Energy Storage Initiatives

BSES Yamuna Power Limited

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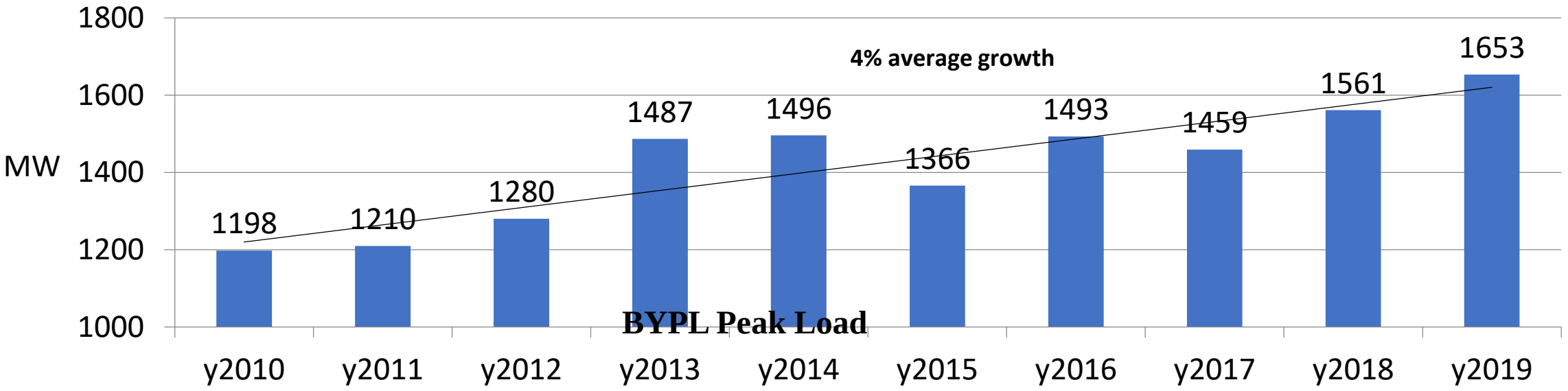
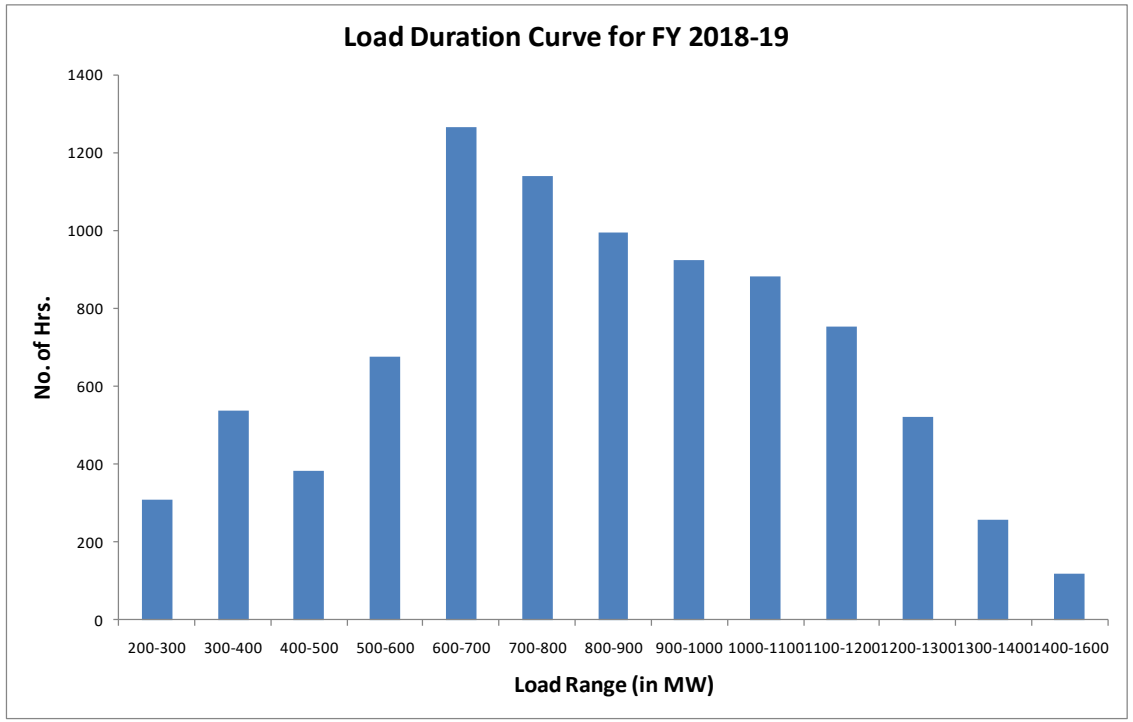
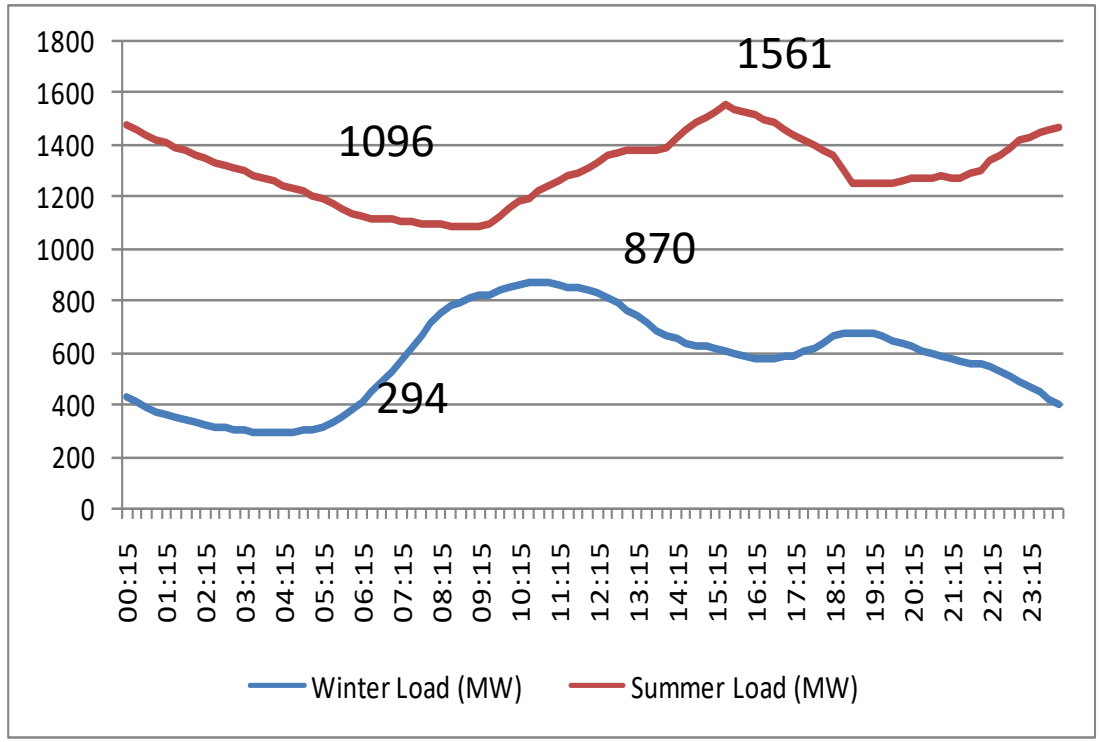
Peak Demand Trend



