Grid Modernization and New Utility Business Models

Clean Energy Legislative Academy, Breckenridge, Colorado

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About RAP – US

• RAP provides technical and policy support at the federal, state and regional levels, advising utility and air regulators and their staffs, legislators, governors, other officials and national organizations.

• We help states achieve ambitious energy efficiency and renewable energy targets and we provide tailored analysis and recommendations on topics such as ratemaking, smart grid, decoupling and clean energy resources. RAP publishes papers on emerging regulatory issues and we conduct state-by-state research that tracks policy implementation.
About Your Presenter – Janine Migden-Ostrander

• Janine L. Migden-Ostrander advises regulators and advocates on energy efficiency, renewable energy, demand response, distributed generation, and integrated resource planning. Recent projects include working closely with the Arkansas Public Service Commission on energy efficiency as part of the Clean Energy Ministerial for the U.S. Department of Energy (DOE), facilitating the Mid-Atlantic Distributed Resources Initiative (MADRI), and providing workshops on energy efficiency policies as part of the SEE Action initiative for DOE. Her projects are predominantly in the U.S., but also overseas.

• Ms. Migden-Ostrander has worked in public utility law for approximately 35 years, most recently as the Ohio Consumers’ Counsel, where she oversaw the state agency that represents the interests of Ohio’s 4.5 million residential households with their investor-owned electric, natural gas, telephone, and water companies.
Developing a range of policy objectives

Role of Legislation
The Role of Good Legislation

- Articulation of a clear vision;
- Define the public interest and the objectives; and
- Provide Guidance to the Regulators with sufficient direction and authority to carry out the legislative intent.
- Details should be left to Regulators.
Grid Modernization

The Next Frontier in Distribution Planning
Issues to be Covered:

• Scope of Grid Modernization
  o Definitions
  o Technologies
• Infrastructure Investments
• Integrated Distribution Planning
• Distributed Energy Resources
• Guidance for legislation
THE CONTEXT FOR GRID MODERNIZATION

MIKE O’BOYLE
CN EE CLEAN ENERGY LEGISLATOR ACADEMY
SEPTEMBER 13, 2017
America’s Power Plan is a platform for innovative thinking about how to manage the transformation happening in the electric power sector today.

We collect expert information for decision-makers and their staffs, highlighting specific solutions to today’s most pressing policy, regulatory, planning, and market design challenges.
THE POWER SECTOR HAS EVOLVED

Old Goals:
- Meet growing demand
- Build new infrastructure
- Build to deliver universal service
- Affordability, Reliability, Safety

Old Options:
- Centralized power plants
- Transmission lines
- Distribution system

New Goals:
- Build → Maintain
- Reliability → Resilience
- Clean power
- Customer satisfaction
- Affordability, Safety

New Options:
- Modern replacement, plus:
  - Innovative distributed energy resources (EE, DR, PV, EVs, etc.)
  - Advanced IT & rate designs
WHAT TO YOU WANT OUT OF GRID MODERNIZATION?
GRID MODERNIZATION TECHNOLOGIES – GRID FACING

(NOT old with new . . . But avoid “paving the road twice”)

• Distribution Substation Automation

• Digital automation, sensing, measurement, and communications (e.g. intelligent switches).

• Integrated Volt-Var Management

• Demand Response/DER Management System

• Telecommunications + Cybersecurity
GRID MODERNIZATION TECHNOLOGIES – CUSTOMER FACING

- Advanced Metering Infrastructure (AMI)
- In-home automation hardware
- Building energy management systems
- Electric Vehicle charging infrastructure
GRID MODERNIZATION TECHNOLOGIES – CUSTOMER FACING

Getting the most for customers – SMUD dynamic pricing pilots

Figure 5. Multifamily energy and load impacts by rate, information and automation.
GRID MODERNIZATION FUNCTIONS

• Platform service provider & data management
• Resilience against severe weather events or attacks
• Improved reliability
• Distributed energy resource management
• Improve system efficiency
• System awareness & automation
• Real-time flexibility
Explicitly state goals – what can grid modernization achieve?

- Increase resiliency to routine faults, cyber or physical attacks, & severe weather
- Unlock demand response & reduce system costs
- Support customer adoption of solar & storage
- In-state industry development
Define the Scope of a PUC proceeding

- Include functions or goals of grid modernization the PUC and utility should investigate & achieve
- Require the PUC develop metrics for grid modernization
- Integrated Distribution Planning
KEY RESOURCES:

Annual Grid Modernization Index – Gridwise Alliance

Modernizing Hawaiʻi’s Grid For Our Customers
AUGUST 29, 2017

HAWAII ELECTRIC COMPANY
GRID MODERNIZATION PLAN
Infrastructure Investments

Source: M&S GmbH Grid Framework 1.0 Sept 2009
Benefits of Smart Grid

Better **Utility System Operations**

- Improved Situational Awareness in Real Time over broader areas
  - Outage restoration improvements
- Ability to deploy contingency resources fast
  - Important for high wind/solar scenarios
  - Synchrophasers
- High probability of success owing to standardization and wire company/RTO control
Benefits of Smart Grid

