# Appendix

Table A1. IEEE topology, node to node list.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| From | to | From | to | From | to | From | to | From | to | From | to | From | to | From | to |
| 1 | 2 | 24 | 72 | 49 | 51 | 70 | 75 | 94 | 100 | 99 | 119 | 29 | 119 | 82 | 119 |
| 1 | 3 | 25 | 27 | 49 | 54 | 71 | 72 | 95 | 96 | 113 | 119 | 85 | 119 | 32 | 119 |
| 2 | 12 | 26 | 25 | 49 | 66 | 71 | 73 | 96 | 97 | 116 | 119 | 16 | 119 | 34 | 119 |
| 3 | 5 | 26 | 30 | 49 | 69 | 74 | 75 | 98 | 100 | 120 | 89 | 112 | 119 | 18 | 119 |
| 3 | 12 | 27 | 28 | 50 | 57 | 75 | 77 | 99 | 100 | 108 | 119 | 39 | 119 | 77 | 119 |
| 4 | 5 | 27 | 32 | 51 | 52 | 75 | 118 | 100 | 101 | 102 | 119 | 46 | 119 | 27 | 119 |
| 4 | 11 | 27 | 115 | 51 | 58 | 76 | 77 | 100 | 103 | 23 | 119 | 67 | 119 | 55 | 119 |
| 5 | 6 | 28 | 29 | 52 | 53 | 76 | 118 | 100 | 104 | 120 | 87 | 107 | 119 | 92 | 119 |
| 5 | 11 | 29 | 31 | 53 | 54 | 77 | 78 | 100 | 106 | 109 | 119 | 4 | 119 | 70 | 119 |
| 6 | 7 | 30 | 17 | 54 | 55 | 77 | 80 | 101 | 102 | 114 | 119 | 94 | 119 | 74 | 119 |
| 7 | 12 | 30 | 38 | 54 | 56 | 77 | 82 | 103 | 104 | 22 | 119 | 36 | 119 | 76 | 119 |
| 8 | 5 | 31 | 32 | 54 | 59 | 78 | 79 | 103 | 105 | 17 | 119 | 105 | 119 | 11 | 119 |
| 8 | 9 | 32 | 113 | 55 | 56 | 79 | 80 | 103 | 110 | 84 | 119 | 35 | 119 | 78 | 119 |
| 8 | 30 | 32 | 114 | 55 | 59 | 80 | 96 | 104 | 105 | 57 | 119 | 118 | 119 | 62 | 119 |
| 9 | 10 | 33 | 37 | 56 | 57 | 80 | 97 | 105 | 106 | 58 | 119 | 13 | 119 | 60 | 119 |
| 11 | 12 | 34 | 36 | 56 | 58 | 80 | 98 | 105 | 107 | 93 | 119 | 47 | 119 | 90 | 119 |
| 11 | 13 | 34 | 37 | 56 | 59 | 80 | 99 | 105 | 108 | 14 | 119 | 98 | 119 | 56 | 119 |
| 12 | 14 | 34 | 43 | 59 | 60 | 81 | 80 | 106 | 107 | 21 | 119 | 120 | 46 | 120 | 54 |
| 12 | 16 | 35 | 36 | 59 | 61 | 82 | 83 | 108 | 109 | 97 | 119 | 41 | 119 | 49 | 119 |
| 12 | 117 | 35 | 37 | 60 | 61 | 82 | 96 | 109 | 110 | 44 | 119 | 42 | 119 | 15 | 119 |
| 13 | 15 | 37 | 39 | 60 | 62 | 83 | 84 | 110 | 111 | 28 | 119 | 100 | 119 | 54 | 119 |
| 14 | 15 | 37 | 40 | 61 | 62 | 83 | 85 | 110 | 112 | 50 | 119 | 96 | 119 | 80 | 119 |
| 15 | 17 | 38 | 37 | 62 | 66 | 84 | 85 | 114 | 115 | 51 | 119 | 104 | 119 | 120 | 12 |
| 15 | 19 | 38 | 65 | 62 | 67 | 85 | 86 | 5 | 119 | 20 | 119 | 3 | 119 | 120 | 59 |
| 15 | 33 | 39 | 40 | 63 | 59 | 85 | 88 | 8 | 119 | 43 | 119 | 66 | 119 | 120 | 61 |
| 16 | 17 | 40 | 41 | 63 | 64 | 85 | 89 | 9 | 119 | 52 | 119 | 79 | 119 | 120 | 25 |
| 17 | 18 | 40 | 42 | 64 | 61 | 86 | 87 | 24 | 119 | 7 | 119 | 110 | 119 | 59 | 119 |
| 17 | 31 | 41 | 42 | 64 | 65 | 88 | 89 | 30 | 119 | 120 | 31 | 120 | 111 | 120 | 100 |
| 17 | 113 | 42 | 49 | 65 | 66 | 89 | 90 | 37 | 119 | 2 | 119 | 95 | 119 | 120 | 26 |
| 18 | 19 | 43 | 44 | 65 | 68 | 89 | 92 | 38 | 119 | 40 | 119 | 31 | 119 | 120 | 65 |
| 19 | 20 | 44 | 45 | 66 | 67 | 90 | 91 | 63 | 119 | 48 | 119 | 106 | 119 | 120 | 66 |
| 19 | 34 | 45 | 46 | 68 | 69 | 91 | 92 | 64 | 119 | 83 | 119 | 19 | 119 | 120 | 10 |
| 20 | 21 | 45 | 49 | 68 | 81 | 92 | 93 | 68 | 119 | 117 | 119 | 12 | 119 | 120 | 80 |
| 21 | 22 | 46 | 47 | 68 | 116 | 92 | 94 | 69 | 119 | 86 | 119 | 75 | 119 |  |  |
| 22 | 23 | 46 | 48 | 69 | 70 | 92 | 100 | 71 | 119 | 101 | 119 | 88 | 119 |  |  |
| 23 | 24 | 47 | 49 | 69 | 75 | 92 | 102 | 72 | 119 | 115 | 119 | 120 | 103 |  |  |
| 23 | 25 | 47 | 69 | 69 | 77 | 93 | 94 | 73 | 119 | 33 | 119 | 1 | 119 |  |  |
| 23 | 32 | 48 | 49 | 70 | 71 | 94 | 95 | 81 | 119 | 53 | 119 | 6 | 119 |  |  |
| 24 | 70 | 49 | 50 | 70 | 74 | 94 | 96 | 91 | 119 | 103 | 119 | 45 | 119 |  |  |

