

# APPLICATION OF BATTERY ENERGY STORAGE SYSTEM (BESS) FOR REDUCING DSM PENALTIES IN DISCOMS

Chetan Gusain<sup>1</sup>, Naqui Anwar<sup>1</sup> and Alekhya Datta<sup>2</sup>

<sup>1</sup>TERI School of Advanced Studies, New Delhi, India 110070

<sup>2</sup>Electricity & Fuels Division, The Energy and Resources Institute, New Delhi, India 110003

## INTRODUCTION

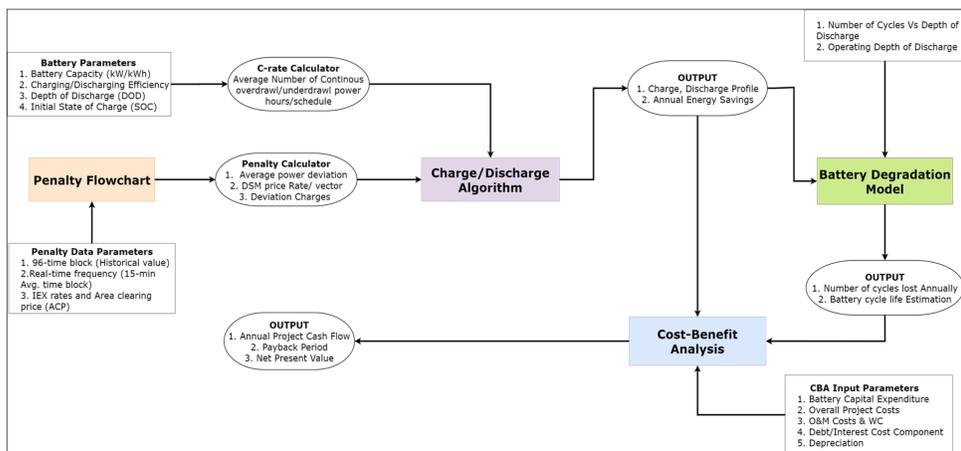
In India, nowadays the power utilities are facing significant problems to manage the 15-minute deviation settlement charges between actual and schedule in the licensee area, this is due to increasing demand over the years with varying load patterns. The main notion of the project is to evaluate the application of BESS for reducing DSM Penalties in distribution utilities (Case Study: CESC Limited).

## OBJECTIVE

- To quantify the amount of Deviation & the associated Penalties for a DISCOM operating in a particular region in India
- To develop the logic for controlling the BESS operation in response to the deviations, on a term-ahead basis.
- To perform techno-economic feasibility analysis for BESS as an option for reducing DSM penalties

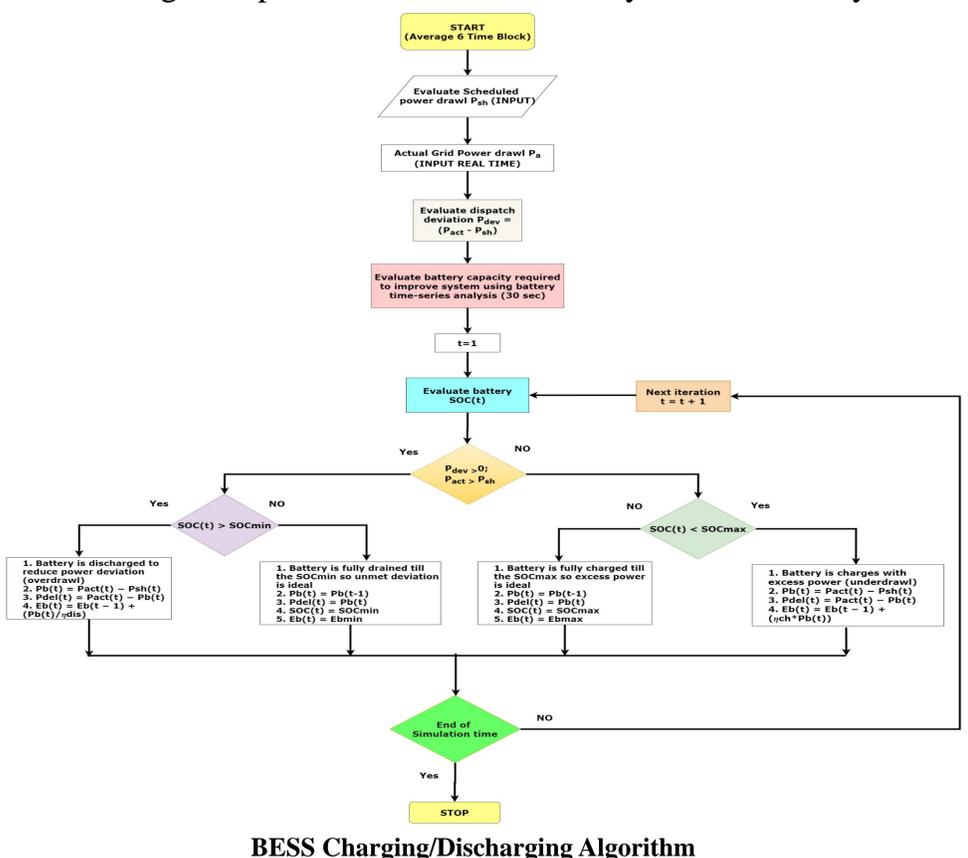
## METHODS AND MATERIALS

- Historical data of 96-time blocks (i.e., 24 hours) and each time block is 15 minutes of Distribution Utility (CESC Limited) is analyzed in real-time basis.