Better Customer Service
- We know who you are when you call
- We know when you lose, restore service
- We can connect move in service fast
  - We can disconnect move out service fast
- We can offer time-based pricing and services
  - Including time-based payments for onsite gen.
  - And facilitate competitors’ services
- We can offer incentives for new and valuable curtailment and meter it (demand response)
Renewable Integration and Flexible Resources

- Percentage of Renewable Energy continues to grow
- New Emphasis is on Flexible capacity as opposed to base load capacity
- Demand Response and storage are tools enabled through a smart grid
The Bulk Power System in Context

**Bulk Power System**
- Transmits power from generators at extra high voltage.
- The higher the voltage, the greater the amount of power transmitted.
- Some capacity needs to be reserved in case something big fails.
- Transformers step down the voltage for delivery to us.
Vision: One Path–An Integrated Grid

Residential Microgrid Example

- Wall-mounted residential electric vehicle charging station
- Wind turbine
- Grid interface controller
- Community-level solar panels
- Battery (local storage for the micro grid)

Bidirectional electricity flow
Flexible generation is just one piece of the puzzle

Source: IEA Energy Technology Perspectives 2014
Choosing the Right Technologies

Characteristics of Desired Technologies

• Compatible with desired outcomes:
  o Two-way communication
  o Strengthens the grid/resiliency issues
  o Provides data that enables third party provider options
  o Enables customer interaction and choice
  o Enables multiple value streams like ancillary services and distributed energy resources
  o Assists in renewable energy integration
Infrastructure Investment

Characteristics of Desired Technologies

• Cost-benefit analysis: Long-term benefits outweigh the cost through:
  o Reduction in operating costs
  o Cost avoidance, example – reduced storm damage
  o Enablement of new technologies that can help lower distribution and generation costs such as:
    ▪ Strategically located DER’s
    ▪ Implementation of Time Varying Rates
    ▪ Facilitates low cost renewable energy and demand response options.
Infrastructure Investment

Characteristics of Desired Technologies

- Interoperability - the ability of the system or software to exchange and use of information
- Adaptable to upgrades as technology evolves to avoid obsolescence and stranded cost
Infrastructure Investment

Rate Recovery – Managing Ratepayer Impacts

• Periodic Audit of Costs
• Net the benefits against costs to reduce sticker shock
  ▪ Reduce project cost by immediate cost savings, OR
  ▪ Reduce rate base to reflect cost is no longer incurred
• Require enforceable reliability objectives—reduce frequency and duration of outages; reduce customer outage costs through performance metrics
• Target distribution investments to provide the most significant impacts
Infrastructure Investment

Cost Recovery Mechanisms

- Base Rates: Costs are amortized over a period of years
- Rider: Supplemental charge folded into bill; costs can be recovered more rapidly, with potentially higher bill impacts
Advanced Metering Infrastructure (AMI)

• A **smart meter** is an electronic device that records consumption of electric energy in intervals of an hour or less and communicates that information at least daily back to the utility for monitoring and billing. This also provides the customer with more information to control energy consumption and monthly bills.
# Traditional vs. Smart Grid Demand Response

<table>
<thead>
<tr>
<th></th>
<th>Conventional DR</th>
<th>Smart Grid DR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Participation</strong></td>
<td>Targeted, Limited to Large C/I &amp; Residential</td>
<td>All Customers</td>
</tr>
<tr>
<td><strong>Who Controls</strong></td>
<td>Utility</td>
<td>Customer</td>
</tr>
</tbody>
</table>
| **What is Controlled** | • Interruptible Rates  
• Res. HVAC, Water Heating                         | All Loads Available                                                        |
| **Control Equipment** | • Utility Provided  
• Few Suppliers                                    | • Customer Provided  
• Many Market Suppliers                                                   |
| **Incentives**        | • Fixed / Participation Payments  
• Baseline metrics                                     | • Retail Dynamic Prices  
• Reservation payments  
• Pay-for performance                                              |
| **DR Products**       | Generally limited to Reliability                                                | Capacity, Energy, Ancillary Services Markets; Congestion Management      |
| **DR, EE, Renewable Integration** | No                                                                  | Yes                                                                       |

Lawrence Berkeley National Laboratory - Smart Grid Technical Advisory Project
Benefits of Smart Meters

• Customer Service Benefits:
  • Eliminates estimated billing and provides bills based on actual readings.
  • The Smart Meter will report back electricity issues (such as periods of low voltage) to deliver better quality of supply.
  • Enables prepaid billing (controversial).

• Source for slides 29 -31: Sustainable Energy Authority of Ireland - http://www.seai.ie/Renewables/Smart_Grids/The_Smart_Grid_for_the_Consumer/Home_Consumer/Smart_Meter/Advantages_of_a_Smart_Meter/
Benefits of Smart Meters

• Smart Metering permits customers to better manage their costs and usage:

• Electricity suppliers can offer new pricing options that more closely align actual cost of generating the electricity during a given period.

