



U.S. Department of Energy

# ELECTRICITY TRANSMISSION SYSTEM WORKSHOP

Mapping Challenges and Opportunities to Help Guide  
DOE R&D Investments over the Next Five Years

DoubleTree Crystal City, 300 Army Navy Drive, Arlington, VA  
November 1-2, 2012

## AGENDA

Thursday, November 1, 2012

8:00-8:10	<b>Welcome and Kickoff</b>	David Sandalow, <i>Acting Undersecretary of Energy</i>
8:10-8:30	<b>Introduction to the Grid Tech Team (GTT), Vision, and Framework</b>  <b>Distribution Workshop Summary</b>	Dr. Anjan Bose, <i>Grid Tech Team Lead</i>
8:30-8:50	<b>OE Vision, Activities, and Issues</b>	Patricia A. Hoffman, <i>Assistant Secretary for the Office of Electricity Delivery and Energy Reliability (OE)</i>
8:50-9:10	<b>EERE Vision, Activities, and Issues</b>	Dr. David Danielson, <i>Assistant Secretary for the Office of Energy Efficiency and Renewable Energy (EERE)</i>
9:10-9:30	<b>Open Q&amp;A</b>	Rich Scheer, <i>Lead Facilitator</i>
9:30-9:45	<b>Break</b>	
9:45-11:00	<b>Forward Looking Panel Presentation &amp; Discussion</b> Moderator: Jay Caspary, <i>Senior Policy Advisor, OE</i> <ul style="list-style-type: none"><li>• FERC</li><li>• ISO/RTO</li><li>• Government Utility</li><li>• Investor-Owned Utility</li></ul>	Cheryl LaFleur, <i>Commissioner, FERC</i>  Carl Monroe, <i>EVP and COO, SPP</i>  David Till, <i>GM, Transmission Strategy, TVA</i>  Michael Heyeck, <i>Senior VP, Transmission, AEP</i>
11:00-11:30	<b>Open Q&amp;A</b>	

11:30-12:30	<b>Lunch</b>	
12:30-12:45	<b>Afternoon Instructions</b>	Rich Scheer, <i>Lead Facilitator</i>
12:45-1:00	<b>Organize into Breakout Groups</b>	
1:00-4:00	<p><b>Future Vision and Grid Challenges</b> Each breakout group will identify 6-8 challenges facing the grid as it integrates ALL the various technologies being or will be deployed while ensuring a safe, reliable, and cost-effective system as described in the Future Vision. Utilizing the GTT framework, a systems-based discussion will aim to identify integration challenges, addressing ALL of the following topics:</p> <ul style="list-style-type: none"> <li>• <b>Grid Visibility</b> <i>What challenges in the informational domain (sensors and relays, AMIs, PMUs, end-use energy management systems, communications hardware and protocols, etc.) impede the increase of visibility and controllability of the grid? What are the characteristics and functionalities needed to address the challenges identified and ensure a safe, reliable, cost-effective system? What are the metrics?</i></li> <li>• <b>Grid Understanding</b> <i>What challenges in the knowledge domain (databases, planning tools, models and simulators, analyses and assessments, etc.) impede the increase of understanding and controllability of the grid? What are the characteristics and functionalities needed to address the challenges identified and ensure a safe, reliable, and cost-effective system? What are the metrics?</i></li> <li>• <b>Grid Flexibility</b> <i>What challenges in the physical domain (component technologies, inverters, power flow controllers, transformers, cable and conductors, protection device, etc.) impede the increase of flexibility and controllability of the grid? What are the characteristics and functionalities needed to address the challenges identified and ensure a safe, reliable, cost-effective system? What are the metrics?</i></li> </ul>	<p>Parallel Breakout Sessions</p> <p><i>(see white paper: "DOE Action Plan Addressing the Electricity Transmission System")</i></p>
4:00-4:20	<b>Break and Reconvene</b>	
4:20-5:20	<p><b>Report Back on Grid Challenges</b> Group Spokesperson report back to the whole group on the challenges identified.</p> <p>Moderator: Rich Scheer, <i>Lead Facilitator</i></p>	Breakout Group Volunteer Spokesperson
5:20-5:30	<b>End of Day Remarks</b>	Dr. Anjan Bose, <i>Grid Tech Team Lead</i>



## **BREAKOUT SESSIONS**

The GTT developed a draft vision which *describes* a future electricity system and lists several *key attributes* of that system. Reactions to the draft vision have been positive, and it will continue to be further refined as the GTT engages with the broader stakeholder community. This vision is:

**A seamless, cost-effective electricity system, from generation to end-use, capable of meeting all clean energy demands and capacity requirements, while allowing consumer participation and electricity use as desired:**

- Significant scale-up of clean energy (renewables, natural gas, nuclear, fossil with CCUS)
- Universal consumer participation and choice (including distributed generation, demand-side management, community storage, electrification of transportation, and energy efficiency)
- 100% holistically designed (including regional diversity, AC-DC transmission and distribution solutions, microgrids, energy storage, and centralized-decentralized control)
- Accommodates two-way flows of energy and information
- Reliable, secure (cyber and physical), and resilient

This vision accommodates the diversity and uncertainty of future demands and generation portfolios, recognizing the inherent regional differences in needs, goals, and available resources. The GTT supports the significant scale-up of clean energy but is also sensitive to the impacts on consumer costs and economic prosperity. To enable universal consumer participation and choice, from using electric vehicles to producing and selling electricity, the future grid will need to accommodate two-way flows of energy and information. The future grid will also require a combination of AC-DC hybrid transmission and distribution solutions, as well as a balance between centralized and decentralized control including microgrids. Through all these changes, the grid must remain reliable and secure against cyber and physical threats, while becoming much more resilient to disruptions and outages.

