Lessons Learnt from Integrating High Penetration Renewables into a Campus Microgrid

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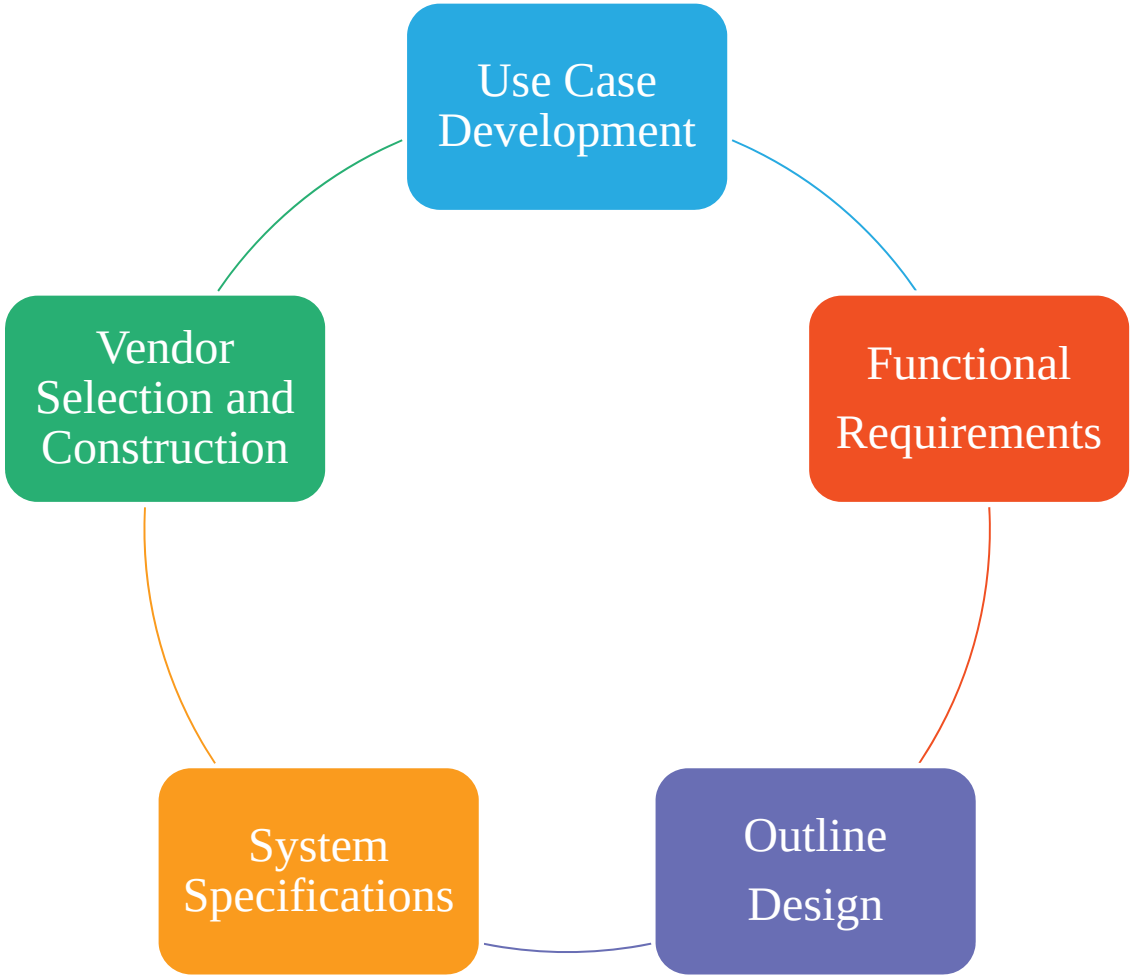
Abstract

- *This confidential microgrid contains multiple MW's of PV, Fuel Cells and advanced Energy Storage. The microgrid is able to operate independently of the wider grid with the use of standby diesel generators and maintain campus operations without grid power.*

- *This presentation will focus on the process and methodology employed by Arup in the design and specification of the system and also highlight challenges and lessons learnt resulting from the detailed design of the microgrid.*

Design Process



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Use Case and Functional Requirements

