

TOWARD A 21ST CENTURY ELECTRICITY SYSTEM IN CALIFORNIA

A Joint Utility and Advanced Energy
Industry Working Group Paper

August 2015



PURPOSE, AGENDA FOR PRESENTATION

- **Purpose**
 - Discuss Position Paper with California's Energy Leaders
- **Agenda:**
 - Working Group and Objectives
 - Position Paper Summary

WORKING GROUP

Working Group Members

- Advanced Energy Economy Institute*
- Bosch
- BRIDGE Energy Group
- California Independent System Operator
- Chargepoint
- EnergySavvy
- EnerNOC
- Enphase Energy
- FirstFuel Software
- General Electric
- Gridco Systems
- Itron
- Navigant Consulting
- Pacific Gas & Electric
- Siemens
- Simple Energy
- SolarCity
- Southern California Edison
- Stem
- SunEdison
- SunPower Corporation

*Advanced Energy Economy Institute (AEEI) served as the facilitator

ADDITIONAL ENDORSERS

Additional AEE Members Who Endorsed the Paper

- | | |
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| <ul style="list-style-type: none">• Ambri• Bergey Windpower Co• Brightergy• Clean Fuel Partners• Landis+Gyr• Next Step Living | <ul style="list-style-type: none">• Opower• Regatta Solutions• RES Americas• Smart Wires• Vestas |
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WORKING GROUP OBJECTIVES

To present a collective vision of how California's electric grid must evolve to meet expanding customer expectations and achieve the state's bold energy and environmental policy objectives.

DRIVERS OF FUTURE INDUSTRY CHANGE

- A confluence of forces is creating both challenges and opportunities for the electric power industry:
 - **Technology**, including DG, EE, DR, the smart grid, and in the future, electric vehicles and energy storage
 - **Market**, including changing customer needs and expectations (e.g., for resiliency and greater control over energy use and costs)
 - **Policy**, including environmental, energy and economic development objectives.

CALIFORNIA ON THE CUTTING EDGE: EXISTING POLICIES, REGS, PROCEEDINGS

- GHG reduction targets (AB 32)
- Renewable Portfolio Standard
- Energy Efficiency Portfolio
- EE rules at the CEC
- California Solar Initiative
- The Loading Order
- The Demand Response Rulemaking (R.13-09-011)
- The Energy Storage Target
- Transportation Electrification
- Net metering (14-07-002)
- Smart grid deployment (08-12-009)
- Demand response and advanced metering infrastructure (11-09-011)
- Residential rates (12-06-013)
- The Integrated Demand-Side Management Program
- Distribution Resource Plans (14-08-013)
- More Than Smart Working Grp
- And more...

VISION OF THE GRID IN 2030



ACHIEVING THE VISION

Three areas to pursue in parallel:

1. Innovation in product delivery and service
2. System design and technology
3. Regulatory framework, incentives and revenue mechanisms

INNOVATION IN PRODUCT DELIVERY AND SERVICE: OVERVIEW

- Customers are becoming prosumers, advancing grid reliability, affordability, and policy objectives
- Relationship between central planning, utility planning and DER deployment is evolving
- Utilities need analytical constructs to determine locational value of DER
- And customers will need new products & services to realize their ability to provide grid services
- Data, data access, privacy and security are also becoming increasingly important.

INNOVATION IN PRODUCT DELIVERY AND SERVICE

Needed to spur innovation:

- Changes to the existing regulatory framework that enable the development of these new products and services and clearly define the roles of utilities and third-party providers.
- A new market structure that provides two-way market signals to modify and reward behavior.
- Data exchange and circuit-level coordination of available grid and customer resources.

SYSTEM DESIGN AND TECHNOLOGY

- **Grid architecture** must consider grid's physical assets (poles/wires/sensors/DER) + communications, forecasting, control and advanced algorithms for everything to work together
- **Utilities** need to increase investment in hardware and analytics and develop tools to optimize DER
- **Regulators** need to design policies to support investments, allow experimentation and require new standards and open protocols for interoperability, integration and cybersecurity

SYSTEM DESIGN AND TECHNOLOGY: KEY ENABLING TECHNOLOGIES

- Real-Time Granular System Monitoring and Visualization
- Robust Communications
- Advanced Software Applications
- Advanced Control Systems
- Advanced Grid Infrastructure
- Advanced Forecasting Tools

REGULATORY FRAMEWORKS, MECHANISMS AND INCENTIVES

We encourage a comprehensive process to:

- Identify regulatory issues that impede – or could enable – evolution from existing business models to new ones.
- Assess what is most appropriate for the regulated market versus the competitive market, and how the two would interact as the market evolves.
- Assess how to best integrate/coordinate the various regulatory proceedings that are each addressing some aspects of the evolving industry structure into a comprehensive framework.

OPTIONS FOR POTENTIAL FUTURE MODELS

- **Organizational models**
 - Distributed System Platform Model
 - Independent Distributed System Operator Model
- **Market operations/pricing models**
 - Regional Grid Optimization Model
 - Distribution Marginal Pricing Model
- **Revenue models**
 - Utility Income Based on Total Expenditure (TOTEX) Accounting
 - Utility Income for Assets Under Management Mechanism
 - Performance Incentives for Capital Utilization

SUMMARY: 10 RECOMMENDATIONS

1. Develop a comprehensive framework that integrates/coordinates the existing regulatory proceedings
 2. Restructure/align/create new incentives to achieve the desired outcomes while maintaining the long-term viability of the utility and recognizing the value of the grid
 3. Develop new market structures that enable two-way market signals to allow customer participation
 4. Encourage data exchange and circuit-level coordination of available grid and customer resources
 5. Utilize standards and protocols, ideally drawing from National standards, to ensure interoperability of devices located on the utility side of the meter and on customer premises
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SUMMARY: 10 RECOMMENDATIONS

6. Assess what is appropriate for the regulated vs. competitive market and how the two would interact as the market evolves
7. Encourage training of the workforce that will develop the skills needed for the 21st Century Electricity System
8. Accelerate the pace of regulatory review and allow utilities to take reasonable risks to encourage innovation and entrepreneurship and accelerate commercialization of new products and services
9. Examine the role of rate design in helping to achieve the long-run financial integrity of the grid as a platform
10. Examine the functionality and enabling technologies that will be integral to the distribution grid of the 21st century



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