Recap: Inverter-Based Resource Workshop

Next Steps?

Jonathan Rose, ERCOT

Resource Integration Workshop

May 23, 2019

Background

- ERCOT stakeholders discussed issues associated with the inverter-based resources (IBR) during a workshop held on April 25, 2019.
- These issues will be presented along with potential working groups and stakeholder meetings.
  - **Better Communicate 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**

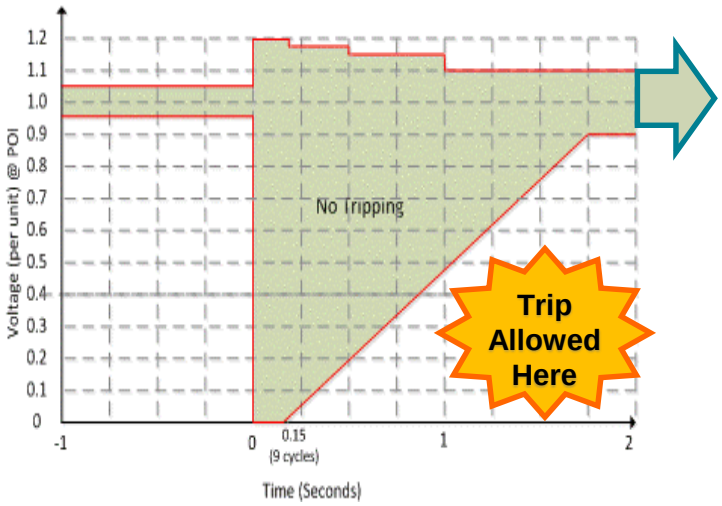
- Refer to IBR presentation:
  - http://www.ercot.com/calendar/2019/4/25/176762

Issue 1: Better Communicate Existing Requirements?

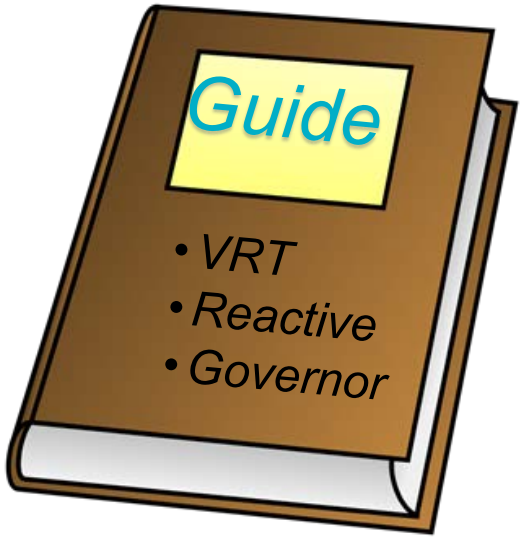
Summary: Better communication of performance expectations of the existing requirements.

Notes:

- Instances observed where unnecessary tripping due to misunderstanding in the requirements by developers / manufacturers.
- Could a guide help communicate ERCOT's requirements and expectations?



(picture for illustration only)

