



Power System Contingencies to Evaluate FLISR Systems

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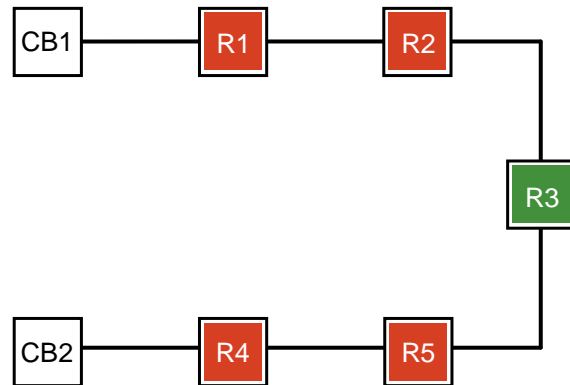
Today's agenda

- Quick overview of FLISR
- Test setup scenarios
- Stakeholders
- Results



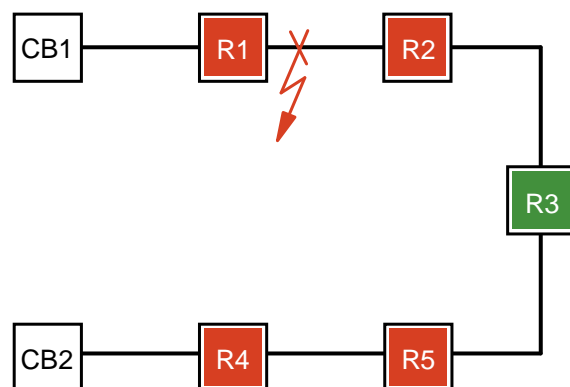
Centralized FLISR operating sequence

1. Identify fault and activate protection
2. Locate fault
3. Isolate fault
4. Determine maximal restoration
5. Restore service



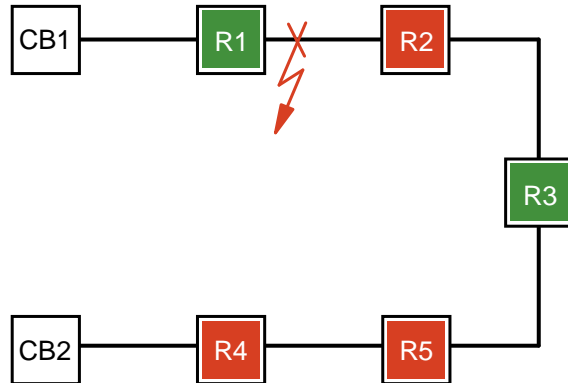
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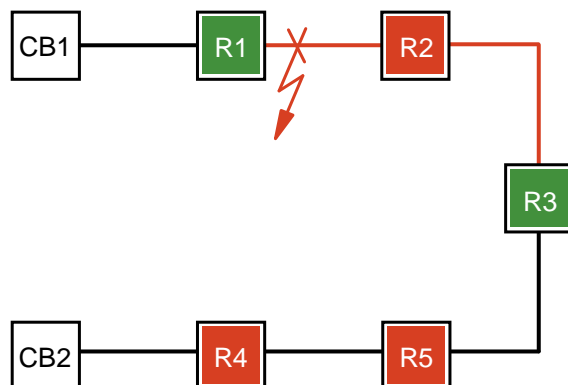
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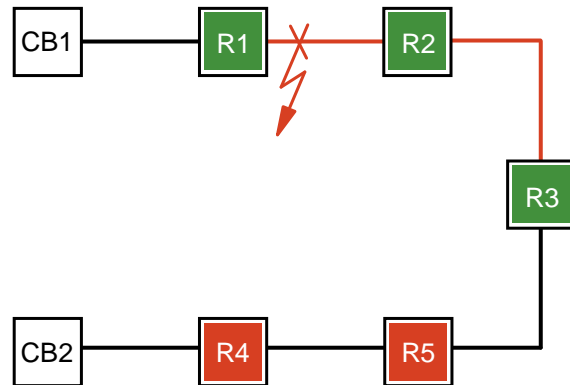
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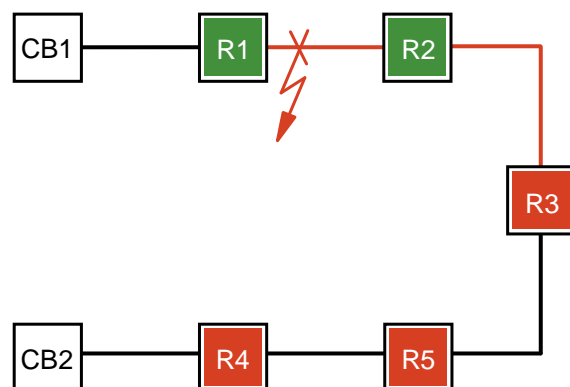
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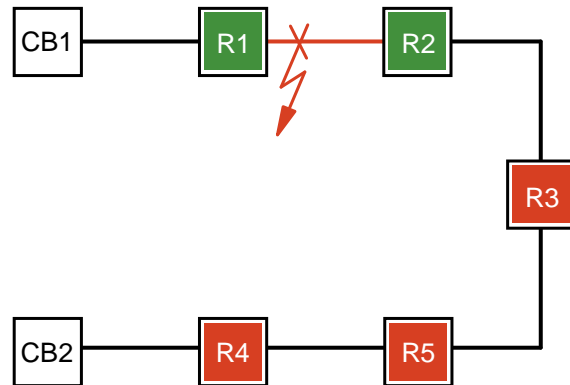
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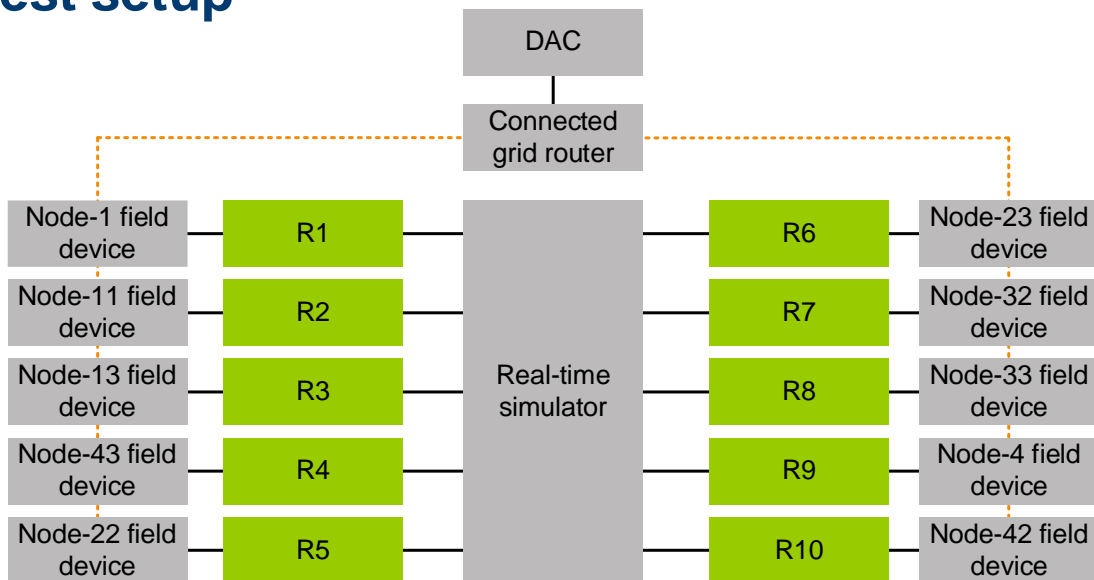


