



## **Item 7.1: ERCOT Projects with EPRI**

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ERCOT Public

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# EPRI Trans. (Grid) Ops & Planning R&D Area

## Transmission Operations



- 39.12 – Volt/VAR Ref. Guide
- 39.12 – Voltage Control Areas
- 39.11 – AM & Protection
- 39.11 – EMS Design/Display
- 39.11 – VOB/COB
- 39.12 – PMU Static
- 39.15 – PMU Apps
- 39.14 – Solution Algorithms
- \*39.13 – Restoration Tools**
- Emergency CC Ops supplemental

## Transmission Planning



- 40.16 – Load, HVDC
- 40.16 – System Validation
- 40.18 – Protection in Planning
- \*40.22 – Risk-Based Planning**
- 40.24 – Contingency Screening
- 40.24 – HVDC/PFC Planning
- 40.18 – Relay settings
- 40.18 – Protection guides
- 40.23 – EMT & PQ
- Power Swing supplemental
- 40.23 – GMD/EMP Planning
- 40.22 – Resiliency Decision
- EMP supplemental
- GMD supplemental

## Bulk Renewables Integration



- 173.03 – Wind, PV, Storage
- 173.05 – Forecasting
- 173.05 – Reserves
- 173.11 – Freq/Volt Performance
- \*173.12 – Flexibility & Adequacy**
- Tools Linking
- 173 – Trans Host Capacity
- 173.09 – Wind/PV impacts

*\* ERCOT participated and funded*

# Transmission Operations – System Restoration Tools

**R&D Goal:** Tools to support restoration planning & black start requirements

## **Capabilities/Accomplishment**

- Effectiveness of existing Black Start Resources during restoration planning
- Evaluation of bids for Black Start Resources

## **2018 Scope/Approach**

- Improve Optimal Blackstart Capability (OBC) and System Restoration Navigator (SRN) software usability
- Investigate ways to incorporate time-domain simulations when picking up aux motor loads
- Application for High-Impact, Low-Frequency (HILF) events
- Restoration Reference Guide

## Progress – Optimal Blackstart Capability (OBC) Tool

- ERCOT also has engaged in a working relationship with EPRI, which allows us access to the source code of the Optimal Blackstart Capability (OBC) tool and provides the ability to develop and/or propose functionality improvements that are more suitable for our use.
- ERCOT proposed changes to the source code in 2016, and is working on further changes in 2017 to make the software more useful in evaluation of black start offers in a bidding process.
- For 2017 Black Start Service (BSS) procurement, OBC tool was applied to determine suitability of existing Black Start Resources (MW size and locations) from a network restoration perspective
  - Previously this was done using heuristic methods.
  - OBC tool seeks to maximize MWh, using load MW to keep voltages within limits.

# Transmission Planning – Incorporation of Risk Analysis into Planning Processes

## R&D Goal

- Develop a risk-based planning framework, associated indices and criteria, tools, and case studies that provide better insights to transmission planners.
- Develop a framework to assess grid-resiliency investment options.

## Capabilities/Accomplishment

- Risk-Based Scenario Builder: Produce a number of cases considering various uncertainties along with a likelihood assigned to each case.
- TransCARE: Perform probabilistic analysis to produce risk metrics such as expected unserved energy and incremental reliability benefit.
- Outage Statistic Creation Tool: Automatically generate outage statistics of system elements modeled in a case.

## Progress - Probabilistic Planning

- ERCOT has participated in EPRI research project since mid-2014.
- During 2015-2016, EPRI and ERCOT performed a case study to understand and evaluate the concept/tools/data requirements.
- ERCOT is currently working with Texas Reliability Entity (TRE) to develop outage statistics.
- Potential applications for ERCOT could be evaluation of transmission project alternatives using probabilistic risk metrics such as expected unserved energy.