- Peak power demand reached all time high of 1563 MW for FY 18-19 under BYPL license area.
- Demand expected to increase further with greater urbanization, population increase, rising incomes, and improving standards of living
- Excess peak demand may at times necessitate purchase of expensive power

Load Duration and Load Curves





- Peak loading conditions are observed for approx 1.3 % of time in a year
- As can be seen peak load in winter is approx three times that of minimum load and in summers it is roughly 1.5 times

Need for New Technologies

- For managing peak conditions and bringing resilience to the network:
  - Energy Storage
  - DR DSM measures
  - Energy Efficiency
  - Distributed Energy Resources
- ESS applications in following areas:
  - Load management
  - Increased operational flexibility
  - T&D loss reduction leading to environmental gains
  - Improved power quality and reliability
  - Reduction in Capex

Energy Storage Initiatives - BYPL

To mitigate the increasing peak demand conditions along with issues related to space constraints for system augmentation, BYPL has initiated following projects

- ESS at 11 kV Substation Level – 1 MWHr (combined capacity)
- Grid Tied Energy Storage with Solar Roof top – Microgrid
- Grid Level ESS (3-4 MW) : Under Feasibility Study

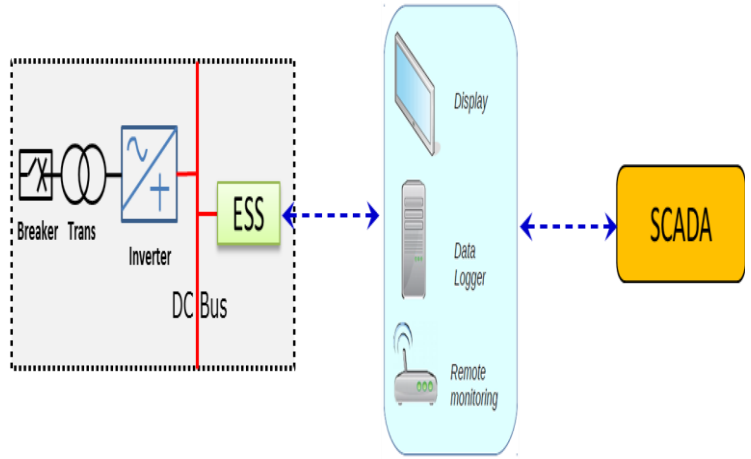
Energy Storage Systems at 11kV Sub-stations

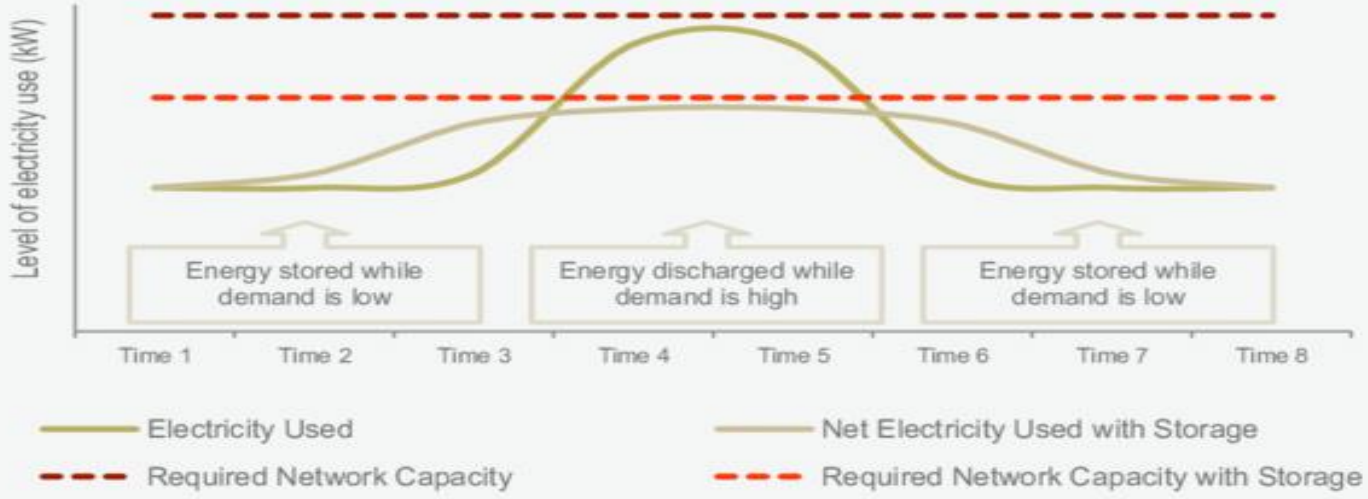
- Li-Ion based Energy Storage System is being installed at five DT locations
- Each system would have a energy storage of 200 kWhr with peak capacity of 100 KVA
- The solution would test different battery chemistries
- Integration with SCADA for simultaneous operations
- Test bed for other projects

