Is It Smart if It's Not Clean? State Policies for Smart Grid Investments

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Business of Clean Energy in Alaska Conference

June 17, 2010

The Regulatory Assistance Project

China ♦ EU ♦ India ♦ United States

About the Regulatory Assistance Project

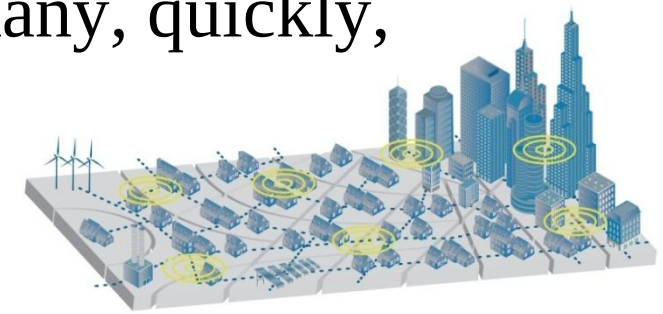
- RAP is a nonprofit organization providing technical and policy assistance to government officials on energy and environmental issues.
- RAP also provides educational assistance to other stakeholders, including consumer and environmental groups, utilities and business associations.
- RAP principals and senior associates all have extensive regulatory experience.
- We are funded by foundations and federal agencies.
- We have worked in nearly every state and many nations throughout the world.

Smart Grid Vision

- Improved grid reliability, security and efficiency
- Optimized grid operations
- Timely information for consumers and new opportunities for saving energy and money
- Large increases in demand response, energy efficiency, energy storage, distributed generation and large-scale renewable resources
- Electrification of the transportation sector

Clean energy and consumer benefits are not automatic.

- Smart grid is an interconnected system of technologies that can engage many, quickly, but it's only an *enabler*.
- Clean energy and consumer benefits require smart policies.
  - Many of the policies should be adopted even without smart grid investments.
- Without the right policies, smart grid will divert attention and funds from clean energy investments that can be made today.
  - Ask which *specific* technologies, programs, policies and rules must be in place to get the asserted benefits.



Examples: Smart Policies to Match Smart Capabilities

Smart Capabilities	Smart Policies
Allow interconnected distributed generators to run during utility outages	Support investments in clean distributed resources, simplify interconnection requirements and procedures, net metering, enable excess power sales
Dynamically integrate wind and solar resources	Better planning for renewable resources and transmission, support utility investments
Continuous building diagnostics	Invest in efficiency programs for buildings and major energy-consuming equipment for all customer classes
Increase demand response	Supportive rates or incentives, consumer access to energy usage data, support for automated controls
Optimize voltage and reactive power	Remove barriers for utility investments to improve distribution system efficiency

How will Alaska develop the necessary policies?

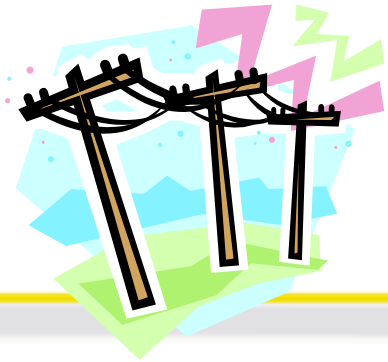
- Leadership
- Pay attention to what other states are trying – benefit from lessons learned
- Public support – don't forget consumers
- Cooperation among utilities, stakeholders
- State regulatory utility commissions have a big role
  - They decide how utility investments are recouped in customer rates, consistent with the public interest.
  - They can establish rules and guidance for smart grid plans and ratepayer-funded clean energy programs.

Preparing for Smart Grid

- Pilots and full-scale deployments in pieces
- Engage consumers
- Set guiding principles and objectives
- Specify minimum functional requirements
- Require utility transition plans with updates
- Address information, data security, privacy, interoperability and cyber-security issues
- Update existing rules and requirements as needed
- Don’t let clean energy policies lag behind – *today’s focus*

WHAT DOES SMART GRID HAVE TO DO WITH CLEAN ENERGY RESOURCES?