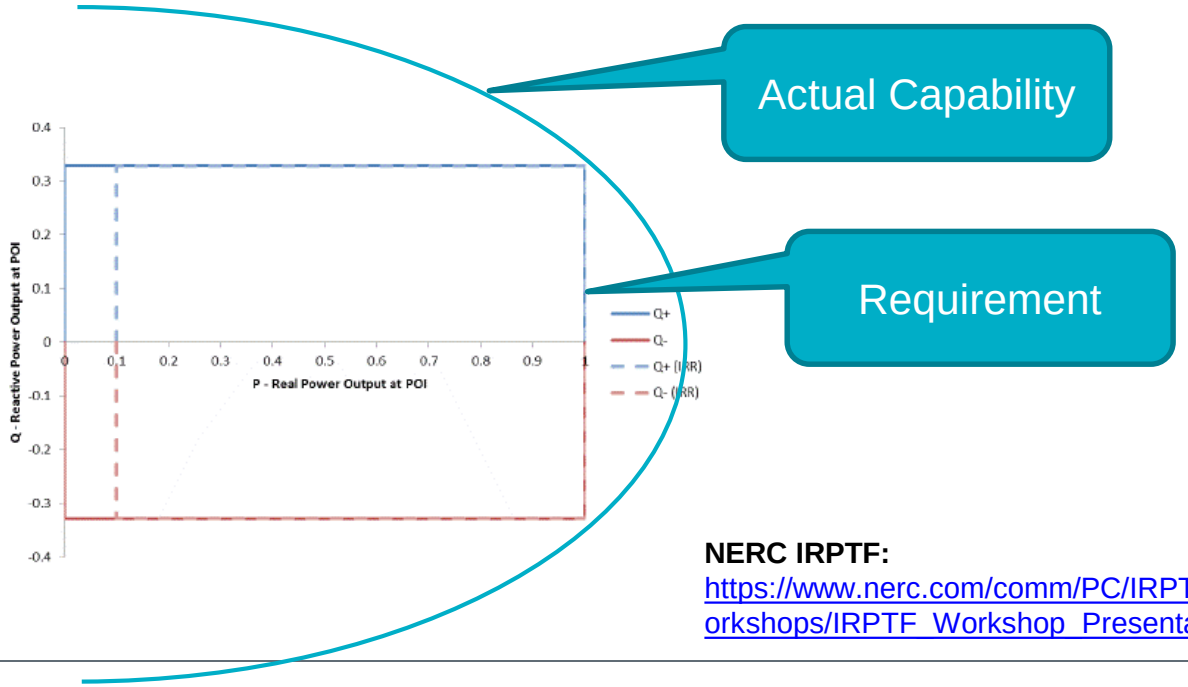


Issue 2: Nuisance Tripping and Artificially Limiting Plant Capability

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:

- 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.



NERC IRPTF:
https://www.nerc.com/comm/PC/IRPTF%20Workshops/IRPTF_Workshop_Presentations.pdf

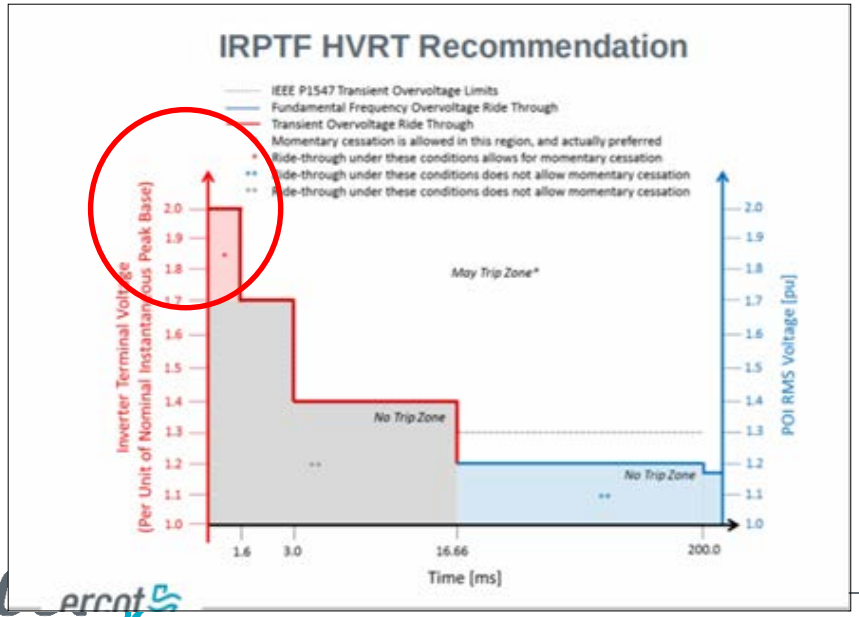
Issue 3: Voltage Ride Through and Momentary Cessation

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

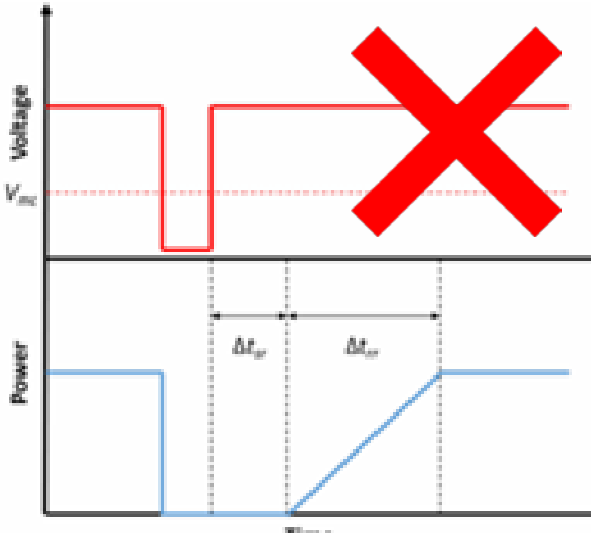
Notes:

- **Momentary Cessation** still observed in various FIS studies. Prohibited by NOG 2.9 (2).
- Overvoltage tripping issues; more detailed analysis needed
  - Increase HVRT to include a transient ride through (e.g. 2.0 per unit).
  - Use a pickup of 0.01 sec for modeling instantaneous relays in PSSE?
- Consider PSCAD in FIS studies?

Transient VRT?



Momentary Cessation



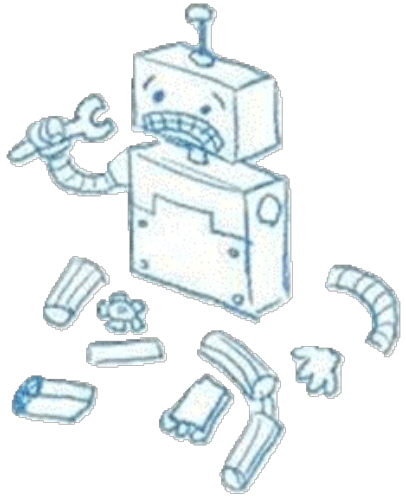
*

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:

- Model issues creating hurdles in FIS studies and later in system studies
- Various modeling issues and concerns were discussed in the workshop
- Manufactures' support needed
- Dynamic models also needed in different software platforms for real time operations
- Consider strengthening model validation requirements
- Consider requiring REs / manufacturers to provide a model check report

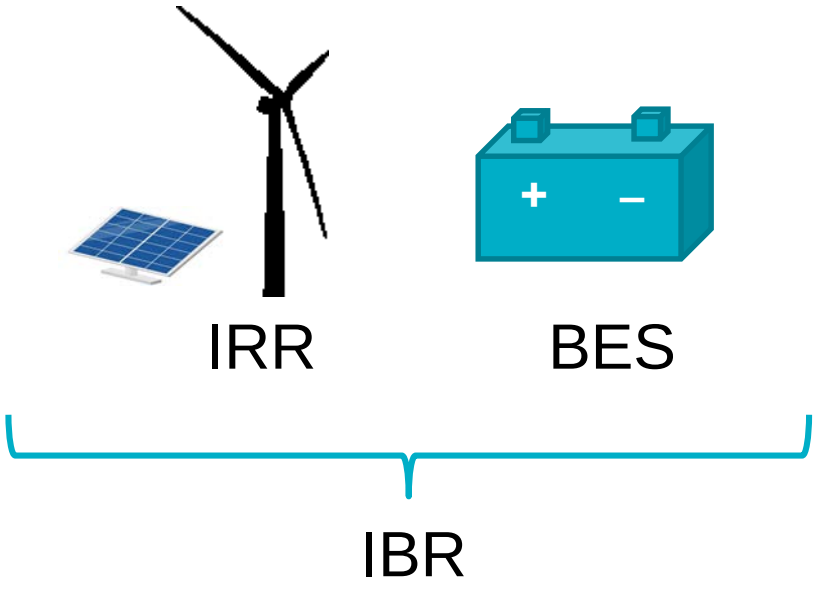


Issue 5: Battery Energy Storage Operational Requirements

Summary: Establish specific operational requirements for battery storage devices

Notes:

- Currently, Protocols refer to IRR. Should sometimes refer to IBR or BES?
- Battery storage devices apply inverters to provide grid support, the capability is expected to be similar or the same as inverter-based resources



Issue 6: Advanced Features and Others

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

Notes:

- Possible to provide Voltage Support (VSS) below 10% power output?
- "Grid-forming" technology to mitigate high IBR penetration issues?
- More PSCAD analysis?

Stakeholder Comments Are Welcomed to

Shun Hsien (Fred) Huang, shuang@ercot.com, and
Jeff Billo, Jeff.Billo@ercot.com