Proposed System

System Architecture

- ESS would form the dispatch able energy source which would have fully autonomous and trigger based response
- The exact time, quantum, and mode of operation would be either pre-programmed or else it could be a user defined pattern based on the historical load data at a particular site
- Real time data visualization along with suitable data analytics would be generated based on detailed scope of project.





ESS at 11 kV Sub Stations

Project Benefits

- The project is expected to help in the following areas:
  - Decongestion of the LT side of the distribution network
    - large-scale batteries installed at appropriate substations would help mitigate the congestion ; Capex Deferral
  - Maintaining load curve
  - Emergency power supply for protection and control equipment
  - Dealing with space constraints as it is increasingly difficult to arrange land for network augmentation
  - Savings on account of avoidance of loss of revenue and penalties for non-provision of power
  - Improving reliability on critical loads
  - Capacity building and use case development for scale up

Project Brief (Key Highlights of the Project)

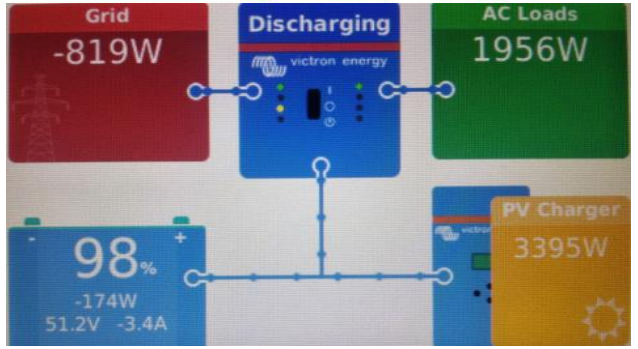
Objectives :

- The project would help finding/developing use cases for integrating renewable energy and Energy storage systems at household level, small consumer communities and power distribution utilities
- Further, it would help to analyse data pertaining to power quality and effects of various parameters viz., temperature on battery performance etc.
- Pave way for further induction of distributed and large battery energy storage systems
- Four microgrid systems were installed at BYPL office locations of varying load and configurations.