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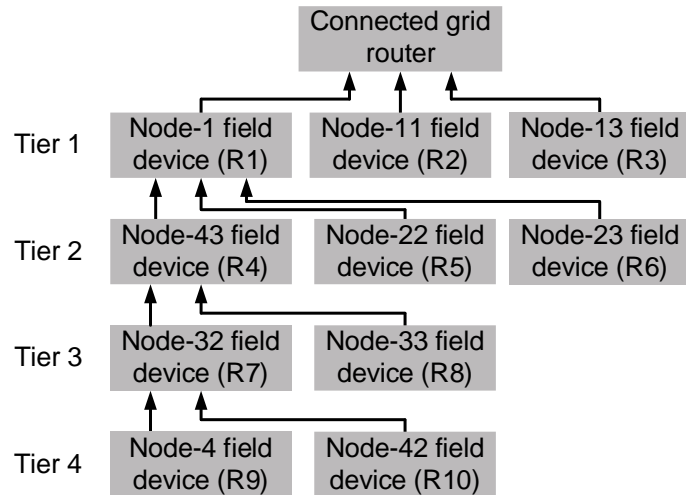


Test setup

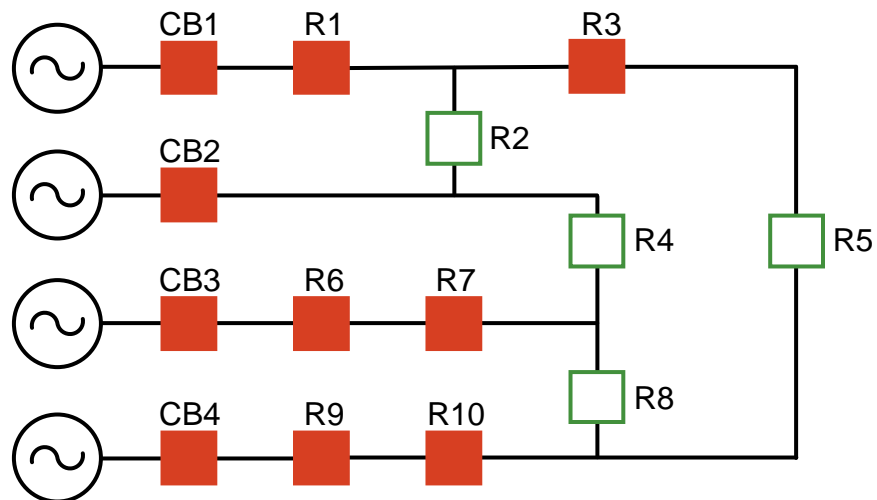


Communication setup

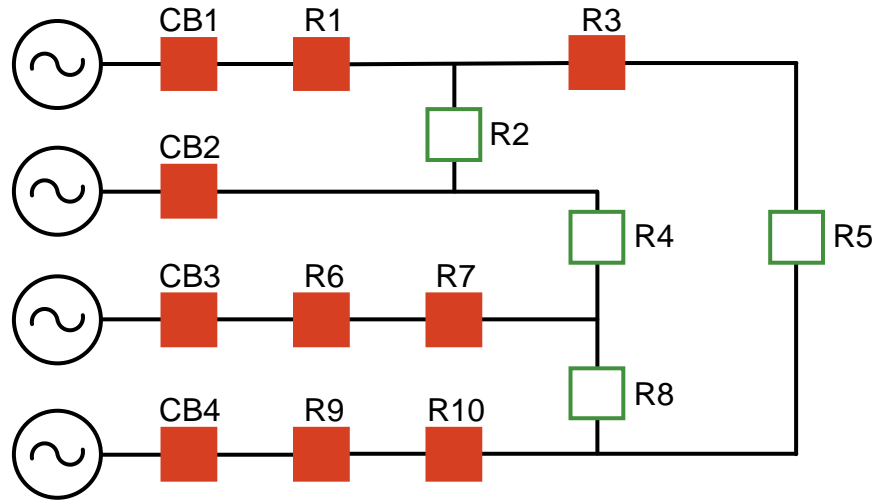
- 10-second polling only
- 60-second polling with unsolicited messaging
- 120-second polling with unsolicited messaging
- OFDM and 2-FSK modulation