• It provides consumers with precise details of their consumption patterns, so that they can better manage their use of electricity.

• Use of customer data to target highest energy efficiency opportunities
Benefits of Smart Meters

- Smart Metering enables new capabilities for consumers by:
  - Facilitating the use of home energy management systems.
  - Enabling remote management of electrical use.
  - Accelerating the development of microgeneration and embedded storage.
  - Assisting in the use of electric vehicles.
Drawbacks of Smart Meters

• Cost – Average cost is $221/meter *
• Benefits expected over a 15-20 year period, while rate impacts are more immediate, (but mitigated by amortization) resulting in a lag between cost and benefit.
• Other methods for residential Demand Response exist such as direct load control programs
• Smart grid enables time of use rates but low-income advocates question the elasticity of demand and potential for savings.

Drawbacks of Smart Meters

- Remote disconnections increase frequency of disconnections because customers have less time to make payment.
- Facilitates prepaid meters about which low-income advocates are wary.
- Privacy Concerns – data on how and when you use electricity.
ASSESS COSTS AND BENEFITS VIA INTEGRATED PLANNING

• What is Integrated Distribution Planning (IDP)?
  • MNPUC 2016 Staff Report: “planning efforts will be an integral part of a systematic approach to grid modernization.”

• Outcomes:
  • Understanding the potential contribution of distributed energy resources and utility-led modernization investments
  • Produce data regulators & stakeholders need to set targets; this also allows DER providers to develop business models.
WHY NOW?

- Addressing changes to planning proactively – not after DER adoption has accelerated.
- Ensure infrastructure is truly needed in a rapidly changing technology environment
- It is a prerequisite, no-regrets step to maximizing the value of customer-side resources
- Unpredictable climate events
IDP’S RELATIONSHIP TO DER ADOPTION
IDP IN STAGES

Figure 11: Illustration of Walk, Jog, Run Approach to Implementation

**Walk**
- Initiate DER Hosting Capacity Analysis & Information
- Improve DER Interconnection Processes & Methods

**Jog**
- DER Locational Benefits Analysis
- Multi-scenario Planning Forecasts

**Run**
- Integrate Resource, Transmission & Distribution Planning
- Sourcing DER for Grid Services

Time to Implement Will Vary

Source: MoreThanSmart.org
EXAMPLE: SOUTHERN CALIFORNIA EDISON

Distribution system mapping
- hosting capacity
WHAT CAN A LEGISLATURE DO?

- Require a PUC to begin a proceeding in IDP
- Authorize the PUC to hire consultants to bring regulators, stakeholders up the learning curve
- Articulate the goals of IDP
Third Party/Load Aggregator

• Third Party Aggregators aggregate customer load to respond to utility needs for demand reductions. Third party aggregators will market to customers, either independently or in working with a utility.
Arkansas Legislation

Sec. 23-18-1003 of the Arkansas Code, authorizes the Commission to “…establish the terms and conditions for the marketing, selling, or marketing and selling of demand response by electric public utilities or aggregators of retail customers to retail customers or by electric public utilities, aggregators of retail customers, or retail customers into wholesale electricity markets...”
Examples of Aggregation

Rule 24 in California permits third-party aggregators to solicit PG&E customers to participate in their demand response programs and to then "bid in" the electricity reduction into the wholesale electricity market administered by the California Independent System Operator (CAISO). The California Public Utilities Commission approved Electric Rule 24 with the goal of promoting demand response participation in CAISO markets.
Some Lessons Learned from Pilots

• Enabling technology enhances the beneficial impacts of time-varying rates. Examples are SMUD and OGE&E pilots that demonstrated all groups of residential across age groupings saved money.

• Peak savings in some pilots persisted for several years

• Low-income customers can respond to price signals, although not necessarily to the degree or in the numbers that other customer classes can
Guidance for Legislation

• Define public interest benefits
• Provide broad statutory language to enable Commission to implement the public policies
• Consider requiring utilities to demonstrate and the Commission to find that the smart grid proposal:
  o Adequately demonstrates significant benefits that exceed costs over the long-term;
  o Provides a mechanism to net the benefits against the costs;
  o Provides sufficient detail to demonstrate the reasonableness of the technology chosen – consider a competitive bid component
Guidance for Legislation

• Consider requiring utilities to demonstrate and the Commission to find that the smart grid proposal:
  • Includes a robust program to implement voluntary time-varying rates within a year of the rollout of the first AMI meters;
  • Includes a plan to enable Distributed Energy Resources;
  • Provides accountability for achieving the benefits set forth in its proposals;
  • Allows for periodic audits of the costs and the implementation of the technologies; and,
  • Requires periodic publication of the audit to help hone in on the benefits and public objectives.
3 Utility Business Models

Power Sector Transformation
Issues to be Covered

• Defining the Business Model
• Decoupling and Lost Revenues
• Performance Regulation
WHAT’S WRONG WITH THE UTILITY REGULATORY MODEL WE’VE GOT?
THE POWER SECTOR HAS EVOLVED

