50E-02                            | 2   | 1       |      | 1680                                    |            |
| DC Cook Units 1&2       | 6.2E-05   | 1.13E-05 | 18.1                         | 4/.975/-/2  | dc load shed   | 4.0E-02                             | 1   |         |      |   |            |
| Diablo Canyon Units 1&2 | 8.8E-05   | 5.0E-06  | 5.68                         | 4/.95/-/1   | Added 1 DG   | 9.1E-02                             | 1   |         |      |   | 261<br>917 |
| Farley Units 1&2        | 1.3E-04   | 1.22E-05 | 9.4                          | 4/.95/10/3  | Service water to Aac, auto load shedding                             | 4.70E-02                            | 2   |         |      |   |            |
| Fort Calhoun            | 1.36E-05  | NA       | -                            | 4/.95/-/2   | DC load shed   | 2.17E-01                            | 2   |         |      |   |            |
| Ginna                   | 8.74E-05  | 1.0E-06  | 1.14                         | 4/.975/-/1  |  | 3.50E-03                            | 4   |         |      |   |            |
| Harris                  | 7.0E-05   | 1.71E-05 | 24.4                         | 4/.95/-/3   | Lighting in several areas, ladder to isolation valve                 |                                     |   |         |      |   |            |
| Indian Point Unit 2     | 3.13E-05  | 4.47E-06 | 14.3                         | 8/.95/60/2  | Added a DG for gas turbine auxiliaries                               | 6.91E-02                            | 2   |         | 3    | 390                                     |            |

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**Table B-1 Operating pressurized-water reactors (Cont.)**

| Plant                   | Plant CDF | SBO CDF  | Percent SBO CDF of Plant CDF | Coping time in hours/EDG reliability/Aac access time in minutes/ extremely severe weather | Modification summary including dc load shed procedural modifications | SBO factors                         |   |         |      |   |          |
|-------------------------|-----------|----------|------------------------------|---|--|-------------------------------------|---|---------|------|---|----------|
|                         |           |          |                              |   |  | PRA LOOP initiating event frequency | Number of LOOP events at power since commercial operation |         |      | LOOP event recovery times ≥ 240 minutes |          |
|                         |           |          |                              |   |  |                                     | Plant   | Weather | Grid | Power                                   | Shutdown |
| Indian Point Unit 3     | 4.40E-05  | 4.80E-06 | 10.9                         | 8/95/60/2   |  | 6.80E-02                            | 1   |         |      |   |          |
| Kewaunee                | 6.6E-05   | 2.64E-05 | 40                           | 4/95/60/2   | Cross-tie to nonsafety power source                                  | 4.4E-02                             |   |         |      |   |          |
| McGuire Units 1&2       | 4.0E-05   | 9.26E-06 | 23.3                         | 4/95/10/1   |  | 7.0E-02                             | 3   |         |      |   |          |
| Millstone Unit 2        | 3.42E-05  | 1.0E-10  | NMN                          | 8/975/60/5  | Upgraded unit 1-2 crosstie   | 9.10E-02                            | 1   | 1       |      | 330                                     |          |
| Millstone Unit 3        | 5.61E-05  | 5.10E-06 | 6                            | 8/975/60/5  | Added DG   | 1.12E-01                            |   |         |      |   |          |
| North Anna Units 1&2    | 7.16E-05  | 8.0E-06  | 11.2                         | 4/95/60/4   | Added DG, switchgear, crosstie                                       | 1.14E-02                            |   |         |      |   |          |
| Oconee Units 1, 2&3     | 2.3E-05   | 2.57E-06 | 11.2                         | 4/975/10/1  |  | 9.0E-02                             | 2   |         |      |   |          |
| Palisades               | 5.07E-05  | 9.10E-06 | 17.9                         | 4/95/-/1  | DC load shed, compressed air for ADVs                                | 3.0E-02                             | 3   |         |      | 388                                     |          |
| Palo Verde Units 1, 2&3 | 9.0E-05   | 1.91E-05 | 21.2                         | 4/95/10/2   | Added 2 gas turbines   | 7.83E-02                            | 3   |         |      | 1138                                    |          |
| Point Beach Units 1&2   | 1.15E-04  | 1.51E-05 | 13.1                         | 4/975/60/2  | Gas turbine modifications  | 6.10E-02                            | 4   |         |      |   |          |