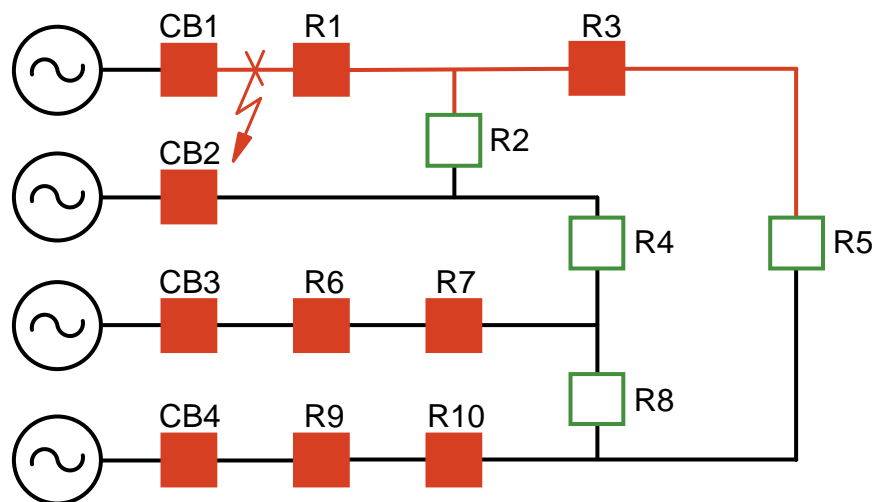
Normal condition



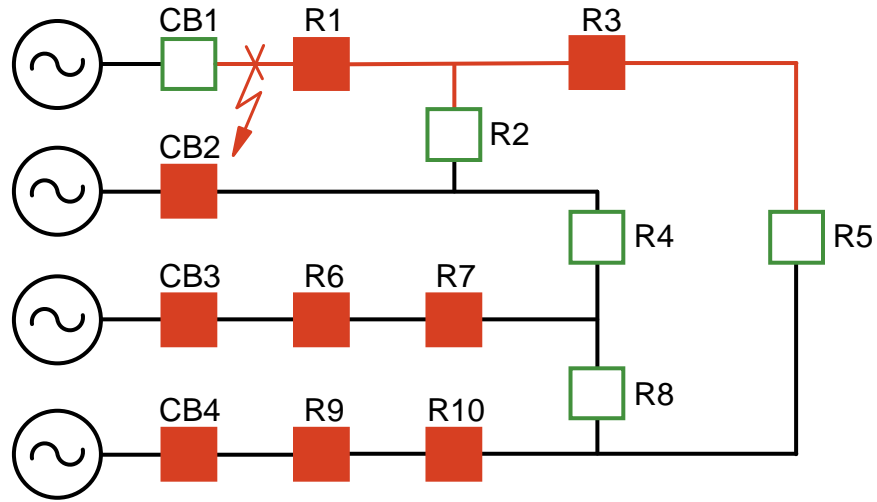
Case 2



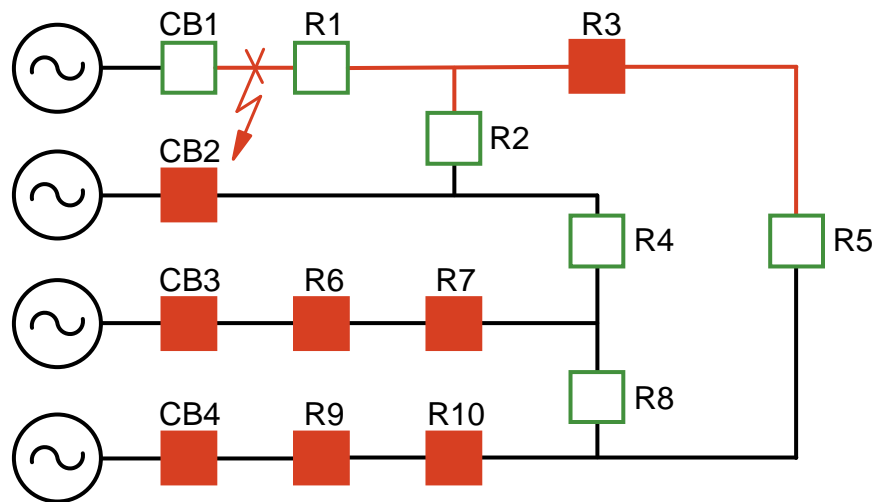
Case 2



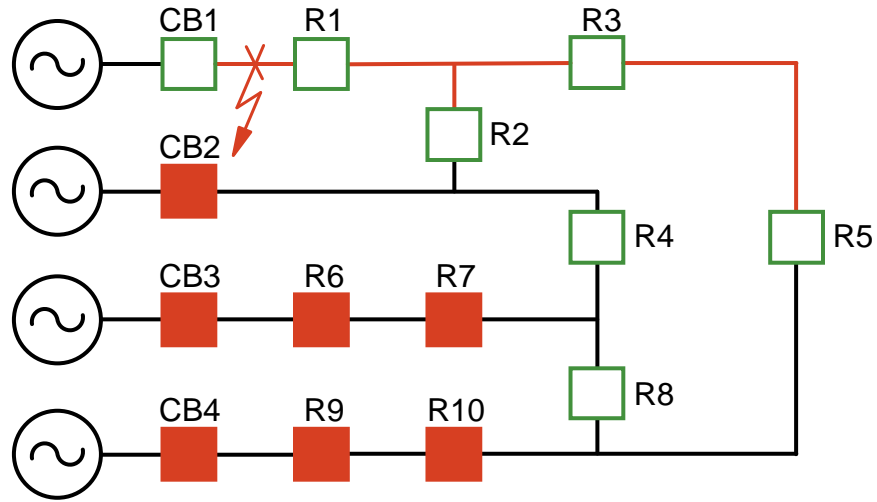
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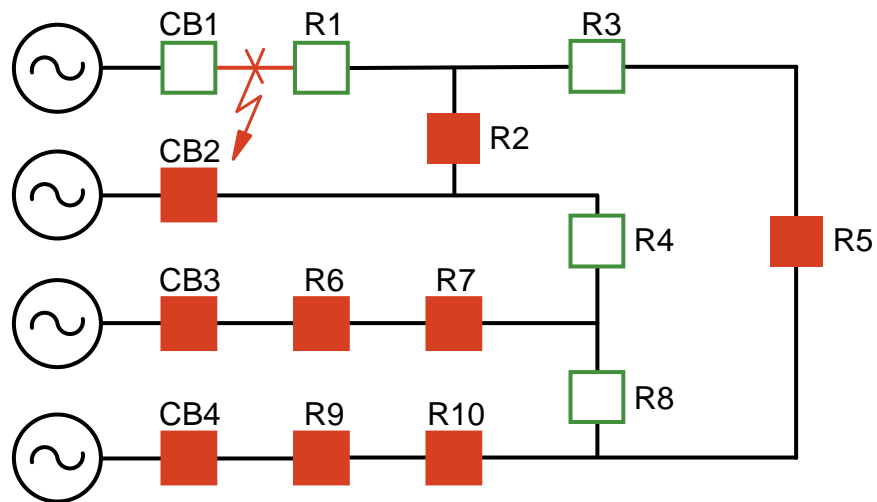
Case 2



