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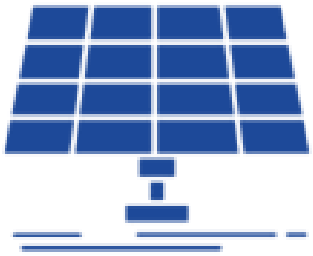
Control Strategies for Lithium-ion Battery Energy Storage Systems in Distribution Networks

Literature Review

J. Bierman

Agenda



Introduction

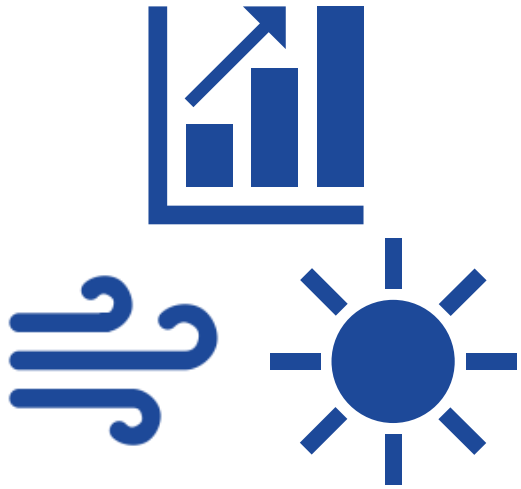
Relevance to South Africa

