Battery Energy Storage: Opportunity & Challenges in Bangladesh

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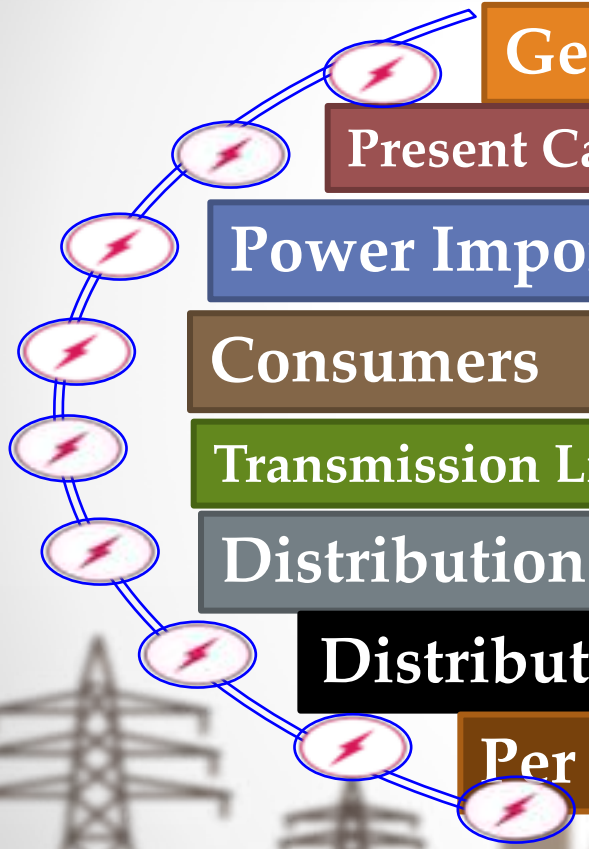
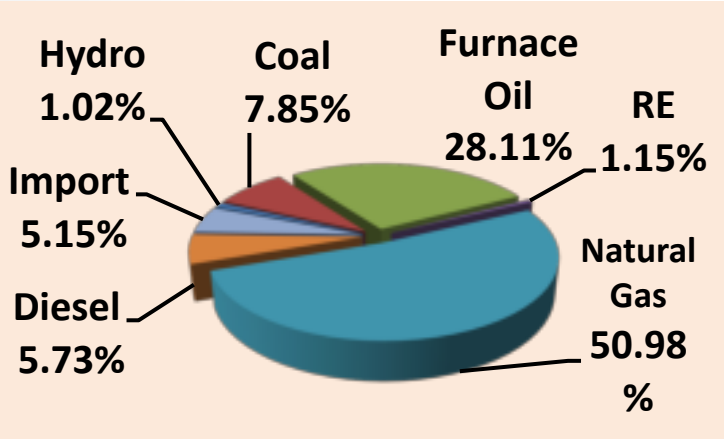
Power Sector: At a Glance



Generation Growth	: 10 % (Av.)
Present Capacity (Excl. Captive & RE)	: 23,482 MW
Power Import	: 2,656 MW
Consumers	: 45.4 Million
Transmission Line	: 14,934 Ckt. km
Distribution Line	: 6,43,167 km
Distribution Loss (FY 2021-22)	: 7.65%
Per Capita Generation	: 608 kWh
Access to Electricity	: 100%

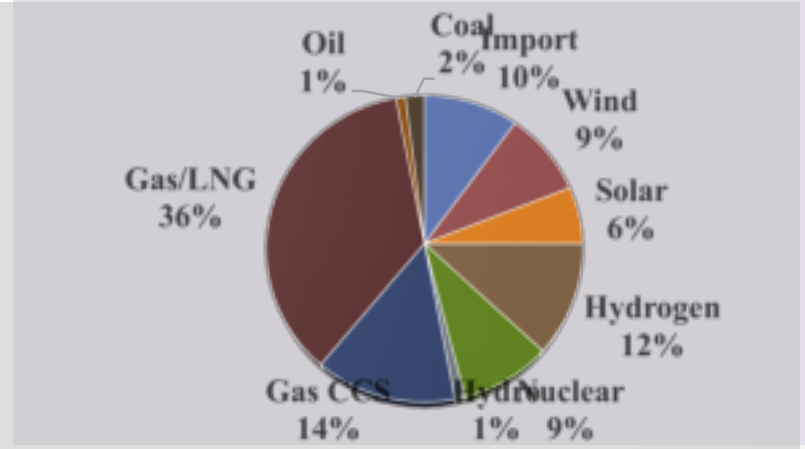
Fuel Mix: Generation Capacity (Grid)

