



Inverter-Based Resource Workshop

Issues, Notes and Next Steps

May, 2019

Background

- ERCOT stakeholders discussed issues associated with the inverter-based resources (IBR) during a workshop held on April 25, 2019.
- These issues have been consolidated and summarized in this document, and will be presented along with potential working groups and stakeholder meetings.
 - **Better Communication of Existing Requirements**
 - **Nuisance Tripping and Artificially Limiting Plant Capability**
 - **Voltage Ride Through and Momentary Cessation**
 - **Dynamic Models**
 - **Battery Energy Storage Operational Requirements**
 - **Advanced Features and Others**

Issue 1: Better Communication of Existing Requirements

Summary: Better communication of performance expectations of the existing requirements.

Notes:

- Instances observed that developers and manufactures misinterpret the requirements and tripped the units that may not be necessary.
- A reference document or guideline was suggested to facilitate the communication and help stakeholders and manufactures better understand ERCOT's requirements and expectations.
- Discussed a need to review and revise the existing IRR definition in the Protocol

Next Steps:

- ERCOT will consider proposing a NPRR on IBR definition
- ERCOT will work with stakeholders (DWG, TSP, and Resource Integration Workshop) to develop a guideline or a reference document
 - Voltage ride through performance expectation
 - Steady state and dynamic reactive power coordination
 - Dynamic performance (active and reactive power) expectation
 - Relay settings (avoid interpreting 'may trip' zones as 'must trip')
 - Momentary cessation, ramp rates, etc.

Issue 2: Nuisance Tripping and Artificially Limiting Plant Capability

Summary: Manufacturers / owners may sometimes reduce plant capability because they fail to notice that many of ERCOT's requirements are minimum requirements. This can cause nuisance tripping and unnecessarily deteriorate the resiliency of the system.

Notes:

- ERCOT recently has observed partial tripping issues because wind farm crowbars had failed or some other causes
- Resource entities shall report actual reactive capability in the RARF, not just the ERCOT requirement
- NERC IRPTF referenced several solar plants that had protection settings to trip right on the VRT boundary. This reduced diversity and caused a large number of plants to trip all at the same time.
- Many inverters already capture a lot of measurements at their terminals

Next Steps:

- ERCOT will follow up with identified Resource Entities and manufactures on the following issues
 - Partial tripping issues due to failure or limitation of auxiliary facilities
 - Improvement on the reactive capability setting and reporting
 - Limitation to provide Primary Frequency Response under curtailments
 - Rapid power recovery without following the ramp rate requirements
- ERCOT will consider proposing a NOGRR to require monitoring devices behind the POI.

Issue 3: Voltage Ride Through and Momentary Cessation

Summary: Units should remain connect to the grid and provide support as long as there is no concern of facility limitation.

Notes:

- Momentary cessation was observed in various FIS studies. NOG 2.9 (2) prohibits momentary cessation.
- NERC IRPTF referenced several solar plants that had protection settings to trip right on the VRT boundary. This reduced diversity and caused a large number of plants to trip all at the same time.
- Increasing instantaneous trip due to overvoltage observed in FIS and detailed analysis is needed to further verify the overvoltage issues.

Next Steps:

- ERCOT will propose a NOGRR to clarify NOG 2.9 on VRT and momentary cessation.
- ERCOT will consider proposing a NOGRR to expand voltage ride through requirement by adding transient overvoltage (within cycles) ride through requirement
- ERCOT will work with TSPs to identify the need of more detailed stability analysis (like PSCAD) in FIS

Issue 4: Dynamic Models

Summary: Models continue to pose simulation challenges. More rigorous model testing during interconnection study and model update process could save lots of time down the road

Notes:

- Various modeling issues and concerns were discussed in the workshop.
- Manufactures' support is necessary.
- Resource Entities' engagement and support in DWG should be considered.
- Dynamic models are also needed for real time operations but in different software platforms.

Next Steps:

- ERCOT will work with DWG on the following issues
 - To implement the dynamic model guideline as a requirement.
 - To require model performance check by REs/manufactures of the provided dynamic models and be compatible with planning and operations tools (PSS/e and TSAT).
 - To propose a requirement of user defined models to be vetted by the software vendors.
 - Potential REs' participation in DWG
 - To strengthen the model validation requirements.

Issue 5: Battery Energy Storage Operational Requirements

Summary: Establish technology-specific operational requirements for battery storage devices

Notes:

- Technology-specific requirements will be needed when new resource definitions are implemented
- Battery storage devices apply inverters to provide grid support, the capability is expected to be similar or the same as inverter-based resources

Next Steps:

- ERCOT will work with TAC designated subcommittee(s) to develop requirements for battery energy storage

Issue 6: Advanced Features and Others

Summary: IBRs' capability has been improved significantly since the Protocol/Guides requirements were proposed initially.

Notes:

- Currently IRRs are not required to provide Voltage Support Service when operating below 10% real power. Current IBR technology is capable of providing reactive support at low and zero output.
- High penetration of existing IBRs' technology (Grid Following) requires sufficient system strength for reliable operations. New development of IBRs (for example, Grid Forming) could help mitigate the issues.
- The performance and requirement of the inverter-based transmission dynamic devices should also be considered.

Next Steps:

- ERCOT will continue the discussion with stakeholders on the following issues
 - For IBRs to provide reactive support at zero output
 - For IBRs to operate at a low system strength condition
 - Considering different real time management for advanced IBRs that would not further stress and even improve the grid's dynamic responses.
- ERCOT will work with DWG to propose operational requirements of inverter-based transmission dynamic devices



Stakeholder Comments Also Welcomed to

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