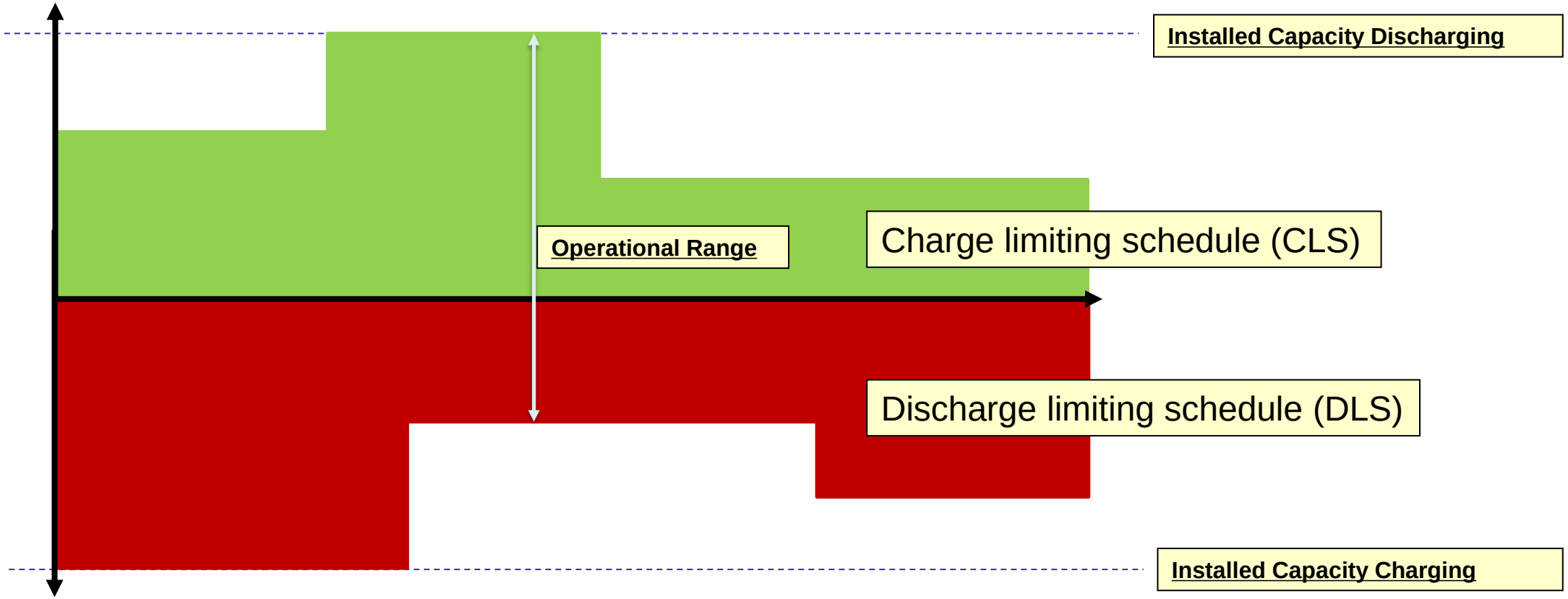
TSRG

BATTERY SCHEDULES FOR INTERCONNECTION

The Objective

… is to provide an interconnection mechanism that reduces storage impacts on distribution systems to achieve an economic optimum between resource value and interconnection cost through implementation of storage schedules that limit storage during peak hours