Case 2



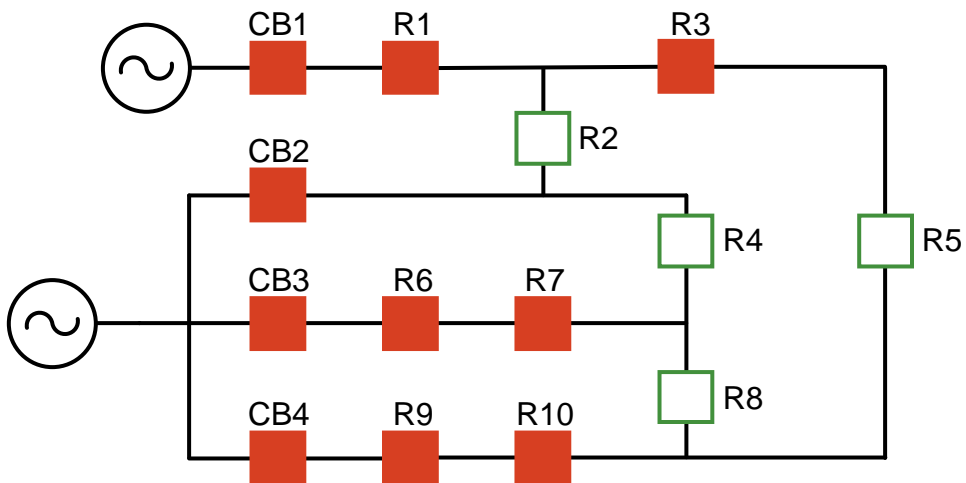
Case 2



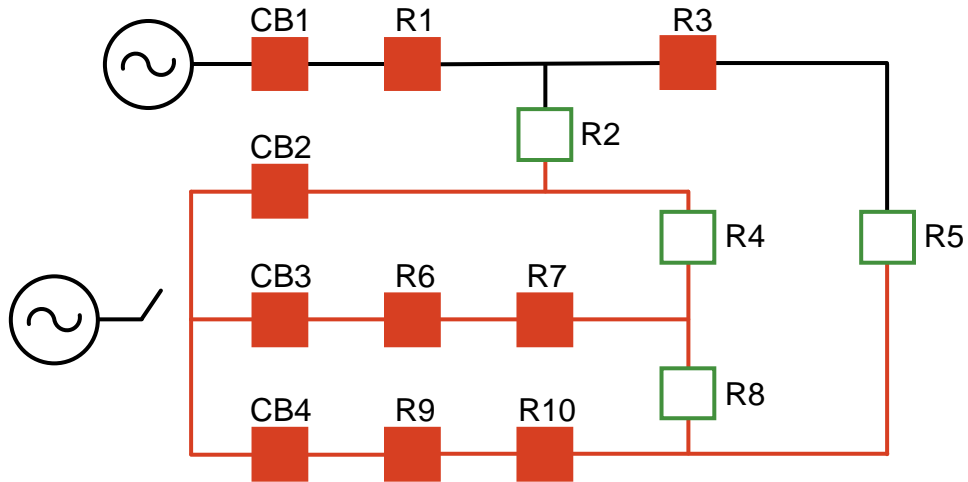
Case 2 restoration

Load	10 s poll only (OFDM)	60 s poll with unsolicited (OFDM)	120 s poll with unsolicited (OFDM)	120 s poll with unsolicited (2-FSK)
1	23.5 s	20.4 s	14.6 s	15.0 s
2	19.9 s	20.4 s	14.6 s	15.0 s

