

# Introduction to the DOE Grid Tech Team

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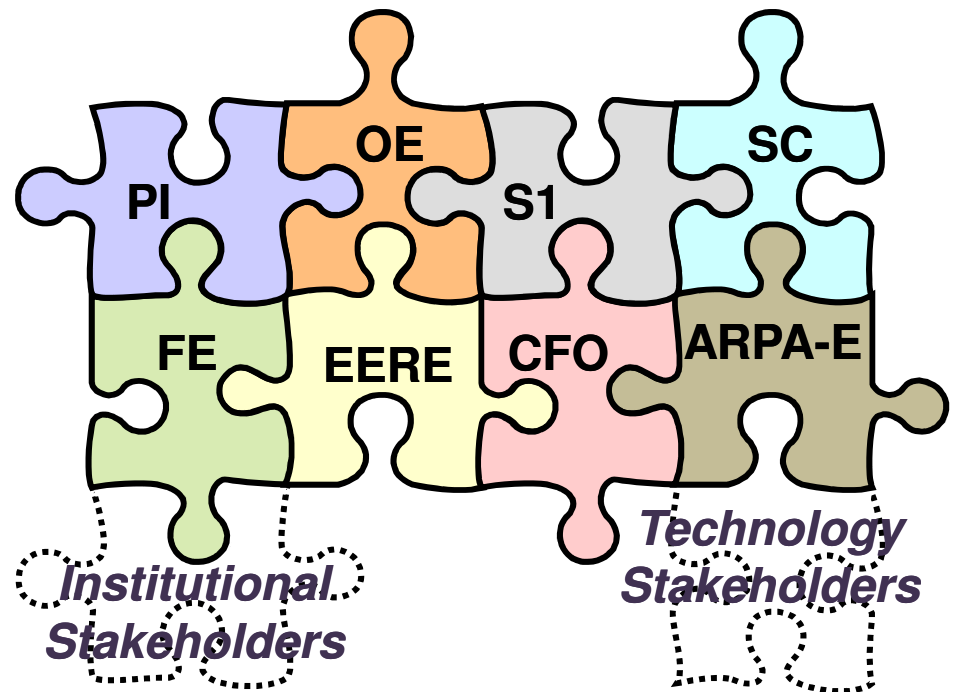
# What is the Grid Tech Team?

The **GTT** is a **DOE inter-office work group** established by the **Undersecretary of Energy** to:

- Develop a long-term strategic vision of the U.S. electricity grid
- Identify pathways to enable grid modernization
- Coordinate and leverage DOE grid resources and activities

## Value to the DOE

- Holistic systems perspective
- Align internal grid activities
- Minimize duplication of effort
- Optimize the use of funding
- Effective collaboration
  - forum to convene stakeholders
  - coordinated internal/external interactions