**Plant-Specific Station Blackout Information by Reactor Type and Operating Status**

**Table B-1 Operating pressurized-water reactors (Cont.)**

| Plant                    | Plant CDF | SBO CDF  | Percent SBO CDF of Plant CDF | Coping time in hours/EDG reliability/Aac access time in minutes/ extremely severe weather | Modification summary including dc load shed procedural modifications | SBO factors                         |   |         |      |   |          |
|--------------------------|-----------|----------|------------------------------|---|--|-------------------------------------|---|---------|------|---|----------|
|                          |           |          |                              |   |  | PRA LOOP initiating event frequency | Number of LOOP events at power since commercial operation |         |      | LOOP event recovery times ≥ 240 minutes |          |
|                          |           |          |                              |   |  |                                     | Plant   | Weather | Grid | Power                                   | Shutdown |
| Prairie Island Units 1&2 | 5.05E-05  | 3.1E-06  | 6.14                         | 4/.975/10/3   | Added 2 EDGs   | -                                   | 1   | 2       |      | 296<br>296                              |          |
| Robinson Unit 2          | 3.20E-04  | 2.6E-05  | 8.13                         | 8/.95/60/4  | Modified conduit supports in switchgear room                         | 6.1E-02                             | 2   |         |      | 454                                     |          |
| Salem Unit 1             | 5.20E-05  | 2.10E-05 | 40.4                         | 4/.975/-/2  | EDG compressed air mod   | 6.0E-02                             | 1   |         |      |   |          |
| Salem Unit 2             | 5.5E-05   | 1.70E-05 | 30.9                         | 4/.975/-/2  | EDG compressed air mod   | 6.0E-02                             | 2   |         |      | 655                                     | 1675     |
| San Onofre Units 2&3     | 3.0E-05   | 2.0E-06  | 6.67                         | 4/.95/-/1   | DC load shed and crosstie  | 1.1E-01                             |   |         | 2    |   |          |
| St. Lucie Unit 1         | 2.30E-05  | 2.65E-06 | 11.5                         | 4/.975/10/5   | Added crosstie   | 1.5E-01                             | 1   |         | 3    |   |          |
| St. Lucie Unit 2         | 2.62E-05  | 2.64E-06 | 10.1                         | 4/.975/10/5   | Added crosstie   | 1.5E-01                             |   |         |      |   |          |
| Seabrook                 | 6.86E-05  | 1.53E-05 | 22.3                         | 4/.975/-/3  | DC load shed   | 4.93E-02                            |   |         |      |   |          |
| Sequoyah Units 1&2       | 1.70E-04  | 5.32E-06 | 3.2                          | 4/.975/-/2  | DC load shed, added air supply                                       | 5.16E-03                            | 2   |         |      |   |          |

