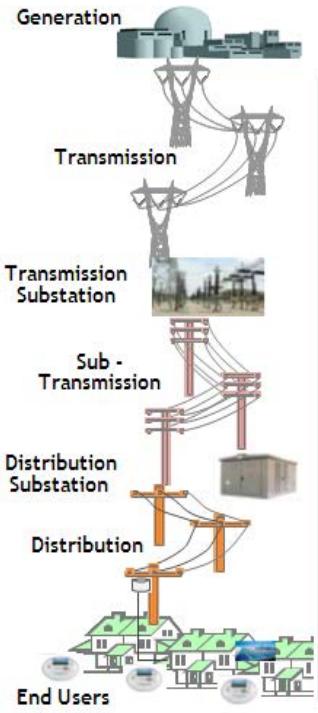
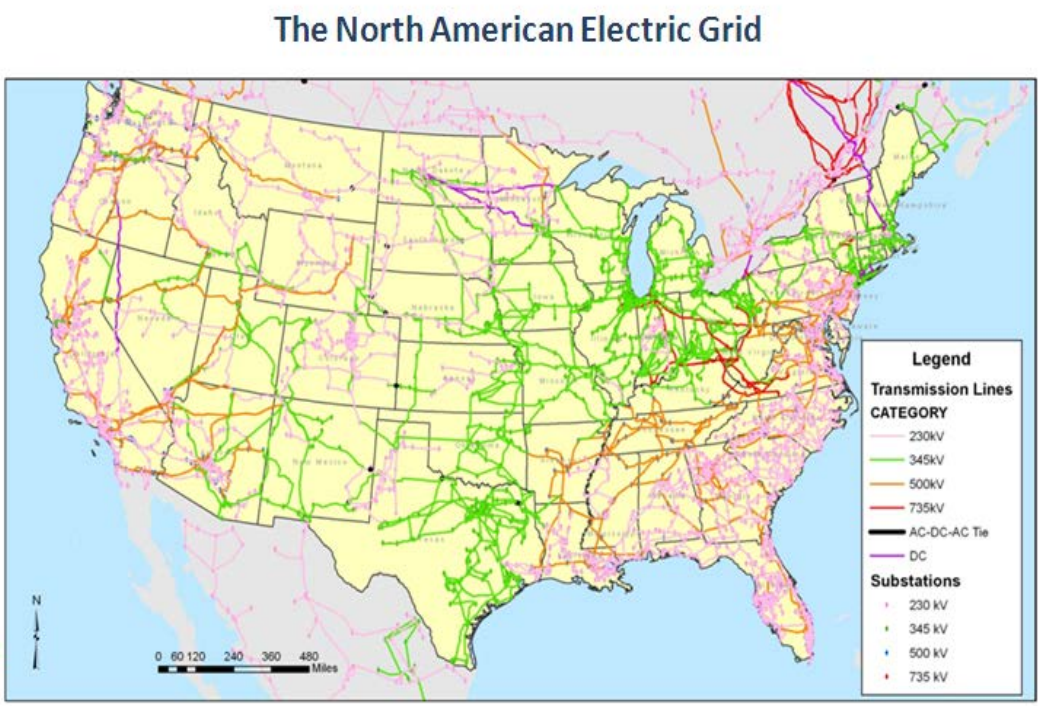




