



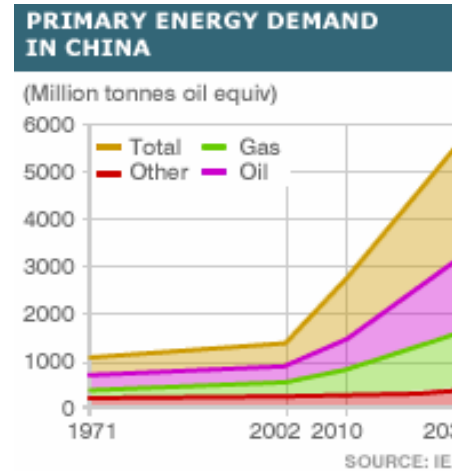
# How2Guide Planning & Development Tools Session

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# Forces Shaping the Future of Energy

- Worldwide, demand for energy -- and costs -- are rising
- Climate change policies set environment as a parameter in the cost equation
- Technology is enabling new ways to get things done
- Customers want more value for their energy dollar



# The Challenge Ahead is Complex

## Historical Expectations



Affordable, Power

Reliable Power

Secure Power

## Emerging Expectations



Deliver significant amounts of renewable generation quickly



Maximize benefits of end-use efficiency and storage

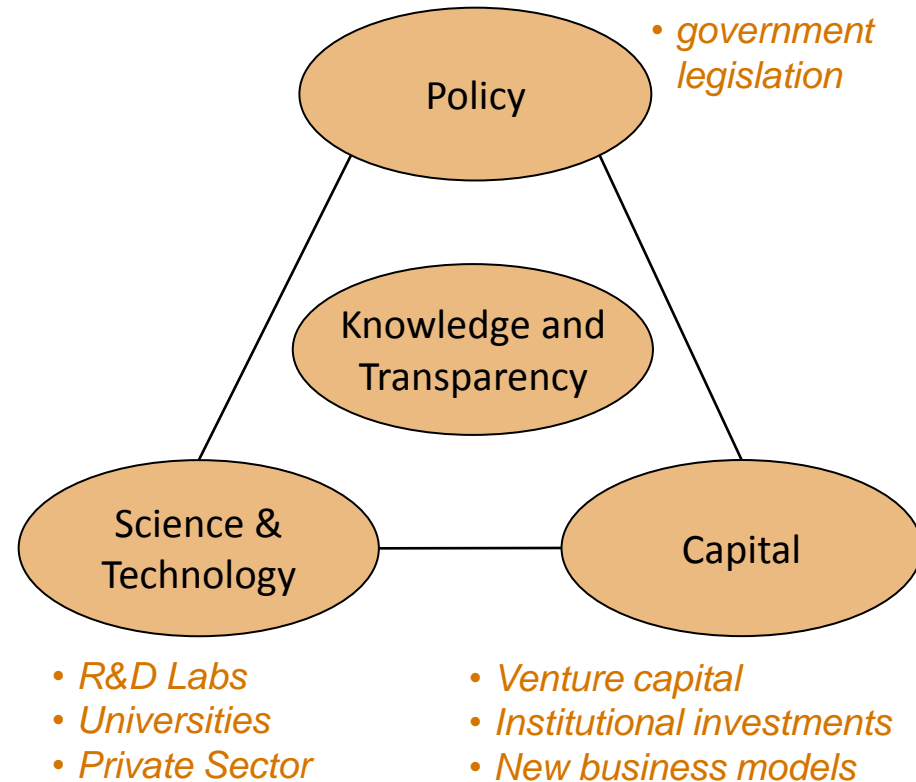


Electrify transportation sector to reduce dependence on imported oil

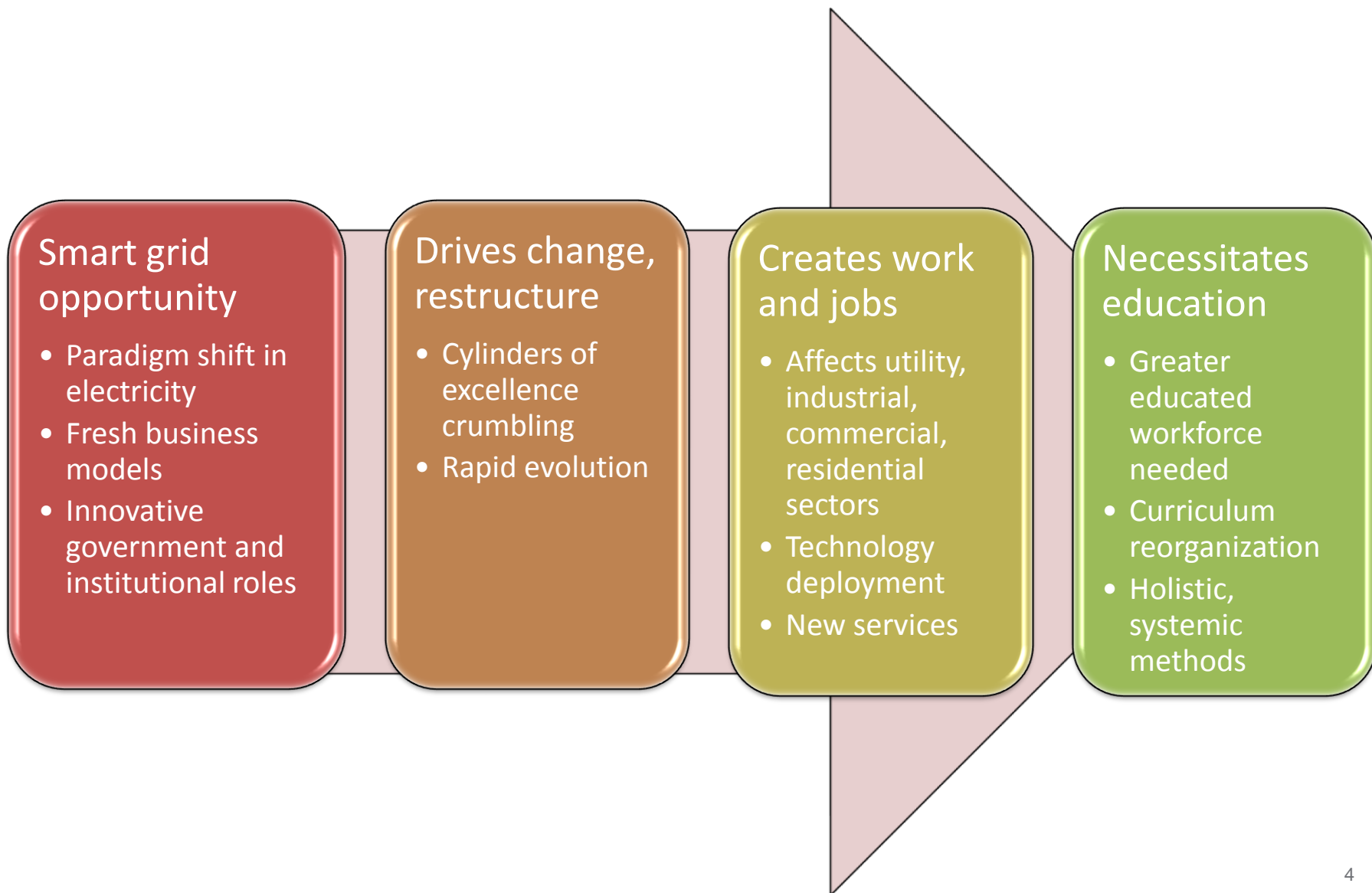


Meet future carbon and emissions constraints

## What will it take to get us there?



# Electricity Ecosystem Transformation





# Planning & Development Challenges

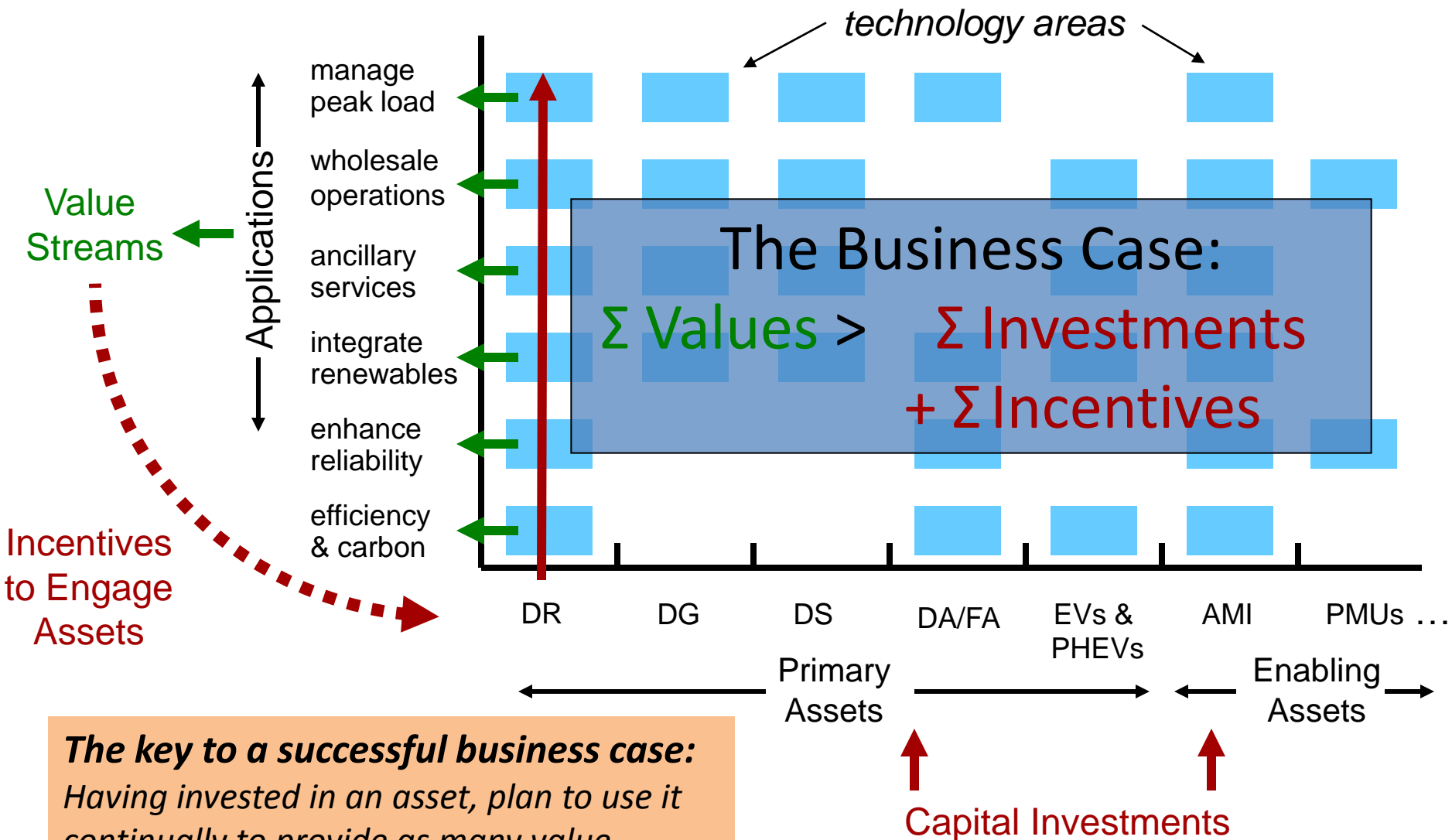
## Technical

- ▶ Innovation breeds multiple, competing approaches
- ▶ Cross-domain unfamiliarity (e.g., electric power & consumer electronics)
- ▶ Simplicity for consumers & operators
- ▶ Design-in cyber-security & privacy
- ▶ Interoperability – dealing with a heterogeneous mix of technology over time

## Business & Policy

- ▶ Communicating the value proposition for each stakeholder
- ▶ Adoption rates uncertain
- ▶ Regulatory appreciation for innovative business models
- ▶ Incentives for efficiency and less impact to environment
- ▶ Inconsistent policy framework hinders regional/national marketplace
- ▶ Policy change risks to economic, national security