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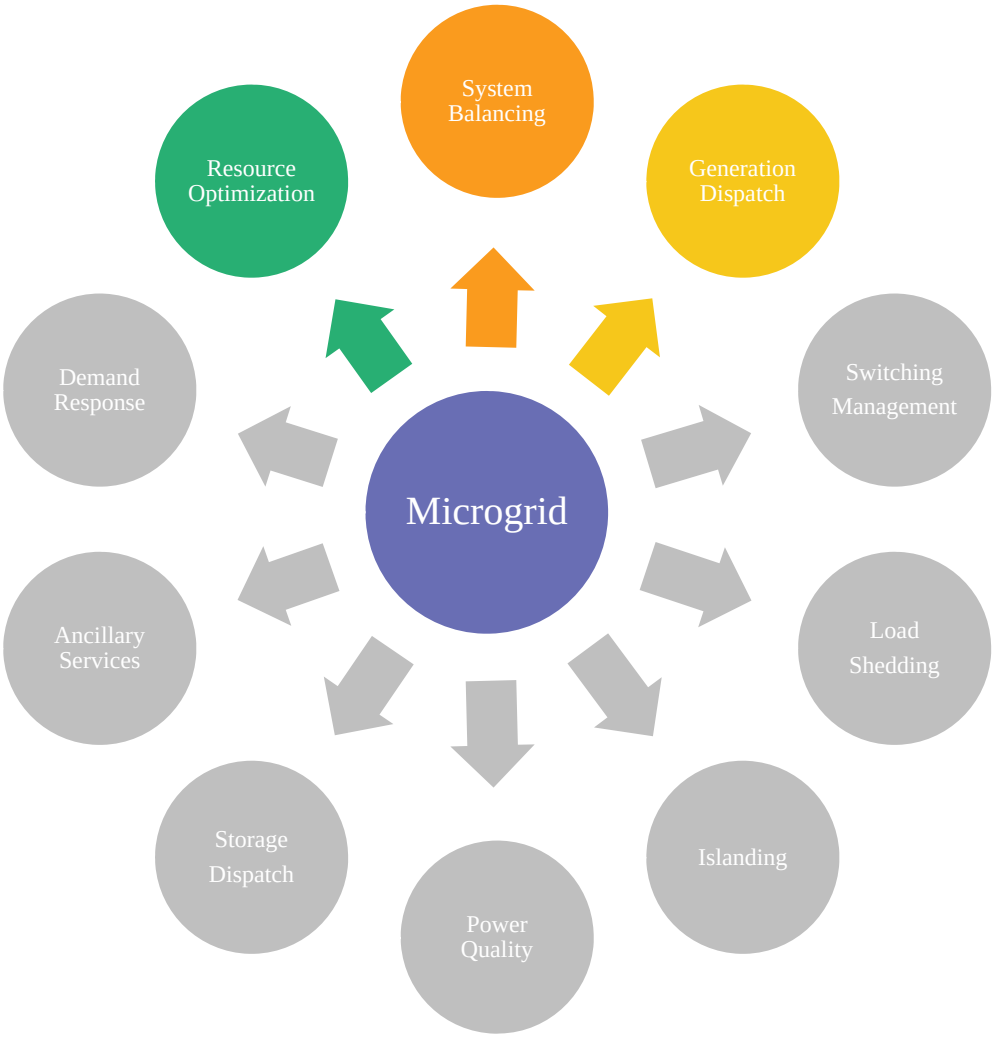

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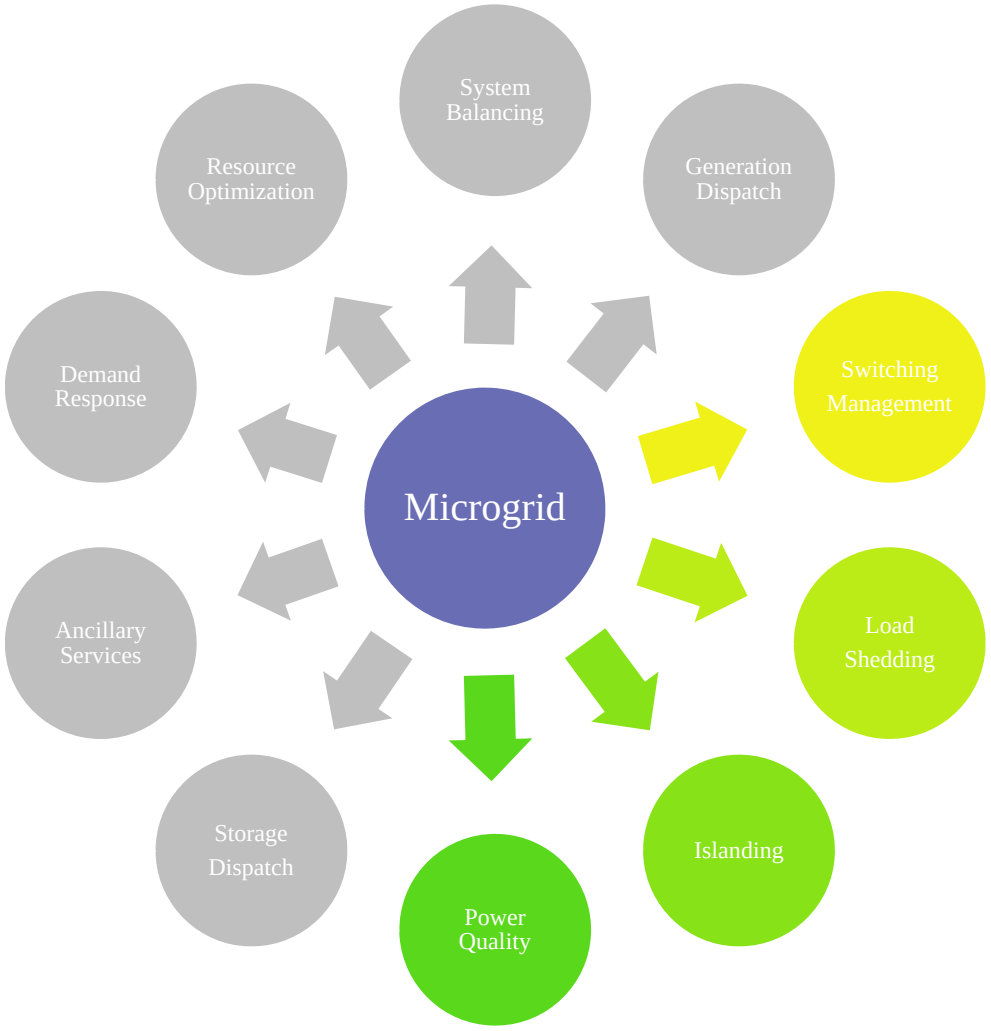