Dispatch Limiting Schedule

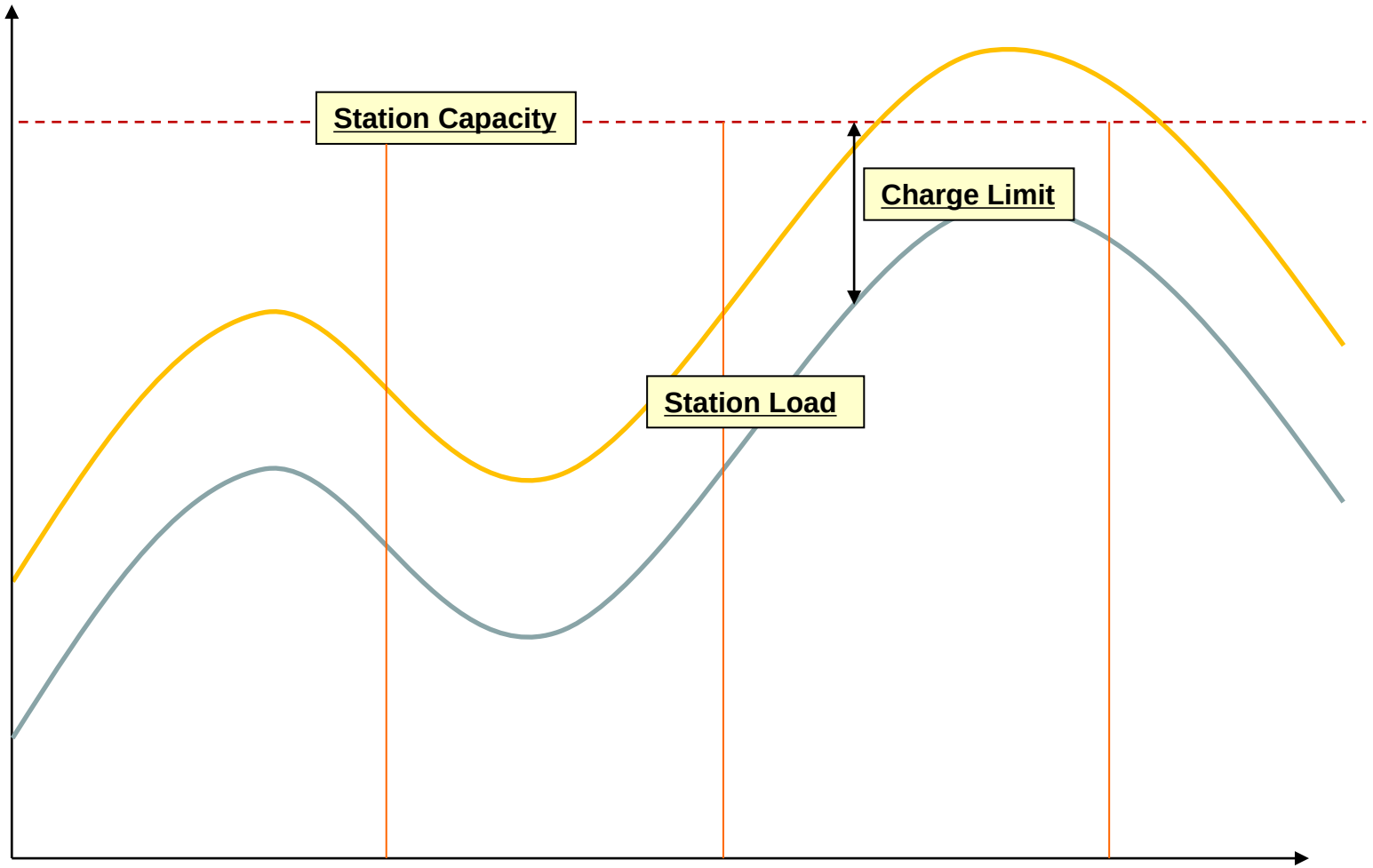


Sample Study Results

Discharge Limiting Schedule	08:00 – 10:00	10:00 – 16:00	16:00 – 18:00	18:00 – 08:00
Spring (April)	75%	75%	100%	75%
Summer (June)	100%	100%	100%	75%
Fall (Sep, Oct, Nov)	Follow Spring Schedule	Follow Spring Schedule	Follow Spring Schedule	Follow Spring Schedule
Winter (Jan)	Follow Summer Schedule	Follow Summer Schedule	Follow Summer Schedule	Follow Summer Schedule
Charge Limiting Schedule	**00:00 – 09:00**	**09:00 – 12:00**	**12:00 – 18:00**	**18:00 – 00:00**
Spring (May)	100%	100%	50%	50%
Summer (July)	25%	50%	25%	0%
Fall (Sep, Oct, Nov)	Follow Spring Schedule	Follow Spring Schedule	Follow Spring Schedule	Follow Spring Schedule
Winter (Feb)	50 %	75%	50%	50%