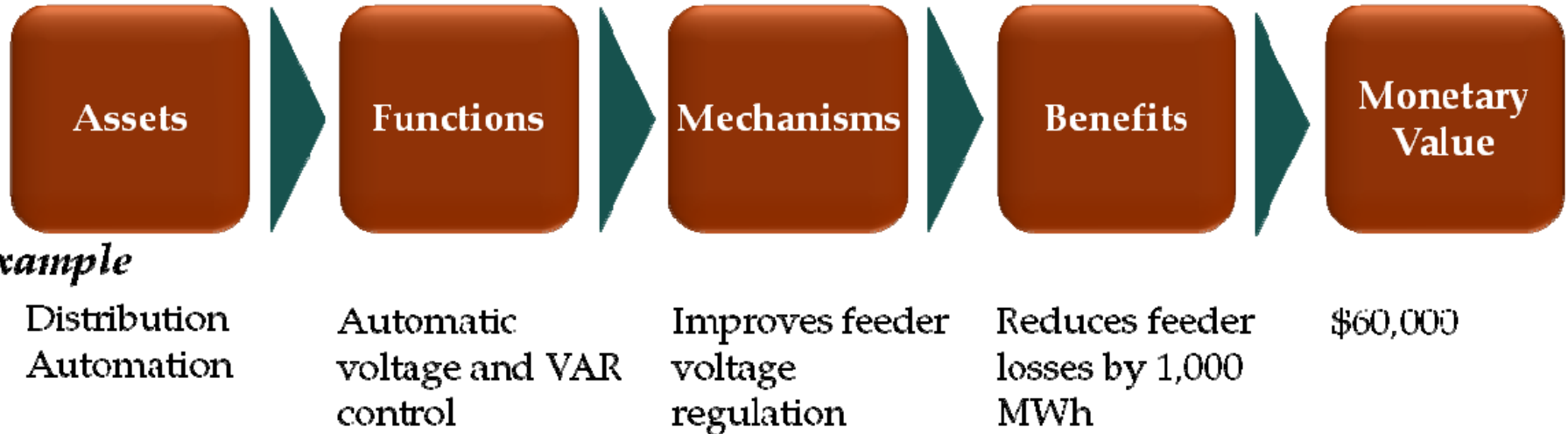
# Assets & Applications Produce Smart Grid Values & Define the Business Case



***The key to a successful business case:***  
*Having invested in an asset, plan to use it continually to provide as many value streams as possible!*

## ► Example: Smart Grid Analytical Framework

■ [http://www.smartgrid.gov/recovery\\_act/program\\_impacts/analytical\\_framework](http://www.smartgrid.gov/recovery_act/program_impacts/analytical_framework)



From USER GUIDE FOR THE U.S. DEPARTMENT OF ENERGY SMART GRID COMPUTATIONAL TOOL, Version 2.0

# Smart Grid Maturity Model (SGMM)

- ▶ A management tool that helps electricity providers develop a programmatic approach and track their progress
  - Provides a common language and framework
  - Defines key elements of smart grid transformation
  - Focused on evaluation of an electricity provider enterprise
- ▶ Steward of SGMM: Software Engineering Institute – Carnegie Mellon
  - Provide governance, education, awareness
  - Enable widespread availability and adoption
  - Evolve the model and grow the community worldwide

See <http://www.sei.cmu.edu/smartgrid/tools/>



- ▶ 8 Domains of smart grid characteristics
  - Strategy, Management, & Regulatory
  - Organization & Structure
  - Grid Operations
  - Work & Asset Management
  - Technology
  - Customer
  - Value Chain Integration
  - Societal & Environmental
- ▶ 6 Maturity Levels: Defined sets of characteristics and outcomes
  - Status quo, initiating, enabling, integrating, optimizing, pioneering
- ▶ 175 Characteristics: Features you would expect to see at each stage of the smart grid journey