22,512 MW



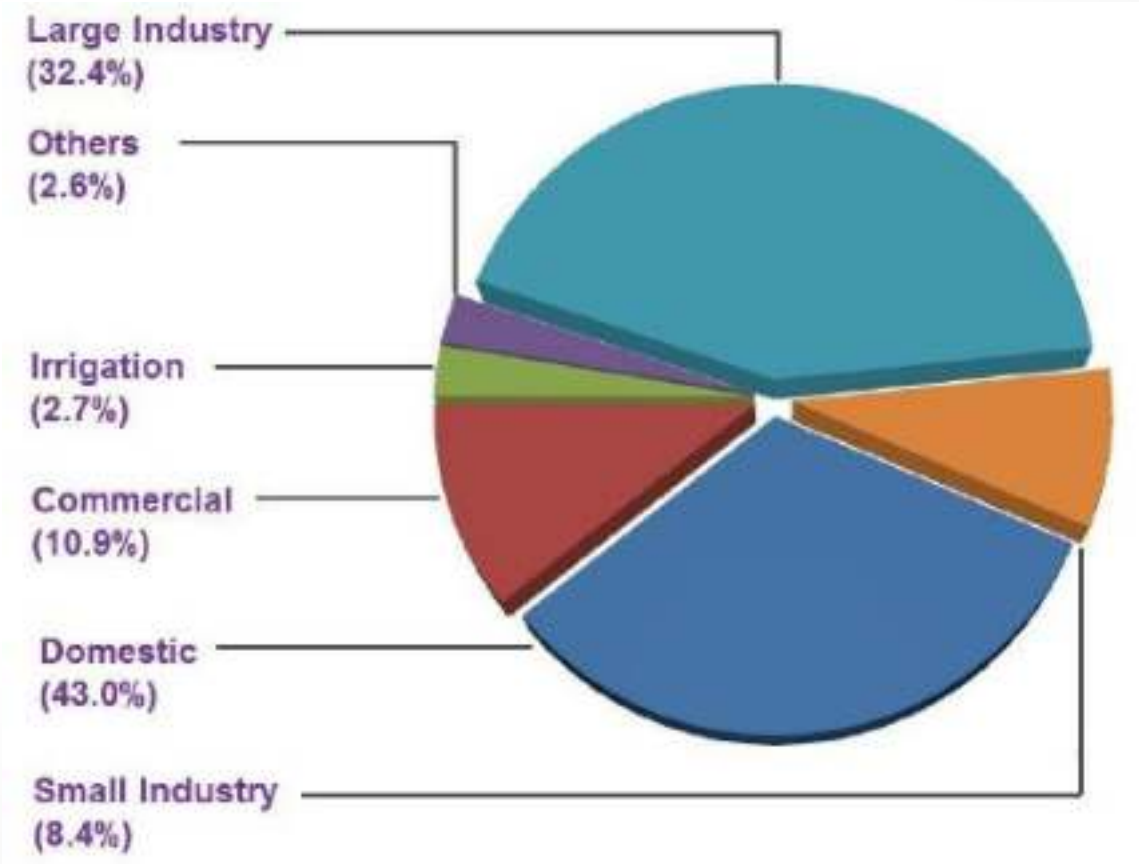
Present

77,000 MW

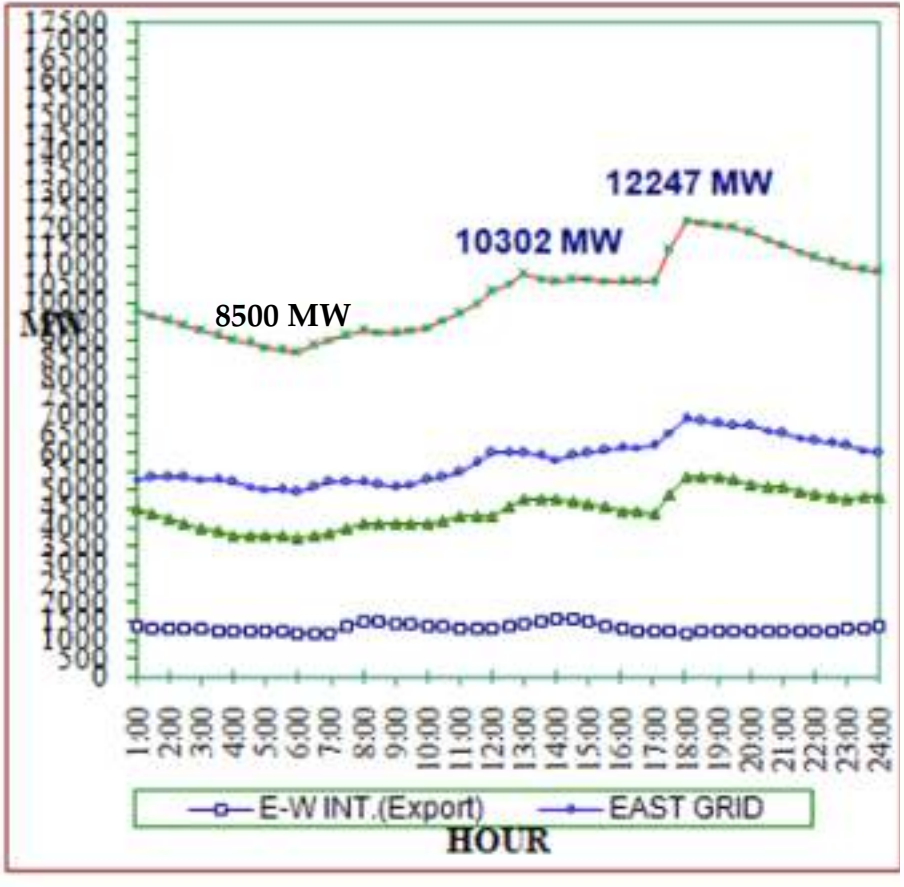


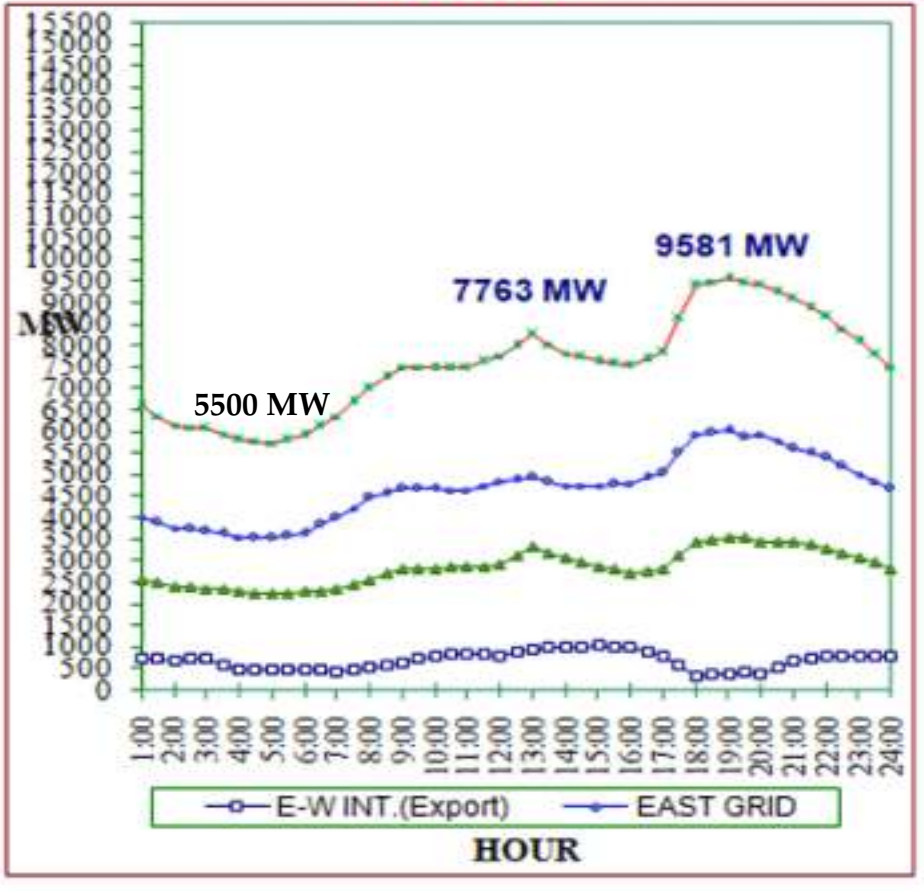
2050

Category wise power consumption



Summer and Winter Demand Curve





Challenges in Bangladesh Power Sector

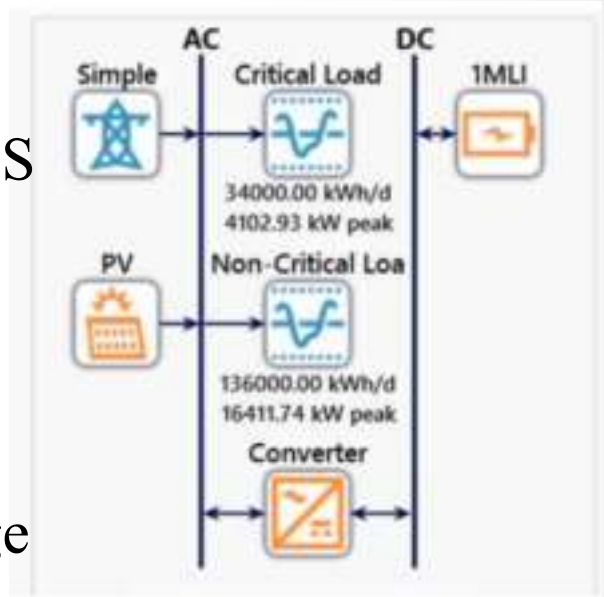
- Quality and reliability of electricity supply
- Load Demand is increasing fast
- Generation growth is high
- Bangladesh-India HVDC B2B inter connection
- Frequency and voltage issues
- Nuclear power is up-coming
- Renewable is continuously added
