Flexible Boundary Design for a Microgrid Powered by Landfill Solar Photovoltaic and Battery Storage

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Background

❖ Repurposing closed landfills for Solar PV and Battery Microgrids allows for use of lands with limited re-use opportunities

❖ Improves resiliency, reliability and energy justice for disadvantage communities.

❖ Flexible boundaries allows the microgrid to expand and shrink based on the available power.

❖ It involves choosing the right intellirupter combination to open or close to ensure active and reactive power balance.

❖ This flexible boundary algorithm was designed for a proposed microgrid topology in Chattanooga, Tennessee.

Microgrid Feeder Topology and Description

❖ The Microgrid takes advantage of an existing radial feeder topology segmented by intellirupters into load sections.

❖ The Interllirupters are from SW1 to SW15, BRK is a circuit breaker, and the Load Sections are from Load section 1 to Load section 8.
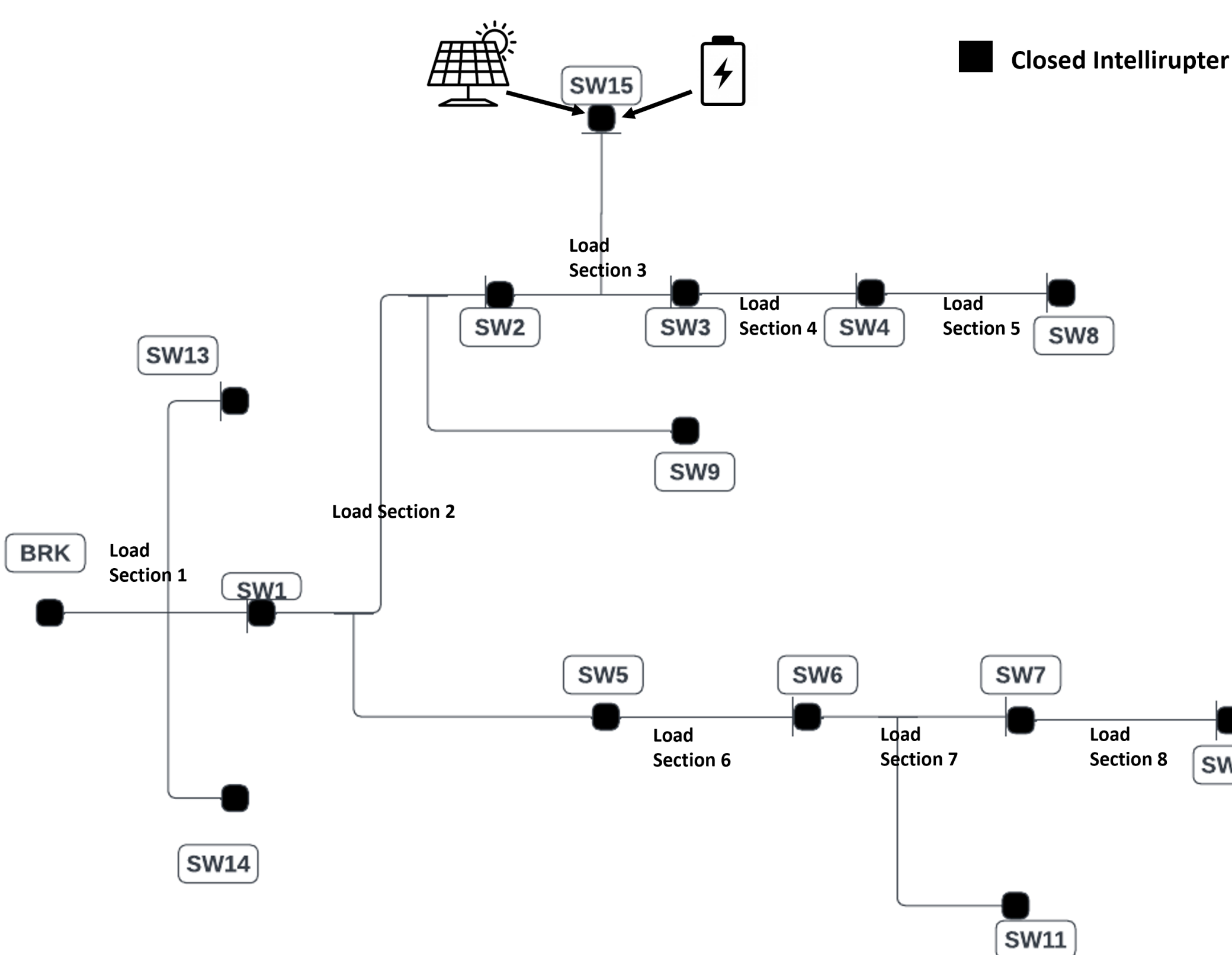
❖ Landfill Solar PV and Battery Connected at SW15