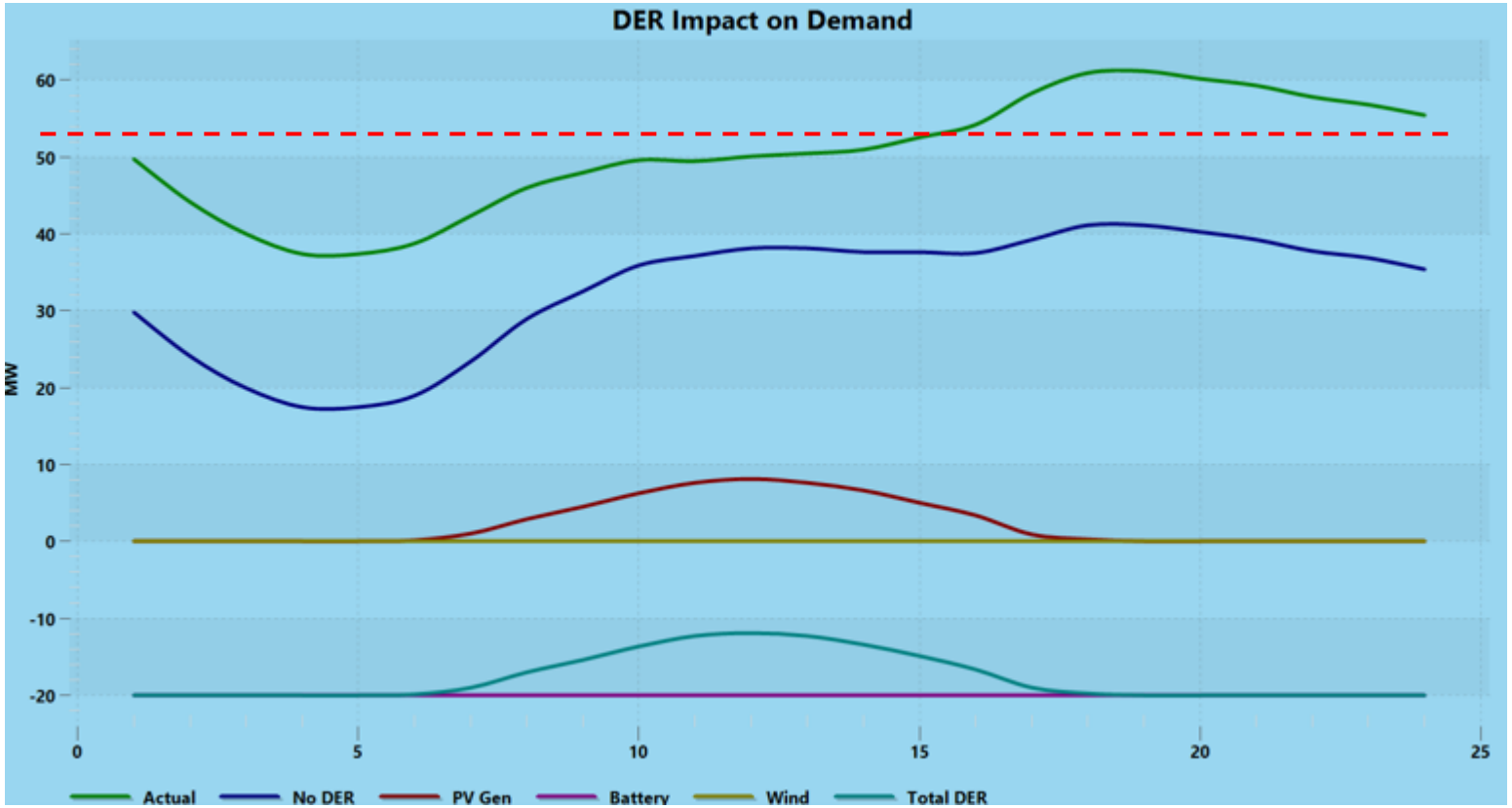
Conceptual Approach

- Simulate battery dispatch at 100% dispatch every hour of the day
- Identify times when capacity limits are breached
- Re-run simulation at 75%, 50%, 25%
- Intervals in violation at 25% are assigned 0%