### **Thursday Sessions**

Each of the afternoon breakout groups will discuss the future vision stated above and identify challenges with grid visibility, understanding, and flexibility requirements necessary for achieving the vision and the respective technology advances needed. These discussions can begin with technology areas identified in Figure 1 below, technology areas not listed, and/or opportunities, challenges, and questions presented in the white paper. The breakout groups will aim to identify 6-8 challenges and a volunteer chairperson will be asked to report key results back to the larger group.

The GTT strategic framework is described below:

There is a multitude of R&D activities that are needed to overcome the technical challenges identified for grid modernization. The GTT proposes a strategic framework (Figure 1) that organizes these activities into three interrelated domains (informational, knowledge, and physical), representative of the systems nature of the grid. Each of these domains corresponds to a strategic focus that aims to increase the

visibility, understanding, and flexibility of the electric power system. The logic behind these focus areas is that a modernized grid should be able to “see” an event or condition, “know” what is happening or about to happen, and “do” something appropriate in response – quickly and seamlessly. In addition to the overlap and interactivity among these three technical focus areas, there are many institutional factors (markets, regulations, policies, standards, etc.) that underpin and influence the success of R&D activities. The diverse institutional challenges associated with specific technical challenges must be addressed and integrated into any initiatives which support the three strategic focus areas.

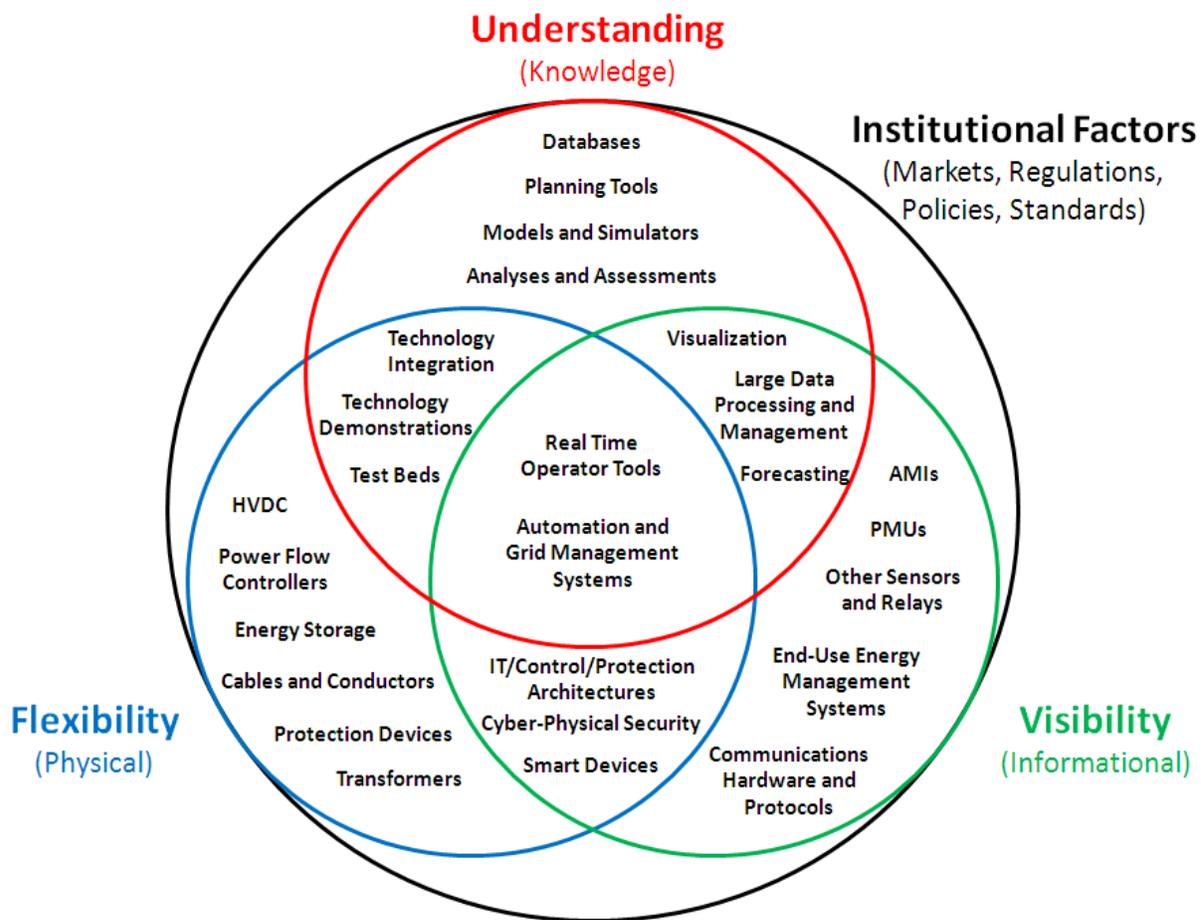


Figure 1 – Strategic Framework for Grid Modernization

### Friday Sessions

Each of the Friday morning breakout groups will discuss the challenges reported back from Thursday’s sessions and aim to identify, expand, and clarify 3-5 top priorities. The groups will then focus on these priorities and discuss specific R&D activities and initiatives that DOE can pursue to address these key challenges and any existing gaps. Activities can span from basic R&D through demonstration projects. A volunteer chairperson will be asked to report key results back to the larger group.