



**RAP**

Energy solutions  
for a changing world

# Foundations of Energy Regulation

House Natural Resources and Energy Committee  
Montpelier, Vermont

## Regulatory Assistance Project

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**The Regulatory Assistance Project**

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# Why are we going to spend three days talking about the electric sector?

- Electricity is the defining feature of a modern economy
- The industry is undergoing terrific change
  - Technological change, changing the economics of energy, and urgent environmental challenges are driving policy and institutional change
    - Some of this is absolute (technology, consumer activation) and will happen in some manner regardless of policy
    - Some of this seems imperative (address environmental issues, retain fairness) but is a policy choice
- Almost all of the solutions to the challenges we face involve doing a better job of aligning the private interest with the public good, and of balancing regulation with market forces

# Vermont Matters

- A state, even a little one, can make a difference
- Exports:
  - Maple syrup
  - Efficiency and integrated resource planning
  - *Efficiency Vermont*
  - The Regional Greenhouse Gas Initiative
    - Allowance auctions and revenues “recycled” into clean energy investment
  - Geo-targeting



WHAT HAPPENS IN  
VERMONT  
GOES GLOBAL!

# Who are RAP?

- Former utility and environmental regulators, consumer advocates, industry officials, and policymakers
- Non-profit, non-partisan NGO
- Mission: To help governments develop and adopt policies that will ensure the long-term economic and environmental sustainability of the power and gas sectors
- Not advocates:
  - We don't take positions in regulatory or other litigated proceedings
  - Work directly with decision-makers in government and industry
- Global perspective
  - Programs in the US, China, Europe, and India
  - Lots of frequent flyer miles

# The Economics and Practice of Utility Regulation

# Economic Regulation

- “When private property is affected with a public interest, it ceases to be *juris privati* only.” Britain’s Lord Chief Justice Hale, 1670
- Munn v. Illinois 94 U.S. 113 (1876)
  - US Supreme Court finding that states may regulate the use of private property "when such regulation becomes necessary for the public good."
- Economic regulation is the explicit public or governmental intervention into a market to achieve a public policy or social objective that the market fails to accomplish on its own

# Reasons to Regulate

- The product is considered essential, and
- The product is most efficiently provided by a single supplier
  - "Natural" monopoly
- Other market failures
  - External (e.g., environmental) costs not full reflected in price
  - Consumer protection
  - Universal service
- Economic efficiency
- Other policy considerations

# What is a Utility?

- A natural monopoly; provides an essential service
- It operates under a franchise granted by the state
- It has “an obligation to serve”
  - 30 VSA §219: “Each company. . .shall be required to furnish reasonably adequate service. . . .”
  - This is not necessarily true of utilities in other countries
- It must provide service at posted prices, available to all who qualify for them
  - Undue discrimination is illegal
  - Rate class distinctions are permitted, because they are based on differences in the costs to serve different customer groups



# The Utility's Role

- A utility performs an important function in a society, which is not entirely commercial:
  - Striking a sound balance between its public service role and its compensation enables capital to flow at reasonable costs, and consumer expectations to be reasonably met
  - This marks the line between the utility's scope of activities and that of the rest of the private sector

# What is Regulation?

- An exercise of the police power of the state
  - Constrained by the state and federal Constitutions
    - Takings and due process
- It is not a contract with the regulated entity
  - There is no “regulatory compact”
    - Not necessarily true in other countries, where the terms of regulation are often set out in contracts

# The Regulator's Role

- Extensions of legislatures, executing powers and oversight originally exercised by legislatures
- Independent
  - Removed from the political process to a significant degree, empowered to make decisions that appropriately balance competing interests: they make the hard decisions
    - Not true in all states
- Expert bodies
- Quasi-judicial, not merely tribunals for dispute resolution, but charged with “promoting the public good”
  - This means they can be more than merely reactive
  - They can look forward, anticipate issues and directions, and clarify and, in so doing, minimize risk
  - They can open investigations on their own motion
    - Not true in all states

# The Regulator's Role

- Process is important
  - Provides notice
  - Fair: decisions based on evidence
  - Access
    - Affected parties can participate
    - Visible to the public and press
  - Disciplined: process obeyed and decisions are made
- Regulation is not a popularity contest, and sometimes unpopular choices are the best public interest choice
- There are inherent dilemmas in regulation, balance is typical, **courage, leavened with realism, is essential**

# Regulatory Authority

- Jurisdiction is defined by statute
  - Deliberative tribunal required to exercise judgment, discretion, within the bounds of the law
- The role of the statute
  - Broad grant of authority
  - Policy-setting
  - Resolving some specific controversies is very helpful (e.g., the societal cost-effectiveness test, 30 VSA §218c)
  - Getting too specific in directing decision-makers risks can hamstring action in the face of unanticipated or changed circumstances
- A living process, especially as technology brings new opportunities and challenges
- State and federal jurisdiction
  - Retail v. wholesale

# Pricing: The Essential Regulatory Act

- “Just and reasonable” rates
  - Posted tariffs
  - Fair, equitable, based on the general principle that the cost-causer pays
  - Rates sufficient but no more than necessary to cover the costs of meeting demand, including investment and return on investment
  - Most efficient if rates send proper economic signals to end-users, who are making usage and investment decisions routinely
    - “Efficient” means that the cumulative result of regulated prices drives investment by the utility and the consumer that is best for the state as a whole, however “best” is defined (overall cost, or cost plus other factors)
- Rate design
  - Structure and periodicity of prices