Old Goals:
- Meet growing demand
- *Build* new infrastructure
- *Build* to deliver universal service
- Affordability, Reliability, Safety

Old Options:
- Centralized power plants
- Transmission lines
- Distribution system
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New Goals:
- Build $\rightarrow$ Maintain
- Reliability $\rightarrow$ Resilience
- Clean power
- Customer satisfaction
- Affordability, Safety

New Options:
- All the old stuff, plus:
- Innovative distributed energy resources (EE, DR, PV, EVs, etc.)
- Advanced IT & rate designs
NEW GOALS FOR THE POWER SYSTEM

Resilient

Clean

Customer-oriented

Affordable, Safe
THIS CREATES TWO NEW ISSUES

1. Increasing options for power system optimization leads to greater information asymmetry between utility and regulator

2. New goals for the power system mean regulators must reexamine existing incentives to build more capital and maintain existing investments
REGULATION CAN EVOLVE TOO

**Old Methods:**
- Line-by-line investment review
- Capital investment and sales growth drive shareholder value
- Infrequent rate cases
- Operational expenses largely a pass-through not subject to review

**New Methods:**
- Focus on outcomes to help sort through complexity
- Create incentives to optimize the system including customer-side resources, third-party providers
- Revenue regulation with efficiency incentives
- Meet customer demands for clean energy
INCENTIVE-BASED REGULATION CAN ALIGN FINANCIAL INCENTIVES

ALIGN FINANCIAL INCENTIVES OF:

<table>
<thead>
<tr>
<th>Utilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customers</td>
</tr>
<tr>
<td>Independent Power Producers</td>
</tr>
<tr>
<td>3&lt;sup&gt;rd&lt;/sup&gt; party service providers</td>
</tr>
</tbody>
</table>

WITH THESE GOALS:

| Resilient | Clean | Customer-oriented | Affordable, Safe |

$
INCENTIVE-BASED REGULATION

Changes the central question...

From: “Did we pay the right amount for what we got?”

To: “Are we paying (the right amount) for what we want?”
Decoupling and Lost Revenues
Energy Efficiency Is the Lowest-Cost Resource

Source: Lazard, 2014
A “Layer Cake” of Benefits from Electric Energy Efficiency

Utility System Benefits
- Power Supply
- T&D Capacity
- Environmental
- Losses and reserves
- Risk
- Credit and Collection

Participant Benefits
- Other Fuels
- Water, Sewer
- O&M Costs
- Health Impacts
- Employee Productivity
- Comfort

Societal Benefits
- Air Quality
- Water
- Solid Waste
- Energy Security
- Economic Development
- Health Impacts
The Utility Business Model

• Decoupling is an important tool to ensure utilities have adequate revenues
• Prevents utilities blocking activities that reduce sales.
• Examples of activities include:
  o Energy Efficiency
  o Demand Response
  o Distributed Generation
Rate of Return Regulation

Under rate of return regulation, utilities can increase earnings by:

• Increasing operational efficiency (reducing costs)
• Selling more energy (“throughput incentive”)
• Building infrastructure (earning a return on the investment)
Rate of Return Regulation Refresher

Revenue Requirement = Test Year Expenses + Depreciation + Taxes + (Rate of Return * Rate Base)

Revenue Requirement is recovered from (#Customers * Customer Charge) + (Projected Sales * Price/kWh)

Or Price/kWh = Revenue Requirement – (Customer Service Charge + Revenue/Projected Sales)

  – Price/kWh collects all fuel costs and, generally, non-customer-specific fixed costs
# How Changes in Sales Affect Earnings

<table>
<thead>
<tr>
<th>% Change in Sales</th>
<th>Revenue Change</th>
<th>Impact on Earnings</th>
<th>% Change</th>
<th>Actual ROE</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Pre-tax</td>
<td>After-tax</td>
<td>Net Earnings</td>
<td></td>
</tr>
<tr>
<td>5.00%</td>
<td>$9,047,538</td>
<td>$5,880,900</td>
<td>$15,780,900</td>
<td>59.40%</td>
</tr>
<tr>
<td>4.00%</td>
<td>$7,238,031</td>
<td>$4,704,720</td>
<td>$14,604,720</td>
<td>47.52%</td>
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<tr>
<td>3.00%</td>
<td>$5,428,523</td>
<td>$3,528,540</td>
<td>$13,428,540</td>
<td>35.64%</td>
</tr>
<tr>
<td>2.00%</td>
<td>$3,619,015</td>
<td>$2,352,360</td>
<td>$12,252,360</td>
<td>23.76%</td>
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<tr>
<td>1.00%</td>
<td>$1,809,508</td>
<td>$1,176,180</td>
<td>$11,076,180</td>
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<tr>
<td>0.00%</td>
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<td>$0</td>
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<td>0.00%</td>
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<tr>
<td>-1.00%</td>
<td>-$1,809,508</td>
<td>-$1,176,180</td>
<td>$8,723,820</td>
<td>-11.88%</td>
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<td>-$5,880,900</td>
<td>$4,019,100</td>
<td>-59.40%</td>
</tr>
</tbody>
</table>
Decoupling

- Decoupling is designed to address the throughput incentive by breaking the link between utility sales and revenue.