CLS - Spring Peak Load Profile

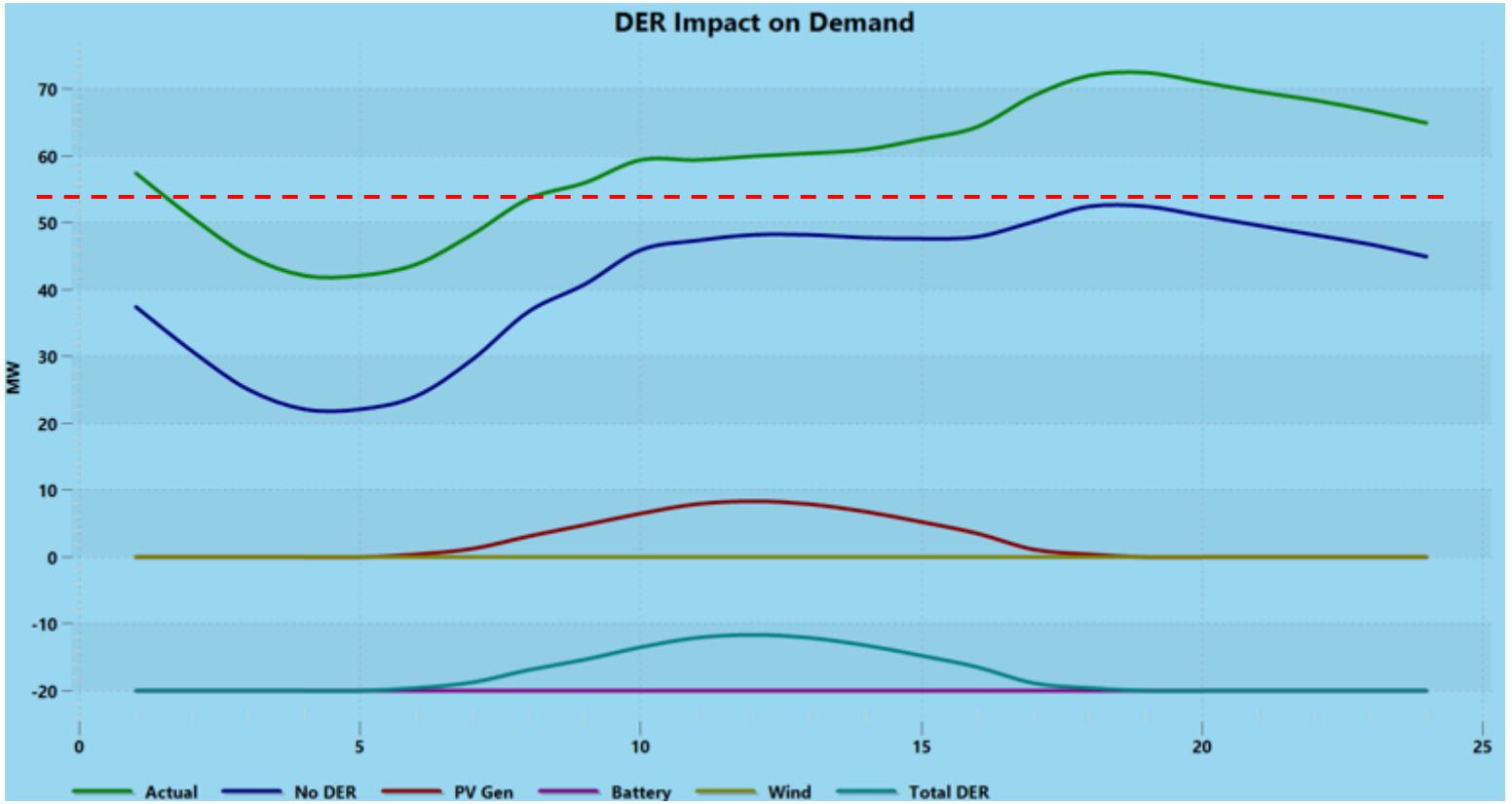
- High Load Profile for Spring
- 56 MVA transformer limited to 95% of capacity = 53.2 MVA
- Battery is charging every hour of the day (green line)
- Violations in station capacity towards evening hours



Peak demand ~ 41 MW
Demand at 20 MVA BESS Charging ~ 61 MW
Solar Generation ~8.2 MW