# Integration of Variable Generation – InFLEXion Tool

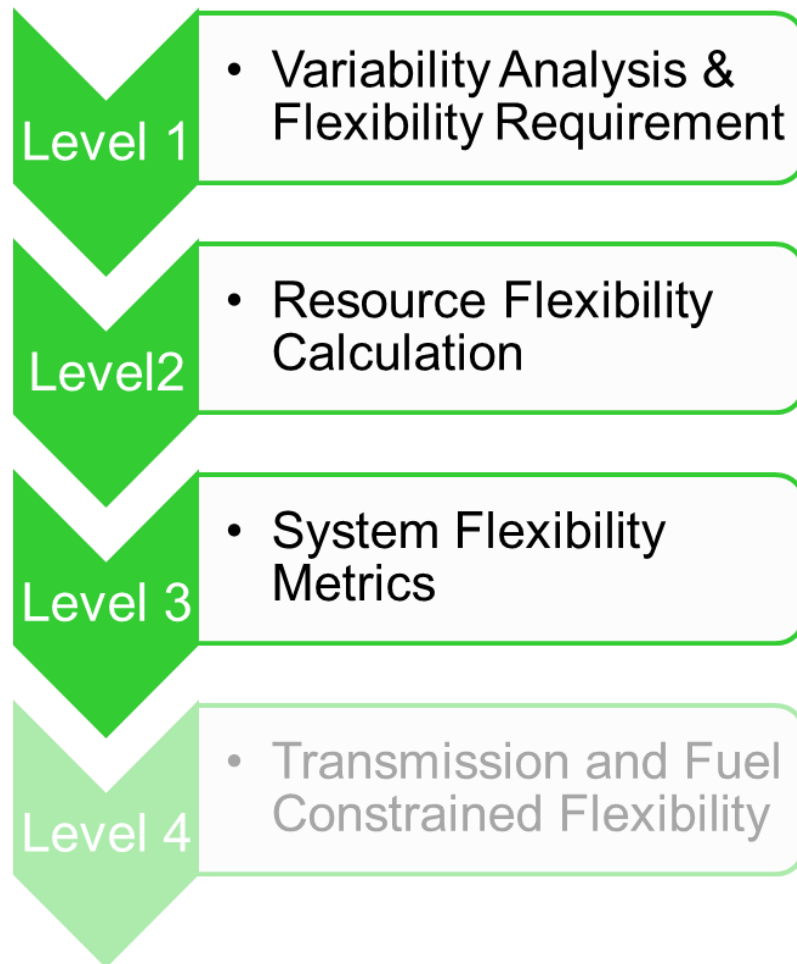
**R&D Goal:** Tools to assess operational flexibility of systems.

## Capabilities/Accomplishment

- Perform a screening analysis of flexibility requirements and resources using a multi-level approach that takes data such as time series of wind and load and generator characteristics into account.
- Calculate flexibility adequacy metrics by using detailed generation dispatch data.

## Additional work within flexibility project

Evaluate the capacity contribution of energy storage (2017-2018 project).



## Progress : InFLEXion (flexibility assessment tool)

- Benchmarked tool using 2014 actual data.
- Simulated year 2017 using Inflexion and Long-Term System Assessment (LTSA) data.
  - Concluded that ERCOT's ramping capability is sufficient in the immediate future.
- Preparing to study flexibility in additional future years, i.e. 2022.
- Once the tool updates are complete, ERCOT will incorporate ramping analysis into planning process.
- EPRI annually holds workshop on flexibility, where a small group of industry SMEs from the areas with flexibility concerns come together and discuss their issues and potential solutions.
- ERCOT is participating as a test system for storage capacity contribution research.



## Supplemental Projects

- ERCOT is participating in EPRI-sponsored investigation of potential impacts of certain types of EMPs.
  - EPRI has partnered with DOE national labs to simulate combined effects.
- ERCOT has been participating in EPRI Market Forum since 2016. The forum has regular meetings with other ISOs/RTOs and discusses their market design improvements.
- ERCOT is monitoring EPRI's work in modeling Distributed Energy Resources (DER).

# Questions?