NERC
NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

Energy Storage for Power System Reliability

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RELIABILITY | RESILIENCE | SECURITY

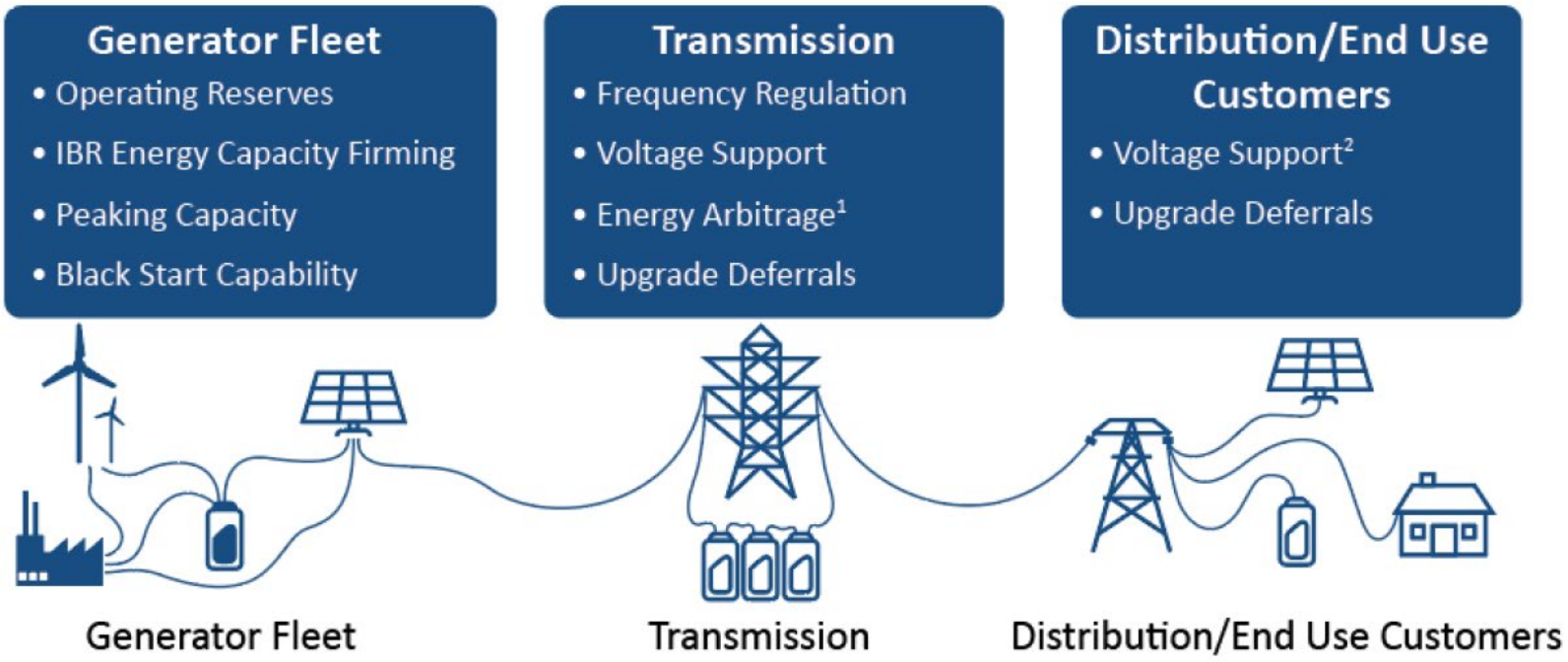



Background

- De-carbonization policy requires large penetration of synchronous generators retirement
- Inverter based renewable energy resources (IBRs) (wind, solar, battery, hybrid etc.) are integrated into the grid with high penetration level in the future
- IBRs take more variability, uncertainty, and unpredictability to the grid, which leading concerns of grid reliability, stability, resilience etc.
- Wind/Solar usually operate at the maximum power point to extract the maximum green energy/profit, which leading no reserve/headroom from wind/solar as synchronous generator
- Energy Storage application increase quickly in the grid

Energy Storage Applications

- *Battery Energy Storage System(BESS)*

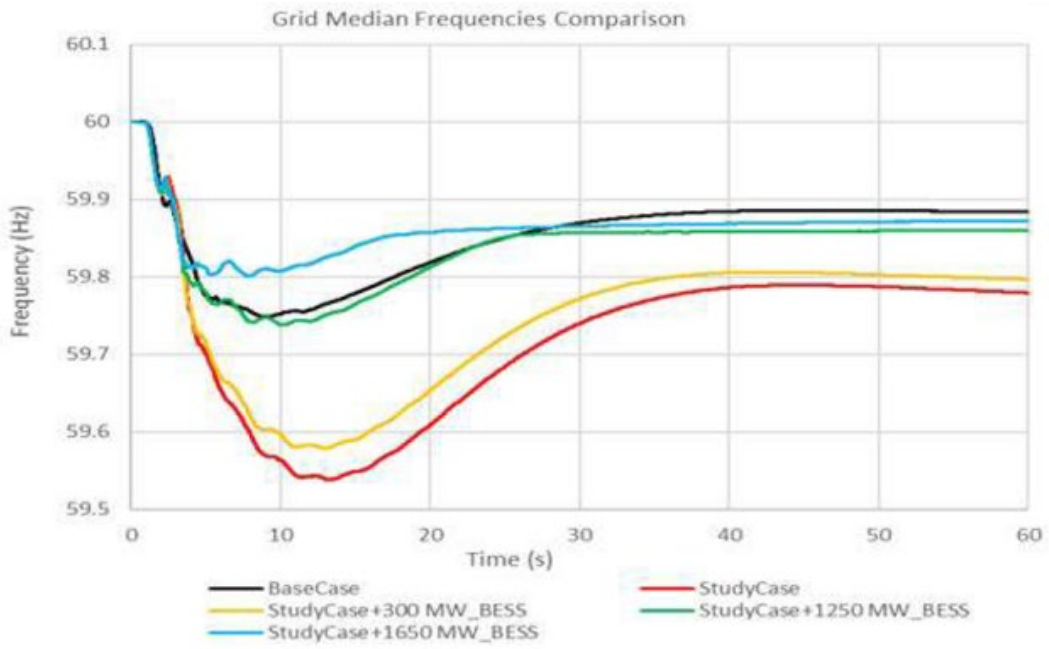


Energy Storage Applications

- *BESS firm up grid capacity shortages, operation reserves and energy adequacy assessments, charging / discharging to balance the generation and load*
- *BESS improve grid reliability from both IBRs forecast variability and unpredictability contingency event*
- *BESS improve grid dynamic stability such as fast frequency response capability, grid forming technology to strength the grid with high IBRs penetration*
- *NERC Standards & Guidelines to support the Energy Storage technology application*

BESS Support Grid Frequency –*NERC/WECC Study*

- *Western Interconnection(WI) grid with 40% Syn generator (with PFR) replaced by IBRs (no PFR)*
- *WI grid 34.4% Inertia reduced*
- *1250MW BESS provide enough support on frequency performance*



https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/Master_ESAT_Report.pdf

Concerns & Challenge

- *Hybrid with PV & Wind*
- *Evaluate the impact and benefit of energy storage*
  --short time dynamic contribution on energy meter, but important for grid frequency and voltage stability
- *Grid forming design and application for the whole grid benefit*
- *Distribution level energy storage resource integrated into BPS*
  --modeling and planning
  --standard authorization

Questions and Answers