CLS - Summer Peak Load Profile

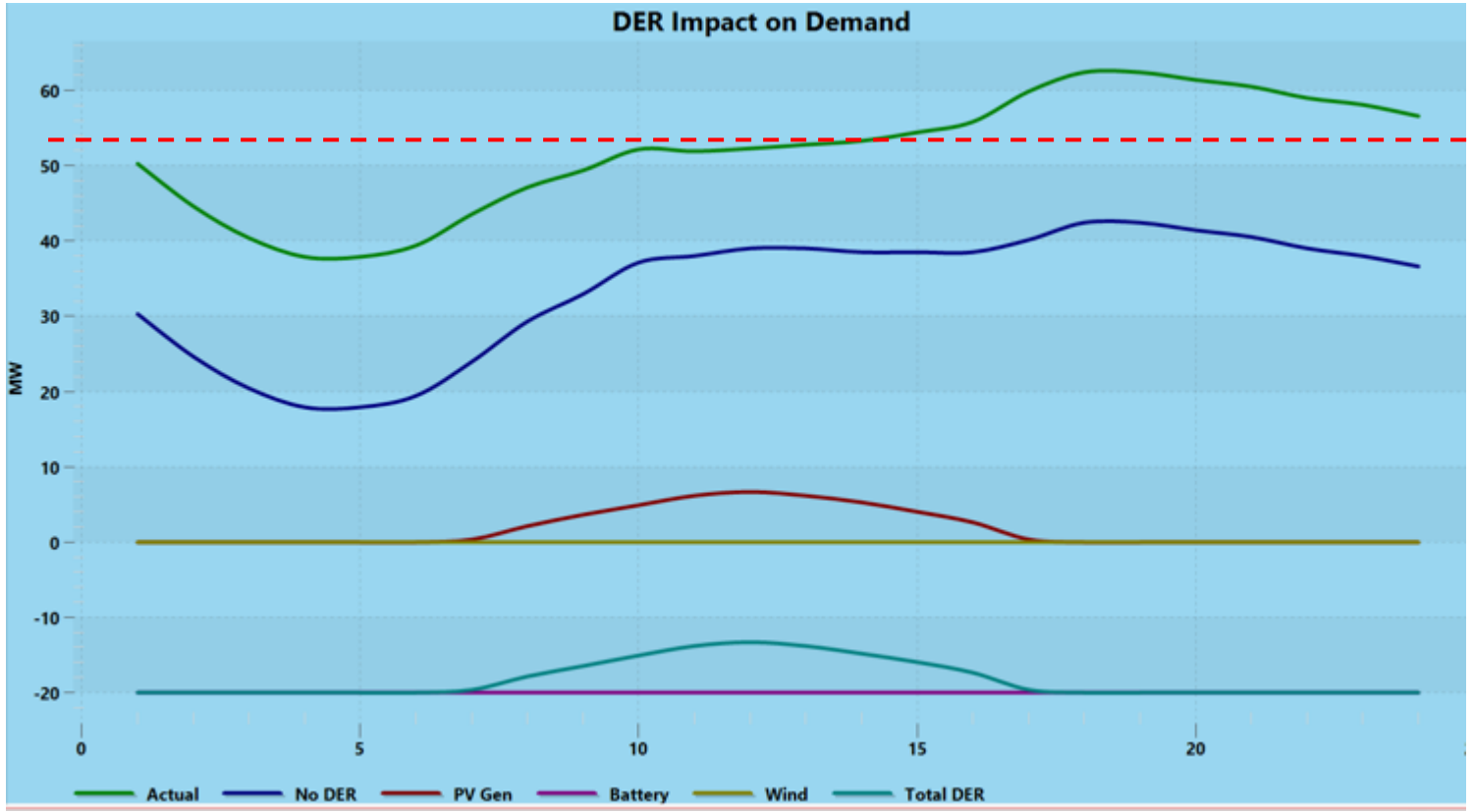
- High Load Profile for Summer
- 56 MVA transformer limited to 95% of capacity = 53.2 MVA
- Battery is charging every hour of the day (green line)
- Violations in station capacity starting early morning → next run at 75%



Peak demand ~ 52 MW
Demand at 20 MVA BESS Charging ~ 72 MW
Solar Generation ~8.2 MW