Table A2. Nodes that act as generator and their corresponding values.

|  |  |  |  |
| --- | --- | --- | --- |
| Node | Gen | Node | Gen |
| 10 | 477 | 65 | 392 |
| 12 | 155 | 66 | 450 |
| 25 | 252 | 80 | 607 |
| 26 | 391 | 87 | 7 |
| 31 | 19 | 89 | 0 |
| 46 | 36 | 100 | 314 |
| 54 | 85 | 103 | 48 |
| 59 | 160 | 111 | 40 |
| 61 | 220 |  |  |

Table A3. Nodes that act as load and their corresponding values.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Node | Load | Node | Load | Node | Load | Node | Load | Node | Load |
| 1 | 51 | 29 | 9 | 54 | 113 | 82 | 54 | 108 | 2 |
| 2 | 20 | 30 | 0 | 55 | 63 | 83 | 20 | 109 | 8 |
| 3 | 39 | 31 | 43 | 56 | 84 | 84 | 11 | 110 | 39 |
| 4 | 30 | 32 | 59 | 57 | 12 | 85 | 24 | 112 | 25 |
| 5 | 0 | 33 | 23 | 58 | 12 | 86 | 21 | 113 | 0 |
| 6 | 52 | 34 | 59 | 60 | 78 | 88 | 48 | 114 | 8 |
| 7 | 19 | 35 | 33 | 62 | 77 | 89 | 277 | 115 | 22 |
| 8 | 0 | 36 | 31 | 63 | 0 | 90 | 78 | 116 | 0 |
| 9 | 0 | 37 | 0 | 64 | 0 | 91 | 0 | 117 | 20 |
| 11 | 70 | 38 | 0 | 66 | 39 | 92 | 65 | 118 | 33 |

Table A4. EDE for each load node and system, for each restoration strategy (= 1).