Control Strategies

Conclusion

Introduction

Electrical utilities aim to maintain a stable and reliable power grid

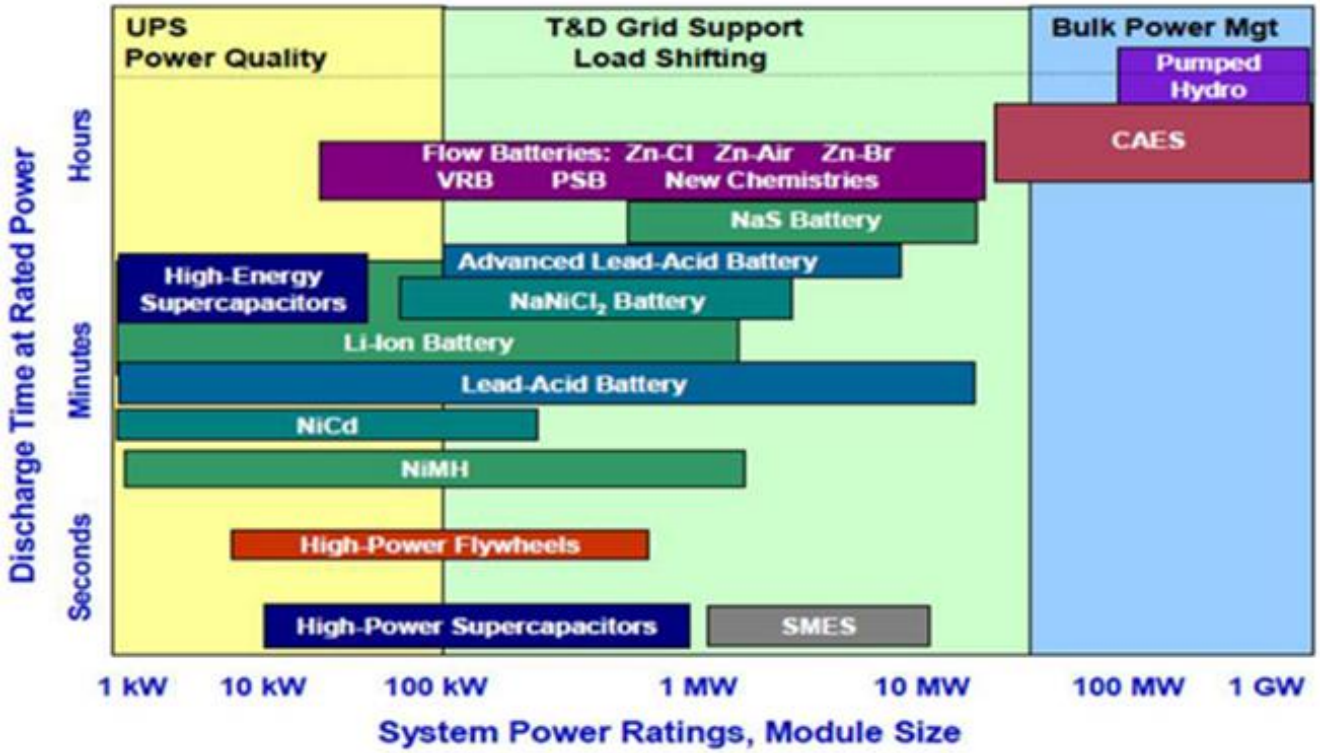


Increased adoption of VRE

Intermittent grid challenges

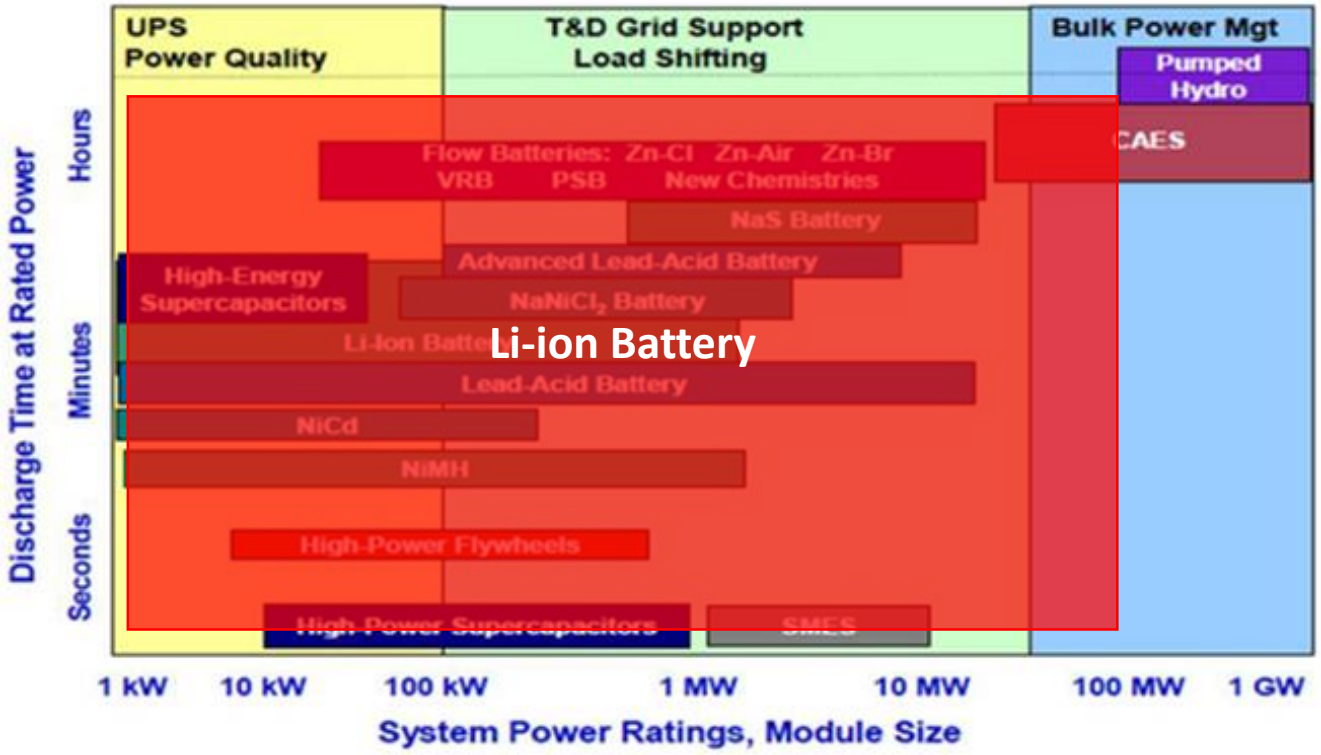
Energy Storage System Technologies

