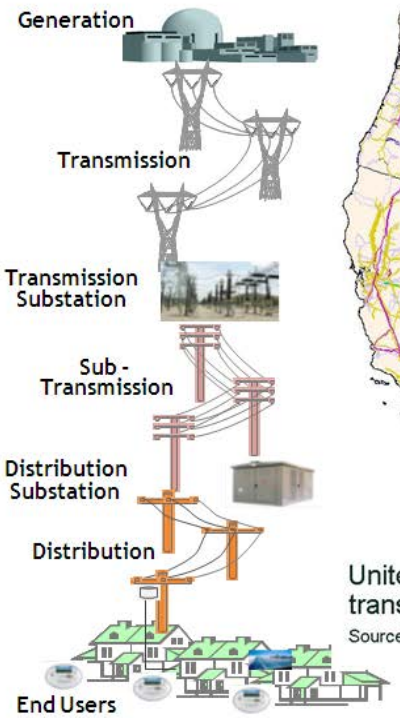
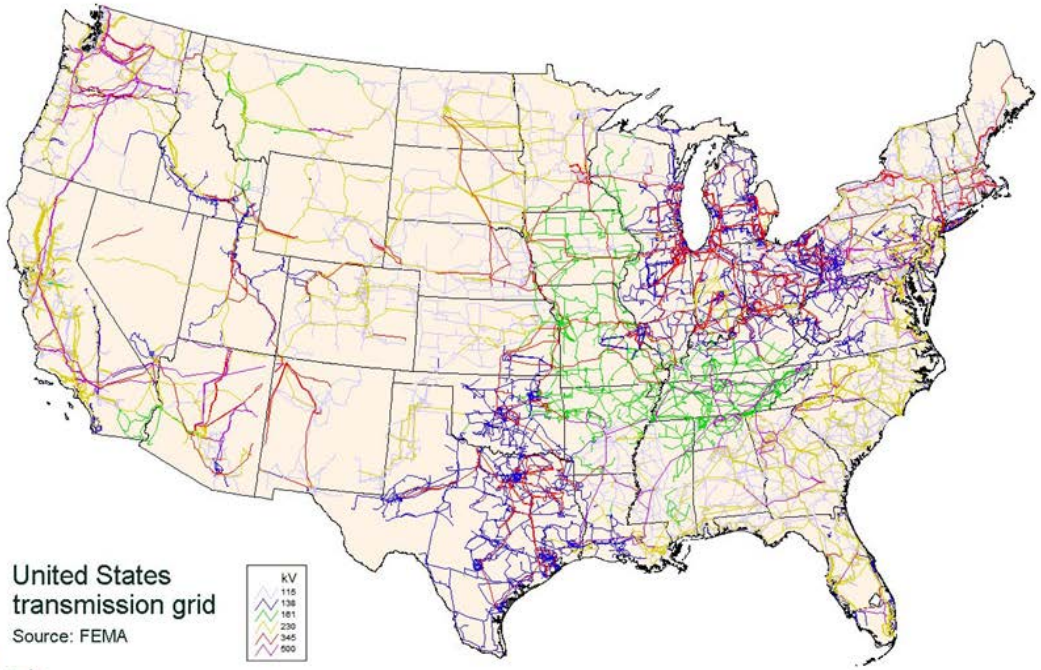




DISTRIBUTION WORKSHOP

SHERATON CRYSTAL CITY
SEPTEMBER 24-26, 2012

Grid Tech Team
U.S. Department of Energy

DOE Grid Tech Team (GTT)