GRID MODERNIZATION EAC MEETING OCT 15

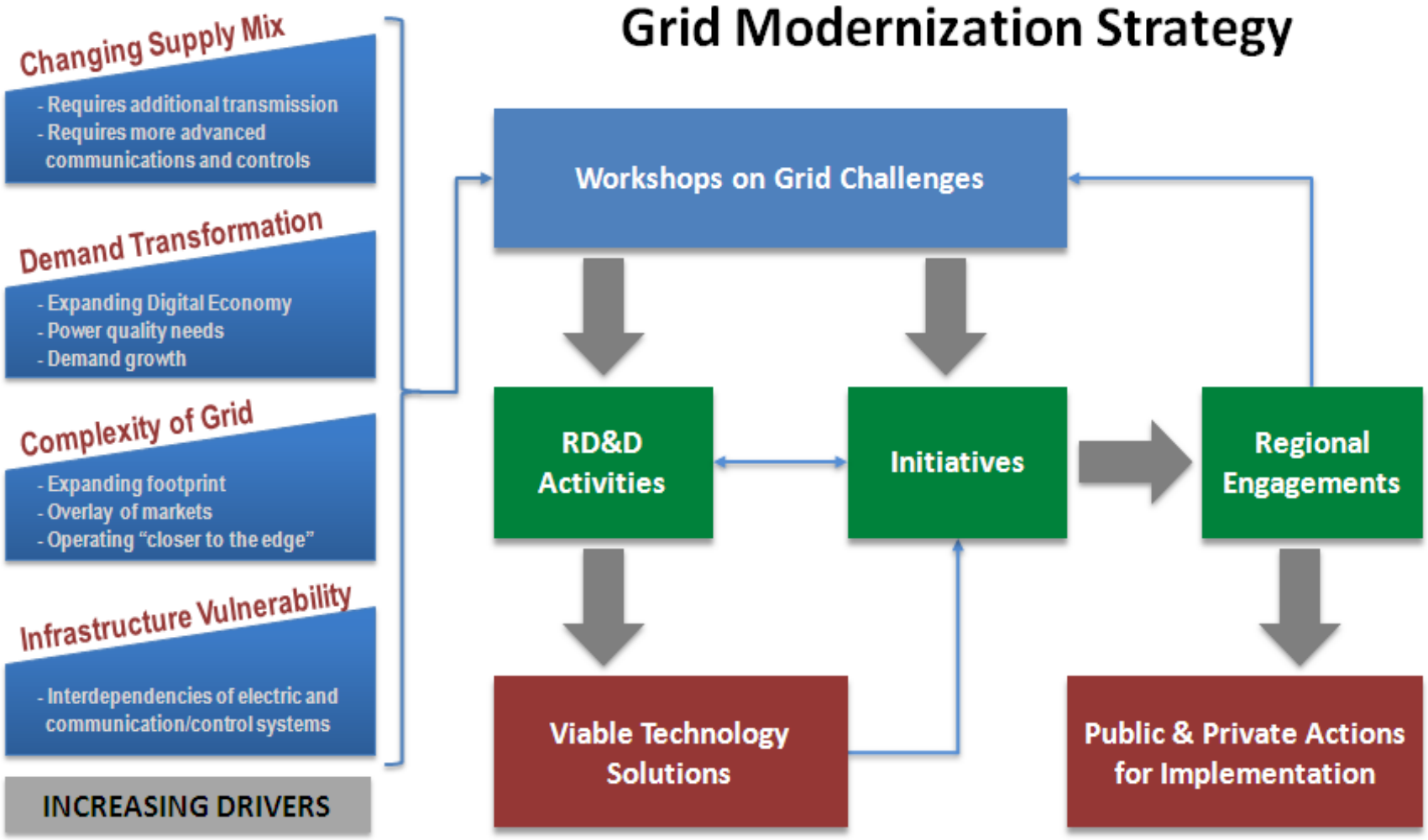
Anjan Bose - Grid Tech Team
U.S. Department of Energy

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 hybrid configurations, and centralized-decentralized control)
- Accommodates two-way flows of energy and information
- Reliable, secure, and resilient