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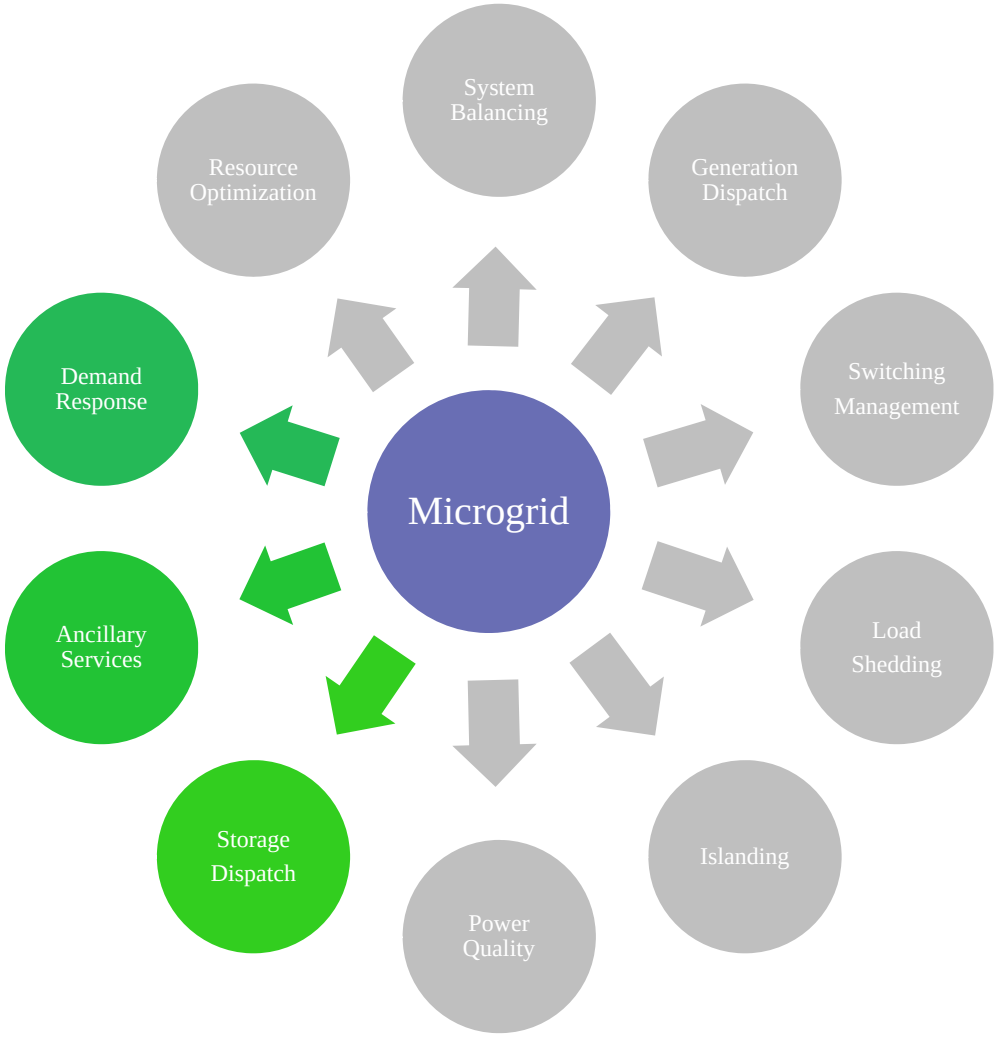