**Plant-Specific Station Blackout Information by Reactor Type and Operating Status**

**Table B-1 Operating pressurized-water reactors (Cont.)**

| Plant                    | Plant CDF | SBO CDF  | Percent SBO CDF of Plant CDF | Coping time in hours/EDG reliability/Aac access time in minutes/ extremely severe weather | Modification summary including dc load shed procedural modifications | SBO factors                         |   |         |      |   |          |
|--------------------------|-----------|----------|------------------------------|---|--|-------------------------------------|---|---------|------|---|----------|
|                          |           |          |                              |   |  | PRA LOOP initiating event frequency | Number of LOOP events at power since commercial operation |         |      | LOOP event recovery times ≥ 240 minutes |          |
|                          |           |          |                              |   |  |                                     | Plant   | Weather | Grid | Power                                   | Shutdown |
| Summer                   | 2.0E-04   | 4.9E-05  | 24.5                         | 4/95/-/3  | DC load shed, battery mod  | 7.3E-02                             |   |         | 1    |   |          |
| South Texas Units 1&2    | 4.3E-05   | 1.46E-05 | 34.9                         | 4/975/10/5  | Procedural cross-tie   |                                     |   |         |      |   |          |
| Surry Units 1&2          | 1.25E-04  | 8.09E-06 | 6.47                         | 4/975/10/4  | Added DG   | 7.69E-02                            |   |         |      |   |          |
| Three Mile Island Unit 1 | 4.49E-04  | 1.57E-05 | 3.5                          | 4/975/10/3  | Modifications to existing DGs  | 5.68E-02                            |   |         |      |   |          |
| Turkey Point Units 3&4   | 3.73E-04  | 4.70E-06 | 1.2                          | 8/95/10/5   | Added 2 EDGs and cross-tie   | 1.7E-01                             | 4   | 2       | 7    | 7950<br>7908                            | 335      |
| Vogtle Units 1&2         | 4.9E-05   | 4.4E-07  | 11                           | 4/95/-/2  | Added 5 circuit breakers and lighting                                | 6.6E-04                             |   |         |      |   |          |
| Waterford Unit 3         | 1.80E-05  | 6.24E-06 | 34.7                         | 4/975/-/4   | DC load shed. Added portable air compressors for EDGs                | 3.6E-02                             |   |         |      |   |          |
| Watts Bar Unit 1         | 8.0E-05   | 1.73E-05 | 21.6                         | 4/975/-/7/1   |  | 3.64E-02                            |   |         |      |   |          |
| Wolf Creek               | 4.2E-05   | 1.88E-05 | 44.8                         | 4/95/-/1  |  | 5.12E-02                            |   |         |      |   |          |

**Plant-Specific Station Blackout Information by Reactor Type and Operating Status**

**Table B-2 Operating boiling-water reactors**

| Plant                  | Plant CDF | SBO CDF  | Percent SBO CDF of Plant CDF | Coping time in hours/EDG reliability/Aac access time in minutes/ extremely severe weather | Modification summary including dc load shed procedural modifications | SBO factors                         |   |         |      |   |             |
|------------------------|-----------|----------|------------------------------|---|--|-------------------------------------|---|---------|------|---|-------------|
|                        |           |          |                              |   |  | PRA LOOP initiating event frequency | Number of LOOP events at power since commercial operation |         |      | LOOP event recovery times ≥ 240 minutes |             |
|                        |           |          |                              |   |  |                                     | Plant   | Weather | Grid | Power                                   | Shutdown    |
| Browns Ferry Units 2&3 | 4.80E-05  | 1.30E-05 | 27                           | 4/.95/-/1   | dc load shed   | 1.12E-01                            |   |         |      |   |             |
| Brunswick Units 1&2    | 2.70E-05  | 1.80E-05 | 66.7                         | 4/.975/60/5   | Modified controls for existing crosstie                              | 7.40E-02                            | 3   |         |      |   | 1508<br>814 |
| Clinton                | 2.66E-05  | 9.8E-06  | 36.8                         | 4/.95/10/1  | Added gas fans for selected room cooling                             | 8.40E-02                            |   |         |      |   |             |
| Cooper                 | 7.97E-05  | 2.77E-05 | 34.8                         | 4/.95/-/2   |  | 3.50E-02                            |   |         |      |   |             |
| Dresden Units 2&3      | 1.8E-05   | 9.30E-07 | 5.03                         | 4/.95/60/2  | Added 2 DGs  | 1.12E-01                            | 3   | 1       |      | 240                                     |             |
| Duane Arnold           | 7.84E-06  | 1.90E-06 | 24.2                         | 4/.975/-/2  | dc load shed, RCIC insulation & main control room lighting           | 1.17E-01                            |   |         | 1    |   |             |
| Fermi                  | 5.70E-06  | 1.3E-07  | NMN                          | 4/.95/60/1  |  | 1.88E-01                            |   |         |      |   |             |
| FitzPatrick            | 1.92E-06  | 1.75E-06 | NMN                          | 4/.95/-/1   | dc load shed, instrumentation and power supply mods                  | 5.70E-02                            |   |         |      |   |             |
| Grand Gulf             | 1.77E-05  | 7.46E-06 | 36.8                         | 4/.95/-/2   | dc load shed   | 6.80E-02                            |   |         |      |   |             |