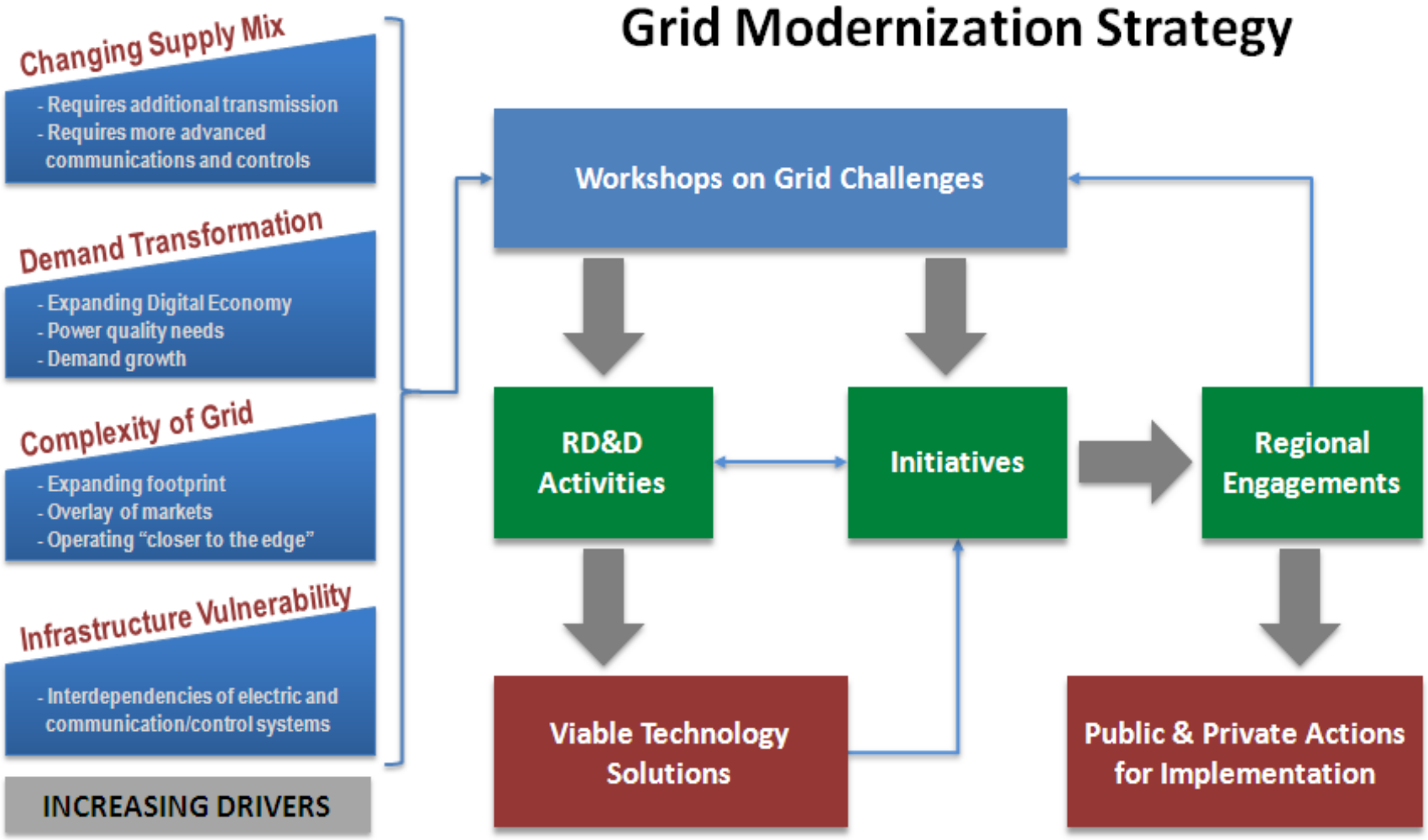
- The Grid Tech Team (GTT), established by the Office of the Undersecretary of Energy, was tasked with coordinating grid-related activities across the Department and accelerating modernization of the electric power system.
- Currently, the GTT comprise of representatives from OE, EERE, ARPA-E, Fossil Energy, Science, Policy and International Affairs, CFO, and the Office of the Secretary of Energy.