- # of EVs (3-wheelers) is increasing (unplanned)
- Climate is changing
- Industries reluctant to utilize grid power accusing unstable power supply
- Investment; high cost of capital

Why Energy Storage?

- Flexibility – Load and generation
- Handle VRE uncertainty/dispatch
- Balance supply & demand
  - As load
  - As source
  - As storage

BESS-EU Project

- Study on Peak Shaving using BESS
- Steady state calculation
- BESS dispatch
- Financial statistics
- Recommendation to use for voltage support



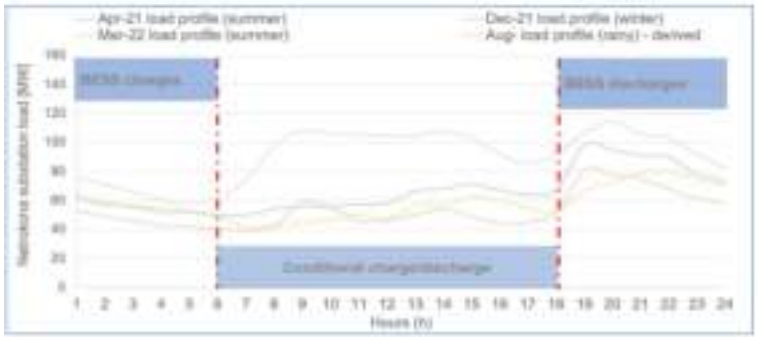
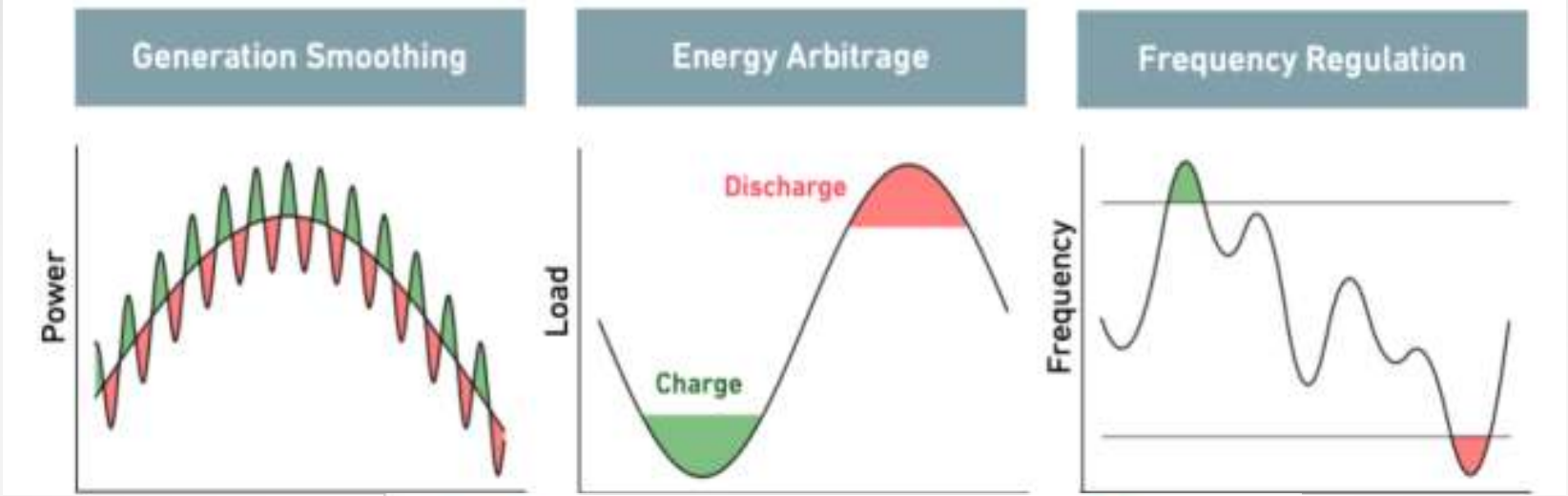


