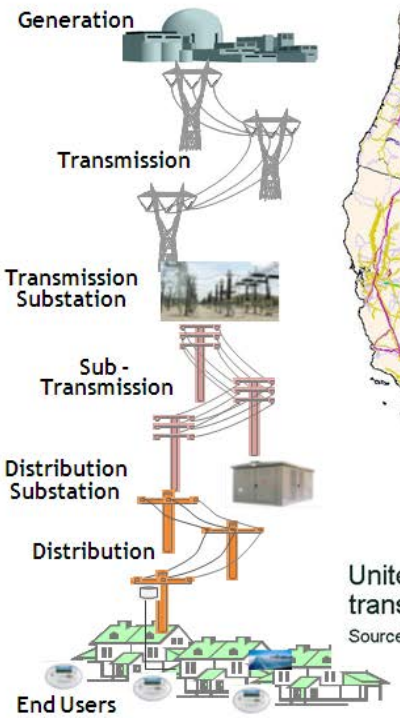
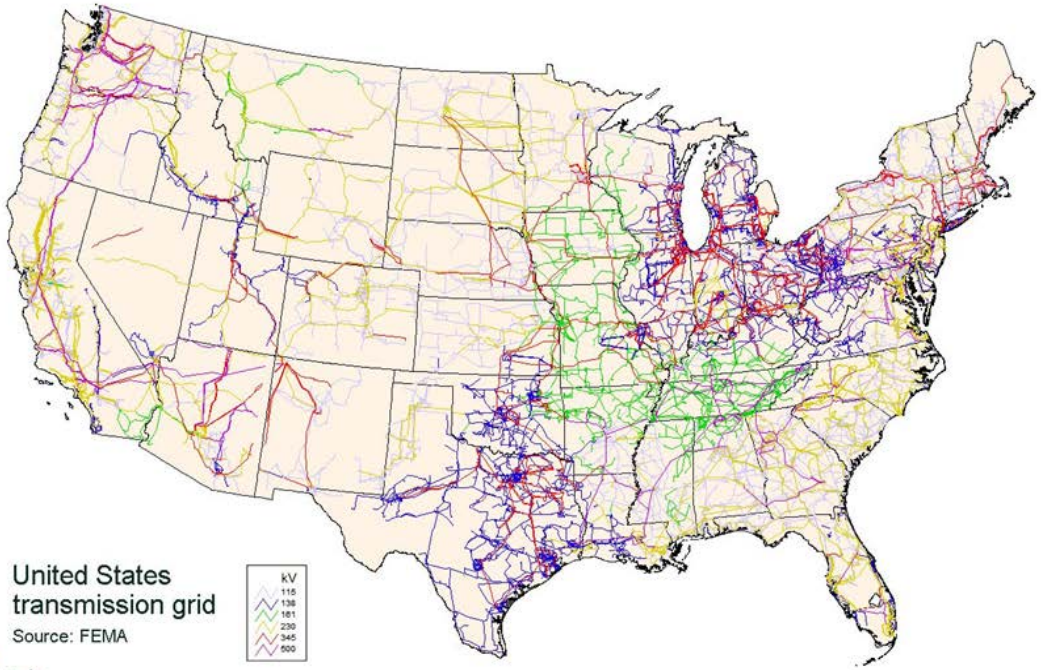




TRANSMISSION WORKSHOP

DOUBLETREE CRYSTAL CITY
NOVEMBER 1-2, 2012

Anjan Bose, Grid Tech Team
U.S. Department of Energy

DOE Grid Tech Team (GTT)