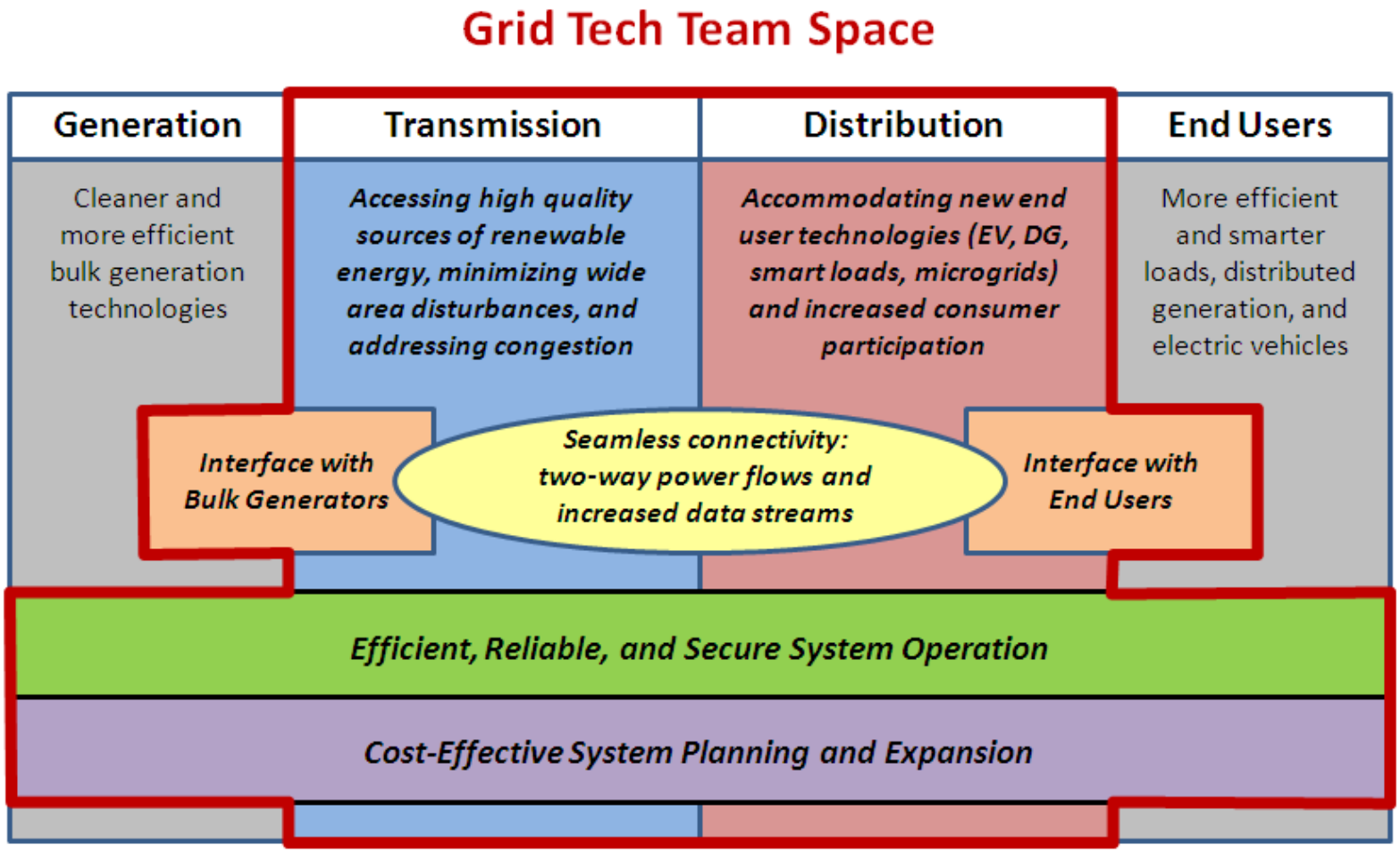
Modernization Drivers and Strategy



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 are focused on overcoming the *technical challenges* identified through workshops on grid challenges
  - Initiatives are focused on overcoming the *institutional challenges* identified through workshops on grid challenges
  - Regional engagements are *extensions of initiatives* that require recognition of regional differences and sensitivities to State and local jurisdictions