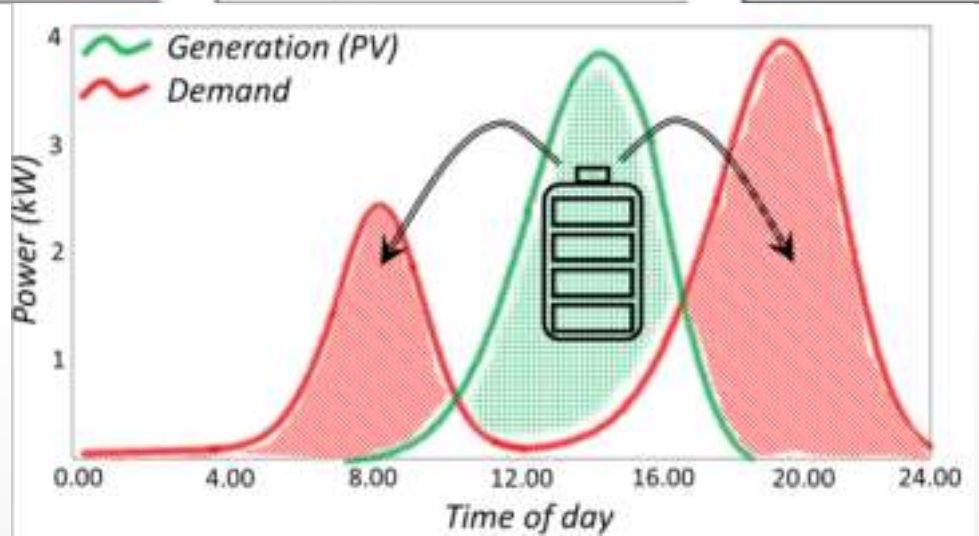
Figure 27: BESS charge/discharge philosophy

BESS-ADB Project

- Study most of the areas
  - Distribution
  - Transmission
  - VREs
- Piloting for end user level (2MWh/1MW)
- BESS Calculator for financial and feasibility study

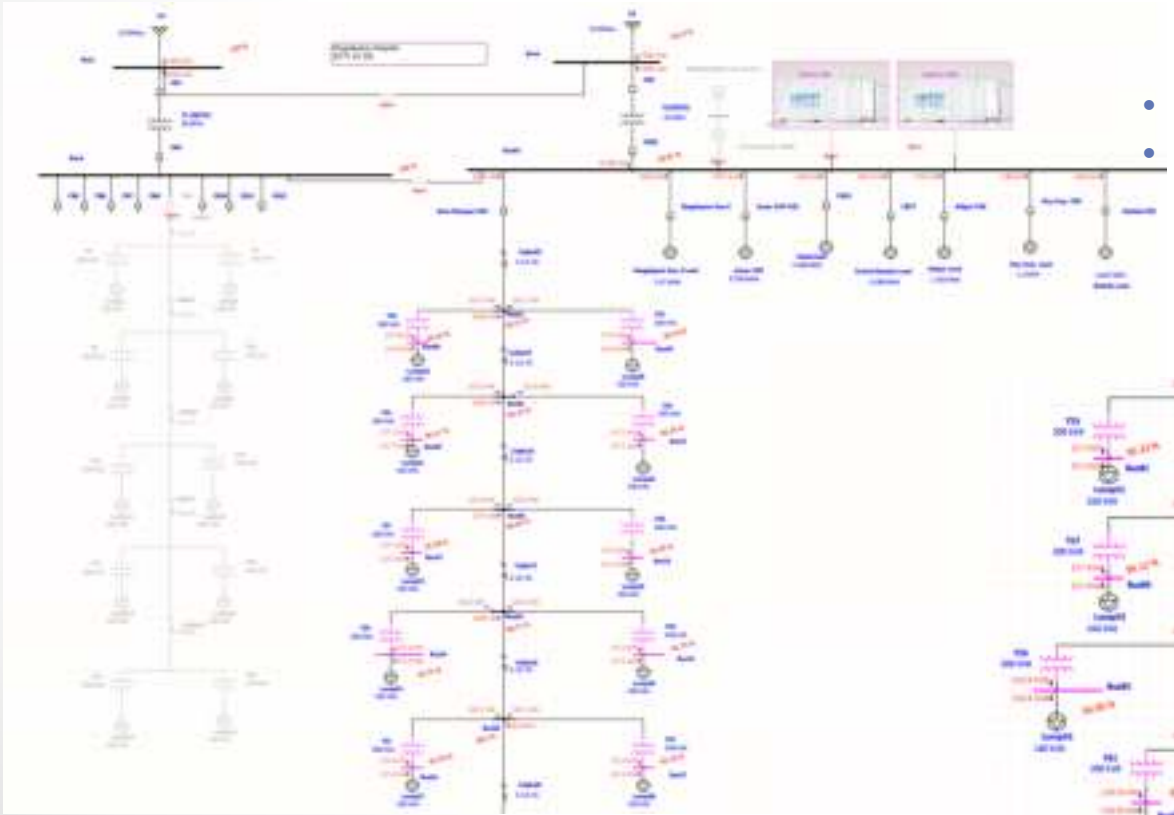
BESS as a solutions for stable power supply





Sub-Station LF- Base Case

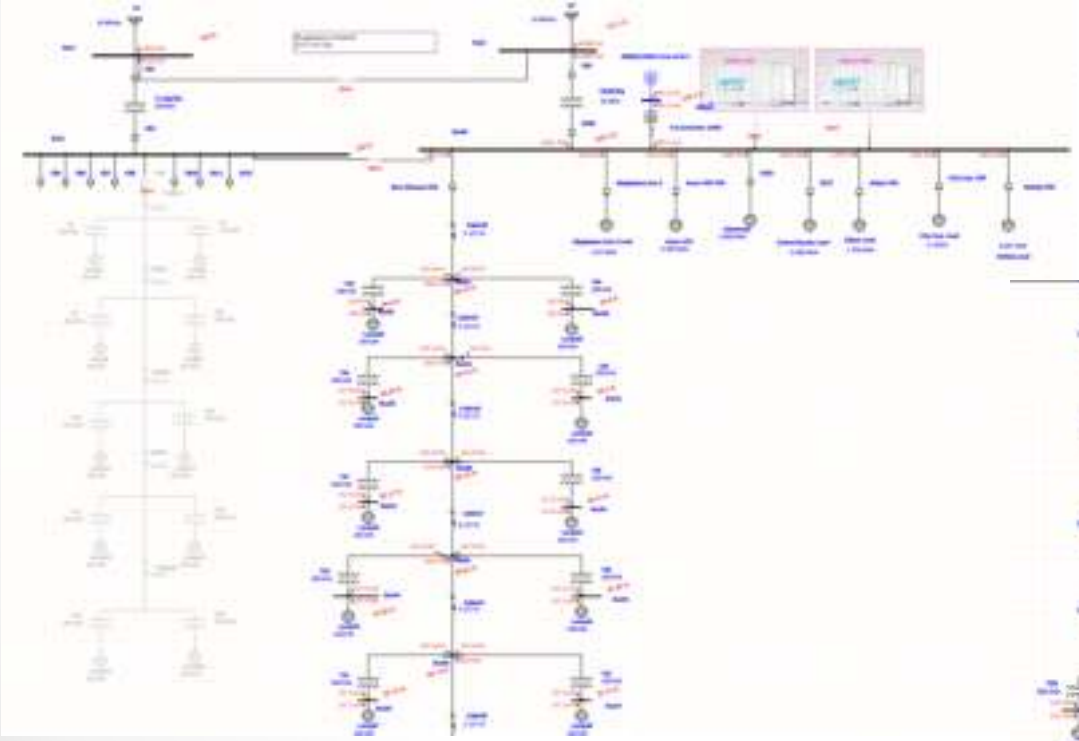
- **Base Case – Peak Load (Worst Case Scenario)**