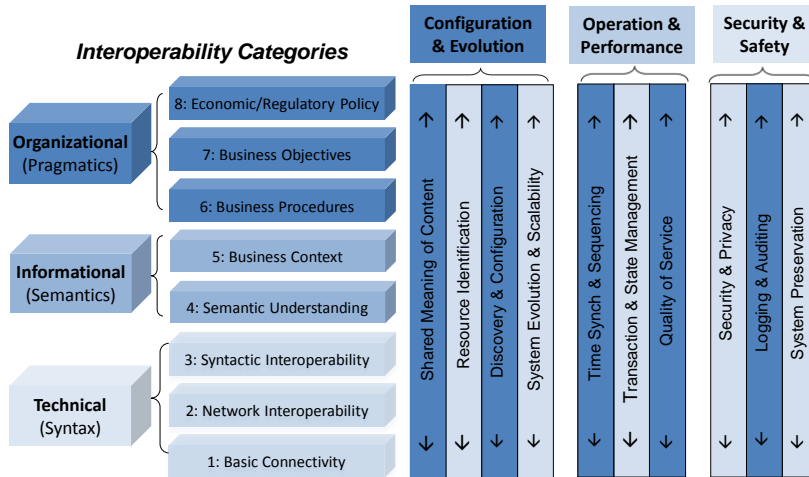
- ▶ Example of a smart grid resource library
- ▶ Links to smart grid material to help with planning and development
  - Tutorials
  - Use cases
  - Projects
  - Deployment experiences, lessons learned
  - Business cases, cost/benefit analyses

<http://www.sgiclearinghouse.org/>

# Development Tools for Interoperability

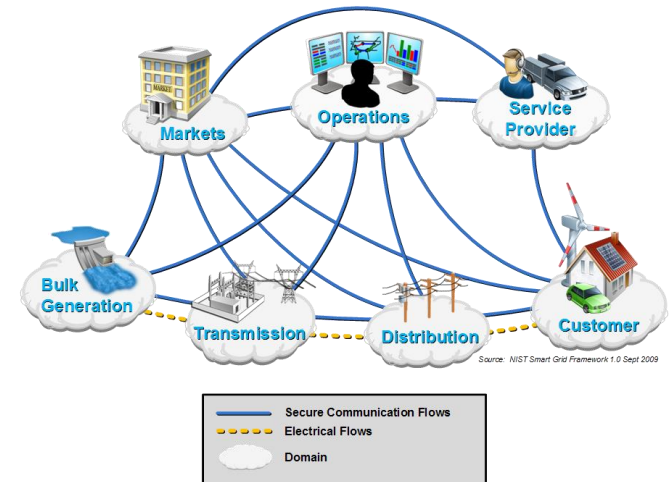
## Context-Setting Framework

### Cross-cutting Issues



<http://www.gridwiseac.org/about/publications.aspx>

## Conceptual Model



<http://collaborate.nist.gov/twiki-sggrid/bin/view/SmartGrid/SGConceptualModel>

## XYZ Interface Specification



## Interoperability Maturity Model

<http://www.gridwiseac.org/about/imm.aspx>



# Other Requirement Tools and Roadmaps

- ▶ EPRI Intelligrid process
  - Use case process
  - Use case repository
  - Utility roadmaps
- ▶ European Smart Grid Coordinating Group (SG-CG)
  - CEN, CENELEC, ETSI cooperation on smart grid standards
  - Framework for standards gap analysis
- ▶ IEC smart grid standards - SG 3 - Strategic Group on Smart Grid
  - Standards mapping tool
  - Roadmap, insights, background material
- ▶ Asian Pacific Economic Cooperation (APEC)
  - Initiatives, member roadmaps, documentation

# Smart-Grid Deployment Is a Journey

- ▶ Smart-grid vision aligns stakeholders toward a direction
- ▶ Action plans need to prioritize incremental steps that provide acceptable return on investments
- ▶ Action plans will have regional and organizational differences
  - Starting points
  - Value propositions and preferences/priorities
  - Government and economic/market frameworks
  - Stakeholder composition (service providers, customer composition, reliability coordinators...)
- ▶ Long term plans need flexibility to change

***One size does not fit all***