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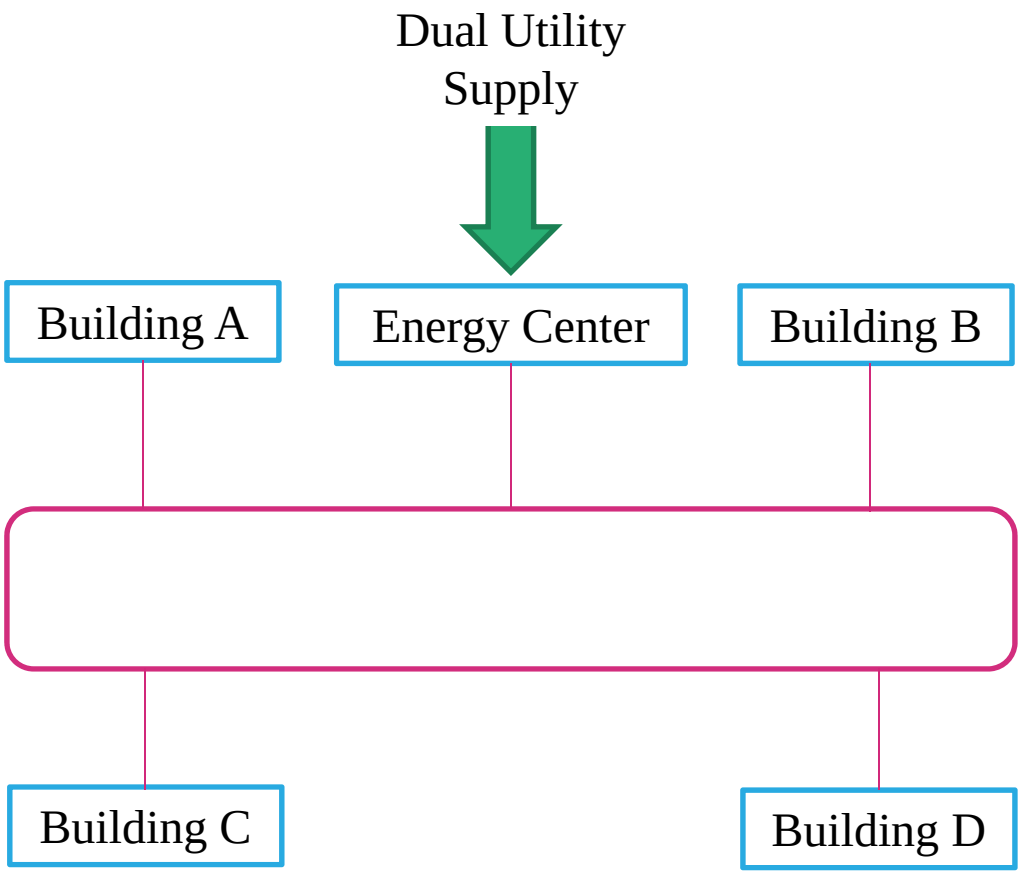
Key Use Case Outcomes

- Generate majority of electricity on site
- Participate in energy storage markets
- Maintain majority of building loads in an outage
- PV and Fuel cells to provide the majority of electricity in island mode