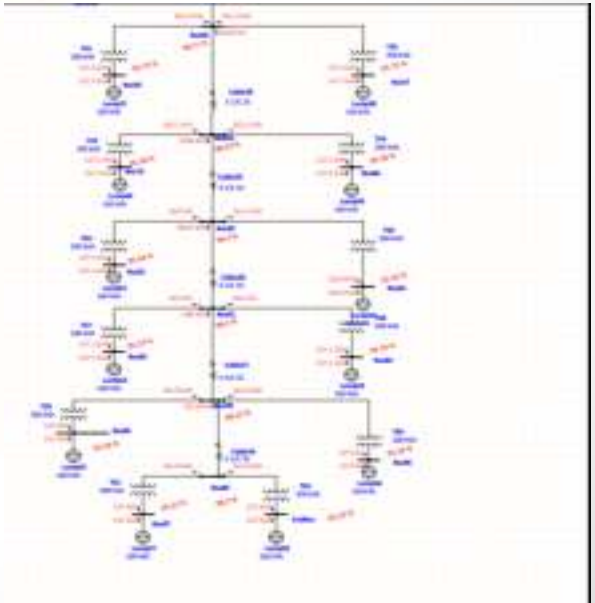
- No voltage violation
- No thermal violation

Sub-Station LF

- **Peak Load; BESS Dis-charging**

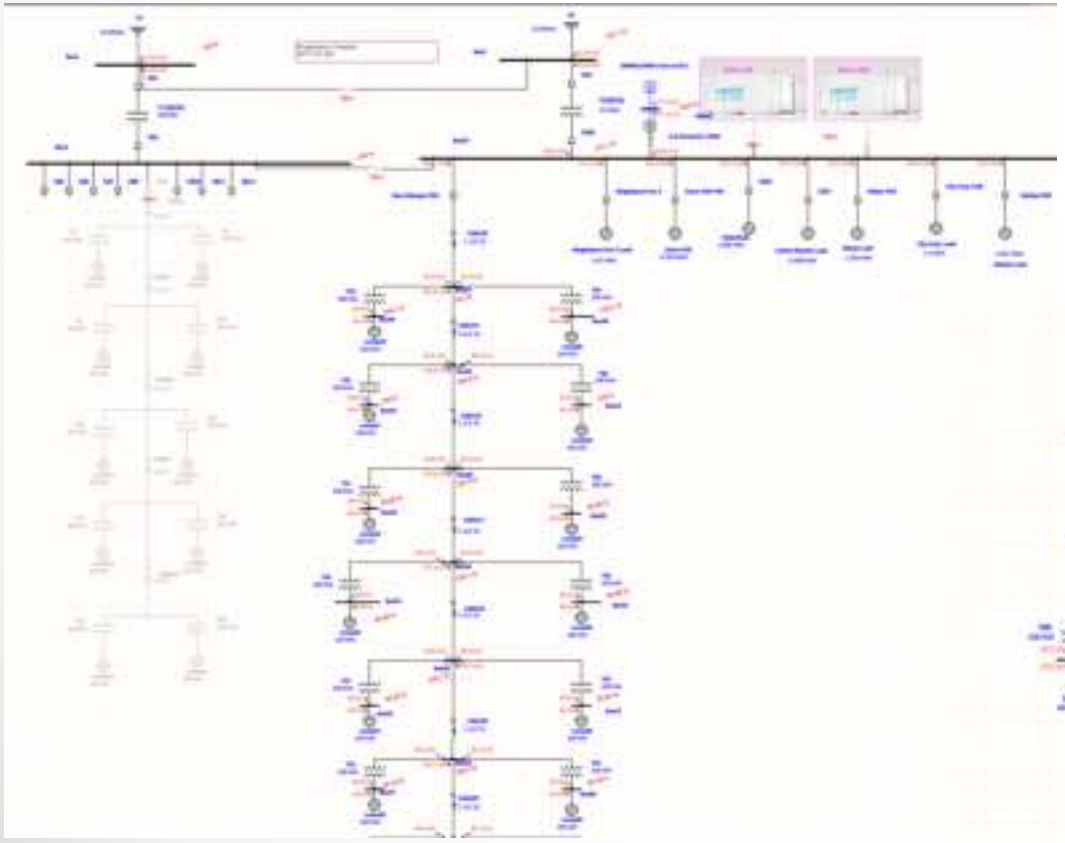


- **No voltage violation**
- **No thermal violation**



Sub-Station LF

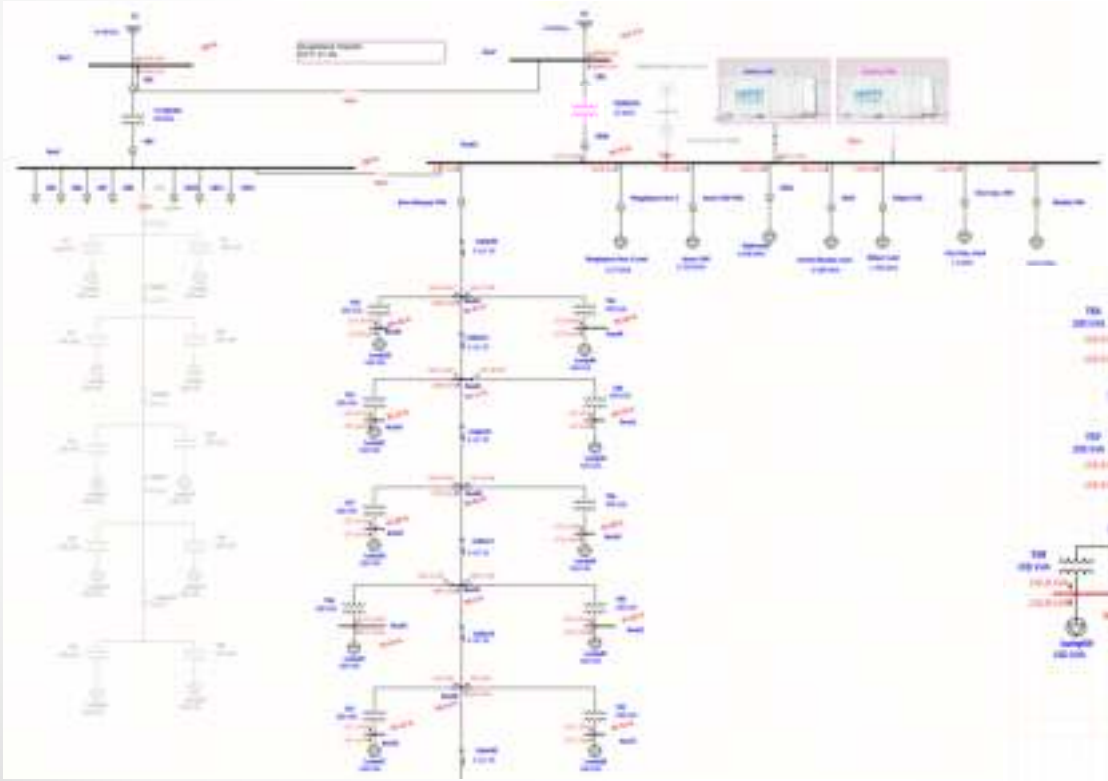