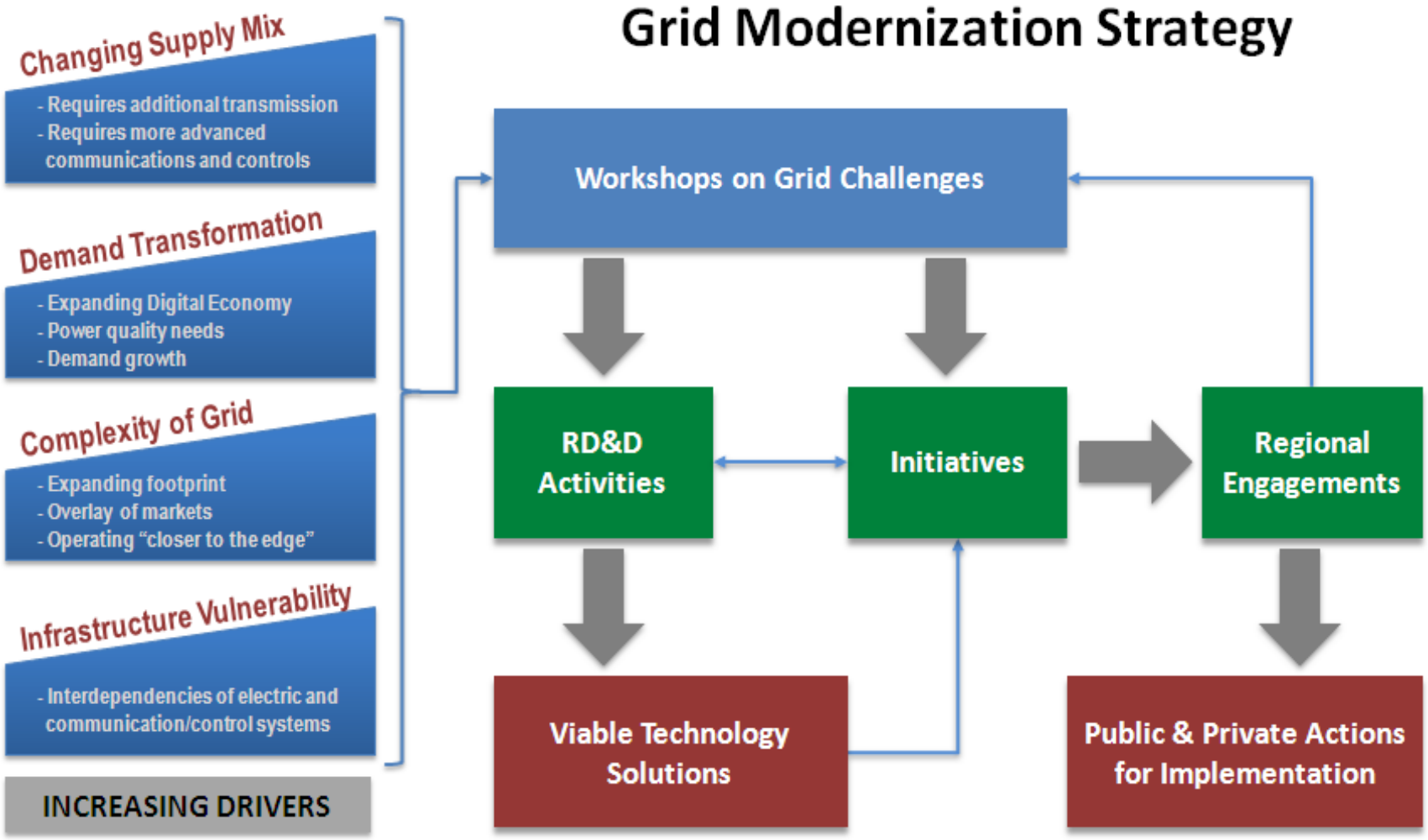
- The Grid Tech Team (GTT), established by the Office of the Undersecretary of Energy, was tasked with coordinating grid-related activities across the Department and accelerating modernization of the electric power system.
- Currently, the GTT comprise of representatives from OE, EERE, ARPA-E, Fossil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

