Urban Micro-grids

Narendra de Silva, PhD.
Electricity Network is the largest machine humans have built
Lanka Electricity Company (Private) Limited

- 600,000 customers
- 250MW peak demand
- 1600GWh of sales
- 1,100km of 11kV network
Future of our world has to be seen through the lenses of four megatrends
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Clean and Just Transition

Energy Selling business

Selling a reliable service

Geographic Service

Individualized service
Future of Urban Utilities – Innovative technology fix

Present status of electricity grid

*Operational as a monolithic structure*

Micro-grids in connected and islanded mode

- Urban Utilities to metamorphosize into micro-grids.
- The micro-grids to provide reliability in islanded mode
Urban Micro-Grids – Mode of Operations

1. On-grid Operations
   a. Peak Shaving mode – Battery is charged and discharged to shift the peak
   b. Solar intermittency mitigation mode – Battery is used for transient mitigation

2. Off Grid Operations
   a. Fault outage mode – Battery is used for fault ride-through
   b. Planned outage mode – Battery is used to maintain supply for longer durations
Urban Micro-Grids – On Grid operation for peak shaving
Urban Micro-Grids – On Grid operation for transient Mitigation
Urban Micro-Grids – Operation during fault

- Non-essential load disconnection
- ADSM Level II
- ADSM Level I
- Peak shaving reserve – Distributor’s share
- Outage reserve – Customer’s share
- Transient mitigation reserve – T/G share
- S
- Battery
- Load
- ADSM Level I
- ADSM Level II
- Non-essential load disconnection
Urban Micro-Grids – Operation during planned outage

- Non-essential load disconnection
- Peak shifting reserve – Distributor’s share
- Outage reserve – Customer’s share
- Transient mitigation reserve – T/G share

- ADSM Level I
- ADSM Level II
- Non-essential load disconnection

ADR Level I & II

Battery

S

DG
Commercial Model for Micro-Grid Operations

**Prosumers**
- Pay for transient mitigation

**DR Consumer**
- Pay for enhanced reliability
- Rebated for Demand Control Responses

**Consumer**
- Pay for enhanced reliability

**Distribution Utility**
- Pay for load management
- Pay for enhanced Reliability (below standard performance)

Micro-Grid Services
- Reliability Payment
- ADSM Payment
- Pay for transient mitigation
- Reliability payment
- Peak shaving Payment
Thank You
Campus Micro-Grids – Design

- 800kWh Battery Bank
- 250kW Solar Installation
- 630kVA Transformer
- Diesel Generator, 320kVA
- Diesel Generator 2, 200kVA
- 400V 3 phase Bundled Conductor distribution line
- Demand Response in the building
Campus Micro-Grids – Design
# Campus Micro-Grids – Project Cost

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