- **Off-peak Load; BESS charging**



- **No voltage violation**
- **No thermal violation**

Sub-Station LF

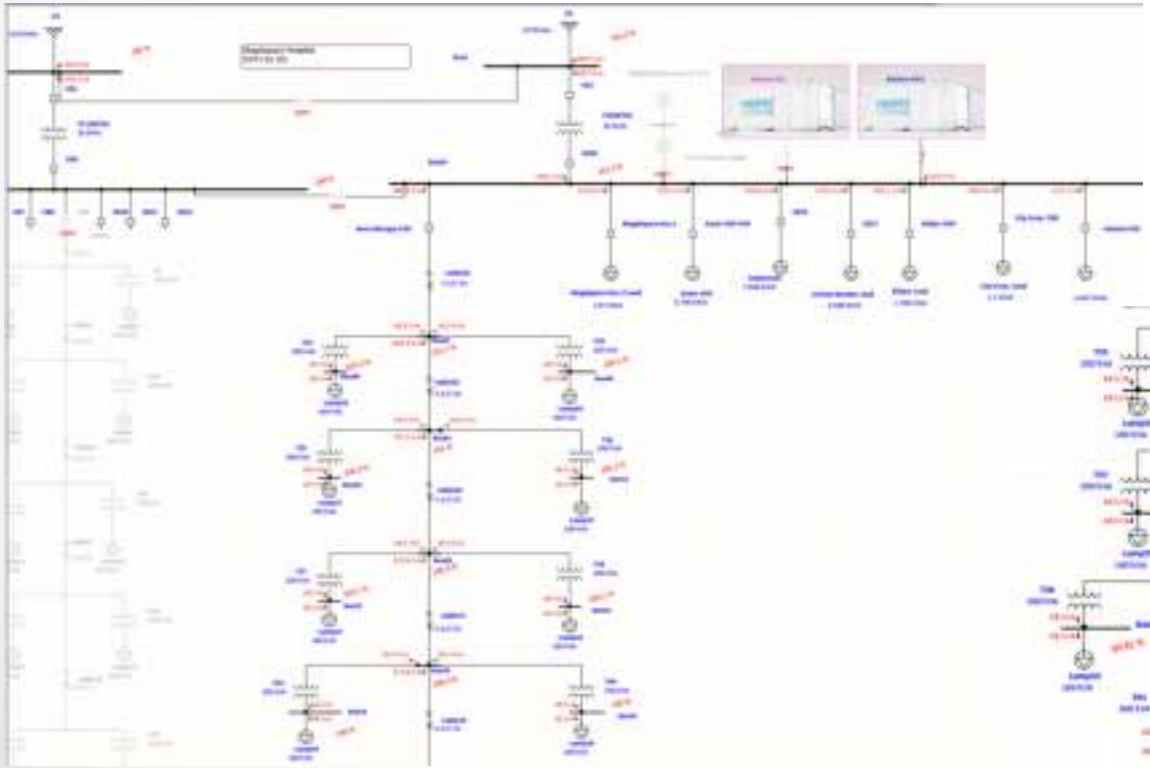
- **Peak Load; BESS charging**



- **Voltage violation**
- **Thermal violation**

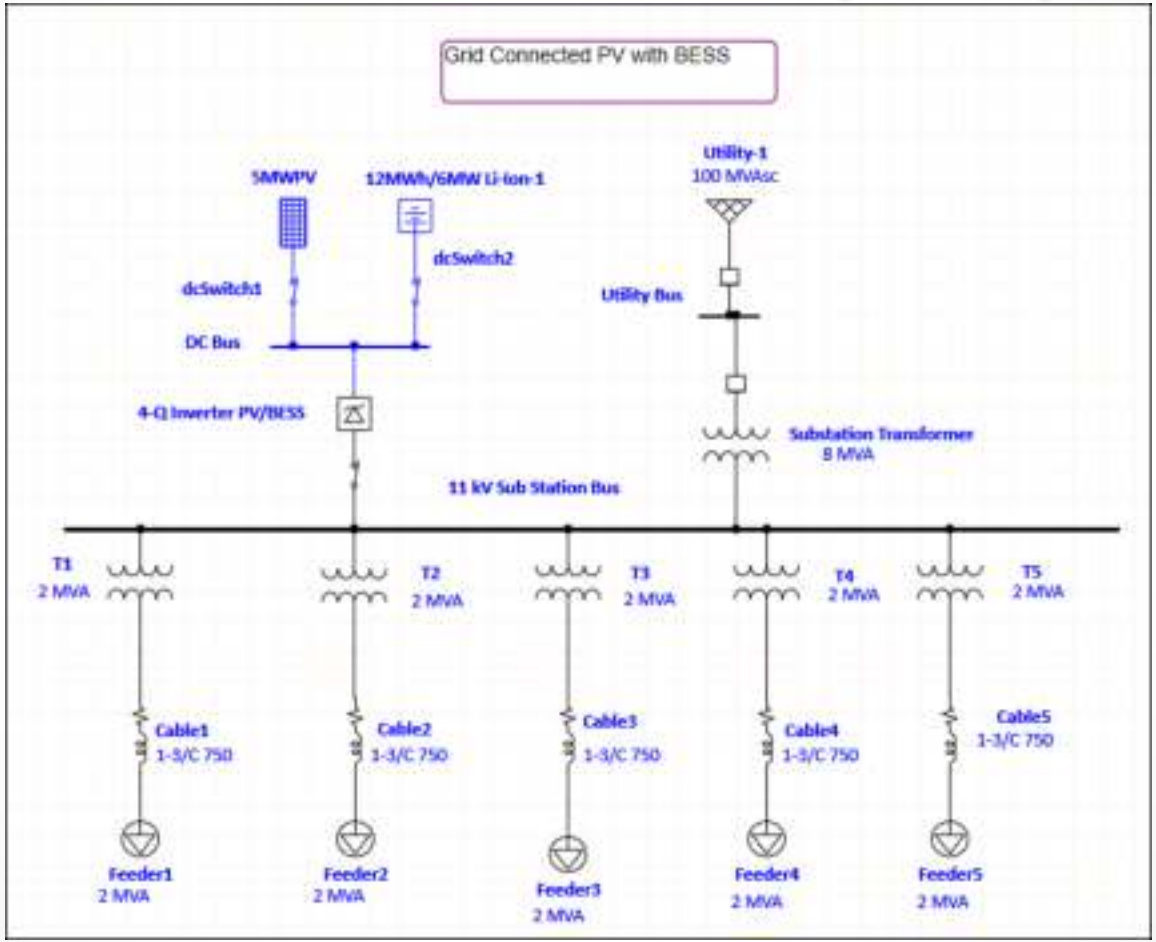
Sub-Station LF

- **Off-peak Load; BESS Dis-charging**