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Strategy | | | | | |  | Strategy | | | | | |
| Node | 1 | 2 | 3 | 4 | 5 | 6 | Node | 1 | 2 | 3 | 4 | 5 | 6 |
| 9 | 0.38 | 0.64 | 0.64 | 0.17 | 0.17 | 0.38 | 67 | 0.64 | 0.63 | 0.63 | 0.64 | 0.63 | 0.63 |
| 24 | 0.38 | 0.38 | 0.17 | 0.38 | 0.38 | 0.17 | 107 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 |
| 38 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | 94 | 0.38 | 0.17 | 0.38 | 0.64 | 0.38 | 0.38 |
| 71 | 0.38 | 0.38 | 0.17 | 0.38 | 0.38 | 0.17 | 36 | 0.46 | 0.70 | 0.70 | 0.31 | 0.51 | 0.70 |
| 72 | 0.38 | 0.38 | 0.17 | 0.38 | 0.38 | 0.17 | 105 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 |
| 73 | 0.38 | 0.38 | 0.17 | 0.38 | 0.38 | 0.17 | 118 | 0.38 | 0.38 | 0.38 | 0.38 | 0.64 | 0.64 |
| 91 | 0.17 | 0.17 | 0.38 | 0.38 | 0.38 | 0.38 | 98 | 0.64 | 0.38 | 0.64 | 1.00 | 0.64 | 0.64 |
| 108 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 41 | 0.38 | 0.38 | 0.17 | 0.17 | 0.17 | 0.17 |
| 102 | 0.17 | 0.17 | 0.38 | 0.38 | 0.38 | 0.38 | 42 | 0.38 | 0.38 | 0.17 | 0.17 | 0.38 | 0.38 |
| 109 | 0.27 | 0.27 | 0.27 | 0.27 | 0.27 | 0.27 | 96 | 0.58 | 0.32 | 0.38 | 0.64 | 0.38 | 0.38 |
| 114 | 0.38 | 0.38 | 0.17 | 0.17 | 0.17 | 0.17 | 104 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 |
| 84 | 0.17 | 0.17 | 0.17 | 0.38 | 0.38 | 0.17 | 66 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 |
| 57 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | 95 | 0.38 | 0.17 | 0.38 | 0.64 | 0.38 | 0.38 |
| 58 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | 31 | 0.72 | 0.85 | 0.85 | 0.61 | 0.61 | 0.72 |
| 93 | 0.28 | 0.17 | 0.38 | 0.52 | 0.38 | 0.38 | 106 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 |
| 97 | 0.55 | 0.30 | 0.55 | 0.88 | 0.55 | 0.55 | 75 | 0.64 | 0.38 | 0.38 | 0.64 | 0.64 | 0.64 |
| 44 | 0.38 | 0.64 | 0.64 | 0.38 | 0.64 | 0.64 | 88 | 0.17 | 0.17 | 0.17 | 0.35 | 0.35 | 0.17 |
| 28 | 0.38 | 0.64 | 0.64 | 0.17 | 0.17 | 0.38 | 45 | 0.48 | 0.71 | 0.71 | 0.48 | 0.71 | 0.71 |
| 50 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | 82 | 0.38 | 0.38 | 0.36 | 0.38 | 0.38 | 0.36 |
| 43 | 0.38 | 0.64 | 0.64 | 0.38 | 0.64 | 0.64 | 34 | 0.38 | 0.64 | 0.64 | 0.38 | 0.64 | 0.64 |
| 40 | 0.38 | 0.38 | 0.17 | 0.17 | 0.38 | 0.38 | 27 | 0.38 | 0.64 | 0.64 | 0.17 | 0.17 | 0.38 |
| 83 | 0.17 | 0.17 | 0.17 | 0.38 | 0.38 | 0.17 | 92 | 0.17 | 0.17 | 0.38 | 0.38 | 0.38 | 0.38 |
| 86 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 70 | 0.50 | 0.38 | 0.33 | 0.50 | 0.39 | 0.34 |
| 101 | 0.17 | 0.17 | 0.38 | 0.38 | 0.38 | 0.38 | 74 | 0.64 | 0.38 | 0.38 | 0.64 | 0.64 | 0.64 |
| 115 | 0.38 | 0.38 | 0.17 | 0.17 | 0.17 | 0.17 | 76 | 0.39 | 0.59 | 0.59 | 0.39 | 0.65 | 0.65 |
| 29 | 0.34 | 0.91 | 1.33 | 0.17 | 0.17 | 0.69 | 62 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 |
| 85 | 0.17 | 0.17 | 0.17 | 0.38 | 0.38 | 0.17 | 90 | 0.17 | 0.17 | 0.38 | 0.38 | 0.38 | 0.38 |
| 112 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 | 0.17 |  |  |  |  |  |  |  |
| 39 | 0.38 | 0.38 | 0.17 | 0.17 | 0.38 | 0.38 | **System** | 0.76 | 0.77 | 0.78 | 0.77 | 0.78 | **0.79** |