Outline Design



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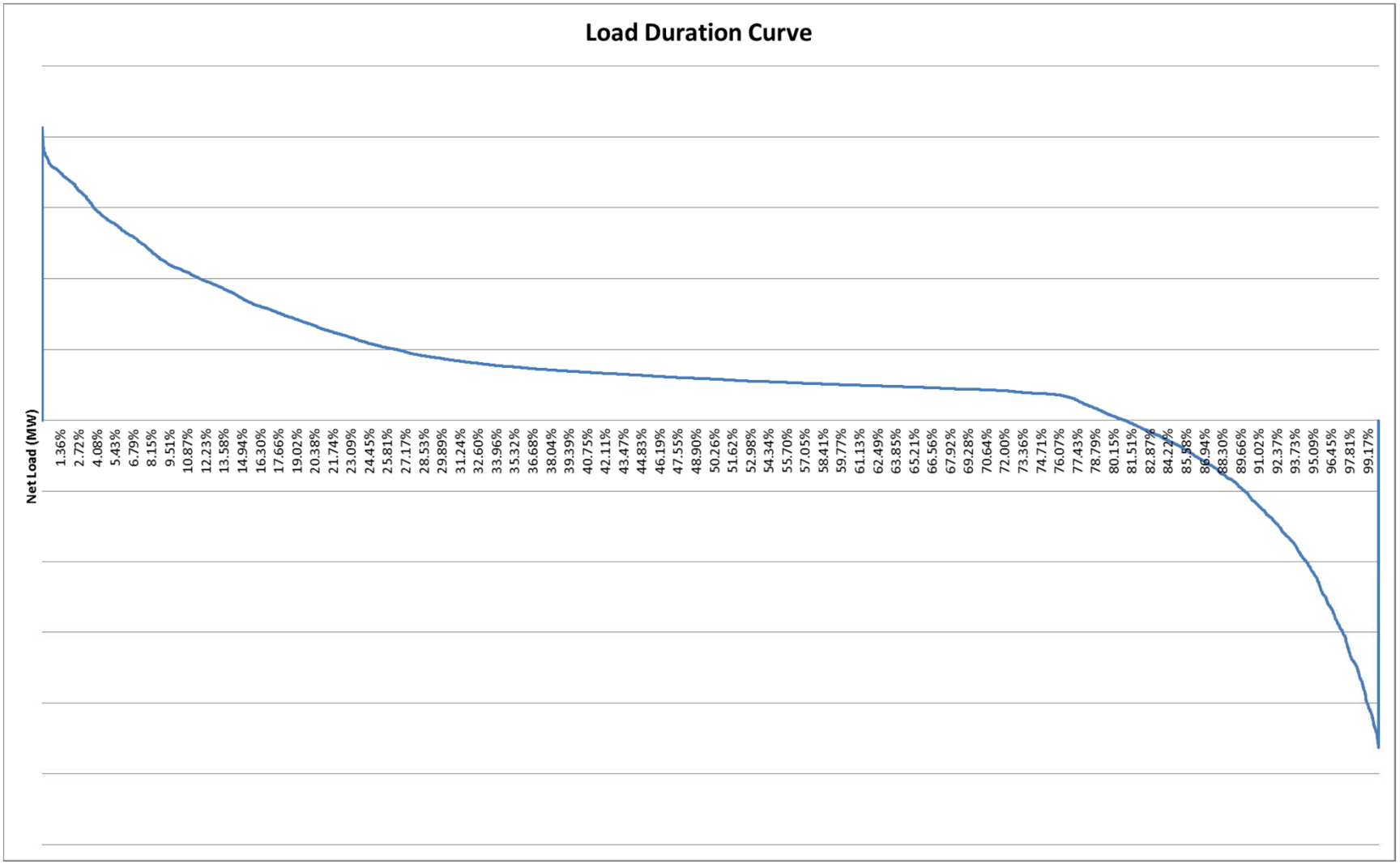
Outline Design



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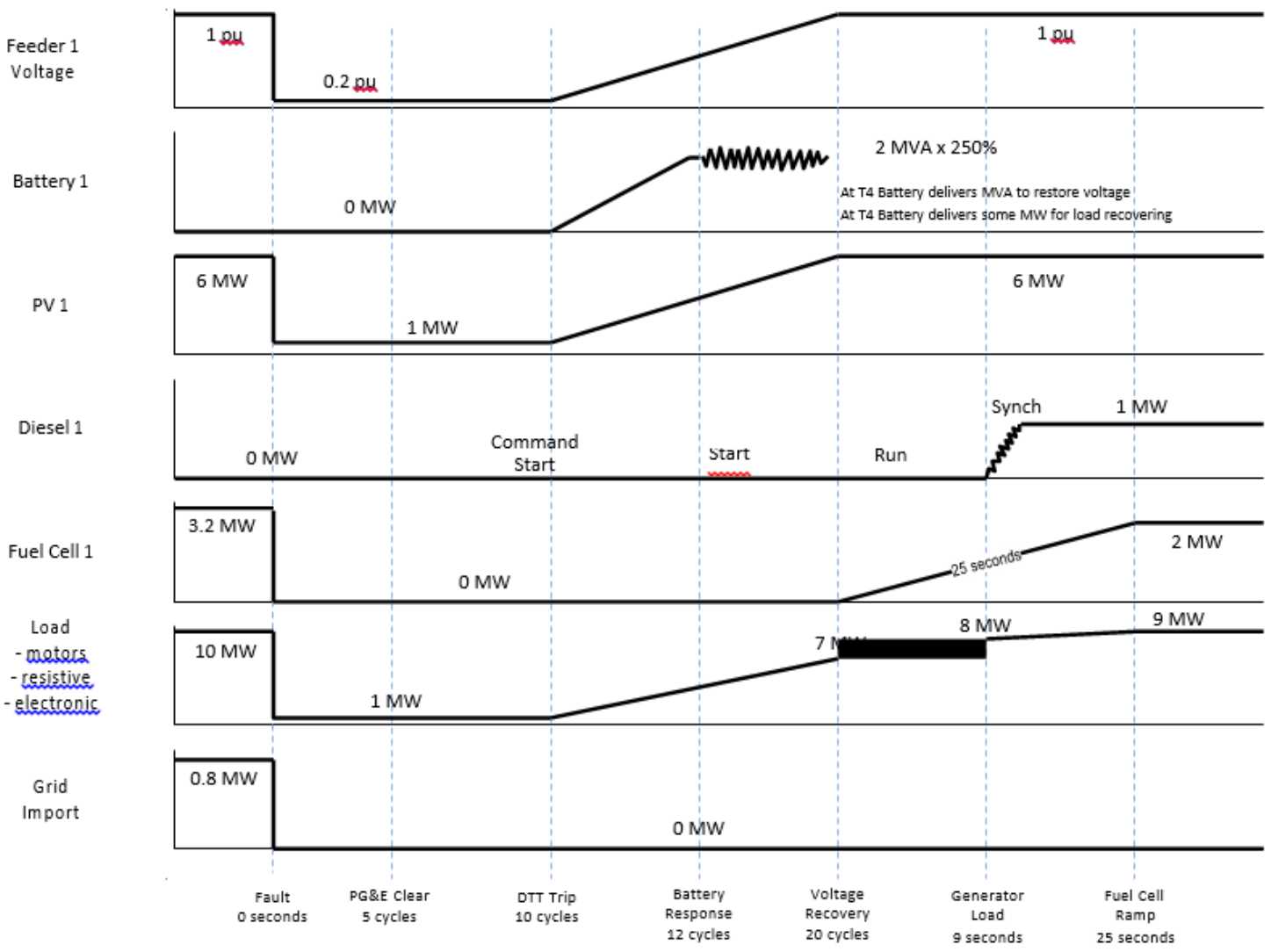
Outline Design