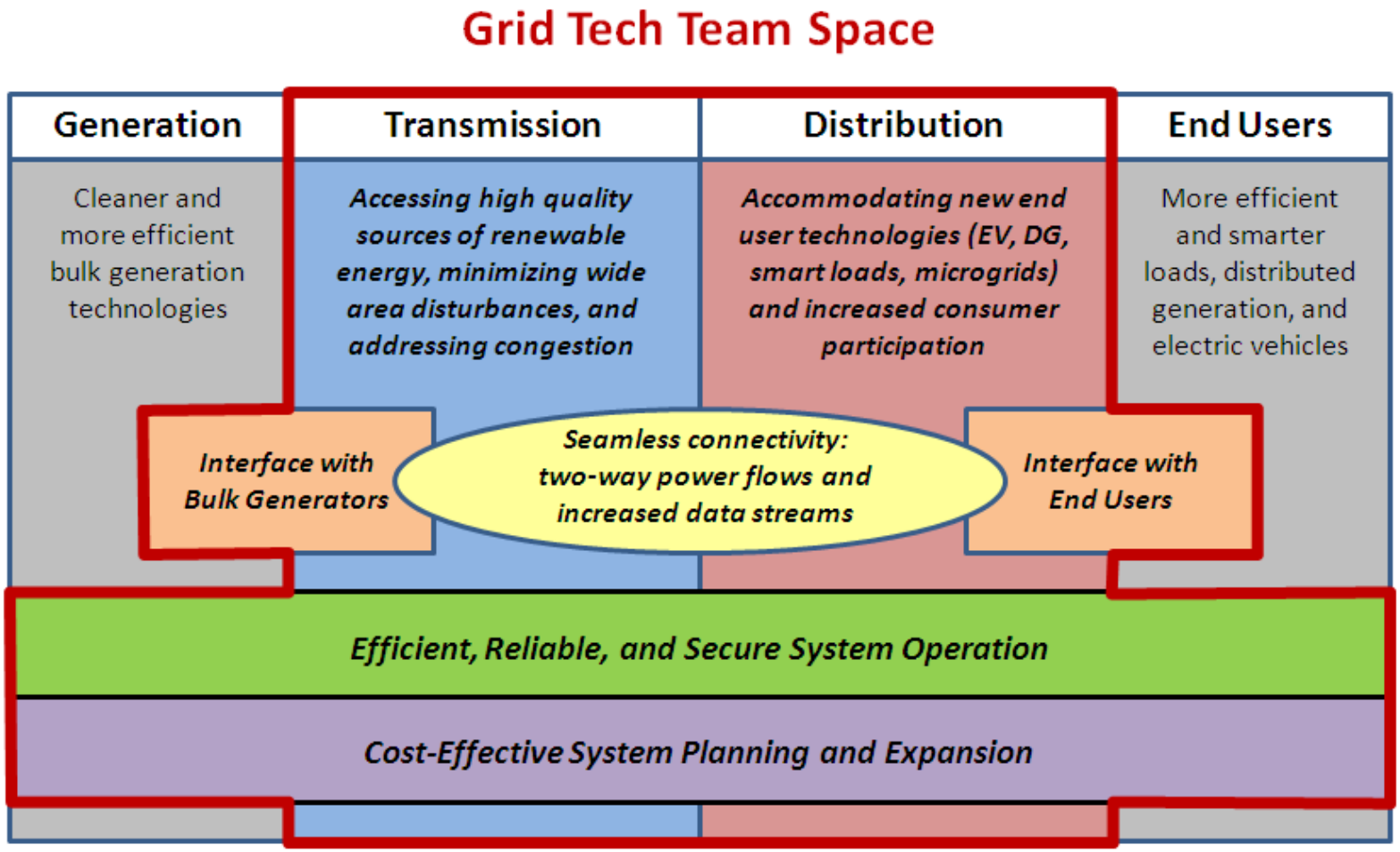
Modernization Drivers and Strategy



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 institutional and/or associated near-term technical issues* identified during workshops and discussions on grid modernization challenges which impose barriers to the deployment and commercialization of technology solutions
  - Regional engagements are necessary to *recognize regional differences and sensitivities with executing initiatives*, including within state and local jurisdictions