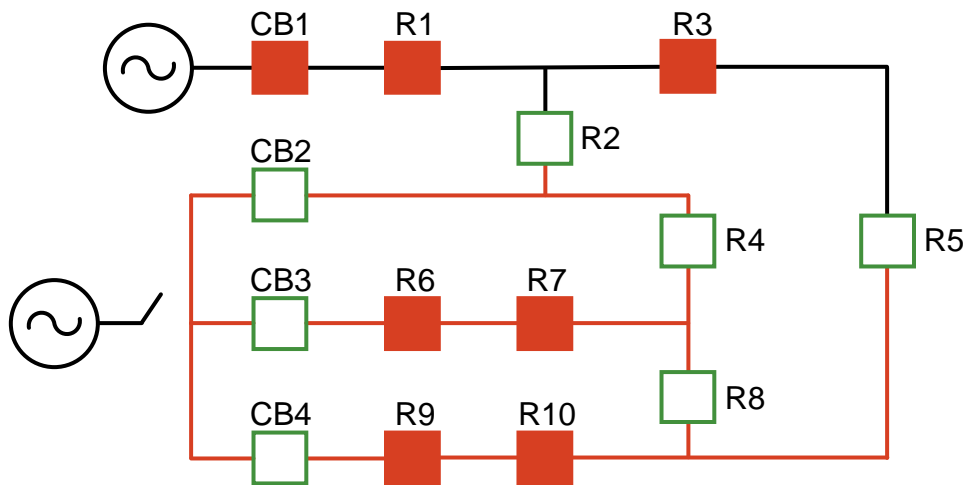
Case 3



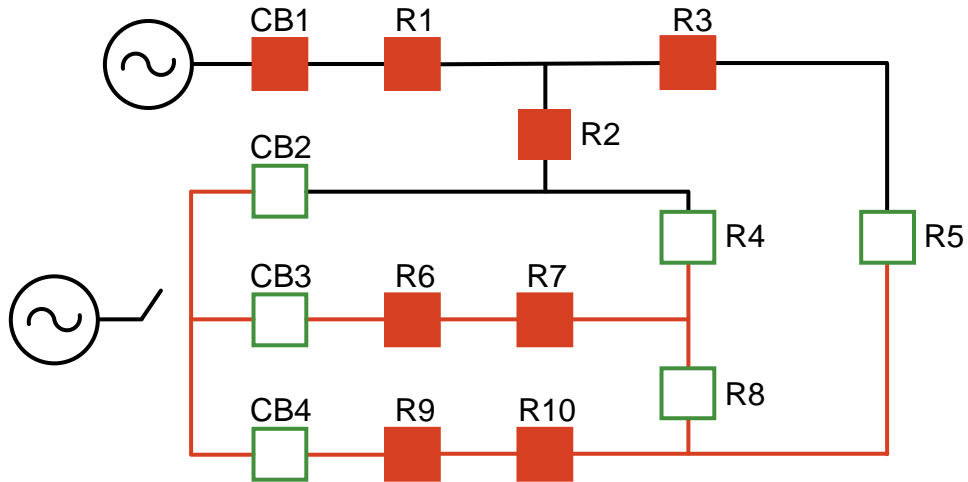
Case 3



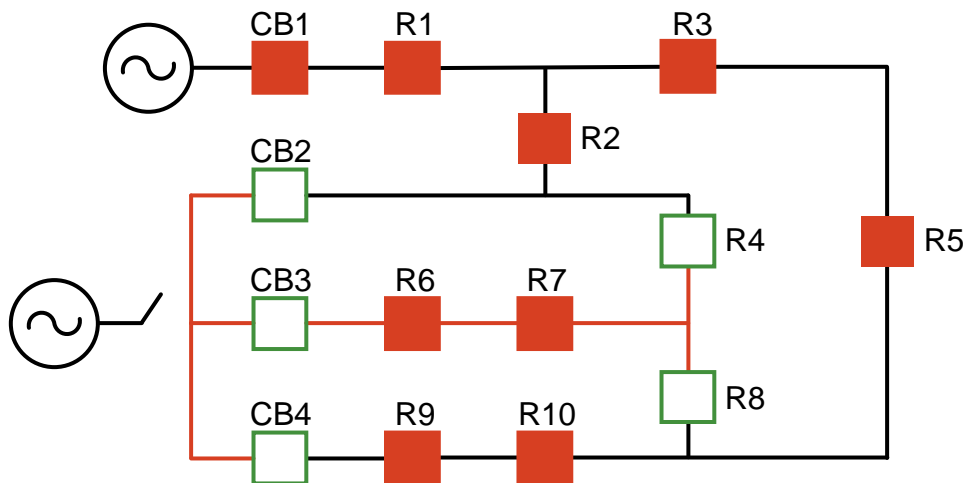
Case 3



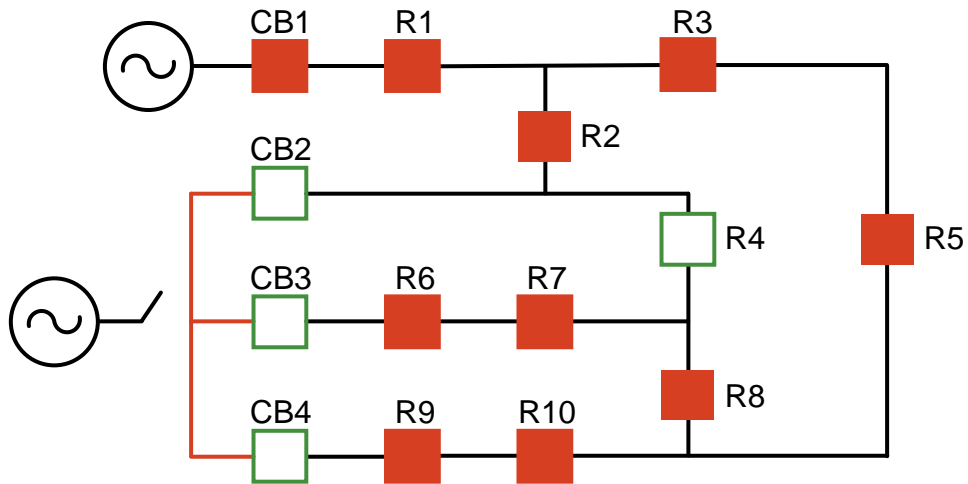
Case 3



Case 3



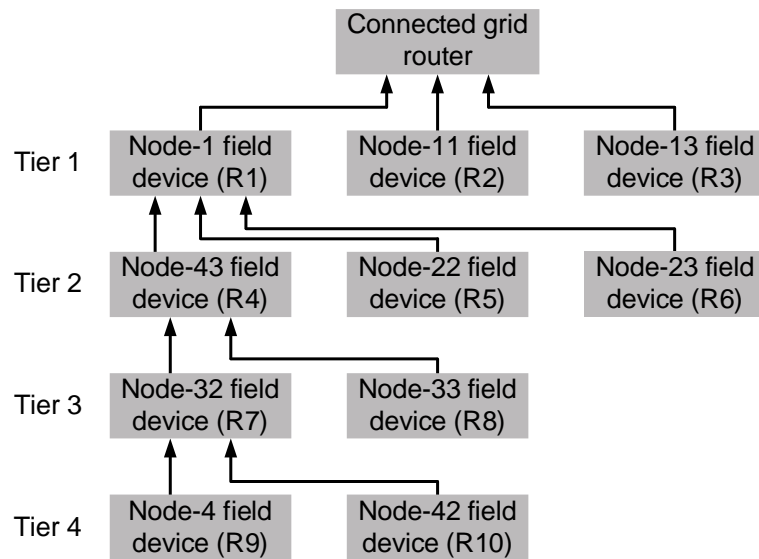
Case 3



