

NIST Transactive Energy (TE) Challenge Kick-Off

Sept. 10-11, 2015
NIST, Gaithersburg, MD

Welcome!



TE Challenge

Where we are

What we have

Where we're going

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Timeline

- TE Challenge Preparatory Workshop, Mar 24-25— demonstrated TE community agreement on the vision and need for the TE Challenge.
- June 2015: TE Challenge **website** at: <http://www.nist.gov/smartgrid/techallenge.cfm>
- **Kickoff Meeting** for team formation (Sep 10-11, 2015)
- Midpoint Coordination and Team Building Meeting (December 3-4)
- **Summit Expo/Report out** (April 2016)—Goal is to present the good work that has been done.
- Second Expo/Report (September 2016)

Presentation outline

- March TE Challenge Preparatory Workshop
 - Grid challenges
 - Gaps in tools
 - Critical Challenge outputs
 - Reporting goals
- Collaboration Site use for teams
- Scenarios and the TE Use Case Framework
- Bit of logistics for today's meeting

March workshop output— Grid Challenges

- Renewable energy integration
 - Capacity and stability
 - Ramping and balancing
- DER behind the meter, EVs, batteries, solar
- Distribution system flows, voltage control, constrained transformers, microgrids
- Market volatility and design
- Regulatory constraints and change
- Challenges in moving forward on TE: roadmap to implementation

Prep workshop output—

Gaps in Modeling and Simulation Tools

- Common platform and standards for co-simulation of markets and grid and consumer
- Consumer behavior and intelligent agents
- Security and reliability concerns when connecting grid control and financial markets—doing this at feeder level, then city/regional levels.
- Real energy, reactance, delivery
- Modeling societal change and public policy
- Changed business/regulatory models

Prep workshop output— Critical Challenge outputs

- Toolset: stable and more capable platforms
- Improved tools: filling gaps, extending range, easier to use with reduced configuration time.
- Set of scenarios covering TE landscape.
- Evaluation of TE approaches
 - Costs and benefits of various TE approaches - including impacts on system investments required
 - performance with: weather events, power transients, power outages and communication networks failure, and other grid challenges
 - Performance of approaches with changes in scale and other metrics/validation
 - Robustness and stability of approaches
- Standards: common input/output formats, common reporting, data formats, protocols.
- Build the TE community and build collaboration
- Utility pilots, roadmap for getting to implementations
- Communicate to utilities, regulators and policy makers about TE

Prep workshop output— Reporting goals (teams)

- Description of the team project: goals, time line, accomplishments to date, participants, project scale, simulation components, etc.
- Modeling and simulation tools used/developed: inputs/outputs, scope, stability, flexibility/extensibility, validation, how used, scenarios, etc.
- Evaluation of TE approach results: timing characteristics, complexity, path to deployment, cost and impact on reliability/efficiency/emissions
- Sharing the results:
 - Open online, (but maintain IP)—public so we all learn from each teams efforts
 - April and Sep Expos for report-out
 - Special proceedings for those who want to publish Challenge results in a journal

NIST Transactive Energy Challenge



Exposing Powerful Techniques for Transactive Energy

What is the TE Challenge?

Transactive Energy (TE) refers to techniques for managing the generation, consumption, or flow of electric power within the electric power system through the use of economic or market-based constructs while considering grid reliability constraints. As the electric grid transforms to integrate more wind and solar energy and to give customers more choice and control in their use of energy, the concept of transactive energy is likely to play a key role. Members of NIST's Smart Grid Team have been working closely with the Department of Energy to understand TE's potential and to support utilities, technology developers and policy makers. The TE Challenge will bring researchers and companies with simulation tools together with utilities, product developers, and other grid stakeholders to create and demonstrate modeling and simulation platforms while applying transactive energy approaches to real grid problems.

- Utilities are concerned about the impact of dynamic pricing and markets on grid stability
- Researchers are interested in the development of economic and grid models for the new complex grid
- Vendors are looking for how to use developing modeling tools to guide technology design and implementations



Learn

TE Challenge Introduction, Timeline, and Benefits for Participation



Tool Chest

Co-sim Platforms, Simulation Tools, Data Sets, Baseline Scenarios



Community

Teams involved in the TE Challenge



Join

Register for the TE Challenge!



Library

Videos, presentations, and documents



Simulation scenarios

- Serve as baseline or points for comparison of results
 - Need definite comparison approaches, to allow ways to compare team outputs.
 - Scenarios provide common test points. Utilities want to know how an approach will work for their extreme situations.

Simulation scenarios

- Initial set of baseline scenarios under development “[basic scenarios doc](#)” on collaboration site Tools page.
 - Scenario 1: Peak Heat Day and Energy Supply
 - Scenario 2: Wind Peak/Calm and Ramp Rate
 - Scenario 3: High-Penetration Wind/PV and Voltage Control
 - Scenario 4: EVs on the Neighborhood Transformer
 - Scenario 5: Islanded Microgrid Energy Balancing
 - Scenario 6: Power Quality Management
- Work continues to refine this set to be a representative set for TE.
- Team effort to develop a reference grid for comparable results (presentation in next session—Steve Ray, CMU)

TE Challenge Interim Meeting

for Coordination and Team Building

- The TE Challenge mid-course collaboration meeting is scheduled for Dec 3-4 at NIST. The goal is to strengthen teams and build new teams, learn from each other, build collaboration, gain resources, and see progress in teams and program as a whole. Goals include:
- Strengthen teams (check-up on team plans and progress, adding team members if needed)
- Adding new teams with interested participants who joined later
- Team interaction and cross-team communication
- Sharing vision, resources, and new program developments

Summit Expo 2016/Report out (April and Sept 2016)

- Agenda:
 - Keynote
 - Presentations
 - Demos/poster session/showcase (is it worth having any booths? Maybe just posters. But might be fine to have booths for some commercial products. Could ask in the winter what teams expect to want to present and how).
 - Presentation of comparative metrics
 - Peer evaluations -- participants review each other
 - Special journal arrangement for publication of results
 - NIST publication on results for each Challenge Goal, plus lessons learned, next steps/roadmap, pointers to various communication tools that have been developed (maybe in SGIP), summary of data resources used/available, etc.
- Second Expo/Report (September 2016) was proposed since some participants might be starting from scratch and only able to produce valuable results on a longer time frame; the first summit would be limited to those who already have some things in place. We could use the same format for each.