Fig 1: Microgrid Topology

Results

Fig 3: Microgrid topology showing optimal boundary for test case example

Flexible Boundary Search Algorithm

❖ The flexible boundary algorithm was designed for this specific case study topology of the proposed microgrid in Chattanooga, and assumes a single source connection point

❖ The algorithm selects the optimal intellirupter combination to open or close to achieve active and reactive power balance
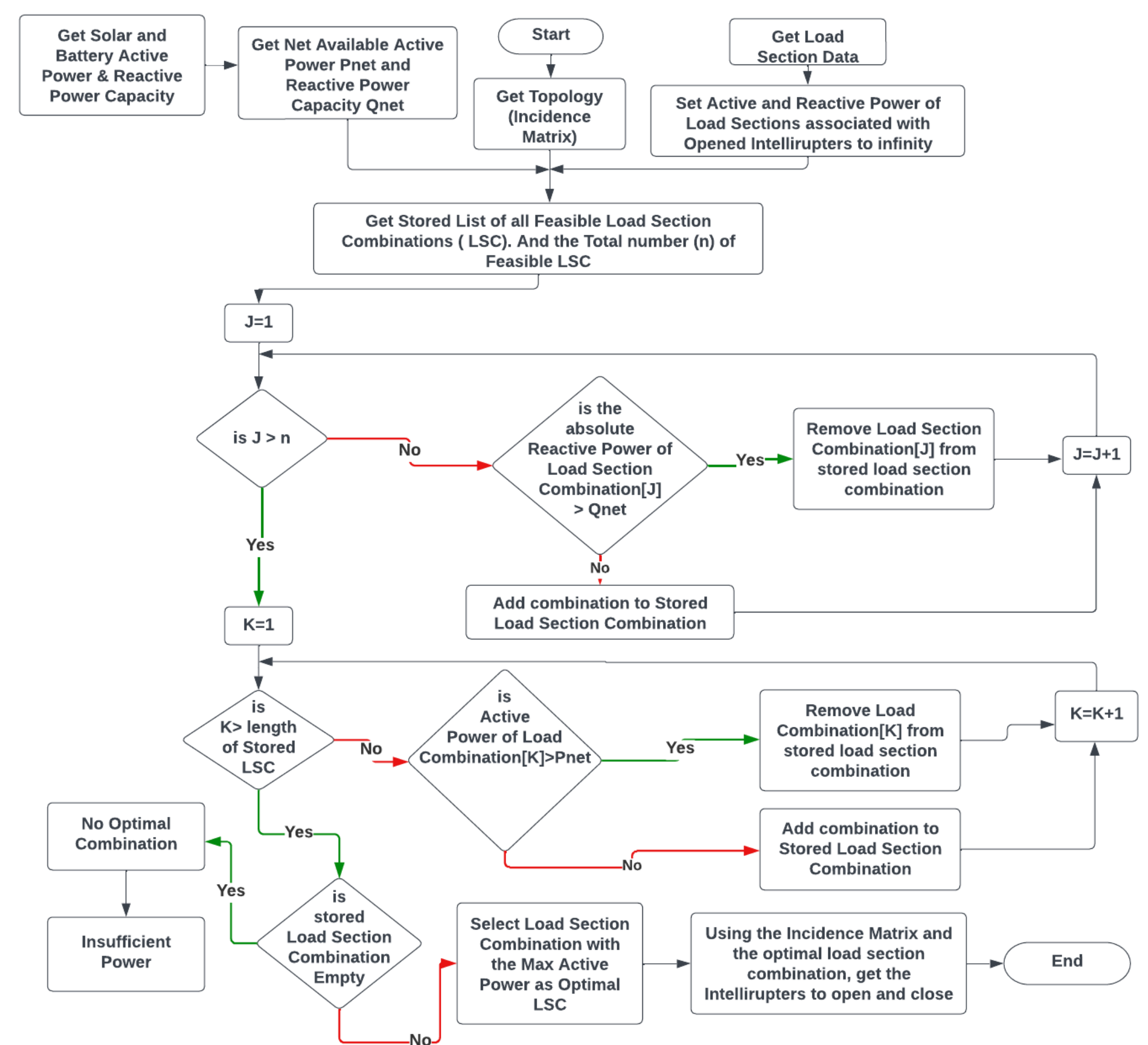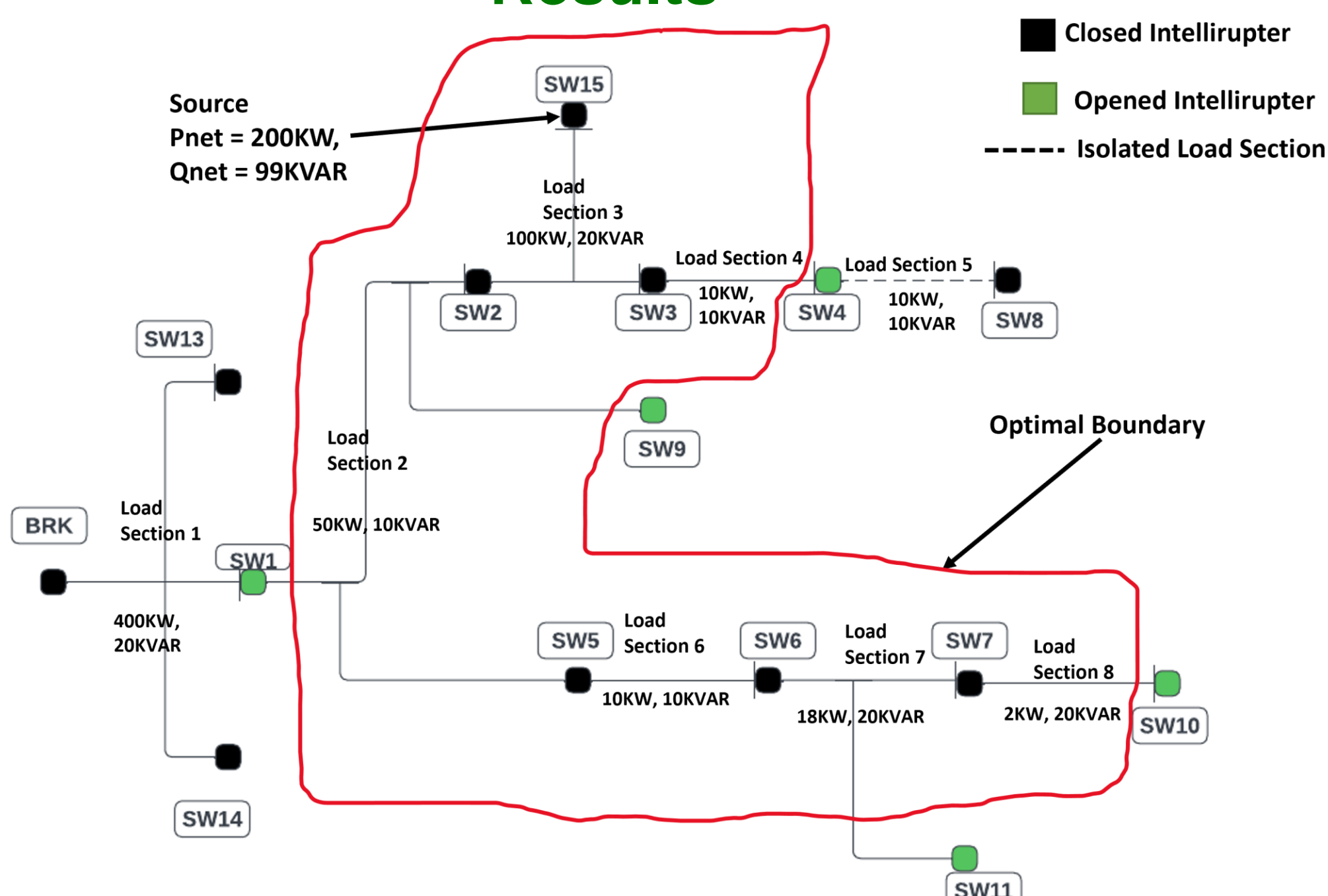

Fig 2: Flowchart of Flexible Boundary Algorithm

	OUTPUT COMBINATION				
Intellirupters to Close	SW15	SW2	SW3	SW5	SW6, SW7
Intellirupters to Open	SW1	SW4	SW9	SW10	SW11

Fig 4: Output Intellirupter Combination

The connected load sections: Load section 2,3,4,6,7,8.

Conclusion and Future Work

❖ The flexible boundary logic was developed using Matlab

❖ For future work, the microgrid with flexible boundary would be simulated in simulink to observe its operation in steady-state.