# GTT Vision of the Future Grid

**Key Goal: Appropriate balance of several key attributes while recognizing situational differences**

Cost-Effective and Reliable

Clean and Efficient

Empowered Consumers  
with Options

Accessible to New  
Technologies

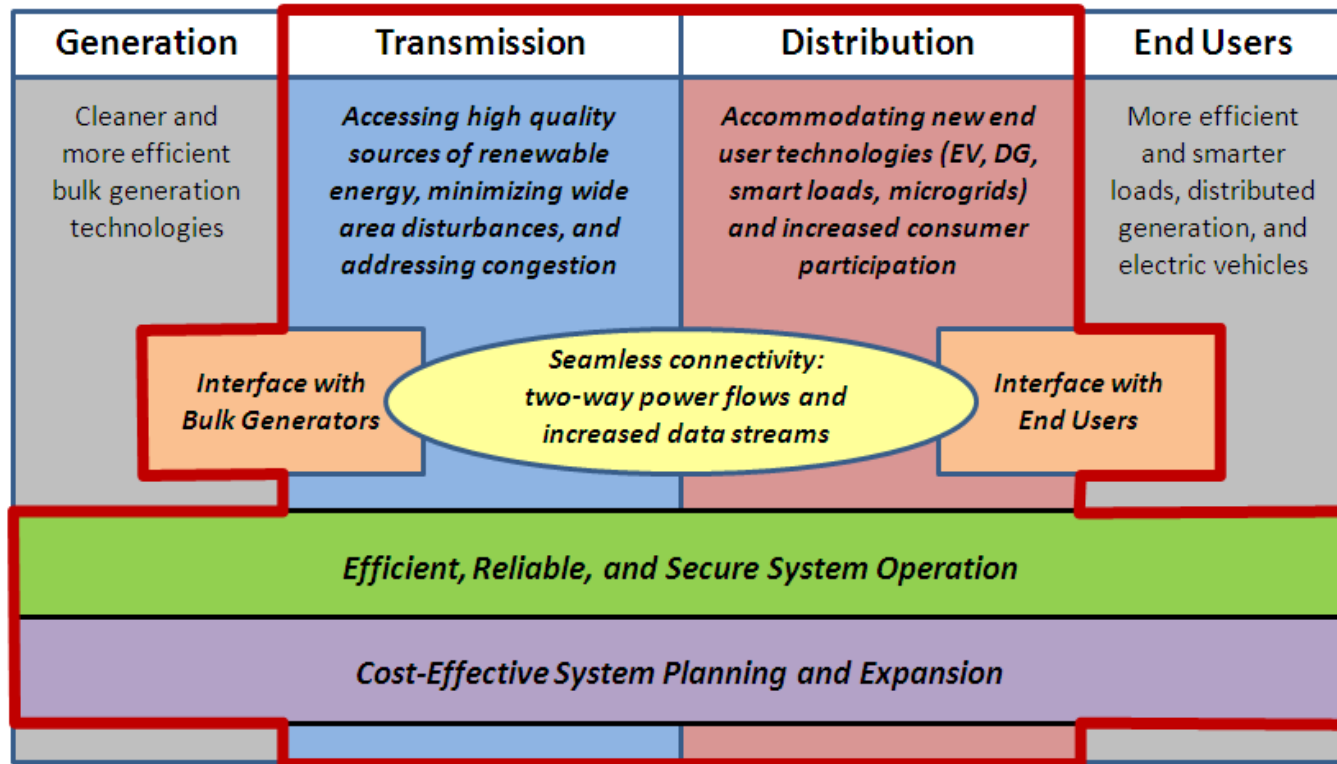
Secure and Resilient

**A seamless, cost-effective electricity system, from generation to end-use, capable of meeting all clean energy demands and capacity requirements, with:**

- Significant scale-up of clean energy (renewables, natural gas, nuclear, clean coal)
- Universal access to consumer participation and choice (including distributed generation, demand-side management, electrification of transportation, and energy efficiency)
- Holistically designed solutions (including regional diversity, AC-DC transmission and distribution solutions, microgrids, energy storage, and centralized-decentralized control)
- Two-way flows of energy and information
- Reliability, security (cyber and physical), and resiliency



# The GTT Space



**Institutions and other drivers are important to consider with a comprehensive RD&D strategy**

**GTT Space**  
(outlined in red)

*The GTT recognizes that the line between T & D is blurring, creating a need to prepare for how this changes the grid space*