CLS - Winter Peak Load Profile

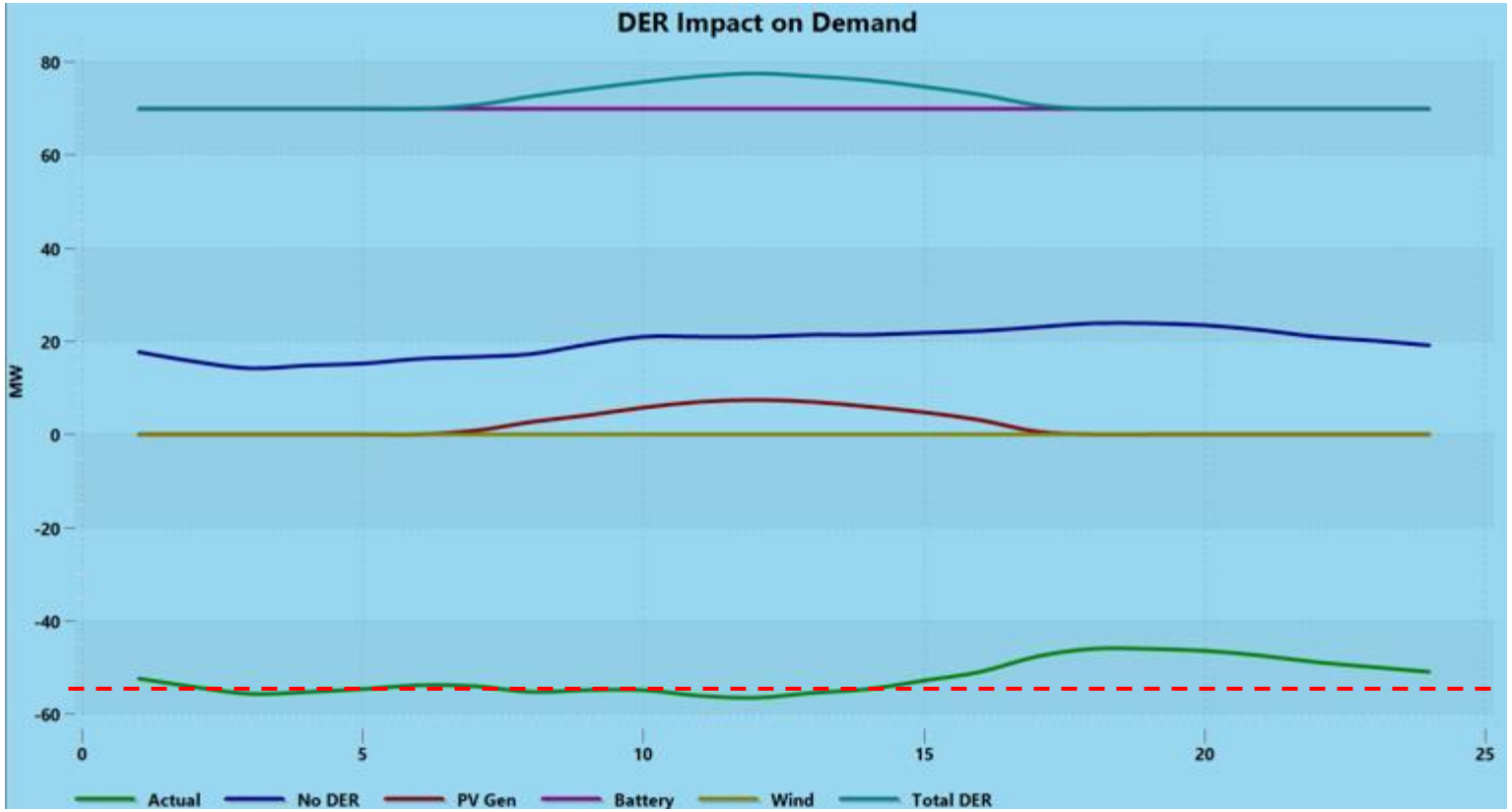
- High Load Profile for Winter
- 56 MVA transformer limited to 95% of capacity = 53.2 MVA
- Battery is charging every hour of the day (green line)
- Violations in station capacity starting early afternoon → next run at 75%



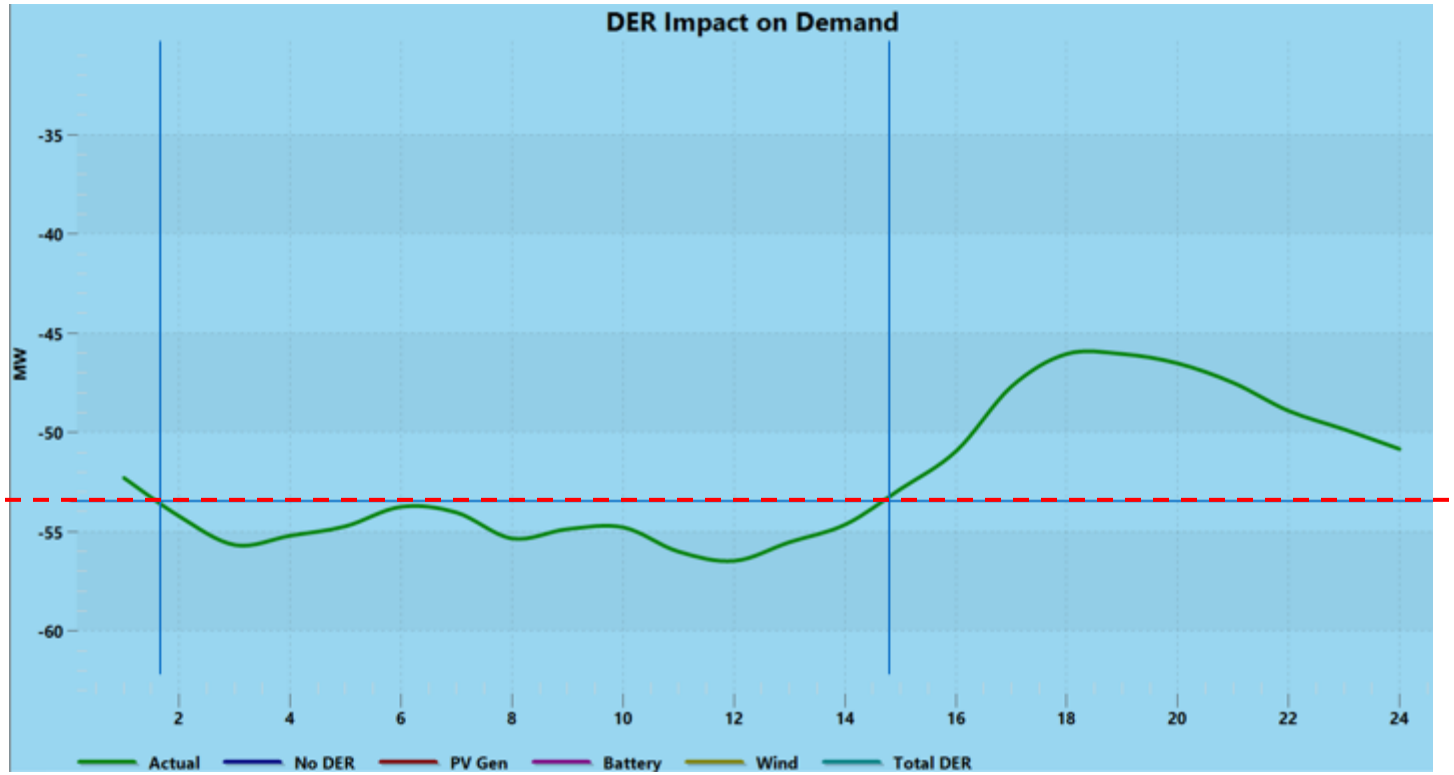
Peak demand ~ 43 MW
Demand at 20 MVA BESS Charging ~ 63 MW
Solar Generation ~6.7 MW