- With decoupling, the Commission, in a rate case proceeding, determines the distribution revenue requirements which become the basis for determining the revenue the utility will receive in rates.

- At the end of an agreed upon period, the utility’s authorized revenue requirements are measured against actual revenues.

- Rates are then reconciled to allow the utility to recover (positive or negative) the difference between revenues authorized and revenues received.
## How Decoupling Works

### Periodic Decoupling Calculation

<table>
<thead>
<tr>
<th>From the Rate Case</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Target Revenues</td>
<td>$10,000,000</td>
</tr>
<tr>
<td>Test Year Unit Sales</td>
<td>100,000,000</td>
</tr>
<tr>
<td>Price</td>
<td>$0.10000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Post Rate Case Calculation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual Unit Sales</td>
<td>99,500,000</td>
</tr>
<tr>
<td>Required Total Price</td>
<td>$0.1005025</td>
</tr>
<tr>
<td>Decoupling Price &quot;Adjustment&quot;</td>
<td>$0.0005025</td>
</tr>
</tbody>
</table>
Decoupling Rate Adjustments Have Generally Been Very Small

Source: Lesh, 2009
What’s Covered?

Decide What’s Covered

- Applicability of Utility Function
  - Transmission & Distribution
  - Transmission, Distribution, & Generation

- Applicability of Revenue Regulation to Customer Classes
  - Residential and Small Commercial
    - All

- Costs Included in Decoupling Mechanism
  - Base Rates Only
    - Riders
  - Some Riders, Not Others
  - All Costs Including All Riders
Choose How to Adjust Utility Revenue

1. Frequency of Rate Cases to Determine Revenue Requirement
   - Rate Case as Needed
   - Mini or Full Rate Case Annually
   - Rate Case Every 3 to 5 Years

2. Ex Ante Adjustment to ROE/Capital Structure
   - Yes
   - No

3. Choosing The Revenue Adjustment Mechanism
   - None
   - Stair/Indexing
   - Revenue Per Customer
   - Attrition
   - K Factor
Design Approaches to Protect Customers

• Symmetry – ensure that credits are provided.

• Stability: cap on rate changes or bands around size of rate adjustment, (e.g. plus or minus 3%)
  ➢ Provisions for carry-over of over or under recoveries

• Bill simplification
Decoupling: Key Take-Aways

- It’s flexible, customizable
- It’s been done before, so models exist
- It can serve the policy goals of most states
- It can be designed to protect consumers
Straight Fixed/Variable:

100% of Distribution System Classified as Customer-related
Straight Fixed/Variable Rates (SFV)

- SFV allows the utility to recover its distribution revenue requirements through a monthly fixed charge.
- Addresses the throughput incentive, but creates other problems
- Reduces the volumetric component of rates to just fuel (or short run marginal) costs.
Considerations with SFV

- SFV fails to provide price signals to conserve
- SFV increases the payback for consumers investing in energy efficiency
- SFV creates social justice problems as customers living in a small apartment pay the same rate as customers living in a large McMansion
- SFV sometimes referred to as the “all you can eat” rate
- Utility keeps any over-recovery of revenues
Other Considerations with High Customer Charges

- Results in low usage customers (often low-income) subsidizing high usage customers (often higher income)
- Impact on utility investments – If the Volumetric Charge is less than the Long Run Marginal Cost, then customers will behave as if their incremental usage has less of a cost effect than it does. This can result in greater customer usage which means utilities need to invest in more facilities, hence raising rates.
- High customer charges may hasten customers exiting the grid, rather than maintaining a connection to it, which further exacerbates the situation.
PAYING UTILITIES FOR PERFORMANCE
1. WHY

2. HOW

3. EXAMPLES

4. NEXT STEPS
FIVE STEPS TO GET THE MOST OUT OF GRID MODERNIZATION

1. Assess the costs and benefits of a modern grid in the context of existing and planned generation and transmission.
2. Clearly define policy goals based on that assessment – focus on desired outcomes.
3. Tie quantifiable and independently verifiable metrics closely to those goals and outcomes as is feasible. Avoid reliance on counterfactuals when measuring performance.
4. Set realistic targets that balance costs and benefits and incorporate stakeholder input.
5. Consider tying utility revenue to performance against these targets.

STEP 2 – DEFINE GOALS OF A GRID MODERNIZATION PROGRAM

• Adaptable for different states & utilities

• Focus on 3 goals
  1. Affordability
  2. Reliability/ resilience
  3. Environmental Performance

• Focus on measurable OUTCOMES
STEP 3 - MEASURING PERFORMANCE

Key Question – what are the metrics to achieve new goals for grid modernization?
PRINCIPLES FOR METRIC DEVELOPMENT

Metrics should be:

1. Tied to the policy goal (outcome oriented)
2. Clearly defined
3. Able to be quantified using reasonably available data
4. Sufficiently objective and free from external influences
5. Easily interpreted
6. Easily verified

(adapted from Synapse Handbook on Performance-based Regulation)
MAKE IT PUBLIC!