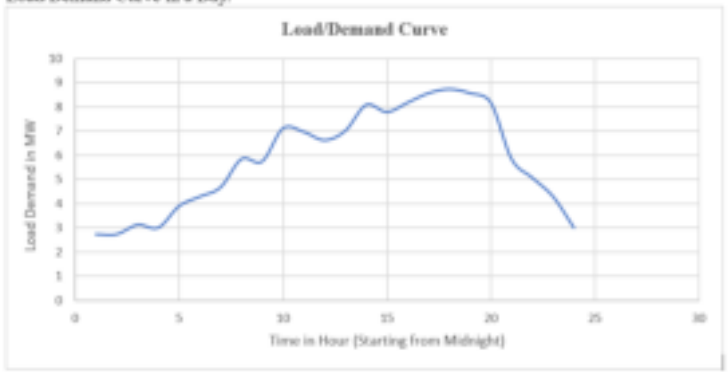
- **No voltage violation**
- **No thermal violation**

BESS and PV (VRE)

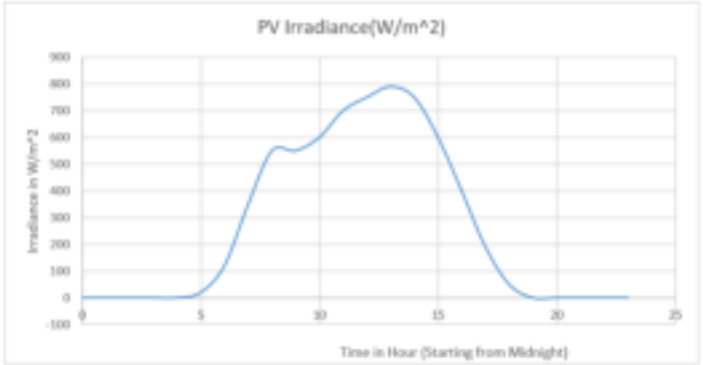


BESS and PV (VRE)

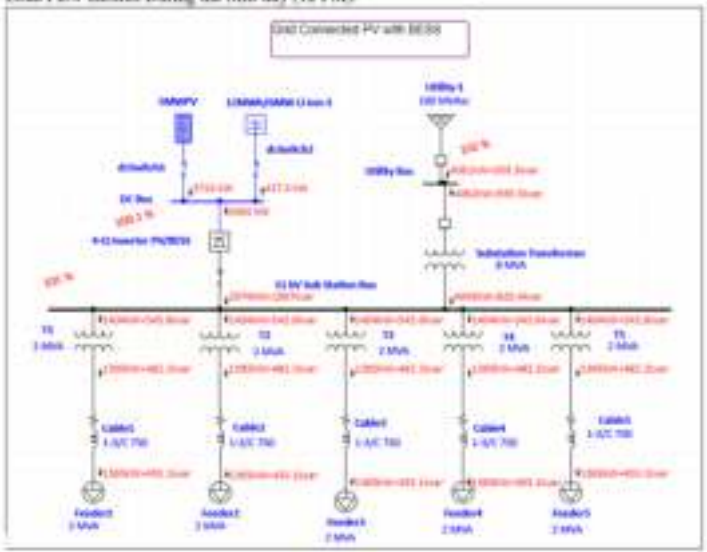
Load/Demand Curve in a Day.



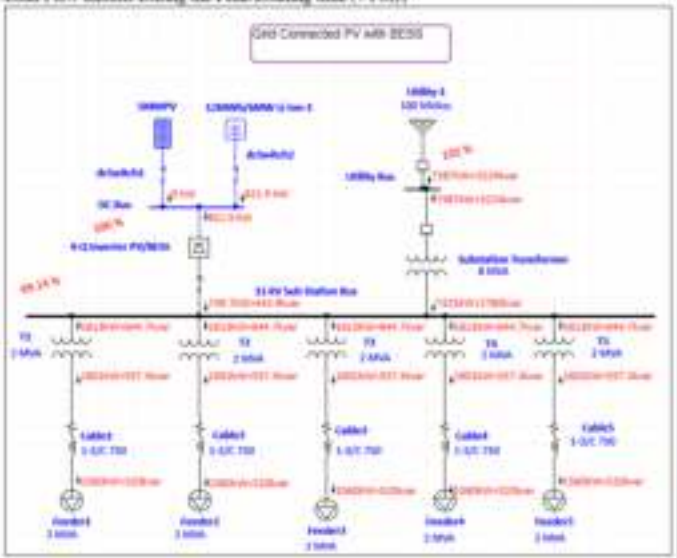
PV Irradiance:



Load Flow Results During the Mid-day (12 PM):

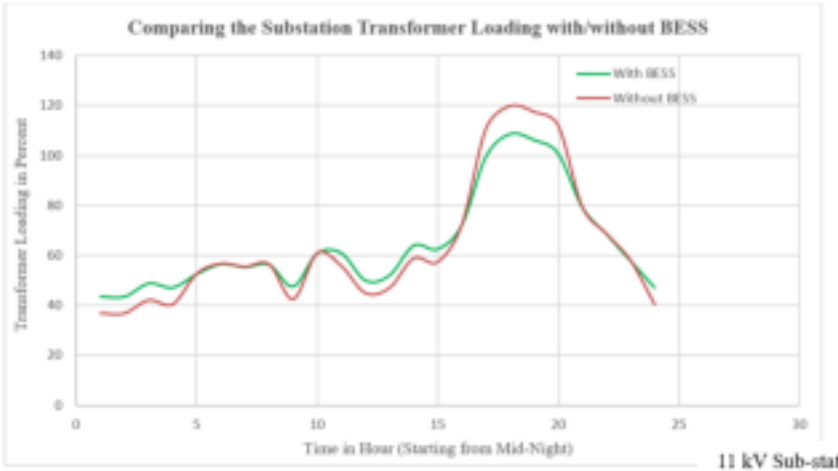


Load Flow Results During the Peak-Loading time (7 PM):

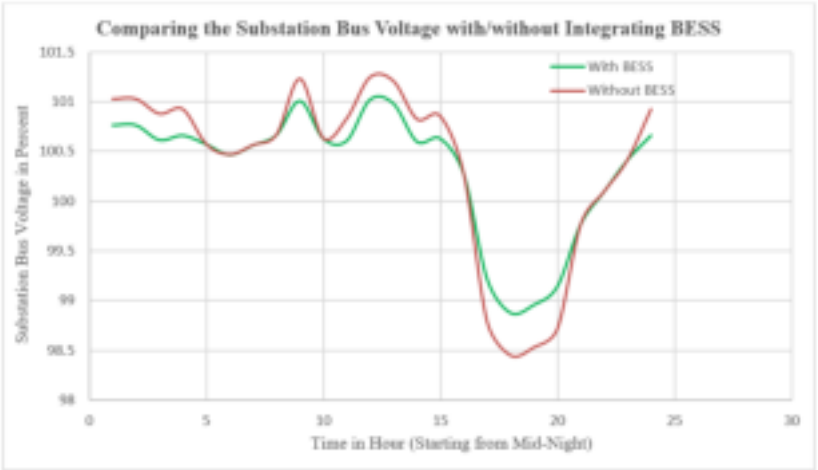


BESS and PV (VRE)

Substation Transformer Loading (Congestion Relief/Deferral):

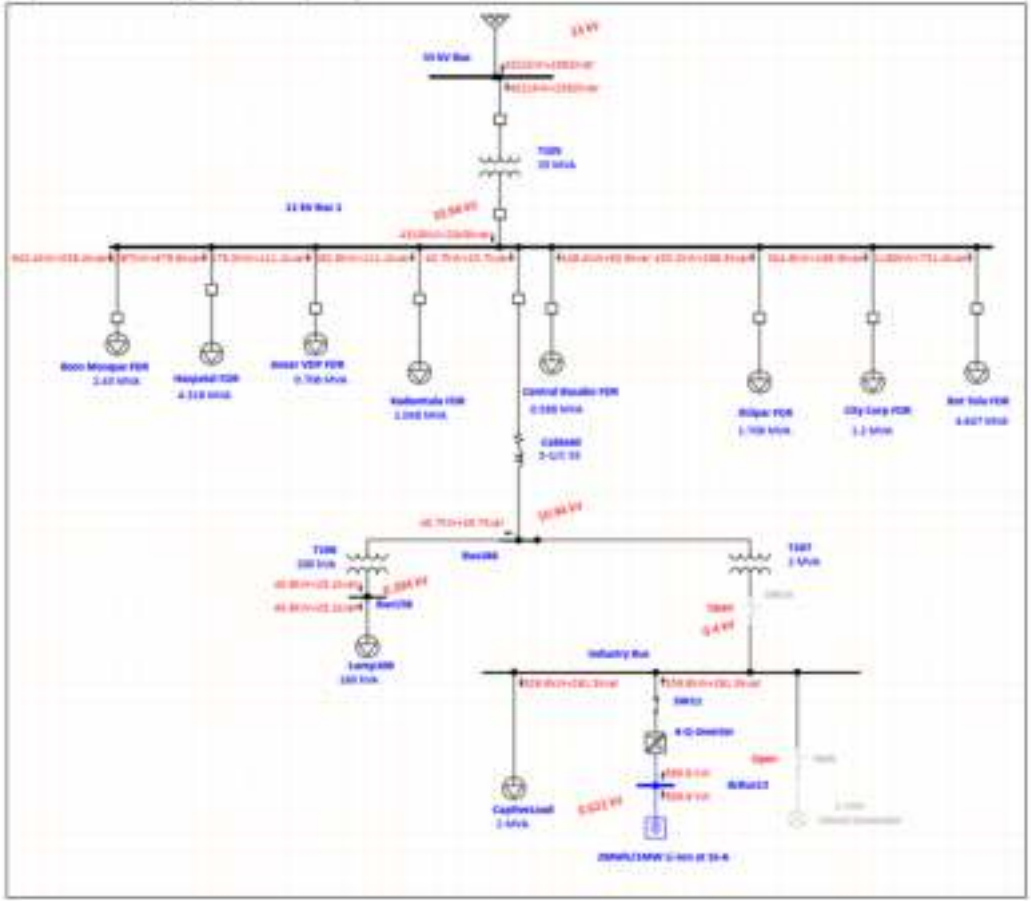


11 kV Sub-station Bus Voltage:



Captive Power

Captive Power Supply by BESS (P&Q):



Challenges

- **High Initial Investment**
- **High bank interest rate for Financing**
- **Space requirement**
- **Climate condition (Temperature, Humidity etc), HVAC required**
- **Duty structure around 60%**
- **Regulatory, incentives**

- **Battery Cost >= 5c / kWh**

Thank You…..