Approach adopted for Deviation Management Tool Development

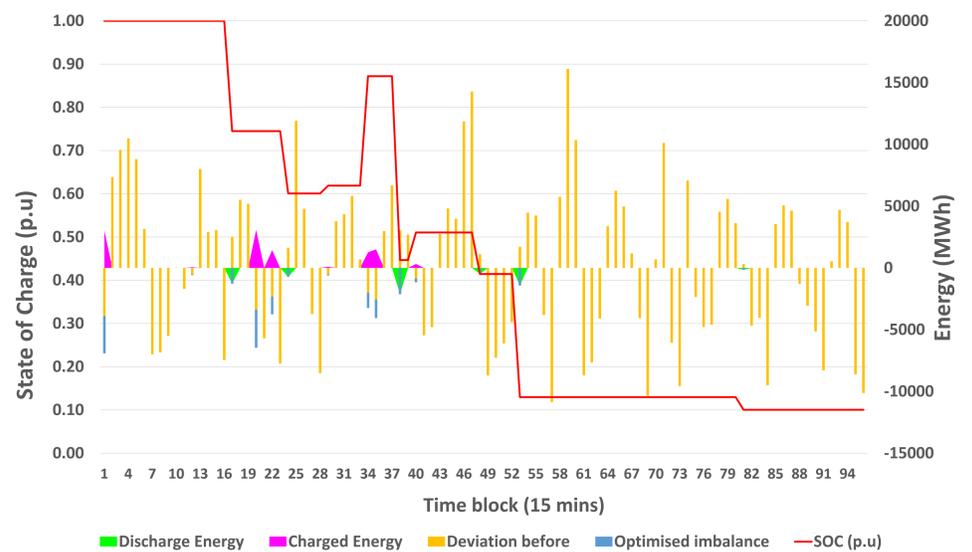
- An interactive excel-based algorithm tool is developed for the entire interpolation of 30 second samplings of ESS, helps in accurate forecasting system and also energy trading, to solve working disruption because of variability and uncertainty.



BESS Charging/Discharging Algorithm

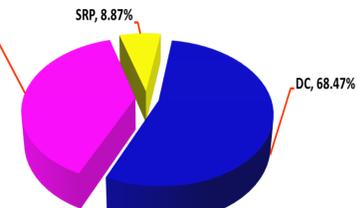
## RESULTS AND DISCUSSION

- The performance for Battery Capacity of 750kW/5000kWh for which the sizing calculated as per the logic adopted in the methodology, the battery is discharging as soon as a peak rate is observed at particular time of the day and also the battery is seen to be charging at off peak rates at lower price. The battery is seen to be idle at mid peak hours in order to incorporate the losses causing extra degradation.



Hourly analysis of imbalance energy before and after the optimization

- After comparative analysis, the overall optimal reduction of DSM penalties post after BESS is 45.19%.
- Changing the economic variants like ROE and Interest on loan the battery NPV is getting positive which depicts the payback period and IRR are more, i.e., 26.24% and also benefit to cost ratio is more than 1, have positive net benefits.



Comparative analysis of existing DSM A/c vs BESS DSM A/c

Monthly Summary & Distribution of DSM Penalties			
	5 <sup>th</sup> Amendment	Using BESS	Reduction (%)
1. Normal Penalty (DC)	₹ 37,92,028	₹ 11,95,456.64	68.47%
2. Addl. Penalty (ADC)	₹ 25,04,710	₹ 12,79,681.28	48.91%
3. Sign Reversal Penalty	₹ 26,82,705	₹ 24,48,770.85	8.87%
<b>Total Payable</b>	<b>₹ 89,79,443</b>	<b>₹ 49,23,908.77</b>	<b>45.19%</b>

## CONCLUSIONS

- The project envisions to implement a such model where DISCOMs can calculate their real time penalties which helps them to reduce the deviation for the Day-Ahead market.
- Deviation settlement charges using Battery Storage has limited benefits due to current policy regime.

## FUTURE SCOPE

- Stacking of Applications generates more Revenue stream for energy storage combining ancillary market
- Market participation in the Day Ahead market and real time energy trading, would increase further in coming years with decrease in battery prices.