Vision of the Future Grid

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)
- Allows 100% consumer participation and choice (including distributed generation, demand-side management, electrification of transportation, and energy efficiency)
- 100% holistically designed (including regional diversity, AC-DC transmission and distribution solutions, microgrids, and centralized-decentralized control)
- Accommodates two-way flows of energy and information
- Reliable, secure (cyber and physical), and resilient

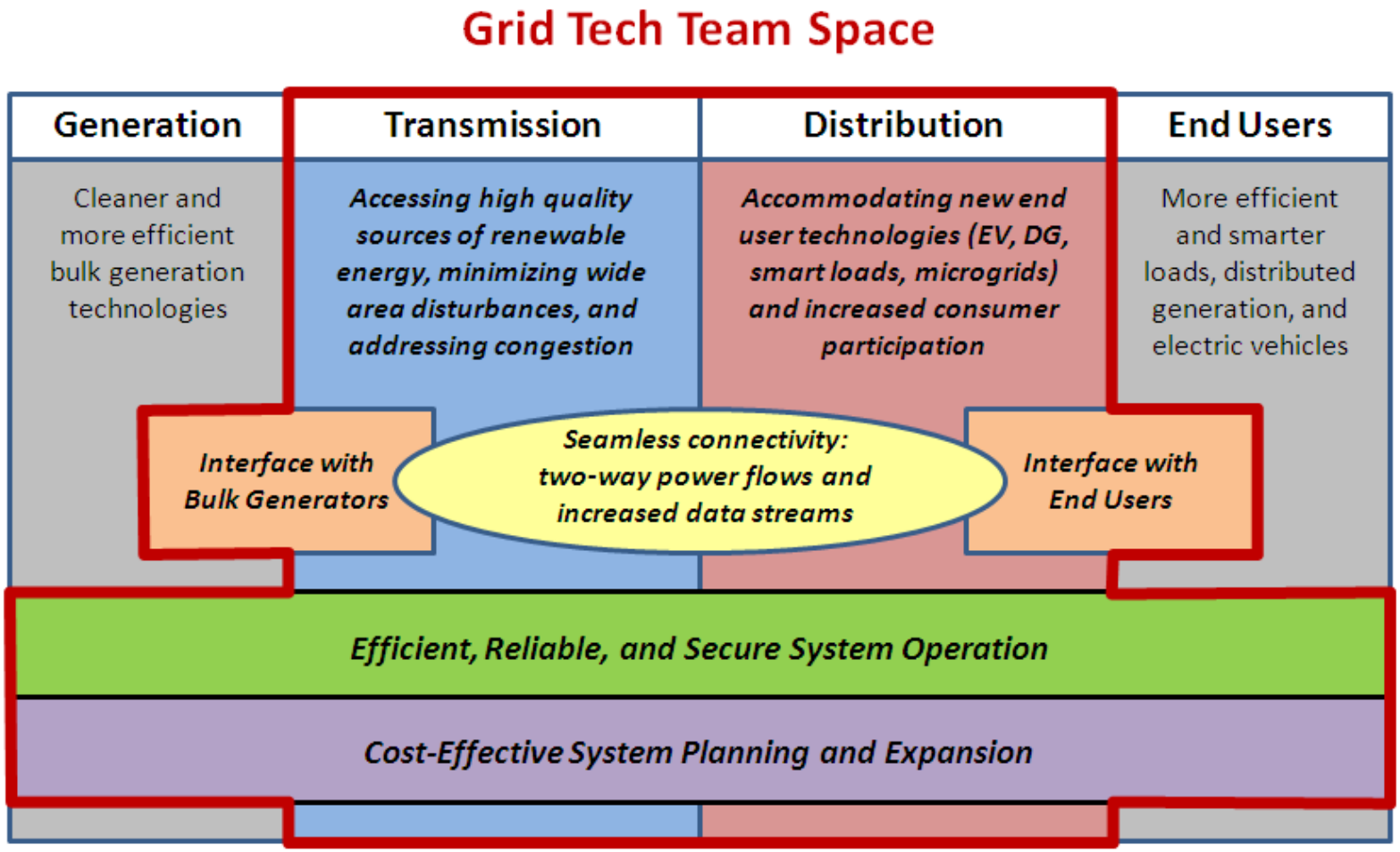
Modernization Drivers and Strategy



DOE Strategic Levers

- Critical Roles
  - Convener of diverse stakeholders
  - Aggregator and disseminator of unbiased information
  - Provider of technical expertise and analytical capabilities
- Key Elements of Strategy
  - RD&D activities will be coordinated around *overcoming mid- to long-term technical issues* identified during workshops and discussions on grid modernization challenges
  - Initiatives will be coordinated around *overcoming near-term technical and associated institutional issues* identified during workshops and discussions on grid modernization challenges which impose barriers to deployment and commercialization
  - Regional engagements are necessary to *recognize regional differences and sensitivities with executing initiatives*, including within state and local jurisdictions