Example: Ontario Energy Board Performance Scorecards
Rhode Island PUC - Initial Considerations on Utility Compensation

Table 4. System Efficiency Metrics

<table>
<thead>
<tr>
<th>Metric</th>
<th>Purpose</th>
<th>Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transmission peak demand</td>
<td>Indicate the extent to which peak demand affects transmission costs</td>
<td>Rhode Island’s monthly contribution to the ISO coincident peak</td>
</tr>
<tr>
<td>Distribution peak demand</td>
<td>Indicate the magnitude of distribution peak demand</td>
<td>Monthly peak distribution demand, by sectors</td>
</tr>
<tr>
<td>Substation peak demand</td>
<td>Indicate the extent to which specific substations are stressed</td>
<td>Percent of capacity utilized on targeted substations, during distribution monthly peaks</td>
</tr>
<tr>
<td>DG-friendly substations</td>
<td>Indicate the portion of substations that are capable of readily installing DG facilities</td>
<td>Ratio of substations that can accept DG without upgrades to all substations</td>
</tr>
<tr>
<td>Distribution load factor</td>
<td>Indicate the portion of distribution sales that occur in peak hours</td>
<td>Ratio of retail sales during peak hours to retail sales in all hours</td>
</tr>
<tr>
<td>Customer load factor</td>
<td>Indicate customer demand relative to energy</td>
<td>Ratio of distribution sales during peak hours to distribution sales in all hours, by customer sector</td>
</tr>
<tr>
<td>Time-varying rates</td>
<td>Indicate penetration of time-varying rates</td>
<td>Percent of customers on time-varying rates, by customer sector</td>
</tr>
<tr>
<td>CO₂ intensity</td>
<td>Indicate intensity of CO₂ emissions from customers</td>
<td>CO₂ emissions per customer, by sector</td>
</tr>
</tbody>
</table>
STEP 4 – CREATE AN OPEN PROCESS TO SET TARGETS

- Transparency
- Time for stakeholder input
- Process for collaboration & periodic revision
- Share data from IDP
- Balance stringency with reality

Example: Minnesota e21 Process
STEP 5 – CONSIDER TYING UTILITY REVENUE TO OUTCOMES

Option 1: *Conditional rate of return or cash incentive*

• Require performance as a precondition, scale with performance, or combine both approaches

Option 2: *Revenue Cap*

• Allow utilities to retain some operational savings (affordability)

Can combine both approaches, e.g. U.K.’s RIIO model
# Examples of Common PBR Mechanisms Already in Use

<table>
<thead>
<tr>
<th>Performance Area</th>
<th>Performance Incentive</th>
</tr>
</thead>
</table>
| Affordability    | • Multi-year rate plans  
|                  | • Revenue decoupling    |
| Sustainability   | • RPS alternative compliance payments 
|                  | • Efficiency performance incentives |
| Reliability      | • Reliability standards and penalties |
1. WHY
2. HOW
3. EXAMPLES
4. NEXT STEPS
NEXT STEPS FOR LEGISLATORS TO CONSIDER

1. Make sure the PUC has authority & direction to do all 5 steps
2. Articulate goals for grid modernization or other regulatory reforms
3. Require development of outcome-oriented performance metrics
THE END STATE – WHAT ARE UTILITY BUSINESS MODELS OF THE FUTURE?
UTILITIES AS SYSTEM OPTIMIZERS
SEVERAL MARKET STRUCTURES CAN WORK, UNDER THESE PRINCIPLES

1. Create a level playing field for competition between all resources, to provide energy services.

2. Allow infrastructure owners and grid operators to capture a fair portion of the value of optimizing new technologies.

3. Foster innovation in energy services delivery by encouraging experimentation and allowing procurement to adapt quickly to technological innovation.

4. Maximize the transparency of energy procurement and markets.
SPECTRUM OF UTILITY BUSINESS MODELS

Utility owned & operated DERs

Utility as a platform provider

Separate non-utility entity operates distribution system

Increasing competition & complexity
WHERE DOES YOUR STATE FIT?

- HI
- MT
- WA
- NV
- AZ
- MI
- MT
- DE
- MN
- NC

Utility owned & operated DERs
Utility as a platform provider
Separate non-utility entity operates distribution system

Increasing competition & complexity
Codes of Conduct

• In order to create a fair and functioning market devoid of cross-subsidies from captive customers, some form of corporate separation and strict enforcement of codes of conduct are paramount to protect ratepayers.

• If the utility is going to compete to offer any services, then codes of conduct are important to ensure that all service providers are on equal footing.

• If the utility is a platform service provider and not offering any competitive services, codes of conduct are less critical.
Separation of the Distribution Company From the Competitive Entity

• **Divestiture** – Requires the disposition or sale of an asset by a company.