Energy Efficiency and Smart Grid



- Optimize voltage and reactive power on distribution systems
  - Reduced line losses and reduced energy consumption in homes and businesses
- Information-driven behavior changes
  - Data from smart meters, smart thermostats, smart appliances
  - Analysis and recommendations to consumers via Web, in-premise devices, phone, mail
- Better evaluation
  - Less $ needed for analysis, more $ spent on measures
- Continuous building diagnostics
  - Alert building owners about problems with energy-consuming equipment

Demand Response and Smart Grid

Traditional DR	Smart Grid DR
➢ Primarily utility control	➢ Customer control
➢ Focuses on a few end uses	➢ All end uses
➢ Limited customer options	➢ Unlimited options
➢ Participation incentives required	➢ Advanced meters enable dynamic pricing for all
➢ Primary focus on retail markets	➢ Wholesale and retail markets linked

Source: Levy, Goldman and Sedano

Renewable Resources and Smart Grid

- Improved integration
  - Awareness of grid conditions
  - Fast operational changes
  - Voltage support
  - Monitor line loading and wind turbine curtailment

- More system flexibility
  - Demand-side management
  - Energy storage
  - Plug-in electric vehicles

Distributed Resources and Smart Grid

- Smart grid's intelligent sensors, software, two-way communications and advanced controls can dynamically integrate distributed generation and energy storage with other resources and loads to minimize line losses, provide voltage support and improve reliability
- Microgrids – Interconnected network of loads, generation, and storage that works connected to or separate from grid
- *Example:* Fort Collins (Colorado) Zero Energy District
  - Create as much energy as district uses
  - Aggregate distributed energy resources – Solar photovoltaics, combined heat and power, fuel cells, microturbines, gensets, thermal storage and demand response

Potential Energy and Emissions Reductions

- Consumer information/feedback (3%)
- Continuous building diagnostics (3%)
- Measurement and verification for efficiency programs (1%)
- Shift load to more efficient power plants (less than 0.1%)
- Support electric vehicles without adding to peak (3%)
- Advanced voltage control to reduce distribution system losses and consumer loads (2%)
  - **12% TOTAL REDUCTION**
- *Big caveats*
  - Does not consider cost-effectiveness
  - Assumes 100% of requisite SG technologies installed
    - Lower penetration of technologies yields proportionately smaller reductions

2010 DOE-funded study by Pacific Northwest National Laboratory, estimates for 2030

POLICIES TO SUPPORT SMART GRID-ENABLED CLEAN ENERGY RESOURCES

Consider Environmental Goals in Energy Regulation

- Smart grid vision
  - *Massive increases* in electric efficiency, distributed demand and supply options, variable renewable energy sources, and energy storage plus a *significantly smaller environmental footprint*
- Getting there will require broadening the energy regulator's mandate to consider environmental goals
  - Are power sector regulations working at cross purposes with carbon reduction and other environmental goals?
  - What are the environmental benefits of smart grid investments compared to other investments?

Acquire All Cost-Effective Energy Efficiency

- Most critical policy
- By and large, energy efficiency is cheapest resource
- Ample supplies at cost-effective levels
- *State investment in energy efficiency below what is easily achievable and cost-effective is at odds with the rationale behind many smart grid investments.*
- Policy options
  - Energy efficiency resource standards with strong targets for cumulative savings (with teeth)
  - Require acquisition of all cost-effective energy efficiency
- Need targeted programs to address market barriers as well as sufficient funding

Get Serious About Integrated Resource Planning

- Objective: Best combination of cost, risk, enviro. impacts
  - Just a few big unknowns for the future: loads, fuel prices, hydro output, technology costs, environmental regulations
  - Scenarios and sensitivities are crucial
- Long-term view and near-term action plan
  - Amount, timing and mix of resources
- Treatment of energy efficiency is key; demand response and distributed generation often get short-shrift
- Need public involvement and state regulatory oversight
  - Establish an acknowledgment or approval process that means something – e.g., in a utility rate case
- Apply same objective and analytical methods at the time the utility seeks cost recovery for the resources it acquires