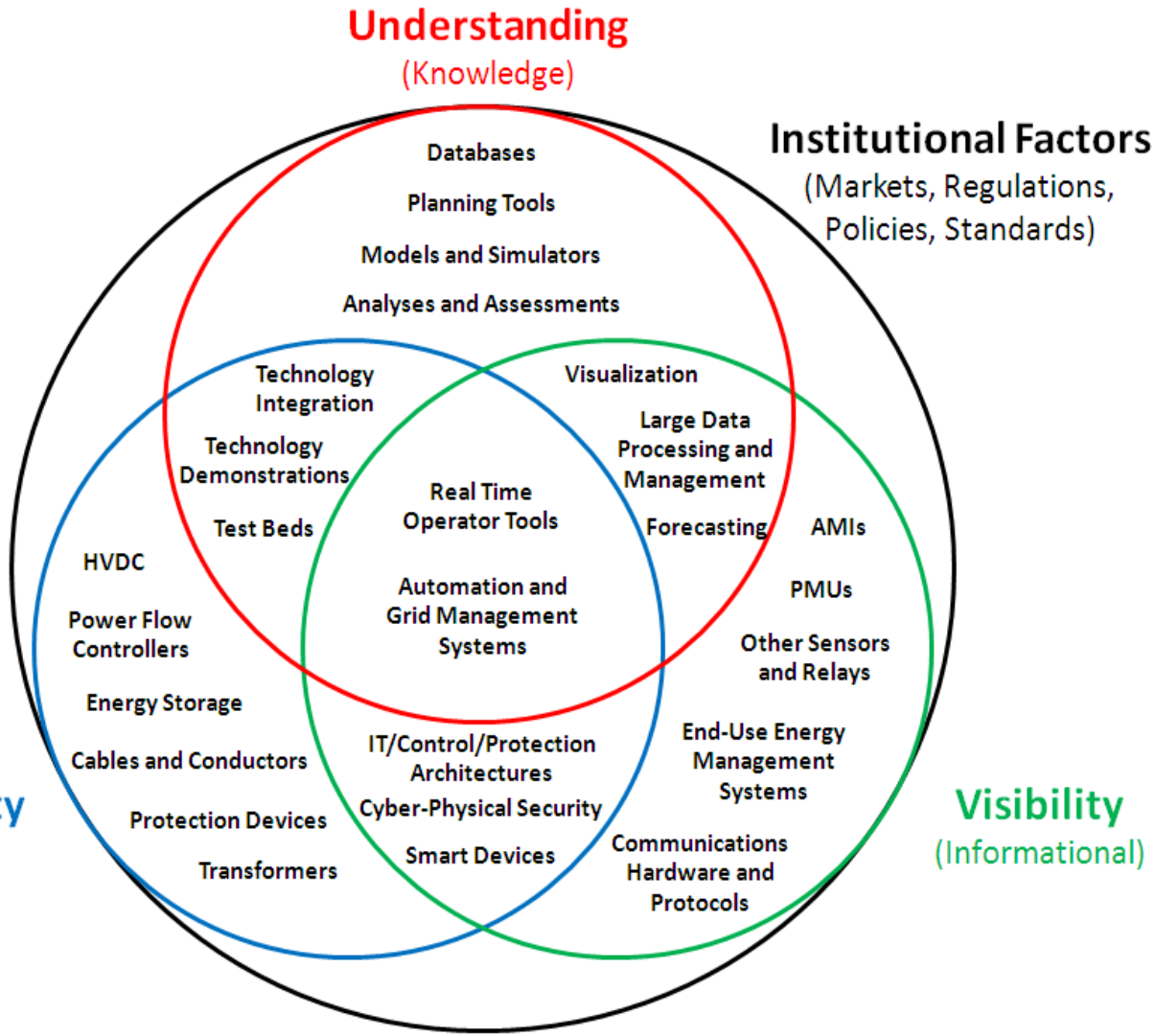
Holistic Systems Perspective



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



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
    - Distribution Workshop September 24-25, 2012
    - Visibility Initiative Meeting October 5, 2012
- 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 (Sep. 24-25)

- 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

Preliminary Findings

- Modeling, Simulation and Optimization
- Controls and Interoperability
- Communications and Database Architectures
- Protocols, Codes and Standards
- Business Case, Risk and Valuation

Visibility Meeting (Oct 5)

- Initiative to examine the barriers to data exchange that limits the visibility of the interconnected grid
- Meeting of 14 invited industry leaders with the Secretary to advise the DOE
- Major suggestions:
  - Data exchange is necessary for situational awareness, blackout prevention and adequate planning
  - The modalities of data exchange must be worked out by the power utility industry (like EIPC)
  - DOE should continue developing applications for data

Transmission Workshop

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

Guiding Questions

- *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?