



EMPOWERING THE ENERGY TRANSITION



DERs Effective Use In Power Systems

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DERs Are Not Well Understood

- Many view DERs as a problem instead of a potential solution
- Use Cases for DER application in grid and markets are limited and inconsistent across the world
- Standards (IEEE 1547-2018 and UL 1741 SA & SB) are not being adopted consistently. Therefore, the industry does not have a common frame of reference for Use Case development of these resources and 'inadequate' resources continue to be deployed into our grid systems because of this fact.
- Expected penetration rates for DERs vary widely based on the vendor, utility, ISO or agency model – This is creating inconsistent 'urgency' to adequately characterize and integrate them into grid and markets

System Effects – DERs done ‘right’ – A few Use Cases

DERs are currently creating significant issues on the grid worldwide largely to how they are being incorporated with no operational visibility and control. However, if DERs are incorporated with Utility/ISO visibility and control, they **CAN** solve many different problems like power factor and phase balance. Solving these problems provides head room on feeders for electrification and dramatically reduces the infrastructure costs for distribution and transmission network upgrades.

1. Correct Power Factor to Unity on each feeder
 - a. With appropriate four-quadrant inverter specification in interconnection agreements, you can ‘dial’ watts and vars from each DER. This has been proven through actual deployments to reduce feeder and customer losses by 6-12%. This creates significant EE effects and extends the life of every electrical device connected to the grid.
2. Correct Phase Balance
 - a. DERs can help solve phase balance issues on the distribution grid. This has been proven through actual deployments to reduce feeder and customer losses by more than 40%. This creates significant EE effects and extends the life of every electrical device connected to the grid.
3. Mitigate ramps
 - a. Morning and afternoon ramps with solar are creating significant issues that active DER control can mitigate and even eliminate. (Duck Curve)
4. “Head room capacity” for EVs
 - a. Through targeted deployment, you can create capacity on each feeder for the electrification of transportation (EVs) without costly feeder reconductors and substation upgrades.

System Effects – DERs done ‘right’ – A few Use Cases

6. Wholesale portfolio use (Energy/Capacity/Ancillary Services in Markets and IRP outside)
 - a. While DERs could be used for distribution purposes 90%-95% of the 8760 hours, they also can be aggregated to lower the cost of the wholesale power portfolio each day through net load adjustments and for the 5%-10% of the hours of the year for hedging offsets, reduced reserve margin requirements, 4 CP mitigation, spinning reserves, non-spinning reserves, and grid emergency services like UFLS and UVLS first stage performance.
 - b. Day of/Day Ahead use for loss of units or other grid anomalies.
 - c. Utility Scale Renewable Balancing – Storage to balance and optimize use of utility scale renewables.
7. Reliability and Resiliency
 - a. Improve Volt/VAR management on each feeder.
 - b. Minimize, and eliminate over time, VAR transport on the bulk electric grid. This will dramatically improve stability margins in grid operation and support ‘inertia/system strength’.
 - c. Provision community reliability and resiliency for major weather (ice, tornado, etc.) events for crucial care customers, police/fire/emergency response, community centers, etc.
 - d. If critical care/emergency response are supported with DER, utilities can address the larger outages first with crews rather than reserving a significant group for these types of customers.
8. DER enablement – IEEE 1547-2018, UL 1741 and FERC Order 2222 have laid the foundation to enable and structure DER transactions to the grid and markets. The policy and standard work is complete, now we must collaborate to effectively enable DERs to grid and markets.
 - a. A standard data collection tool for interconnections must be enabled. While it is not possible to ask 3000+ utilities in the US to have a standard legal document for interconnection, they could have a standard data collection and management tool to characterize the DERs appropriately. With this structure in place, a common registry becomes an even more effective tool that incorporates all DERs, not just those participating in a program/market