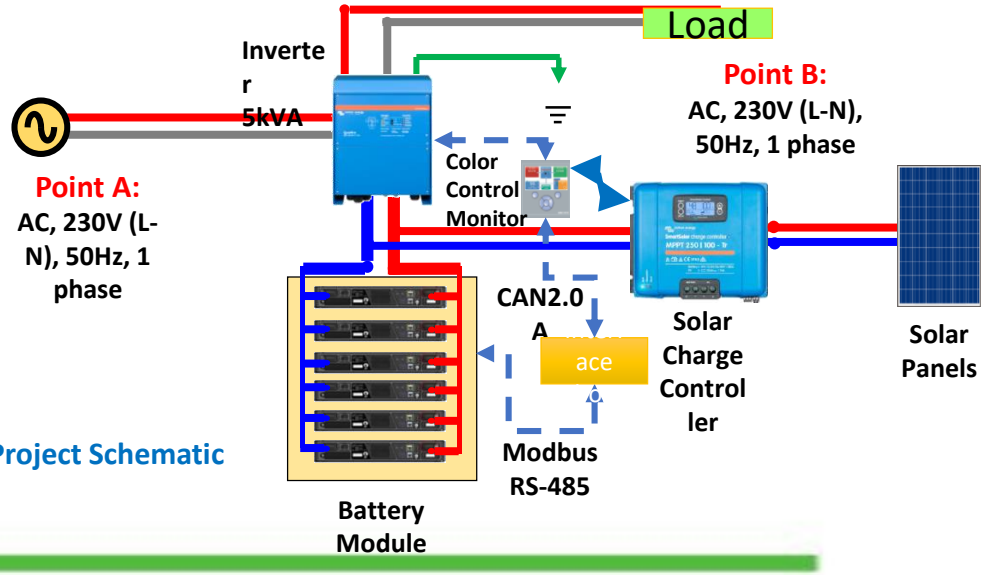
Installation Locations

System Locations	PV Capacity	Battery capacity
MVR Business Office	7Kwp	10.4kWh
PKT-C Mayur Vihar	3Kwp	5.2kWh
Trilokpuri Dispensary	3Kwp	5.2kWh
Sadar O&M	3Kwp	5.2kWh

Energy Flow Snapshot



Project Schematic



Potential Impact of the Project

Assessing Case from	Motive

• Replacement of DG
• Act as a Microgrid (standalone)
• Bunch of small ES can act as large storage
• DSM and DR enabler
• Simulation case for replicating the same to MW level
  • Utility Business case
  • Case for consumer adoption
	• Managing overloading in LT systems
	• Energy Storage & DER integration
	• Capacity Building
	• Technical know how and testing of installed system

Initial Findings:

- The self sufficiency level efficiency is coming out in the range of 65-75 % across sites
- The microgrids if optimally sized can attain a self sufficiency level to the tune of 80-90%

- **Reduced Grid dependency :** Reduction in energy consumption upto `80 % if the system is optimally sized with respect to load
- GHG mitigation to the tune of 10,000 tons of CO_2 in case of a large scale deployment of 1000 installations
- Utility can gain through peak demand reduction through DR, decongestion at LT level and loss reduction.
- Further large scale rollout can give utility an energy reserve to minimise DSM penalties

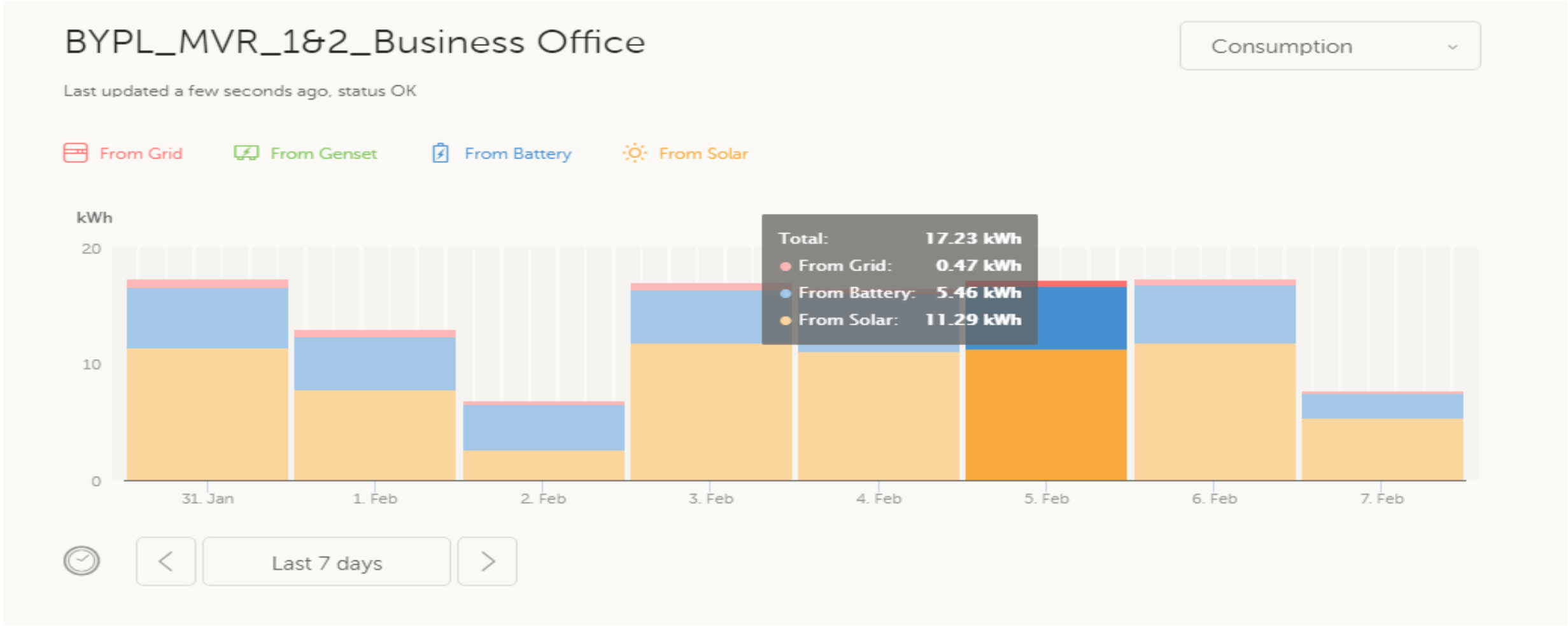
Scalability and Replication Potential of the Project

