

Fast Response Distributed Energy Resources (DER)

Performance Characteristics

- ***Interconnection:*** Distributed generation connected at a voltage less than sixty (60) kilovolts (kV), in parallel operation to the utility system, export approved by TDSP, per P.U.C. SUBST. R. 25.211 and 25.212.
- ***Maximum Resource Size:*** 2 MW.
- ***Response time and shape:*** Symmetrical, < 10 seconds.
 - Standby to full output in < 10 seconds
 - Full output to Standby in < <10 seconds
 - Standby: offline and not synchronized
- ***Deployment Initiation:*** Dispatch instruction or under frequency relay auto-start @ **59.9 Hz**
- ***Runtime characteristics***
 - Multiple starts within the same day
 - Min Runtime: None.
 - Max Runtime:
 - Limited by TCEQ permitted hours, typically 10% of available hours/year
 - Not limited by fuel availability
- ***Telemetry:***
 - Generation output, others as required.
 - Transparency is a function of sufficient telemetry and controls, not transmission interconnection.
 - Redundant connectivity
- ***Resource Bid Size:***
 - Consistent Resource specific bid independent of customer load curve, function of generator output
 - Not a function of weather, economics, timing of business process, etc.
- ***Energy characteristics, when deployed:***
 - Transmission Energy Equivalent. ***Transmission-level energy equivalent of DER is greater than nameplate capacity of DER Resource:***
 - DER Displaces low-voltage, distribution load. When called, Distributed Energy Resources, by definition, displace low-voltage, distribution load

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that was being served by traditional transmission-connected generation. Said another way, energy for the load displaced was coming from somewhere.

- Low-voltage, distribution-level load is the most inefficient load to serve because of Distribution losses of 3-5% average/baseload and higher on peak.
 - DER displacing this distribution-level load at the point of consumption, resulting in net gain of energy at the transmission level equal to (load displaced)/(1-T&D losses).
 - For example, if distribution losses are 5% from the ERCOT injection point to the load, 1.00 MW distribution-level load displaced = $1 \text{ MW} / (1 - .05) = 1.052 \text{ MW}$ transmission level equivalent generation.
- Interconnection/T&D Risk. *DER T&D is risk equal to or less than most other transmission-connected resources:*
- As long as DER capacity is less than the load at the ERCOT injection point, *the loss of that distribution circuit is equivalent to generation coming on line/load shedding at the bulk transmission level.*
 - This is not true for transmission-level resources, where if the interconnection and/or transmission line connecting the Generation Resource to the transmission grid fails, there is a loss of generation that needs to be replaced.
 - TDSP manages amount of DER on any one distribution circuit through procedures in PUC approved Interconnection Application process (SUBST. R. 25.211 and 25.212).
- Congestion: No Transmission-level congestion as DER is next to and displaces existing load.
- *DER Aggregate Characteristics* - Diversified aggregation of many small units:
 - Greatly diminished per unit operational risk per Resource given small output size leads to high reliability of aggregate DER in total.
 - Aggregate bid for DER classification fairly consistent over time.
 - Minimized single point of failure through geographic diversification of smaller units.