- Modes of Operation

  - Loss of a Feeder
  - Load Shed Scheme
  - Matrix of generation / load scenarios
  - Utility Momentary Loss of Power
  - Utility Brown Out
  - Natural Gas Loss (Fuel Cells)
  - Utility Under-Frequency Event
  - Resynchronize to Utility

Outline Design



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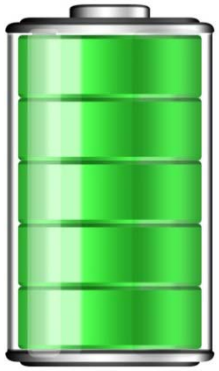
Design Challenges

- Design Challenges
  - High PV penetration
  - Mixed DER assets
  - Availability of products



Solutions

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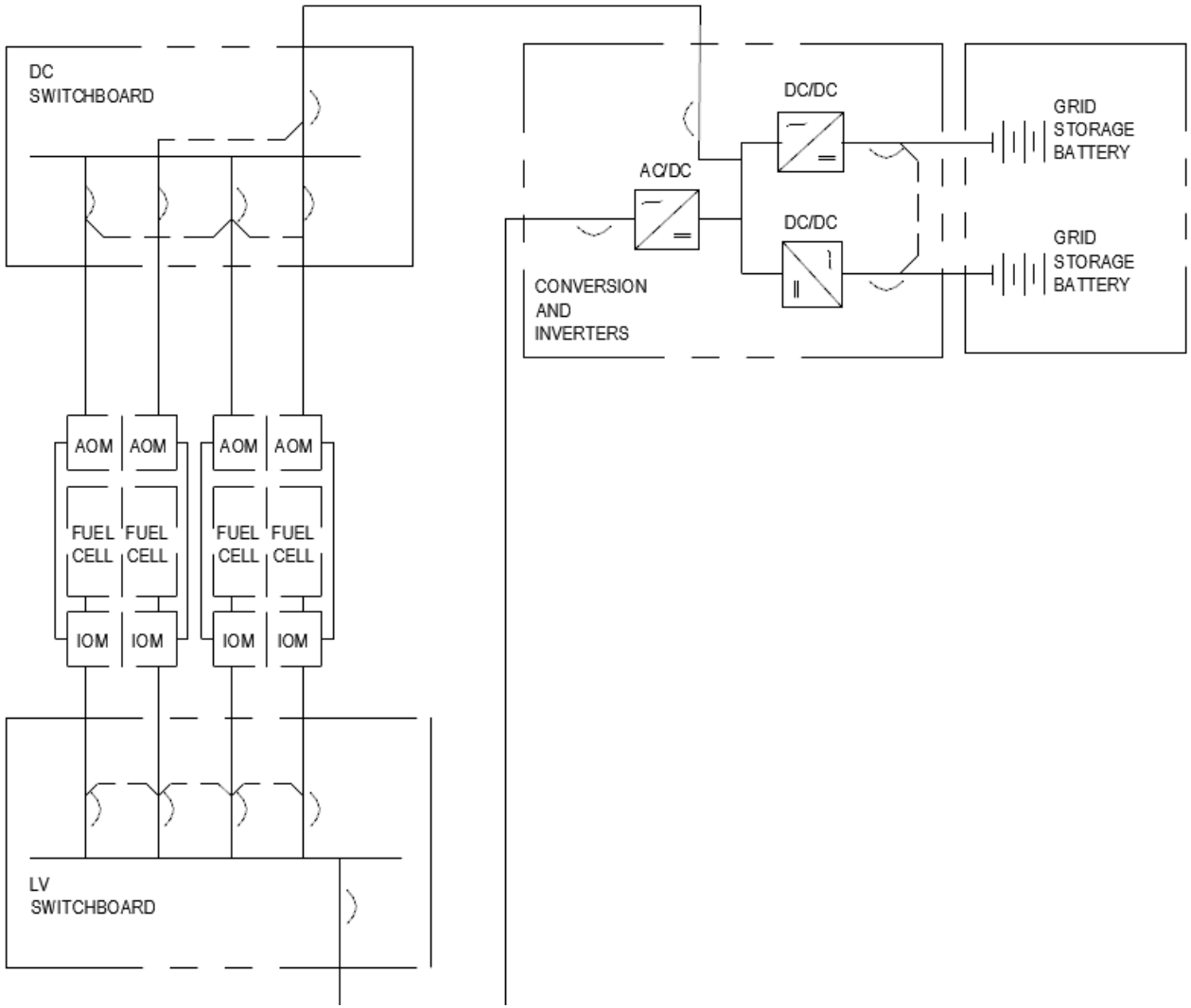
Solutions



