

# Aligning Rate Making and Grid Modernization

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## Approach

- **Major Challenges**
  - Efficient Investment
  - Reliability and Resilience
  - Environmental Protection
  - Cyber & Physical Security
  - Operational Efficiency during a Workforce Turnover
- **Key Question**
  - How to Have a Strategy that Combines Technology including Grid Modernization, Public Policy including Rate Making, & Economics to Address Major Challenges?
- **Opportunities to Better Align Rate Making & Regulatory Policy with Strategy**
  - Investment & Efficiency in a Rising Cost Environment
  - Output Based Incentives
  - Demand Optimization
  - Incentives for Innovation

## Investment Challenge

- **American Society of Civil Engineers: Maintaining electric infrastructure requires \$673 billion in new investment by 2020**
  - Investment required exceeds the Market Capitalization & approximates the Net Plant in Service of US Investor Owned Electric Companies
- **Challenging investment environment:**
  - Slowly growing or declining sales, which could be further eroded by the falling cost of distributed resources
  - Credit quality vulnerable to lags in cash flow: Majority of electric utilities have credit ratings of BBB or lower, compared to 1 in 5 in 1992
- **ASCE findings on the consequences of failing to close the investment gap:**
  - “As costs to households and businesses associated with service interruptions rise, GDP will fall by a total of \$496 billion by 2020. The U.S. economy will end up with an average of 529,000 fewer jobs than it would otherwise have by 2020. .... In addition, personal income in the U.S. will fall by a total of \$656 billion from expected levels by 2020.”
- **Increasing frequency of major events:**
  - Power outages affecting more than 50,000 customers doubled 2001 to 2010

## Investment & Efficiency in a Rising Cost Environment

- **Regulators Dilemma:**
  - Absence of competition to provide consumers value for their dollars, that in a competitive market provides incentives for investment, efficiency and innovation
  - Information Asymmetry: Regulator doesn't know true utility costs & opportunities
  - Conventional Assumption: Growth in revenue (customers & sales) approximates marginal costs & lag between cases is an incentive to disclose efficient costs
    - Breaks down during investment cycles
- How can regulation:
  - Support and provide incentives for needed investment;
  - Provide incentives for utility to operate efficiently; and
  - Encourage utility to accurately disclose its efficient costs such that a portion of any efficiency savings can be shared with consumers?

## Investment & Efficiency in a Rising Cost Environment

- **Rate Making Models that Lean Toward Supporting Investment**
  - Forward planning process or commitments may be used to ensure investment

Model	Examples	Form	Key Implications
Formula Rate	FERC, Illinois	Form 1 Costs + Carrying Charges	No Efficiency Incentive Regulatory Risk Reduces Spending
Annual Rate Case	Wisconsin	Forecast Test Year	Limited Efficiency Incentive Administratively Burdensome
Capital Expenditure Tracker	Pennsylvania DSIC	Separate Rate for Investments	Incentives Investment that Reduces Operating Costs

- **Rate Making Models that Lean Toward Efficiency (and Sharing Cost Savings)**
  - Strong output incentives may be needed to encourage investment

Model	Examples	Form	Key Implications
Multi-year Revenue / Price Cap	NSTAR SIP, Ontario	$P - X \pm Z = \text{Prices} - \text{Productivity} \pm \text{Extraordinary Costs}$	Price & Productivity Indices May Not Apply During Investment Cycle Savings Only Shared when New Cap
Revenue Plan + Information Quality & Efficiency Incentives	RIIO	Shared Efficiency Savings or Costs vs. Benchmark	Advance Business Plan Review Regulator may Compete Parts of Plan Incentives to Provide Efficient Plan

## Information Quality Incentives

- U.K. Office of Gas & Electric Markets Information Quality Index
  - Advance plan review enhances alignment and reduces risk for utility and consumer
  - Consultant to the regulator estimates costs to deliver expected outputs
  - Utility can choose among contracts with different cost savings / efficiency incentives, with the opportunity for higher earnings if they elect to try to meet the regulator’s cost estimate

**IQI MATRIX (For information only)**

	90	95	100	105	110	115	120	125	130
DNO:Ofgem Ratio	90	95	100	105	110	115	120	125	130
Efficiency Incentive	70%	68%	65%	63%	60%	58%	55%	53%	50%
Additional income (£/100m)	1.5	0.7	0.0	-0.9	-1.8	-2.8	-3.8	-4.9	-6.1
Rewards & Penalties									
Allowed expenditure	97.50	98.75	100.00	101.25	102.50	103.75	105.00	106.25	107.50
Actual Exp									
90	6.7	6.6	6.5	6.1	5.7	5.1	4.5	3.6	2.7
95	3.2	3.3	3.2	3.0	2.7	2.3	1.7	1.0	0.2
100	-0.3	-0.1	0.0	-0.1	-0.3	-0.6	-1.1	-1.6	-2.3
105	-3.8	-3.5	-3.3	-3.2	-3.3	-3.5	-3.8	-4.2	-4.8
110	-7.3	-6.9	-6.6	-6.4	-6.3	-6.4	-6.6	-6.9	-7.3
115	-10.8	-10.2	-9.8	-9.5	-9.3	-9.2	-9.3	-9.5	-9.8
120	-14.3	-13.6	-13.1	-12.6	-12.3	-12.1	-12.1	-12.1	-12.3
125	-17.8	-17.0	-16.3	-15.7	-15.3	-15.0	-14.8	-14.7	-14.8
130	-21.3	-20.4	-19.6	-18.9	-18.3	-17.9	-17.6	-17.4	-17.3
135	-24.8	-23.7	-22.8	-22.0	-21.3	-20.7	-20.3	-20.0	-19.8
140	-28.3	-27.1	-26.1	-25.1	-24.3	-23.6	-23.1	-22.6	-22.3
145	-31.8	-30.5	-29.3	-28.2	-27.3	-26.5	-25.8	-25.2	-24.8
150	-35.3	-33.9	-32.6	-31.4	-30.3	-29.4	-28.6	-27.9	-27.3