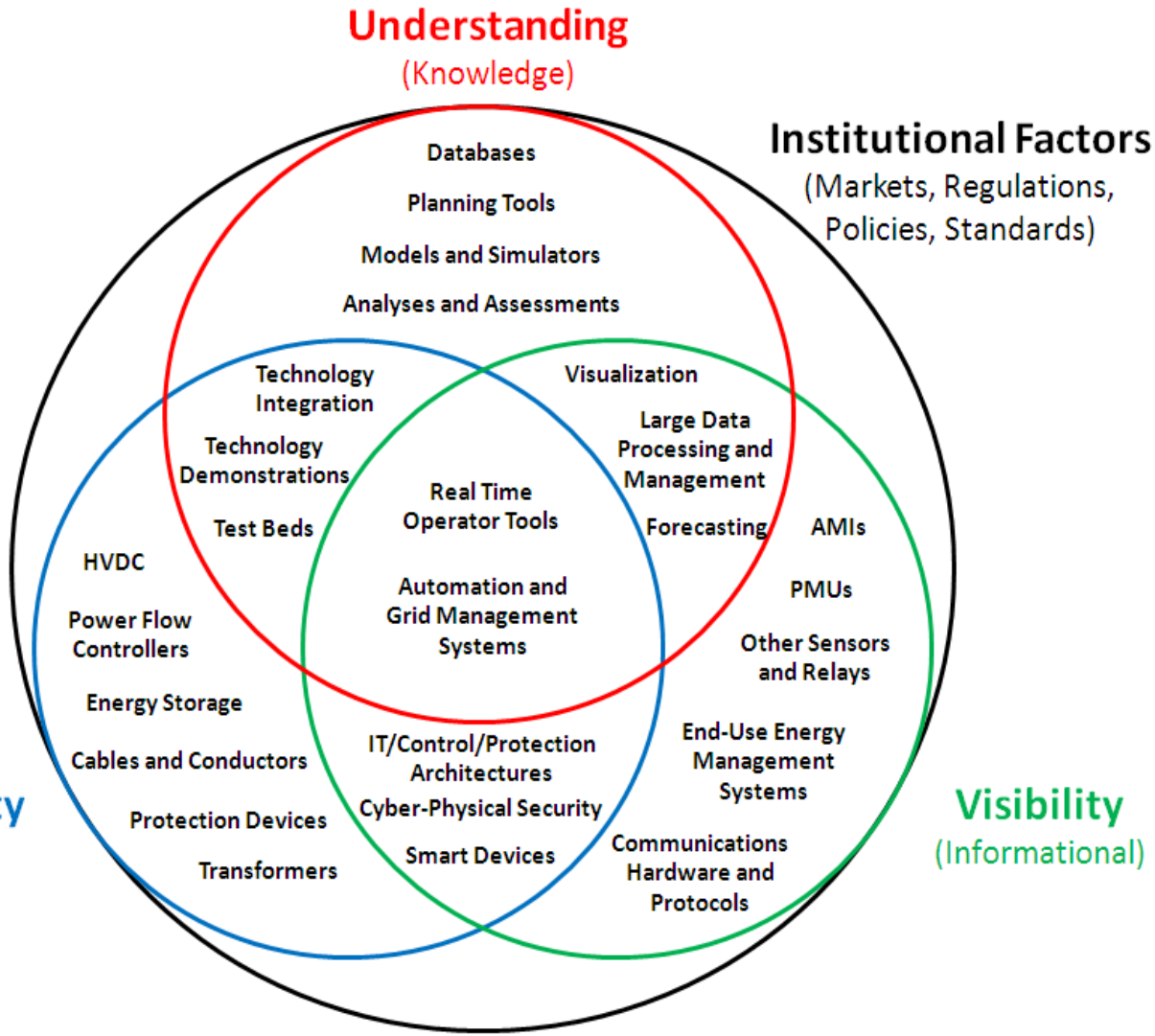
Holistic Systems Perspective



Institutional issues and solutions must be considered in conjunction with these technical challenges

Strategic Framework

- Visibility to "see" an event or condition
- Understanding to "know" what is happening or about to happen
- Flexibility to "do" something appropriate in response



GTT Grid Modernization Goals

- Visibility Goals
  - Deployment of PMU functionality at all substations $\geq$ 230 kV
  - Visibility of whole interconnection to appropriate control rooms at PMU rates
  - Increase deployment of sensors (including AMI) on distribution feeders
  - Energy use data will be accessible to utilities and customers
- Understanding Goals
  - Harmonized and accessible databases of grid assets for planning and operation
  - Development of operator and planning tools that utilize improved methodologies (stochastics, forecasting, parallel processing, etc.)
  - Development and validation of models for new technologies and systems integration
  - Development of advanced energy/distribution/outage management systems
- Flexibility Goals
  - Increase deployment of power controllers on the transmission system
  - Increase deployment of controllers/smart devices on distribution feeders
  - Expand the use of demand side resources to provide flexibility
  - Expand the use and capabilities of thermal units to provide flexibility

Near-Term Priorities

- Initiatives
  - Improving Situational Awareness (Visibility)
  - Planning Database Standardization (Understanding, Visibility)
- RD&D Activities
  - Grid Metrics Development (Understanding)
  - Electricity Systems Hub (All)
  - Next Generation Tools and Data for Distribution Systems (All)
  - Interface Tools for Advanced Grid Modeling (Understanding)
  - Advanced Power Flow and Protection (Flexibility)