- The system is fully scalable
- Can be deployed in large scale if utility and customer can share cost , the project can be viable.

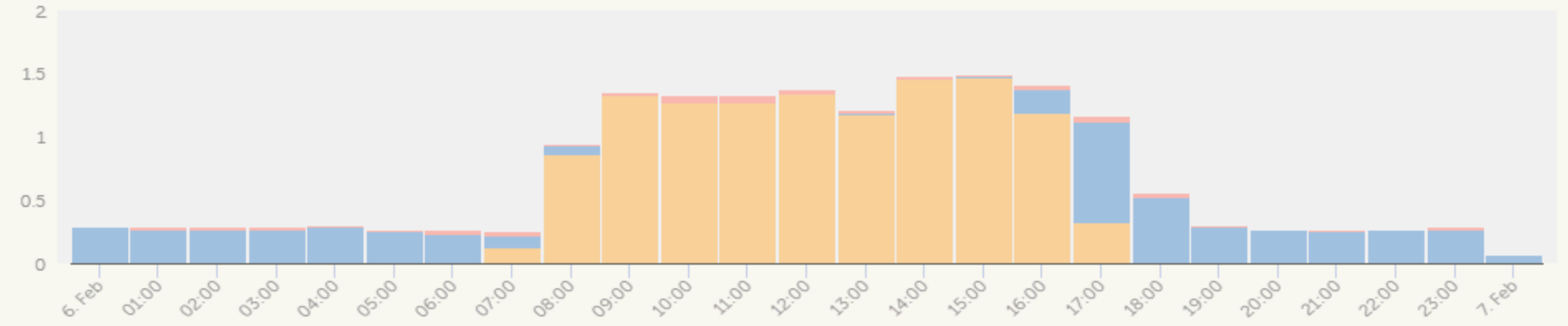
Economic Rationale of Project

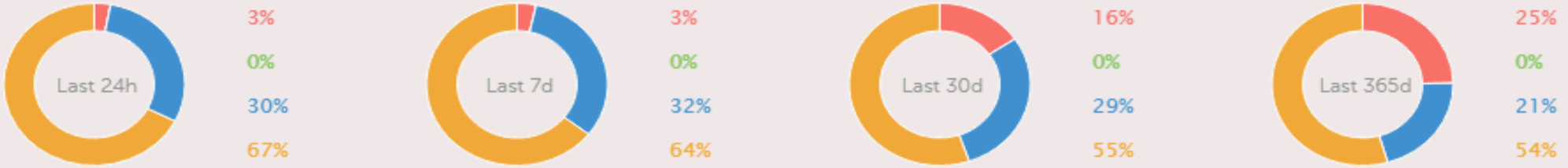
Power Purchase Reduction	**UI/DSM benefit**	**Upstream Transmission charges and losses reduction**	**CAPEX Deferral**	**Solar energy generation and DG mitigation**