Grid-connected ESS can provide various services to assist utilities



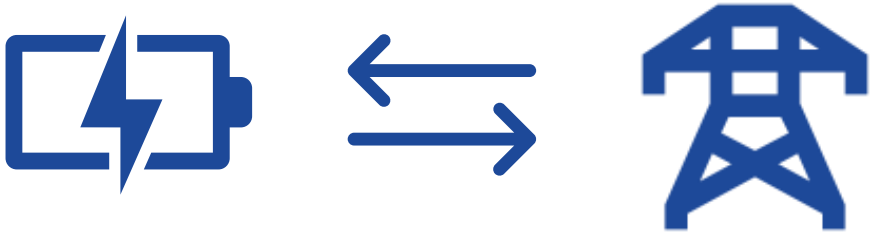
Energy Storage System Technologies

Lithium-ion as emerging BESS technology



Control Strategies

Maximize the value provided by BESS



Relevance to South Africa

Efficient control strategies would assist Eskom in operating future BESS

1. Eskom's BESS Project
   - 360 MW/1440 MWh
   - 1 MW to 60 MW
   - Average 24 MW/96 MWh

2. Eskom Unbundling
   a. Generation
   b. Transmission
   c. Distribution

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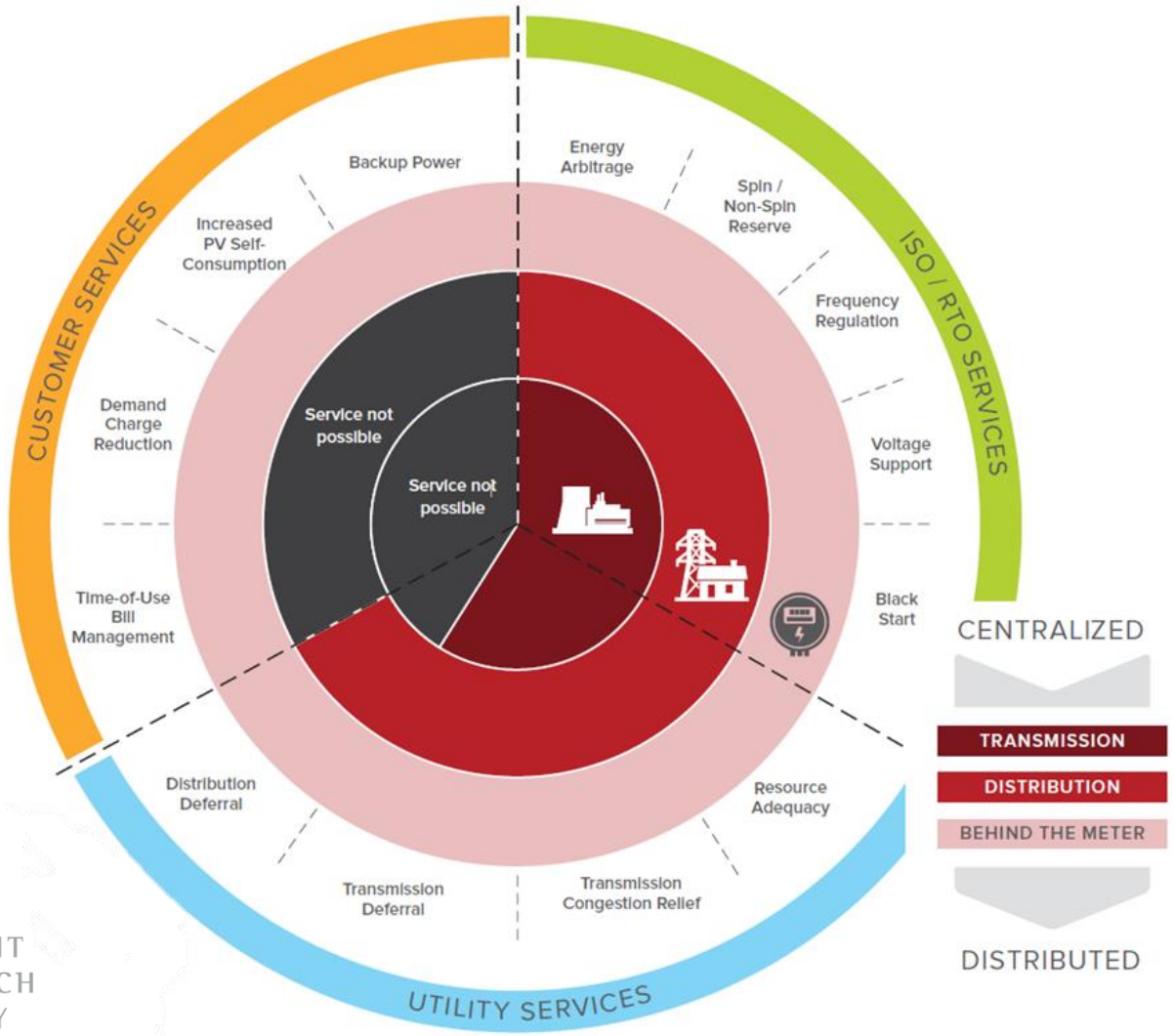
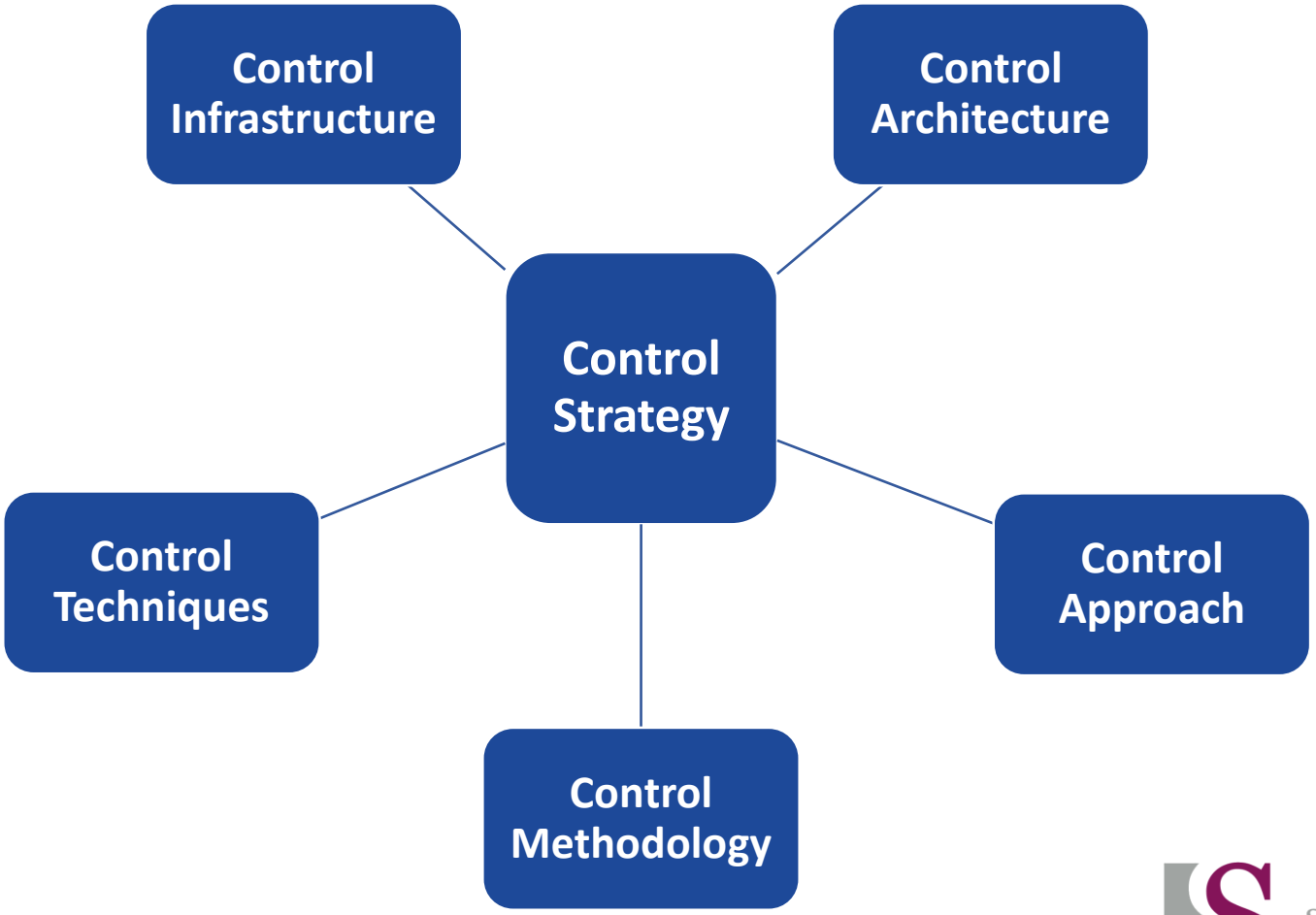
Services