## Output Based Incentives

- **Limitations of Conventional Regulation**

- Absent market incentives to provide value for dollars, least cost focus drives quality to an “adequate” level, externalizing billions in costs to consumers & increasing societal costs
  - Ensuring equivalent reliability leads to focus on worst circuits rather than greatest value
    - Undergrounding & micro-grids in some areas might be cost-effective based on value
    - Customer value is rarely quantified
  - MD Resiliency Task Force estimated customer outage cost of 3 storms >\$1 billion, conservatively assuming all affected customers were residential
  - Assuming a less than proportionate impact on commercial customers (4% of affected customers) estimate would have exceeded \$20 billion

- **Developing Output Metrics & Incentives**

- Potential outputs to encourage:
  - Reliability, storm restoration, asset utilization, distribution efficiency, environmental impacts, worker safety, interconnection availability, customer satisfaction, call center response
- Bi-directional incentives encouraging continuous improvement or penalties for non-performance
- Value based or uniform incentives

- **A Broader Strategy than Ratemaking:**

- Role of the distribution utility changes from wires company to real-time distribution system & market operator

## Demand Optimization

- **Fixed Generation Rates Raise Total Consumer Costs**
  - Capacity factor for U.S. generation: 45%; T&D capacity utilization is often lower
  - Average Capacity Utilization in Other Capital Intensive Industries: >75%
- **Retail Rates Suppress Efficient Competitive Market Price Signals**
- **Energy’s “Holy Grail” – Storage Capabilities of End Use Devices**
  - Most energy uses that have thermal inertia (heating, cooling, water heating, & refrigeration) and/or flexibility in timing of power draws (pumping loads, industrial batch processes, pool pumps, dishwashers, clothes driers, & charging of vehicles and battery powered devices)
  - Optimize the timing of power draws 24/7 & maintain the value of energy services to consumers
- **Opportunity to Create a More Agile Power System:**
  - Improve asset utilization
  - Enhance resilience through beneficial feedback
  - Provide foundation for greater reliability through balanced clusters of distributed resources & local intelligent control
  - Enable integration of renewables & electric vehicles at scale



## Demand Optimization: Role of the Regulator

- **Dynamic Default Pricing**
  - Pricing Objectives:
    - Convey efficient, Dynamic Real-Time Price (RTP) signals
    - Provide consumers the opportunity to address loss aversion
    - Give consumers options that match different price & risk preferences
  - Two-Part Market Pricing Can Meet These Objectives: e.g. Consumer Subscription Pricing
    - RTP + Insurance: Prepaid call option for selected kW at fixed strike price
    - When Market Price > Strike Price, Consumer earns rebate for using less than subscription kW & Pays RTP for only use above subscription kW
    - Default might initially include insurance for consumers anticipated peak demand with each consumer having the choice to change their kW subscription level

## Demand Optimization: A Strategy Broader than Pricing

- **Redefining the Interface between Utility and Customer to Provide Access to Market Prices and Enabling Technology that Can Lower Costs, Enhance Customer Choice, & Remove Barriers to Innovation**
- **Tools Enabling Automated Price Response**
  - Information & efficiently structured choices: Bill comparisons
  - Metering & billing: Support dynamic pricing options
  - Broadcasting prices to intelligent devices: Standard, real-time, ubiquitous communication of current and indicative forward interval prices
  - Financing: On-bill repayment

## Incentives for Innovation

- **Policy Dilemma:**
  - Carbon is a global problem, unlikely to be successfully managed absent the development of additional low cost low carbon alternatives
  - Estimates place electric utility R&D spending as high as \$700 million per year – a fraction of expenditures on renewable energy
  - Theory that regulation should be “a closely imitative substitute for competition” largely fails in practice with respect to encouraging innovation
- **Regulation’s assumption of stable or “static equilibrium” conditions leads to focus on market power- ensuring reasonable rates & adequate service**
  - Regulation gives limited consideration to value once minimum service standards are met
  - External review process slows the cycle of innovation, learning, &, if needed, redirecting efforts
  - Successful innovation may have limited positive impact on utility earnings
- **Need dialogue on utility role in R&D & commercialization of advanced technology**
  - A modest, well designed catalyst might make a large difference: e.g. Israeli VC initiative attracted \$10 billion VC industry in a decade by offering partial funding matches to private investors



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