• **Corporate Separation** – Requires the EDU to separate its competitive enterprise from its regulated enterprise by creating a separate affiliated company.

• **Functional Separation** – Maintains the competitive arm within the EDU as a separate division with its own accounting system, staff, and services.
Codes of Conduct: General Pitfalls to Avoid

- Discrimination in providing access to essential services should be prohibited.
- There should be no sharing of competitive information among affiliates.
- Cross-subsidization by the EDU to benefit the competitive enterprise should be prohibited and carefully monitored by regulators.
Codes of Conduct

- Nondiscrimination;
- Information Sharing and Disclosures;
- Corporate Identification and Logo
- Record-keeping
- Transfer of goods and services
- Sharing of Facilities, Equipment and Costs
- Joint Purchases
- Corporate Support
- Employees
Codes of Conduct: Regulatory Oversight

- **Compliance Plan** - The EDU should be required to file a compliance plan detailing the implementation of the code of conduct.

- **Compliance Audit** – There should be annual compliance audits by an independent auditor, filed with the commission, and made available to public.

- **Complaint Procedure and Log** - To allow for informal complaint resolution, the EDU should establish a complaint process that includes a defined number of days to record, investigate and respond to the complainant regarding the EDU’s findings and any corrective action.

- **Penalties** - The commission should have the authority to levy fines for violations of the code of conduct.
Code of Conduct: Ring Fencing

- Ring-fencing applies when a regulated public utility business financially separates from a parent company that is engaged in non-regulated businesses.
- The purpose of ring-fencing is to protect the EDU and its customers from the risks associated with unregulated enterprises and to protect the delivery of essential utility services in the event of financial instability or bankruptcy of the unregulated affiliate.
THANK YOU!
About RAP

The Regulatory Assistance Project (RAP)® is an independent, non-partisan, non-governmental organization dedicated to accelerating the transition to a clean, reliable, and efficient energy future.

Learn more about our work at raponline.org

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United States

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Appendix A: Code of Conduct
Codes of Conduct

• **Nondiscrimination** - The EDU should be prohibited from providing a competitive advantage to its affiliated energy service provider (the Affiliate) through any kind of preferential treatment that would extend to any service or price unless the same offer or advantage is contemporaneously provided to all unaffiliated energy service providers (UESPs).
Codes of Conduct

- **Information Sharing and Disclosures** - Information on customers should be provided on a nondiscriminatory basis to both the affiliate and UESP but only with a customer’s written consent.

- **Corporate Identification and Logo** - The affiliate should have its own separate identification and not use or trade upon, promote, or advertise its business using the EDU’s name or logo. If such practice is permitted, then the affiliate must disclose legibly or in audible language that the affiliate is not the same company as the EDU, is not regulated by the commission, and that the customer need not purchase the services of the affiliate in order to remain a customer of the EDU.
Codes of Conduct

• **Record-keeping** - EDUs and the affiliate should each be required to maintain separate books and records in accordance with the applicable Uniform System of Accounts and the Generally Accepted Accounting Principles.
Codes of Conduct

- **Transfer of Goods and Services** - In all proceedings, complaints, investigations, and filings, the EDU should have the burden of demonstrating the fair market price and that there is no cross-subsidy. Transfers of goods and services from the EDU to the affiliate should be set at the higher of fully allocated cost or fair market price to protect the captive customer from subsidizing the affiliate operation. Alternately, any transfer from the affiliate to the EDU should be at the market price to prevent the affiliate from selling any asset or service at an inflated price at the expense of those same captive customers.
Codes of Conduct

• **Sharing of Facilities, Equipment, and Costs** - An EDU should not share any office space, equipment, services, and systems with the affiliate. The only exception is the manner of the separation between the EDU and the affiliate and if corporate support functions are shared.

• **Joint Purchases** - An EDU should not be allowed to make joint purchases with the affiliate that are associated with the marketing of the affiliate’s products and services.
Codes of Conduct

• **Corporate Support** - Corporate support for the affiliate, which consists of overall corporate oversight, governance, support systems, and personnel can be created through a separate entity or provided by the parent company which also houses the EDU.

• **Employees** - Generally, the EDU and the affiliate should not jointly employ the same people. The only exception is the case of shared directors and officers stemming from the corporate parent or holding company.
Code of Conduct: Ring Fencing

The NARUC Subcommittee on Accounting and Finance made the following recommendations as fence-ranging measures:

1. Commission authority to restrict and mandate the use and terms of sale of utility assets, including restriction against using utility assets as collateral, etc. for any non-utility business.

2. Commission authority to restrict dividend payments to a parent company to maintain financial viability of the utility, including maintenance of a minimum equity ratio balance.

3. Commission authority to authorize loans, loan guarantees, engagement in money pools, and large supply contracts between the utility and affiliate companies.