Fundamental BESS services applicable to distribution networks



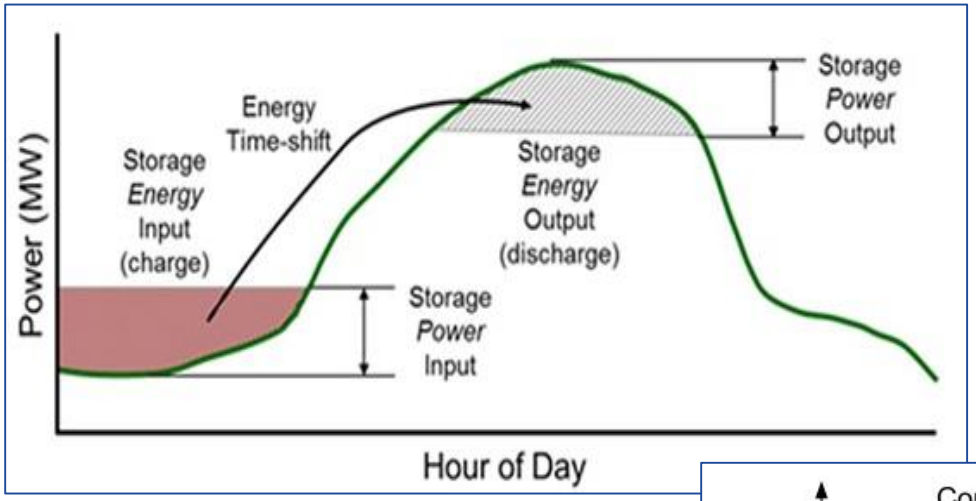
Key Definitions

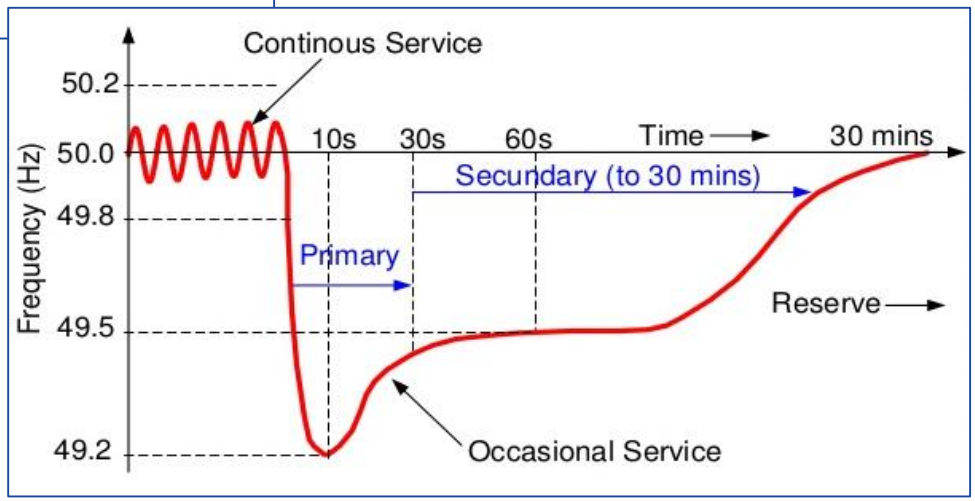
Ambiguous control terms presented in a holistic perspective



Current Research

Most literature focus on optimizing control strategies that provide only one or two services, thus not taking full advantage of value staking