Next Steps and Summary

- Next Steps
  - Proceed with near-term initiatives, associated regional engagements, and workshops on grid challenges
- Summary
  - Utilizing the convening power of government, the capabilities and expertise within DOE, and targeted RD&D investments and initiatives, we will build collaborations and catalyze the industry to enhance the visibility, understanding, and flexibility of the electric power system to achieve the vision of the future grid

Distribution Workshop

- Purpose: To identify DOE's role in addressing the modernization of the electricity distribution system in a holistic manner
- Goal: Work with stakeholder communities to establish a comprehensive vision for a 21st century distribution system and a corresponding DOE research and development roadmap

Breakout Sessions

- Distributed Technologies
  - Variable Renewables
  - Dispatchable Renewables
  - Smart Grid Technologies
  - Electric/Fuel Cell Vehicles
  - Building Loads
  - Energy Storage

- Goal: Identify challenges and opportunities for each technology integrating into the grid

- Systems Perspective
  - Key Challenges to Grid Integration
  - Grid Visibility
  - Grid Understanding
  - Grid Flexibility

- Goal: Identify barriers and R&D activities to achieve holistic integration of **all** technologies

Systems Perspective

- *Visibility*: What advances could be made in the informational domain (sensors, AMIs, PMUs, etc.) to increase the visibility and controllability of the grid?
- *Understanding*: What advances could be made in planning tools, models, distribution management systems, etc. to increase the understanding and controllability of the grid?
- *Flexibility*: What advances could be made in component technologies to increase the flexibility and controllability of the grid?