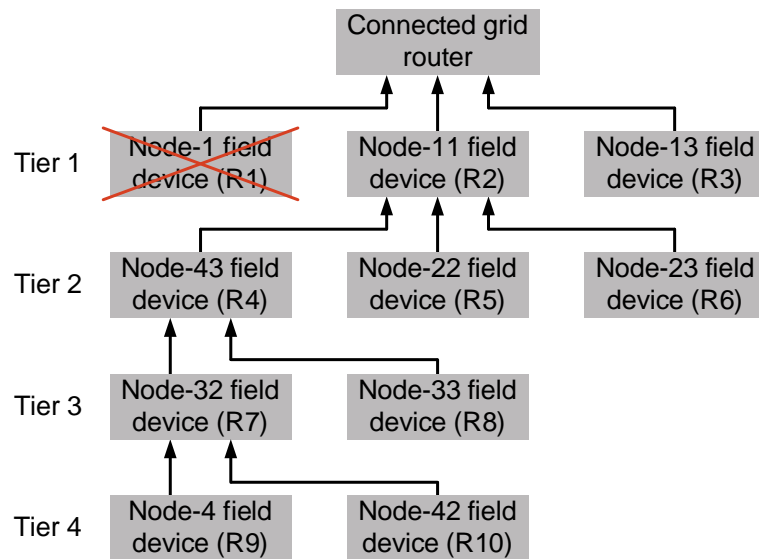
Case 3 restoration

Load	10 s poll only (OFDM)	60 s poll with unsolicited	120 s poll with unsolicited	120 s poll with unsolicited (2-FSK)
1	32.2 s	24.9 s	25.5 s	28.2 s
2	41.3 s	27.2 s	28.8 s	32.2 s
3	53.5 s	31.2 s	38.4 s	43.0 s