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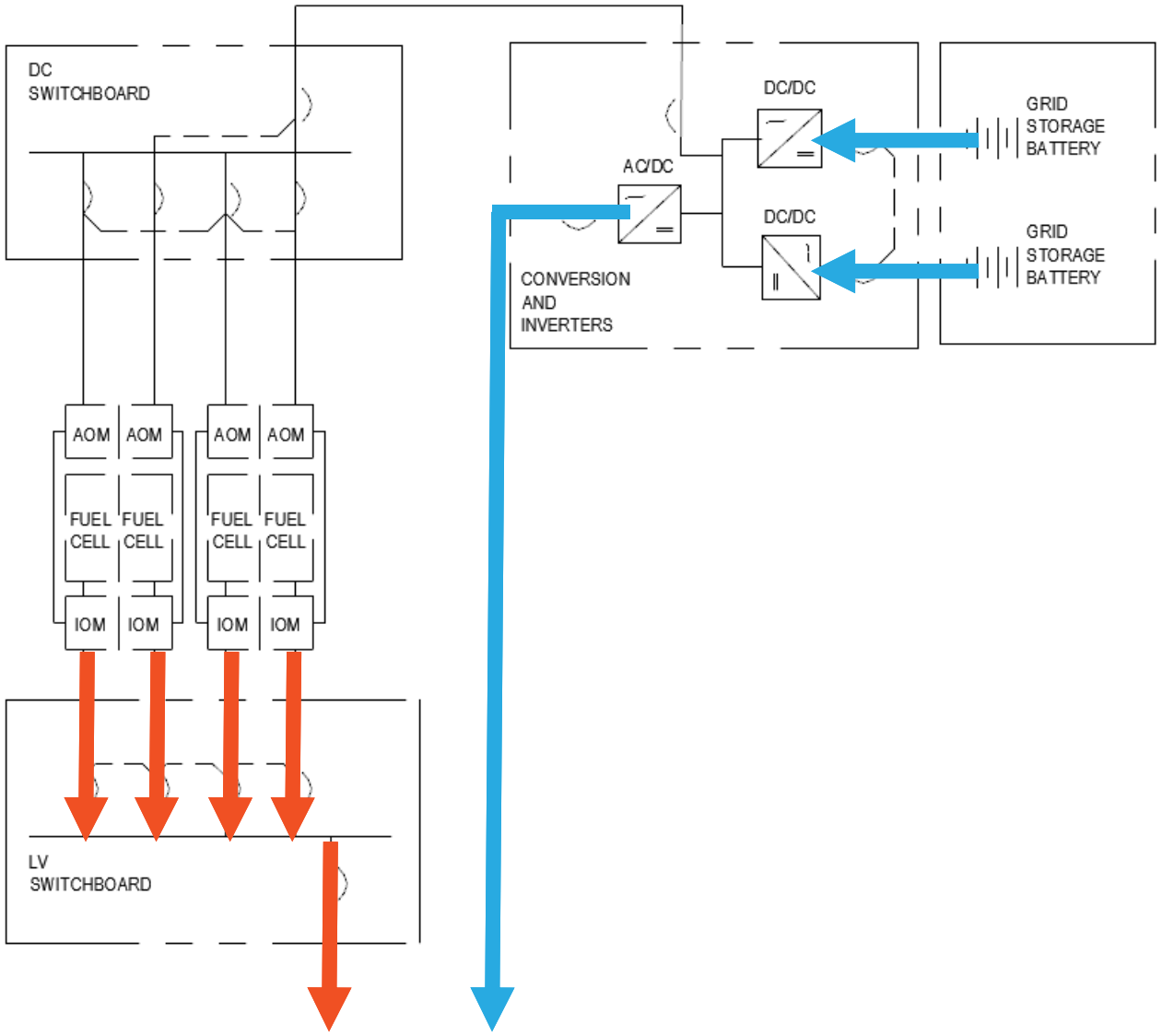
Solutions