4. Commission authority over the establishment of a holding company structure involving a regulated utility.

5. Expand commission authority over security applications to include the ability to restrict type and use of financing.

Source: NARUC Subcommittee on Accounting and Finance, “Ring Fencing Mechanisms for Insulating a Utility in a Holding Company System,”
Appendix B: Decoupling
Credit Implications of Decoupling

- Standard & Poor Views Decoupling as Generally Positive from a Credit Perspective:
  - Provides the opportunity for a utility to earn a pre-determined level of distribution revenue regardless of the actual KWH sold
  - Enables utilities to project cash flow more accurately and avoid much of the earnings volatility from changes due to policy goals (and other influences – weather/Economy) that occur under traditional regulations
  - Reduces the need for rate case filings, resulting in lower overall costs for the utilities
Electric and Gas Decoupling in the U.S. December 2015

LEGEND
- Adopted Gas Decoupling (22)
- Pending Gas Decoupling (5)
- No Gas Decoupling (24)
- Adopted Electric Decoupling (15)
- Pending Electric Decoupling (9)
- No Electric Decoupling (27)
## Comparison of Different Bill Rate Designs

<table>
<thead>
<tr>
<th></th>
<th>Conventional Rate Design</th>
<th>High Customer Charge</th>
<th>$20 Minimum Bill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Bill; Usage of 1,000 kWh</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer Charge</td>
<td>$5.00</td>
<td>$30.00</td>
<td></td>
</tr>
<tr>
<td>Minimum Bill:</td>
<td></td>
<td></td>
<td>$20.00</td>
</tr>
<tr>
<td>Per-kWh Charge</td>
<td>$0.100</td>
<td>$0.075</td>
<td>$0.105</td>
</tr>
<tr>
<td>Total Bill (1000kWh)</td>
<td>$105.00</td>
<td>$105.00</td>
<td>$105.00</td>
</tr>
</tbody>
</table>

### Elasticity Impact

<table>
<thead>
<tr>
<th></th>
<th>Conventional Rate Design</th>
<th>High Customer Charge</th>
<th>$20 Minimum Bill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate Difference</td>
<td>($0.025)</td>
<td></td>
<td>$0.005</td>
</tr>
<tr>
<td>% Rate Difference</td>
<td>-25%</td>
<td></td>
<td>5%</td>
</tr>
<tr>
<td>Short Run Elasticity</td>
<td>-0.20</td>
<td>5%</td>
<td>-1%</td>
</tr>
<tr>
<td>Long-Run Elasticity</td>
<td>-0.70</td>
<td>18%</td>
<td>-3%</td>
</tr>
</tbody>
</table>
# Boiling It Down To Rate Design

<table>
<thead>
<tr>
<th>Rate Element</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Costs to Connect to the Grid</strong></td>
<td></td>
</tr>
<tr>
<td>Billing and Collection</td>
<td>$4.00/month</td>
</tr>
<tr>
<td>Transformer Demand Charge</td>
<td>$1.00/kVA/month</td>
</tr>
<tr>
<td><strong>Power Supply and Distribution (both directions)</strong></td>
<td></td>
</tr>
<tr>
<td>Off-Peak</td>
<td>$.07/kWh</td>
</tr>
<tr>
<td>Mid-Peak</td>
<td>$.10/kWh</td>
</tr>
<tr>
<td>On-Peak</td>
<td>$.15/kWh</td>
</tr>
<tr>
<td>Critical Periods</td>
<td>$.75/kWh</td>
</tr>
</tbody>
</table>
MOVING FROM COST OF SERVICE TO PERFORMANCE-BASED REGULATION

Opex (including depreciation & taxes)

ROR

Revenue

Totex

Traditional Model
(r>k); value derived from all investment activities

Performance Value Model
value derived from both investments and performance

Incentives available for value-creating activities*

*Overall costs may actually decrease; but potential returns to shareholders should grow commensurate with the additional risk shifted to utilities
EXAMPLE 1 OF 2: FIRST STEPS – PROVIDE ROE BONUS FOR COST SAVINGS

New York – Brooklyn-Queens Demand Management Project

- Consolidated Edison proposed demand management solutions to defer $1 billion substation upgrades from 2017 to beyond 2026 – at a cost of $200 million ($800 million savings!)
- Commission granted full regulated rate of return on operational expenditures to reduce demand; capped costs at $200 million
- Additional 100 basis point bonus (~$2 million) available for excellent performance in 3 primary output categories:
  - **Energy Savings**: Exceeding the peak reduction target (45 points)
  - **Market animation**: Increasing the diversity of DER in the marketplace (25 points)
  - **Affordability**: $/MW less than traditional investment solution (30 points)
EXAMPLE 2 OF 2: GOING (A LOT) FURTHER

United Kingdom

- 3% of total utility revenue at stake
- Penalties and rewards offered
- 6 primary output categories tied to revenue
  - customer satisfaction, reliability and availability, safe network services, connection terms, environmental impact, social obligations
- 8 years to adapt and perform, opp to review at year 4
- Incentive delivery: ROE adjustments applied to all cap and op expenditures

“Utility investors agree RIIO is a paradigm of success.”

Julien Dumoulin-Smith, UBS