Sandia’s ESS Demonstration with Duke Energy

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Motivation: As distributed solar penetration increases, PV output intermittency can cause significant power swings on the distribution circuit.

Unique Features:
- ESS has no direct connection to the PV: centralized location enables ESS to smooth power swings from multiple dispersed PV sites on a feeder circuit.
- Substation-based ESS can reduce wear and maintenance needs on substation assets by compensating for PV-induced voltage swings.

Tasks:
- Develop and validate models for substation, load tap changer (LTC), feeder, and voltage regulator (VR).
- Design and test control strategies for the ESS to mitigate the impact of PV on both the LTC and VR.

Duke Substation-based Energy Storage System:

Primary ESS Components:
- FIAMM Sodium Nickel Chloride Battery
- 402 kW/282 kWh ESS Capacity
- 1.25 MVA S&C Electric Company Inverter/SMS

ESS Interconnection:
- ESS is electrically located on a 12.47 kV feeder.
- ESS is physically located just outside substation.
- Feeder contains a 1.2 MW PV site ~3 miles away.

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