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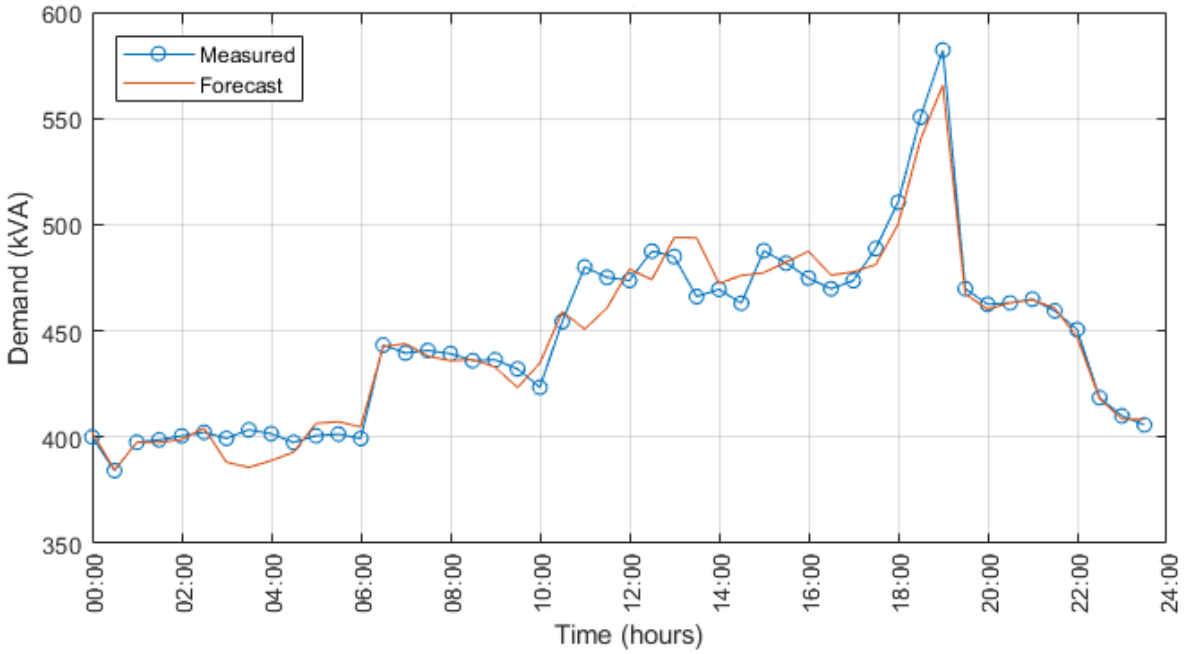
Research Trends and Opportunities

Research trends and challenges indicate opportunity

- Cost-aware Models
- Forecasting
- Stochastic Modeling
- Battery Degradation
- Multiple Services
- SoC Balancing
- Value Quantification



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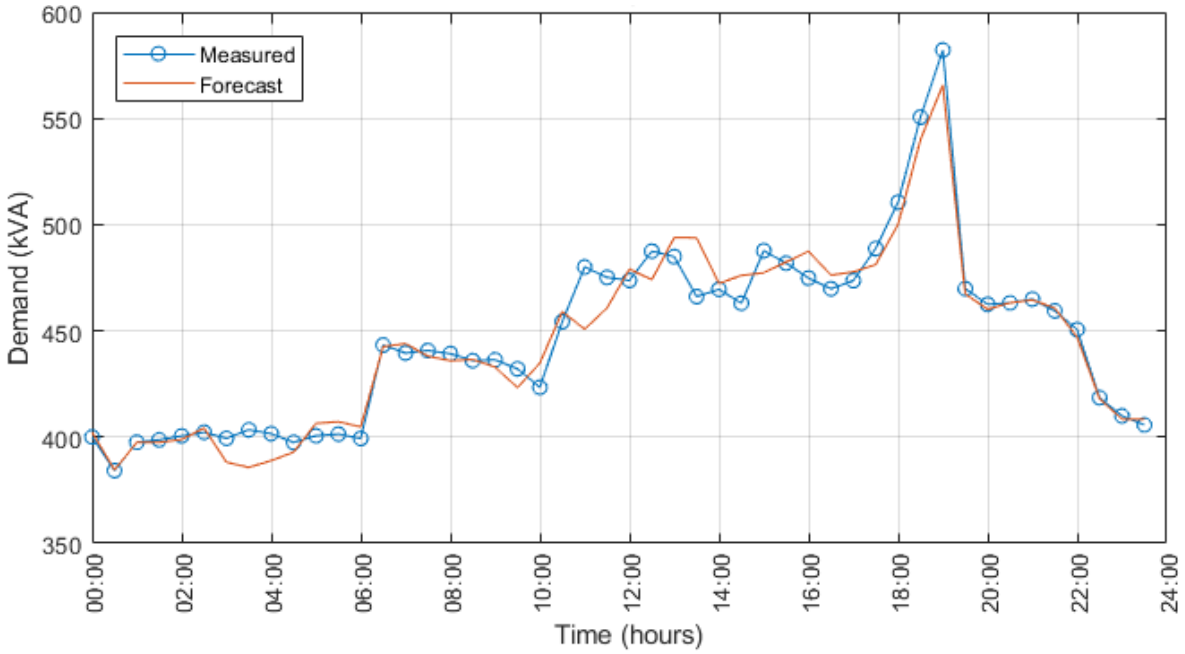

