



Office of Electricity Delivery
and Energy Reliability

FUTURE OF THE GRID TRANSITIONING TO THE FUTURE

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March 12, 2015

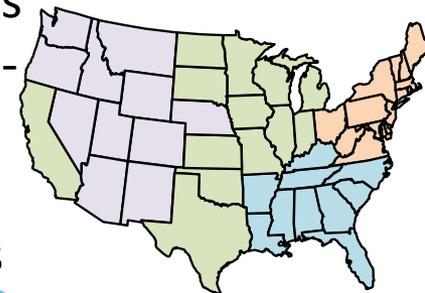
The Future of the Grid Evolving to Meet America's Needs

Partnered with GridWise Alliance to hold a series of multi-stakeholder regional workshops to determine the changing operational, business and policy requirements needed in the electricity industry over the next 20 years to sustain the Nation's economic prosperity and facilitate the industry's transformation.

Overview

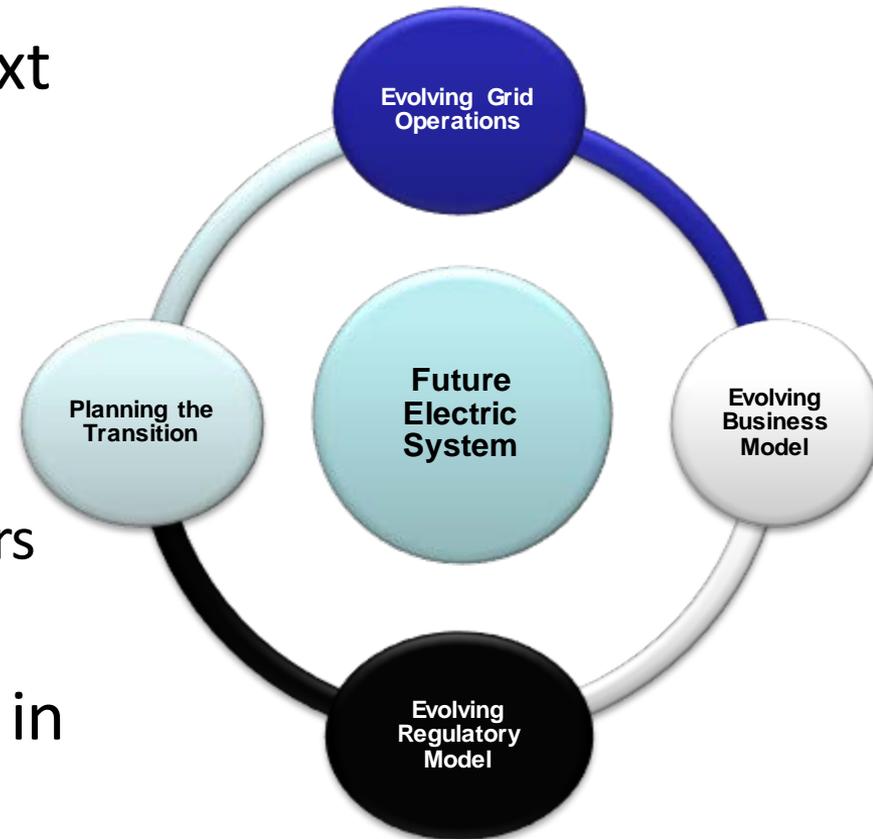
Understanding Industry Challenges

- Multi-stakeholder: Utilities (ISOs, Munis, Co-ops, PUDs, PPA) , Regulators, State Energy Offices, Consumer Advocates, Business Leaders, Technology providers, Academics and Researchers (>400 participated)
- Four one-day regional workshops focused on the Challenge of :
 - Balancing Supply and Demand as Grid Complexity Grows
 - Involving Customers and Their Electrical Loads in Grid Operations and Planning for Empowered Customers
 - Higher Local Reliability through Multi-customer Microgrids
 - Transitioning Central Generation to Clean Energy Sources - Wind, Solar, and Gas
- National Summit held June 2014 in Washington, DC
- Final Report released December 2014 with recommendations next steps



New Approach to Understanding Challenges

- Looked at the grid in the context of the entire value chain
- Allowed an understanding of
 - the grid as an enabling platform
 - the evolving role of grid operators
- Illuminated necessary changes in
 - Utility business models
 - Regulatory framework



- **Generation**
 - Centralized and distributed
 - Dispatchable and non-dispatchable
 - Microgrids – complementary not replacement
- **Energy storage**
 - Important
 - Still need “dispatchable” generation and resources
- **Balancing supply and demand**
 - Increasing complex and important
 - Moves down into distribution network
- **Consumers**
 - Different expectations and options
 - Prosumers
- **Markets**
 - Wholesale and retail
 - Third party non-regulated competitive players

- Will want and need a grid
- No longer just a delivery “pipe”
 - => Multi-way power flow
- Must be agile and “fractal”
 - Flexible, adaptable, responsive
- Enabling platform
 - For a very dynamic and complex system
 - Robust retail market
- Balancing supply and demand
 - Distribution will look and act more like transmission
 - Essential function for both T&D
- Connecting markets
 - Linking new retail markets to wholesale markets

Future Value Propositions for Grid Operators

- Integrating all types of generations
- Being agnostic as to where supply comes from
- Increasing grid efficiency
- Enabling customers to provide services back to grid
- Facilitating a retail market for consumers to buy and sell services
- Optimizing asset utilization
- Supporting/implementing public policies
- Maintaining a safe and reliable grid
- Enabling highly reliable and resilient energy services to end consumers
- Identifying most cost-effective way to achieve outcomes

Challenges for Regulators

- Providing regulatory clarity in time of significant change
- Align regulatory process to embrace speed of change and technology innovation
- Balancing public good with the needs and desires of individual consumers
- Addressing consumers' obligations to the grid as well as utilities' obligations to consumers in the future

- Establish clear and comprehensive guiding principles to develop a unifying architecture to ensure interoperability across the entire grid
- Create a transition framework for guiding investments that will assist with regional/state planning which includes:
 - Standardized industry metrics
 - Foundational investments
- Drive solutions through stakeholder engagement and education.
- Address technology challenges and limitations through robust research and analysis.