Decouple Utility Sales and Revenues

- Energy efficiency and distributed generation reduce sales
  - Utility has less revenue to cover fixed costs
- Decoupling is a ratemaking mechanism that breaks the link between energy sales (kilowatt-hours) and revenues.
  - Prices are periodically adjusted (up or down) based on *actual* units sold to keep utility revenue at approved level – no more, no less
  - Removes *disincentive* but provides no incentive
- For investor-owned utilities, performance-based shareholder incentives can help ramp up programs
  - Third-party administration of energy efficiency programs is another option

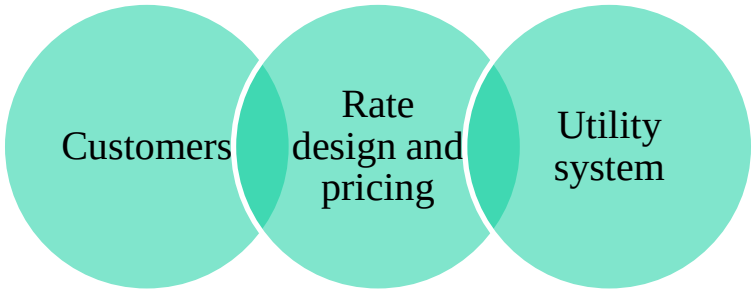
Ensure Consumer Access to Energy Information

- Specify consumers' access to their energy usage data
  - Day after vs. near-real time
  - Historical usage
  - Also retail and wholesale prices

- Spell out rights and consumer protections for sharing data with third parties that can offer customized products and services
- Address data security and privacy issues

Integrate Smart Grid With Rate Design and Demand-Side Programs

- Smart grid allows customers to become more involved in how and when they use energy.
  - But they won't respond just because they get shiny new meters.
- Let customers choose a dynamic pricing option that varies according to market prices and system conditions.
  - Rates that reduce overall utility costs, encourage customers to reduce peak loads *long-term*, and support distributed resources
- Make it easy for customers
  - Controls that respond automatically to prices



Consider Customer Resources in Distribution System Plans

- Energy efficiency, demand response, and distributed resources can reduce peak loads. “Geo-targeting” may be able to defer some proposed distribution system upgrades.
- Guidelines for considering cost-effective alternatives to distribution system upgrades
- Incentives for consumers and businesses to invest in projects that defer costly upgrades

Policies to Promote Renewable Energy, Clean Distributed Resources and Transportation

No time to talk about today

- Streamlined interconnection standards
- Renewable portfolio standards
- Targeted procurement of small-scale renewable generation
- Net metering and PURPA (combined heat and power and renewable energy)
- Cost-based standby rates for customer-generators, including optional non-firm service
- Right-time charging/discharging of plug-in electric vehicles

For More Information

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EXTRA SLIDES

Consumer Perspective

- SG should be used to improve efficiency, reliability and security
- Evidentiary proceeding for cost recovery: benefits > costs
  - Use same ratemaking criteria as for any other investment
- Protect consumers from rate shock of smart grid investments
- Transportation, telecom and IT should help pay if they benefit
- Integrated approach – interoperability, local/state planning
- Mitigate new technology risk (let shareholders shoulder it)
- Ensure secure communications network for privacy, reliability
- Consumption data should be used to improve load forecasting
- Use smart grid data to identify activities that reduce costs
- Don't reduce consumer protections – e.g., for disconnection
- Don't make dynamic pricing mandatory for residential and small business customers

Federal Funding for Smart Grid Pilots & Deployments

Funding (millions $)

- Smart Grid Investment Grants - $3,400
- Smart Grid Regional Demonstrations - $615
- Standards/Interoperability Framework - $10
- Some funding for state regulators ($50) and state planning ($55) is for smart grid

Smart Grid Systems and Equipment	Number of Units
Networked Phasor Measurement Units	877
Smart Transformers	205,983
Automated Substations	671
Load Control Devices	176,814
Smart Thermostats	170,218
Smart Meters	18,179,912
In-Home Display Units	1,183, 265
Charging Stations	100

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RAP is committed to fostering regulatory policies for the electric industry that encourage economic efficiency, protect environmental quality, assure system reliability, and allocate system benefits fairly to all customers.