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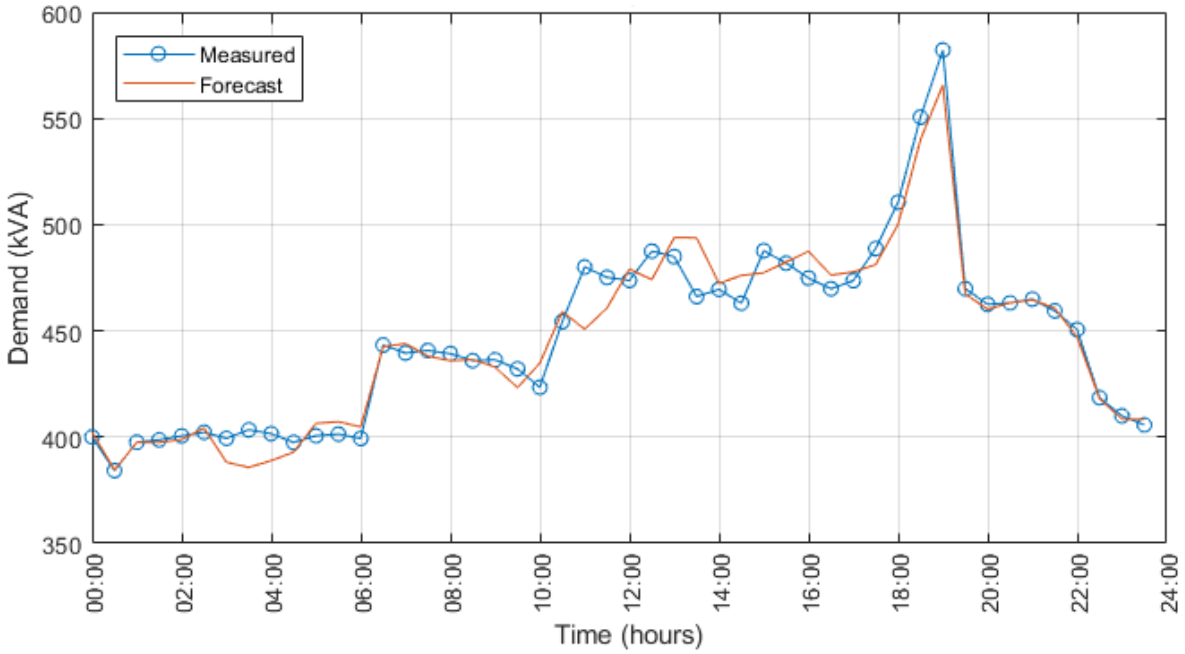

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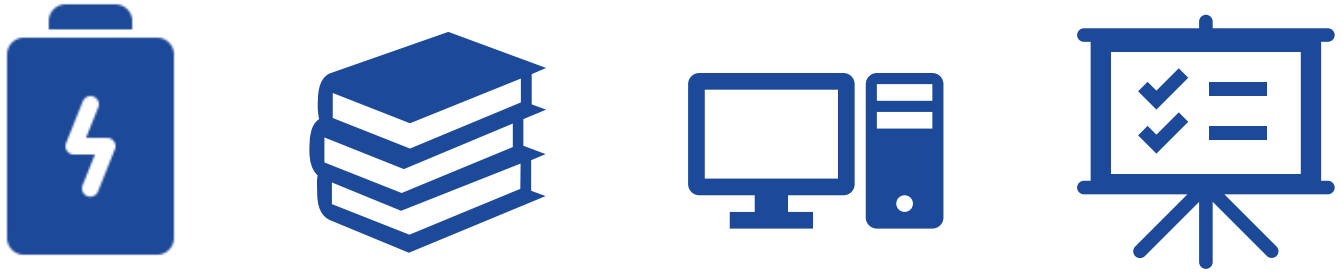
Conclusion

Lack of an operation framework that considers all the fundamental BESS services within various stakeholder and technical contexts



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