# GTT Framework – Grid Interdependencies

The future grid will be vastly more complex than the one we have today

*Grid operators must be able to see events coming*

*Grid operators must be able to understand implications of events*

*Grid operators must be able to respond appropriately to events*

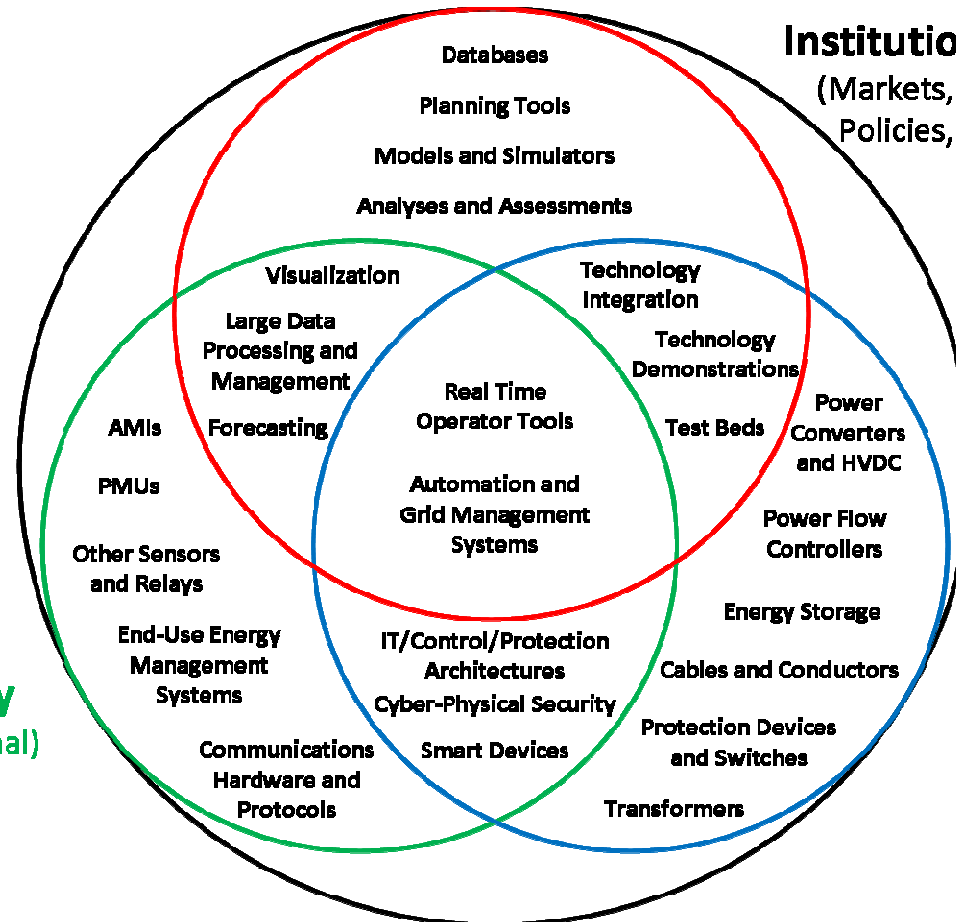
*Institutional factors guide actors' behavior*

**Visibility**  
(Informational)

**Understanding**  
(Analytical)

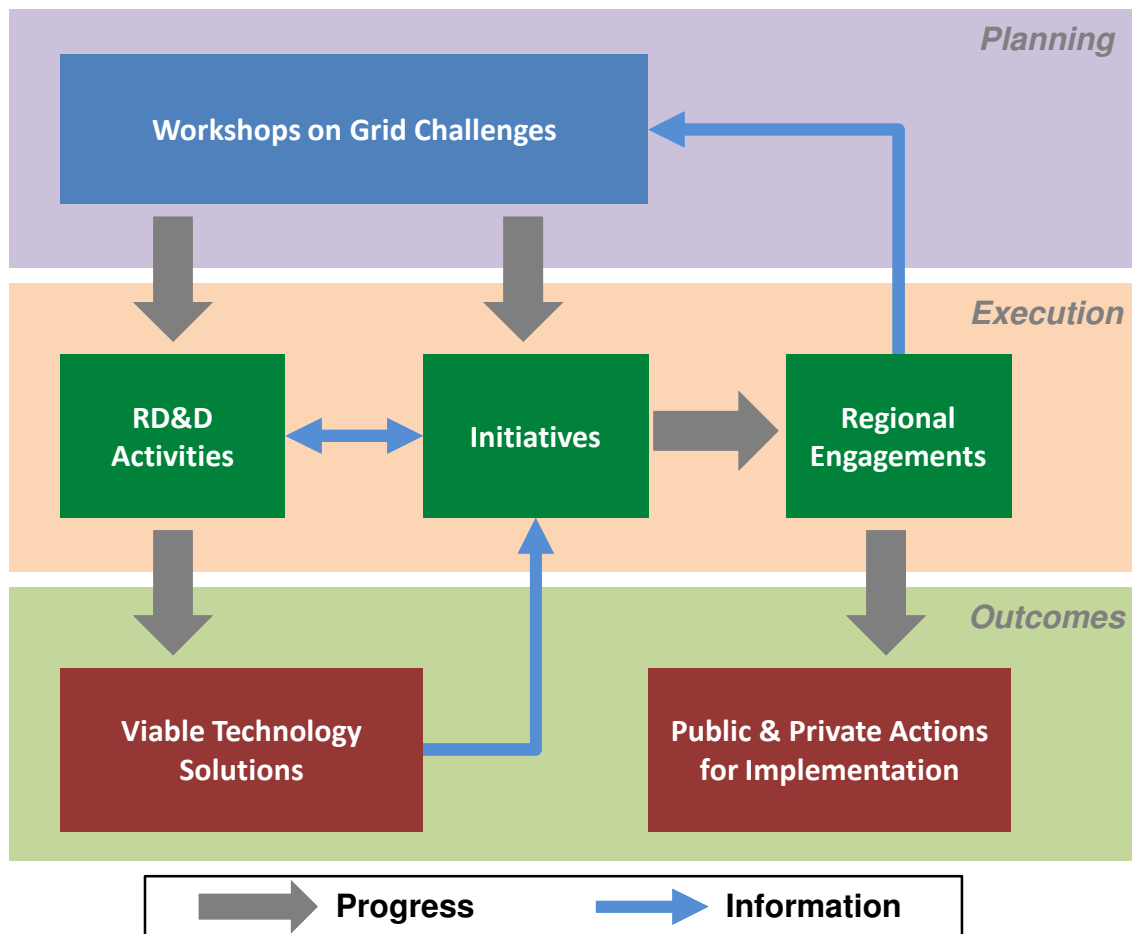
**Institutional Factors**  
(Markets, Regulations, Policies, Standards)