System Overview

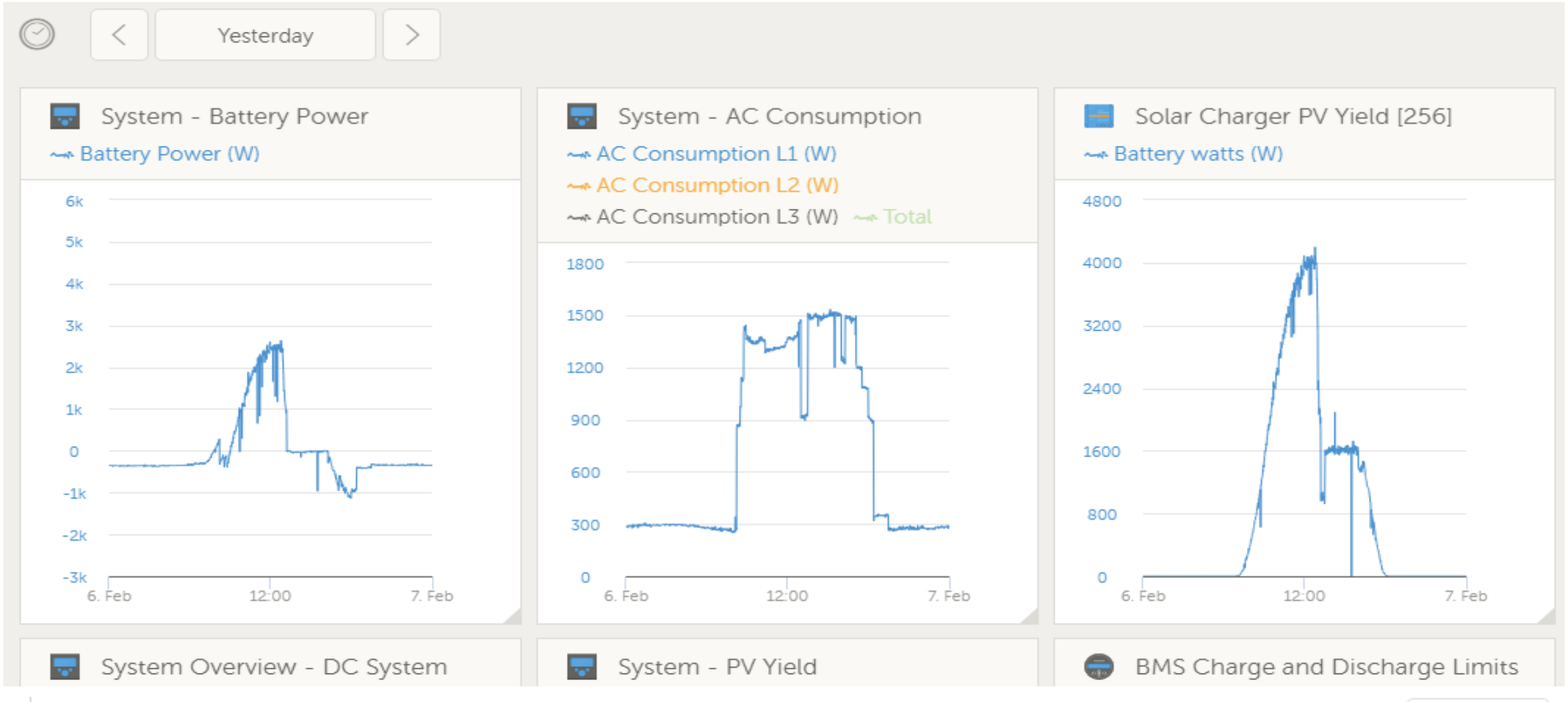


Consumption





System Parameters



Energy Storage – Grid Level

- With the help of above POC, looking for suitable business models for Utilities
- Going ahead with technical studies with a leading Govt. Entity for possible capacity deployment of Energy Storage in BYPL licensee area
- Major Applications
  - DSM Penalty mitigation
  - Ancillary Service for power quality
- Further looking for partners for looking out for feasibility of Battery Swapping System deployment. The system can act as a Energy Storage system as and when required by Utility.

Thank You…

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