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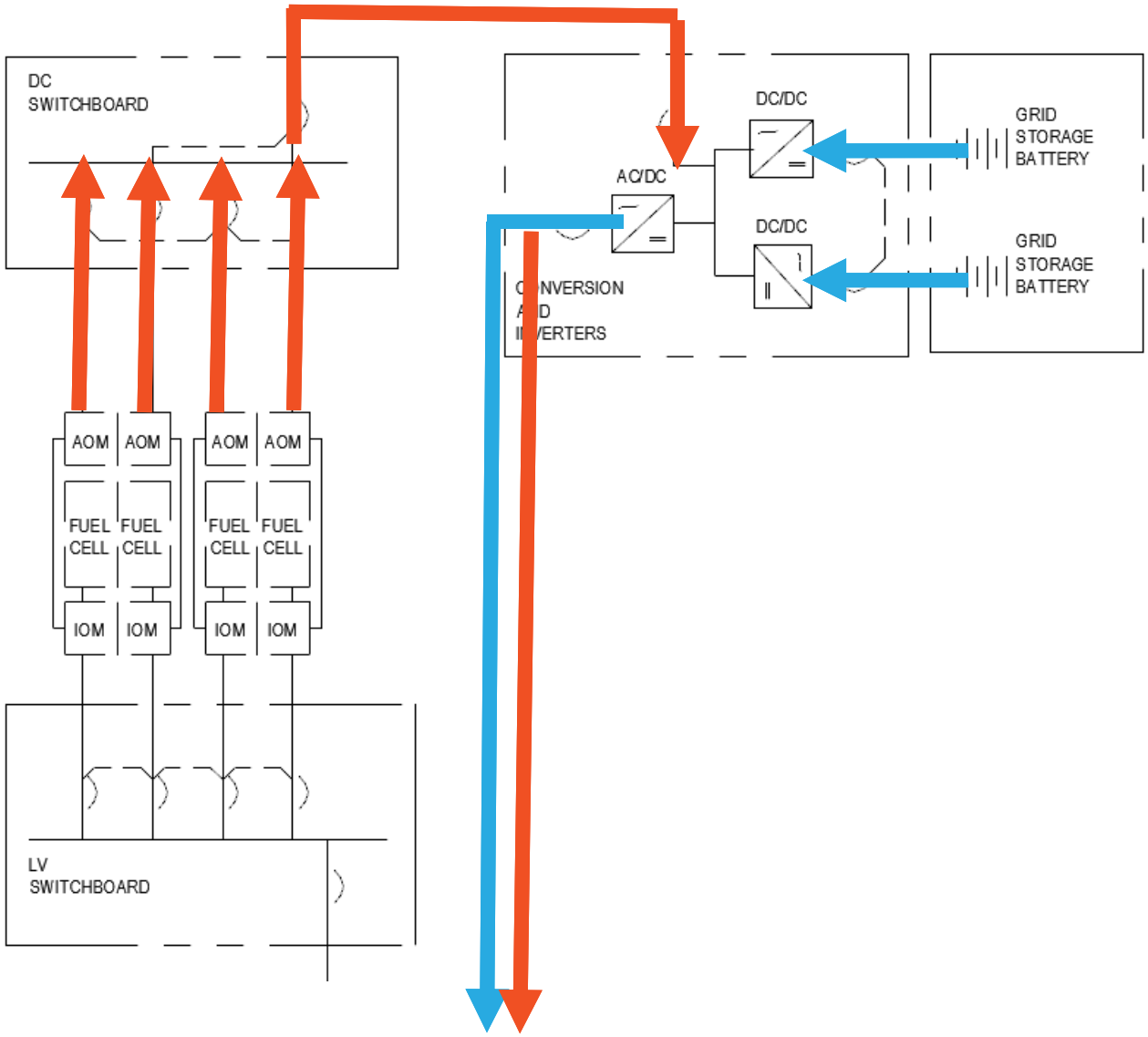
Solutions



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Summary

- Lessons Learnt
  - Use case process is key to success
  - Engage with vendors early
  - Cost v benefit assessment
  - Utility engagement

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