**Flexibility**  
(Physical)



# Grid Modernization - Strategy

DOE has several strategic roles: convener, provider of technical capabilities and expertise, and disseminator of data and information



## Key Elements of Strategy

- **RD&D activities** to overcome mid- to long-term technical issues identified during workshops and discussions on grid modernization challenges
- **Initiatives** to address institutional barriers and near-term technical issues that represent obstacles to the broad deployment and commercialization of technology solutions
- **Regional engagements** to incorporate regional differences and sensitivities associated with executing Initiatives at regional, state, and local levels



# GTT Activities

## PROGRESS

- **Informational GTT workshops:**
  - *Vision of the Future Grid*, Nov 2011
  - *Distribution Workshop*, Sep 2012
  - *Situational Awareness*, Oct 2012
  - *Transmission Workshop*, Nov 2012
  - *HVDC Workshop*, Apr 2013
- **R&D Coordination (examples):**
  - Advanced Grid Modeling
  - Energy Storage
  - Power Routing
  - Distribution Integration
  - Power Systems Research and Education

## KEY NEXT STEPS

- **5-year grid modernization roadmap (technological/institutional)**
  - priority areas for investment
  - targeted objectives
  - detailed timeline
- **Ongoing, systematic GTT outreach with stakeholder groups**
  - NRECA
  - FERC
  - APPA
  - ...others being scheduled
- **Regional GTT dialogues**
- **Additional Workshops**



# Grid Modernization Roadmap – Objectives

- **Developing the Future Grid Operating System (Transmission)**
  - Applications with weather forecasting and stochastic tools for more accurate scheduling
  - Predictive controls incorporating new data streams for increased system reliability
  - Data visualization methods and tools to improve decision-making by system operators
- **Improving the Control of Power Flows (Transmission)**
  - Power flow controllers to route power, buffer the grid, and reduce congestion costs
  - Storage integrated with variable renewable resources for dispatchable power and the provision of ancillary services
  - Assessment of grid assets to understand available capabilities for system flexibility
- **Creating Smarter, More Resilient Distribution Systems (Distribution)**
  - Advanced concepts utilizing distributed generation to enhance resiliency
  - Control room applications to optimize assets, save energy, and accelerate outage restoration
- **Integrating Multiple Systems and Technologies (Distribution)**
  - Seamless consumer-utility interface to unlock demand side flexibility and options
  - Optimized feeder to demonstrate advanced concepts and microgrids
- **Designing and Planning the Future Grid (Transmission and Distribution)**
  - Integrated data, communication, and control architectures for secure interoperability
  - Analytical tools for exploring future scenarios and planning the future transmission grid
  - Analytical tools for designing future distribution feeders with two-way power flows
- **Engaging and Assisting Grid Stakeholders (Transmission and Distribution)**
  - Analytical tools for decision makers to assess the value of technology options and quantify risks
  - Regional engagements to identify and address local challenges to grid modernization