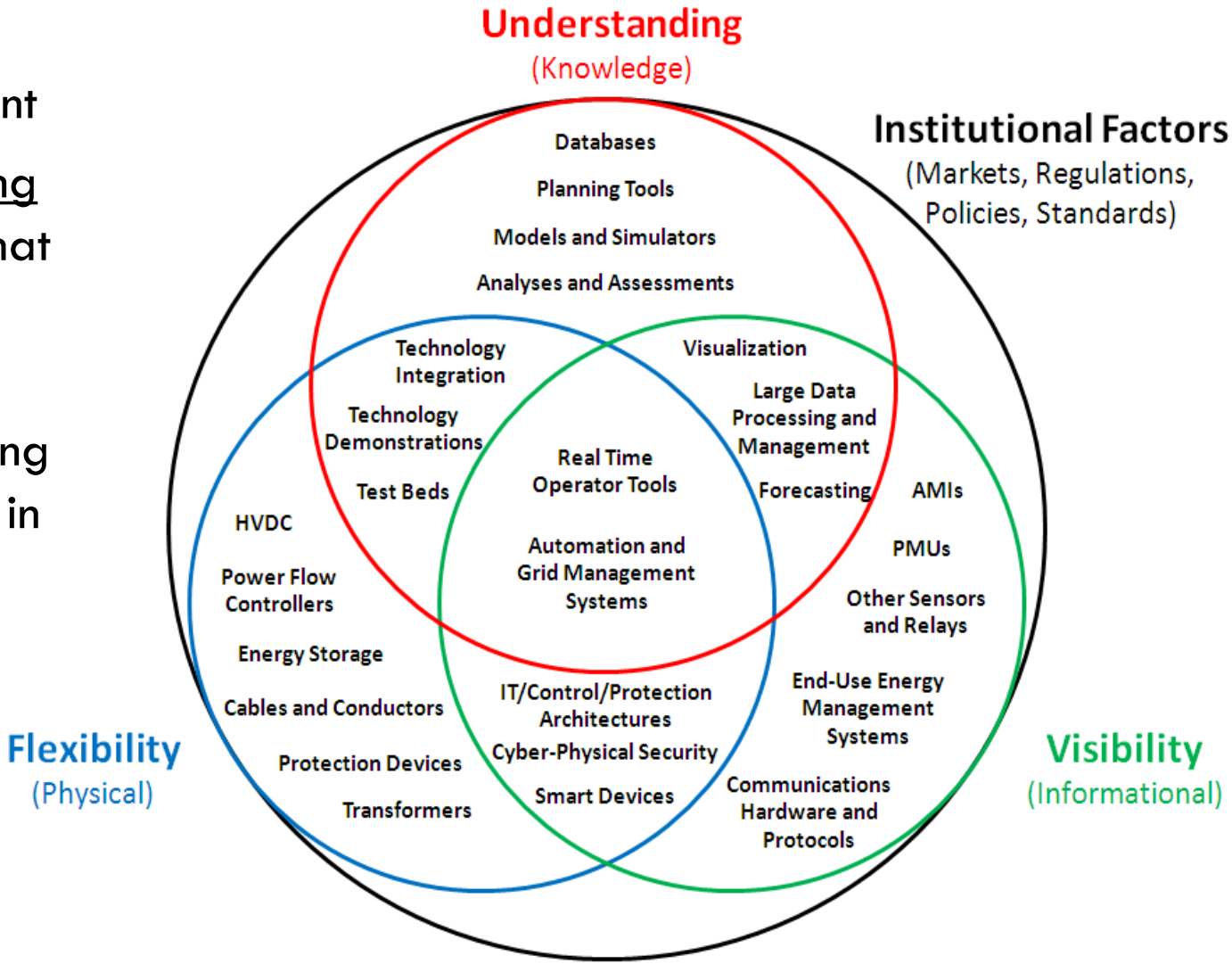
Holistic Systems Perspective



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

Strategic Framework

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



Near-Term Priorities

- Initiatives
  - Improving Situational Awareness (Visibility)
  - Planning Database Standardization (Understanding, Visibility)
- RD&D Activities
  - Roadmap for R&D in the Distribution System to meet Grid Modernization goals
  - Roadmap for R&D in the Transmission System to meet Grid Modernization goals

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

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)

Transmission Workshop (Nov 1-2)

- 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 distribution system and a corresponding DOE research and development roadmap

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?