**Plant-Specific Station Blackout Information by Reactor Type and Operating Status**

**Table B-2 Operating boiling-water reactors (Cont.)**

| Plant                  | Plant CDF | SBO CDF  | Percent SBO CDF of Plant CDF | Coping time in hours/EDG reliability/Aac access time in minutes/ extremely severe weather | Modification summary including dc load shed procedural modifications | SBO factors                         |   |         |      |   |          |
|------------------------|-----------|----------|------------------------------|---|--|-------------------------------------|---|---------|------|---|----------|
|                        |           |          |                              |   |  | PRA LOOP initiating event frequency | Number of LOOP events at power since commercial operation |         |      | LOOP event recovery times ≥ 240 minutes |          |
|                        |           |          |                              |   |  |                                     | Plant   | Weather | Grid | Power                                   | Shutdown |
| Hatch Unit 1           | 2.23E-05  | 3.30E-06 | 14.8                         | 4/95/60/2   | Replaced battery chargers  | 2.20E-02                            |   |         |      |   |          |
| Hatch Unit 2           | 2.36E-05  | 3.23E-06 | 13.7                         | 4/95/60/2   | Replaced battery chargers  | 2.20E-02                            |   |         |      |   |          |
| Hope Creek             | 4.63E-05  | 3.38E-05 | 73                           | 4/95/-/2  | Valve modifications  | 3.4E-02                             |   |         |      |   |          |
| LaSalle Units 1&2      | 4.74E-05  | 3.82E-05 | 80.6                         | 4/975/-/1   | dc load shed, New batteries  | 9.60E-02                            | 1   |         |      |   |          |
| Limerick Units 1&2     | 4.30E-06  | 1.0E-07  | NMN                          | 4/95/60/3   | Upgraded cross-ties  | 5.9E-02                             |   |         |      |   |          |
| Monticello             | 2.60E-05  | 1.20E-05 | 46.2                         | 4/95/-/1  | dc load shed   | 7.90E-02                            |   |         |      |   |          |
| Nine Mile Point Unit 1 | 5.50E-06  | 3.50E-06 | NMN                          | 4/975/-/1   | dc load shed, added two safety related batteries                     | 5.00E-02                            | 4   |         |      | 595                                     |          |
| Nine Mile Point Unit 2 | 3.10E-05  | 5.50E-06 | 17.7                         | 4/975/-/1   | dc load shed   | 1.20E-01                            |   |         |      |   |          |