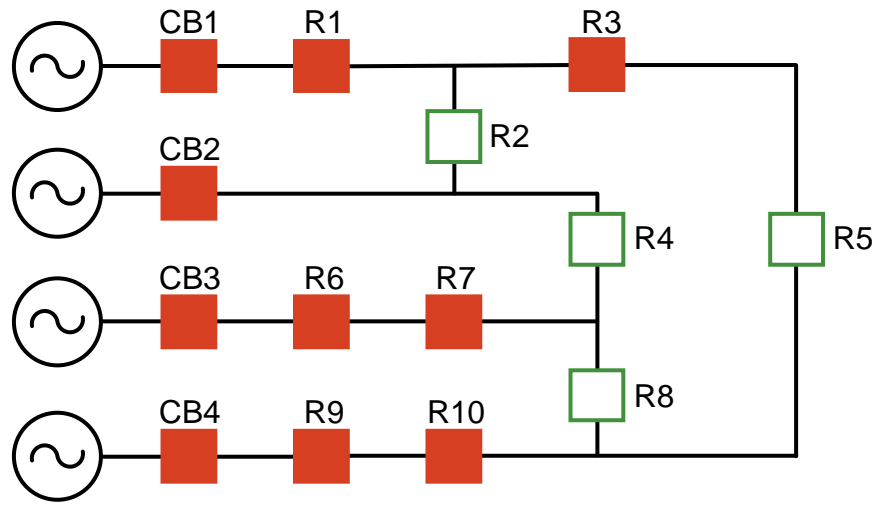
Normal network topology



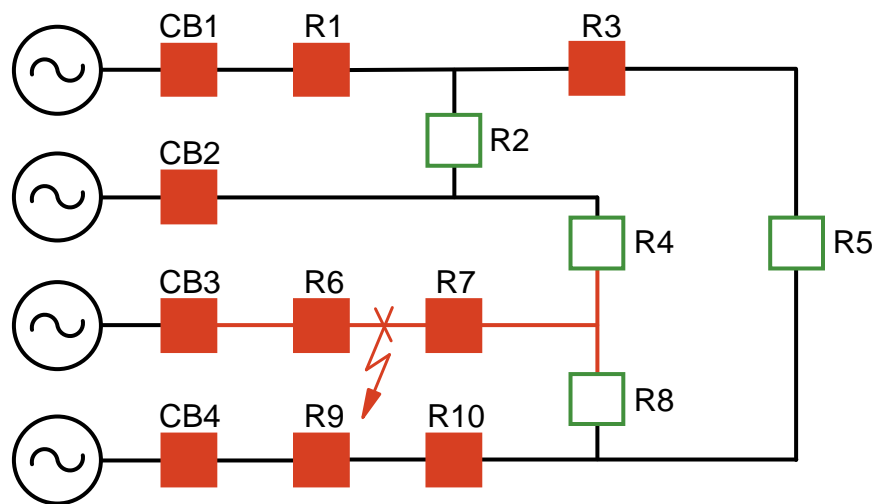
Alternate network topology



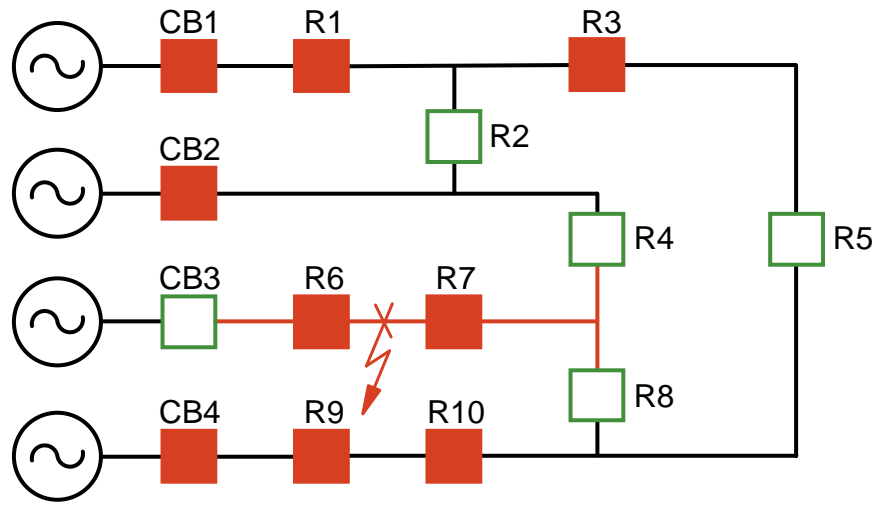
Case 5



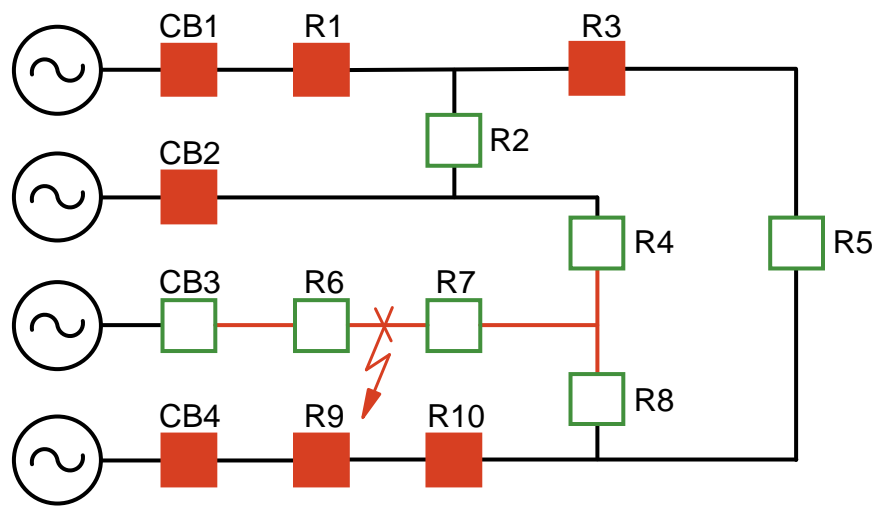
Case 5



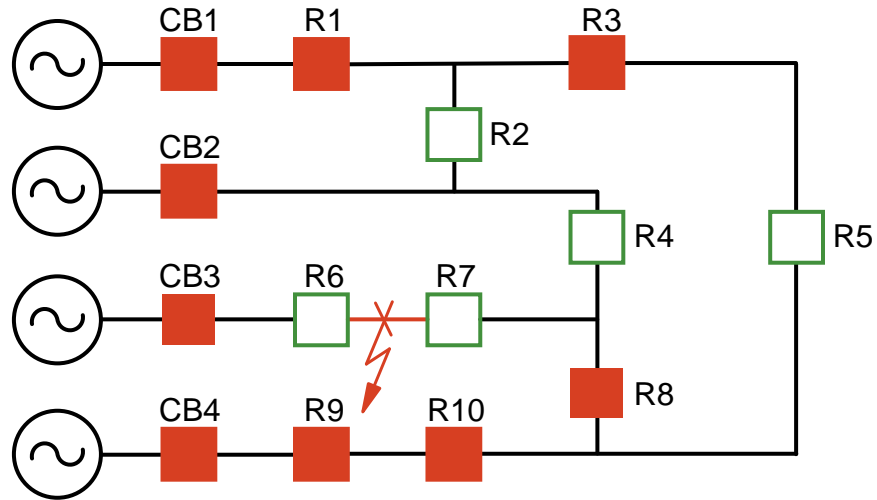
Case 5



Case 5



Case 5



Case 5 restoration

60 s poll with unsolicited	120 s poll with unsolicited
181 s	164 s

Summary of testing evaluations

- Identify disciplines involved in FLISR implementation
- Define test scenarios based on input from disciplines
- Ensure scenarios tested do not cause additional outages or unsafe conditions



Questions?