DLS - Spring Light Load Profile

- Light Load Profile
- 56 MVA transformer limited to 95% of capacity = 53.2 MVA
- Battery is discharging every hour of the day (green line)
- Violations in station capacity around noon→ next run at 75%



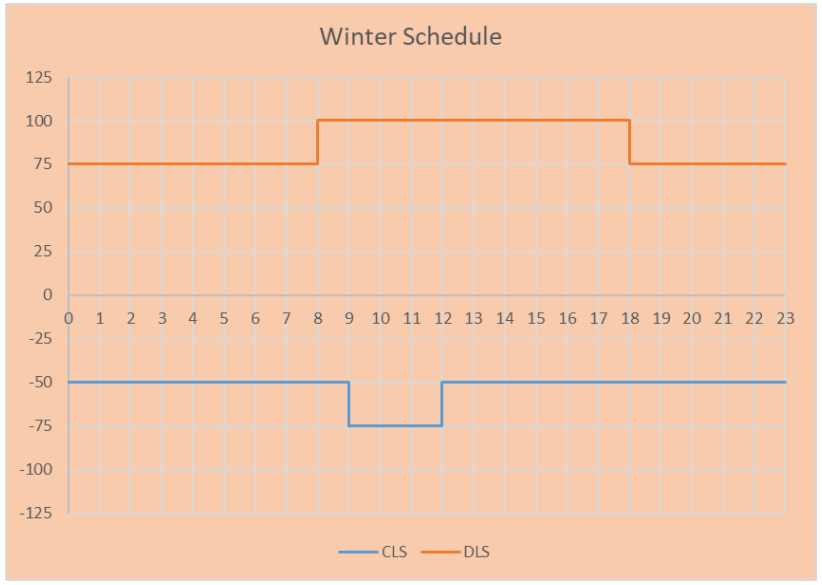
Min Demand ~ 16 MW
Reverse flow at 70 MVA BESS Discharging ~57 MW
Solar Generation ~8.2 MW