**Plant-Specific Station Blackout Information by Reactor Type and Operating Status**

**Table B-2 Operating boiling-water reactors (Cont.)**

| Plant                           | Plant CDF | SBO CDF  | Percent SBO CDF of Plant CDF | Coping time in hours/EDG reliability/Aac access time in minutes/ extremely severe weather | Modification summary including dc load shed procedural modifications | SBO factors                         |   |         |      |   |             |
|---------------------------------|-----------|----------|------------------------------|---|--|-------------------------------------|---|---------|------|---|-------------|
|                                 |           |          |                              |   |  | PRA LOOP initiating event frequency | Number of LOOP events at power since commercial operation |         |      | LOOP event recovery times ≥ 240 minutes |             |
|                                 |           |          |                              |   |  |                                     | Plant   | Weather | Grid | Power                                   | Shutdown    |
| Oyster Creek                    | 3.90E-06  | 2.30E-06 | NMN                          | 4/.975/60/1   | Added crosstie & reactor pressure indication                         | 3.26E-02                            | 3   |         |      |   | 240         |
| Peach Bottom Units 2 & 3        | 5.53E-06  | 4.81E-07 | 8.7                          | 8/.975/60/3   | Cross-tie to hydro unit  | 5.9E-02                             |   |         |      |   |             |
| Perry                           | 1.30E-05  | 2.25E-06 | 43.4                         | 4/.95/10/1  | Replaced selected cables   | 6.09E-02                            |   |         |      |   |             |
| Pilgrim                         | 5.80E-05  | 1.0E-10  | NMN                          | 8/.975/10/4   | Alarms to line-up Aac  | 6.17E-01                            | 1   | 5       |      |   | 1263<br>534 |
| Quad Cities Units 1&2           | 1.2E-06   | 5.72E-07 | NMN                          | 4/.95/60/1  | Added 2 DGs  | 4.81E-02                            | 2   |         |      |   |             |
| River Bend                      | 1.55E-05  | 1.35E-05 | 87.5                         | 4/.95/-/2   | Minor structural mod   | 3.50E-02                            | 1   |         |      |   |             |
| Susquehanna Units 1&2           | 1.7E-05   | 4.2E-11  | NMN                          | 4/.975/-/2  | dc load shed   | -                                   | 1   |         |      |   |             |
| Vermont Yankee                  | 4.30E-06  | 9.17E-07 | 21.3                         | 8/.975/10/4   | Modified incoming line and controls                                  | 1.0E-01                             | 2   |         |      | 277                                     |             |
| Washington Nuclear Plant Unit 2 | 1.73E-05  | 1.07E-05 | 61.1                         | 4/.95/-/1   | dc load shed, replaced inverters                                     | 2.46E-02                            |   |         |      |   |             |

**Plant-Specific Station Blackout Information By Reactor Type and Operating Status**

**Table B-3 Reactors no longer operating**

| Plant               | Plant CDF | SBO CDF  | Percent SBO CDF of Plant CDF | Coping time in hours/EDG reliability/Aac access time in minutes/ extremely severe weather | Modification summary including dc load shed procedural modifications | SBO factors                         |   |         |      |   |          |
|---------------------|-----------|----------|------------------------------|---|--|-------------------------------------|---|---------|------|---|----------|
|                     |           |          |                              |   |  | PRA LOOP initiating event frequency | Number of LOOP events at power since commercial operation |         |      | LOOP event recovery times > 240 minutes |          |
|                     |           |          |                              |   |  |                                     | Plant   | Weather | Grid | Power                                   | Shutdown |
| Big Rock Point      | 5.40E-05  | 5.10E-07 | NMN                          | 4/.95/-/1   | DC load shed, added crosstie   | 2.8E-01                             |   |         |      |   |          |
| Browns Ferry Unit 1 | 4.80E-05  | 1.30E-05 | 27                           | 4/.95/-/1   |  | 1.12E-01                            |   |         |      |   |          |
| Haddam Neck         | 1.90E-04  | 8.70E-06 | 4.46                         | 4/.95/-/2   | Fuel system for gas water pump                                       | 9.0E-02                             | 5   |         |      |   |          |
| Maine Yankee        | 7.40E-05  | 1.11E-05 | 15                           | 4/.975/60/3   |  | 5.0E-02                             | 1   |         |      |   |          |
| Millstone Unit 1    | 1.13E-05  | 7.00E-06 | 62                           | 8/.975/60/5   | Upgraded crosstie  |                                     | 1   | 2       |      | 300                                     |          |
| Zion Units 1&2      | 4.0E-06   | 4.4E-07  | NMN                          | 4/.95/10/1  |  | 4.60E-02                            | 1   |         |      |   |          |