A collaborative approach that engages the ecosystem of stakeholders

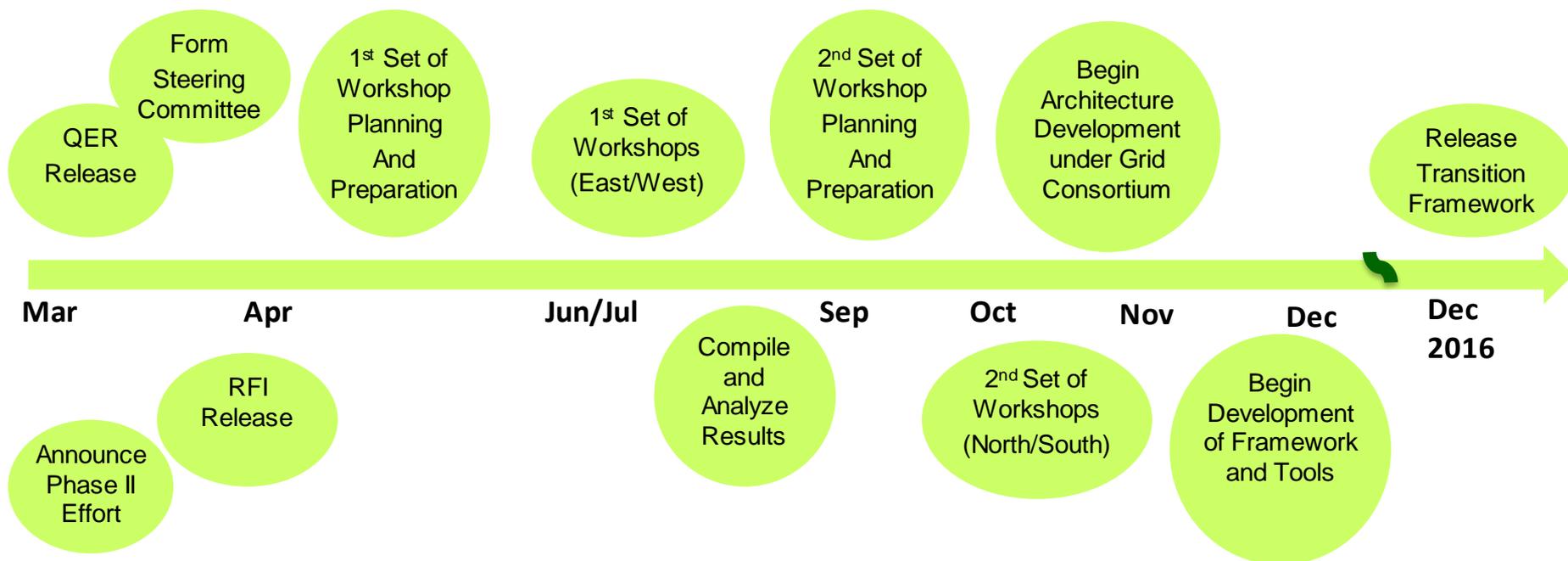
Purpose: Implement recommendations #1 and #2 from the Future of the Grid initiative in partnership with GridWise Alliance.

General Approach

- Open, transparent, multi-stakeholder effort
- Steering committee to guide effort
- Marketing/outreach activities to gain support/buy-in and broad awareness
- Include multiple data gathering techniques (RFI, webinars, interviews, etc.) to collect input from stakeholders to better inform and develop workshop/discussions
- Conduct stakeholder workshops
 - Workshops a means to an end – not the main driver
- Conduct any needed research or modeling to make the process more efficient and results more actionable. (incorporate QER research and findings)

Target timeline of April 2015 – April 2016

Deliverables complete by end of 2016



- Framework Components for transition to Grid 2030 Vision
 - Guiding Principles
 - Unifying Architecture
 - Characterization of foundational investments with business case drivers
 - Linkages between technologies, time frames for implementation
 - Interdependencies between investments
 - Standardized industry valuation metrics for measuring operational performance
 - Market structure impacts/options
 - Impacts to current regulatory models

- Engage all stakeholders; Build understanding and support; Create/sustain momentum
 - Recognize all roles involved including new entrants, state/federal distinction, RECs, DSOs, TSO, ISO
- Recognize and accommodate differences (e.g. regional, market structure)
- Develop actionable steps that can be undertaken to accelerate the transition by:
 - Grid Owners/Operators
 - ISO/RTOs
 - Vendors
 - Policy Makers
 - Regulators

- Utilities/DSO
- TSO
- ISO/RTO
- Customer advocates
- Regulators (State and Federal)
- Legislators (State and Federal)
- Vendors of measurement, sensor, analytics, comms, control, compute, storage
- Vendors of energy services and behind the meter technologies
- Key associations (e.g. EEI, APPA, NRECA, EPRI, NEMA, etc)