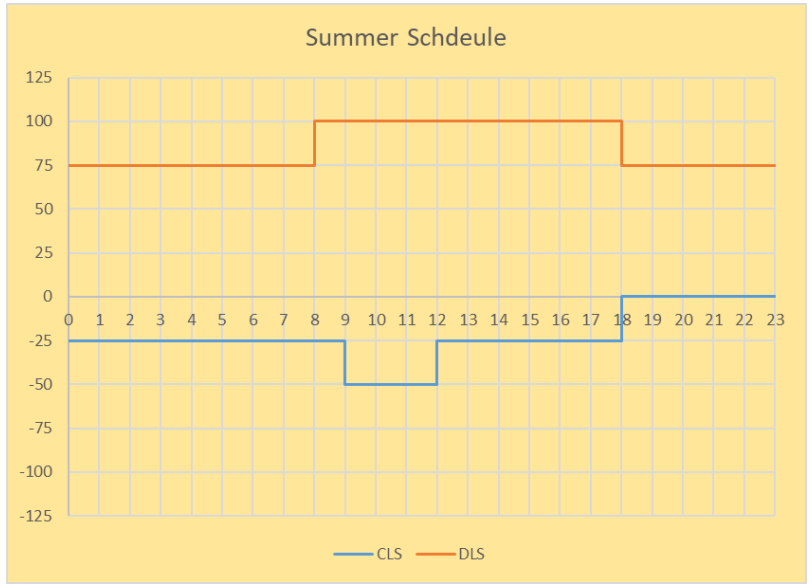


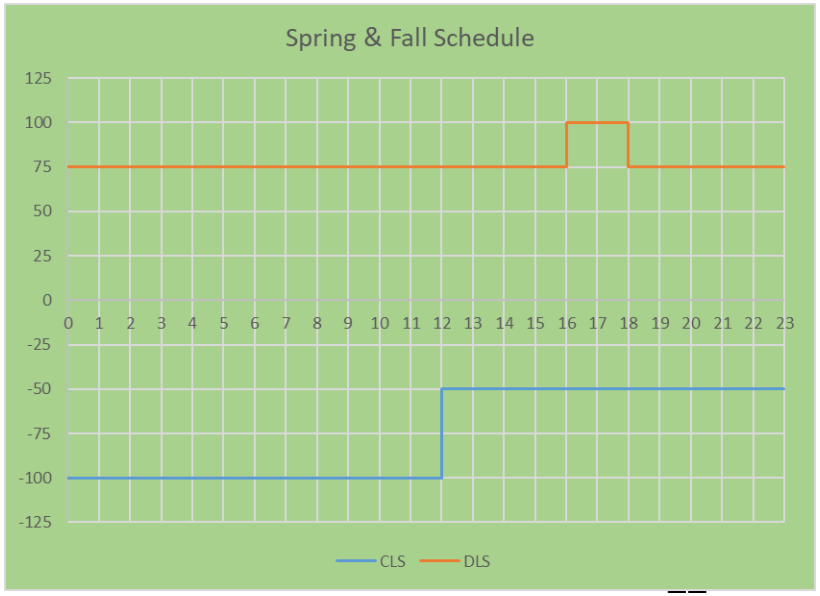
Min Demand ~ 16 MW
Reverse flow at 70 MVA BESS Discharging ~57 MW
Solar Generation ~8.2 MW

Resulting Schedules

- Schedules are set at 0% / 25% / 50% / 75% / 100% of installed capacity
- Batteries can dispatch between dispatch limits freely







Technical Requirements

To Achieve these requirements, the following technical requirements must be met

- Real time monitoring capabilities of the BESS for the EDCs
- Real time control mechanisms of the BESS for the EDCs
  - Ability to set active and reactive power outputs
    - Ability to disengaged schedules
  - Ability to fully disconnect the Battery

Technical capabilities will be provided through the RTAC solution currently tested and deployed by GridMod

Contractual Requirements

In order to address concerns around unknown storage behavior during critical system conditions (grey and black sky events), the following abilities by the EDCs would be required

- Disconnect ability if schedules are violated
  - Fee and fines structure for violation of schedule regardless of system impact
- Upgrade of any schedule interconnected BESS to DERMS once available
  - DERMS schedules can be flexible but not more restrictive than the fixed
- Full operational control during grey and black sky events (regardless of any prior storage commitments with zero upfront warning)
  - up to and including full disconnect
  - for the event duration
  - Not for non-wires alternative events

Initial Review

- Based on the interconnection request, **feeder head capacity limitations and transformer loading limits**, the EDC's will conduct a spreadsheet-based load analysis of time series loading data
- This analysis will review 24-hour time series data in 15-min intervals for each season, returning estimated schedules (where they would be more restrictive than the base schedule)
- The EDC will return to the developers the following upon the initial review (for feeder head capacity and station capacity)
  - Ability to interconnect on Base Schedule without capacity related upgrades (yes/no), if no
    - Required schedule to prevent station capacity upgrades
    - Required schedule to prevent feeder capacity upgrades
  - *the are preliminary, capacity based only, evaluations and do not reflect any power flow related issues that might arise.
- The Developer makes a decision on how they would like their interconnection to be studied by the EDC

QUESTIONS?