# Regulatory Concerns

- How does an investor-owned utility earn for shareholders and to reinvest in the business?
  - Nearly 100% is based on a return on invested capital
  - What about performance?
  - Is there a bias toward spending on capital rather than expenses?
    - And if so, does it matter?
- Prudence, used-and-usefulness of utility actions
  - How regulation serves as a proxy for the discipline of the marketplace (or does not)

# Conclusion: Objectives of Economic Regulation

- Economic efficiency
- Fair prices
  - To consumers and revenue adequacy for the utility
- Reasonable service, with nondiscriminatory access for all
- Adequate quality and reliability
- Other policy considerations



# Traditional Cost-Based Price Regulation

# Pricing Authority

- 30 VSA §218(a): “... the Board may order... such rates, tolls, charges, or schedules... as shall... be found by it to be *just and reasonable*.”
- What does this mean practically?
  - Prices are as low as they can be to produce revenues to cover all the costs (including return of and on investment) prudently incurred by a company to provide safe, reliable, and adequate service to all willing buyers.

## 30-Second Lesson in Traditional Ratemaking

- The basic formula for determining rates is simple

$$\text{Price} = \text{Cost of Service} / \text{Sales}$$

- But, in its details and nuances, it can be very complicated

# 120-Minute Lesson in Ratemaking

- Rate Case:
  - Determine total cost to serve in a rate period (“adjusted test year”)
    - Expenses, depreciation, taxes, undepreciated assets (“rate base”), costs of debt and equity
- Rate Design:
  - Allocate costs among customer classes (groups whose usage patterns are similar)
  - Create pricing structures that reflect cost causation and will fairly recover the costs of service from rate classes
  - Minimize cross-subsidization
    - Subsidies are fine if they are the result of an explicit public policy decision and are, to the degree possible, explicit

# What Does This Rate Design Say?



**\$1.50**



**\$2.25**



**\$2.75**

*Eat  
More  
Ice  
Cream!*

Prices  
Matter

# Bonbright Principles of Rate Design

*Plus RAP*

- Simple, understandable, publicly acceptable, feasible
- Easily to interpret consistently
- Adequate revenue
- Revenue stability over time
- Rate stability
- Fairness
- No undue discrimination
- Efficient – discourage wasteful use while otherwise encouraging use
- Reflect non-priced externalities
- Encourage customer investment

*Inherent tension among these, judgment needed to resolve*

# Regulating Utility Financial Commitments

# Evolution of the Regulatory Model

- Realization that the entire network, from fuel to end-use, constitutes the thing that is “affected with the public interest” and should be the object of public policy
- Investment and expenditure decisions should be subject to a rigorous public process of input and review
  - Before or after?



# Regulatory Oversight

- Physical assets and purchases:
  - Wires, other plant
  - Power plants and power purchases
  - Environmental impacts
  - Economics of investments and purchases
- Financial management
  - Mergers and acquisitions
  - Capital-raising

# Things regulators worry about

- Building rate base
  - Bias toward capital investment over expenditure
  - Gold-plating
- Flawed analytical methods
  - Poor risk assessment
- Institutional biases, inertia
- Non-market-based investment decisions
  - Unwillingness to cut losses
- Self-dealing

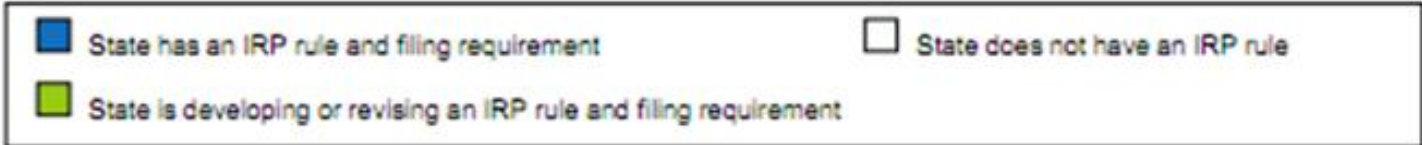
# Competitive Services and Regulated Markets

- Companies that provide monopoly services and competitive services
  - Separations
  - Codes of conduct
  - Effects on markets and innovation
- Competitive providers of services
  - Distributed generation
  - Energy efficiency (and why EE also fails in competition)
  - Demand response

# One Solution to the Investment Problem: Integrated Resource Planning

- 30 VSA §218c(a)(1):
  - A "least cost integrated plan" for a regulated electric or gas utility is a plan for meeting the public's need for energy services, after safety concerns are addressed, at the lowest present value life cycle cost, including environmental and economic costs, through a strategy combining investments and expenditures on energy supply, transmission, and distribution capacity, transmission and distribution efficiency, and comprehensive energy efficiency programs.

# States with Least Cost Planning (Integrated Resource Planning – IRP)



# Cost v. Value: “Compared to What?”

- Resource choices cannot be made simply on the basis of costs (or prices)
- The lower-cost resource is not always the most *valuable* resource
- How do we determine the value of a resource option? What is its value to us?
- IRP is the process by which resource options are compared and aggregated to meet demand for service to produce the highest value at the lowest total cost over the long-term

# Facilities Siting

- The utility system is a network
- Its value lies in its diversity of providers and consumers
- It is also a means by which public interest objectives can be accomplished
- Consumers benefit if resources can access the network, and if the network itself is built to a least-cost ideal
- A dilemma emerges as least-cost methods of generating and delivering energy create problems for all or for some
  - Social justice is implicated if a disadvantaged group tends also to receive the brunt of adverse impacts from utility siting
- States rely on the regulatory process to resolve these dilemmas
  - In many instances, the original intent of a proposal can be preserved while adverse consequences can be removed or reduced with money or ingenuity
  - Sometimes, in resolving such dilemmas, in determining “the public good”, some interests are upset or disappointed

# End-Use Energy Efficiency

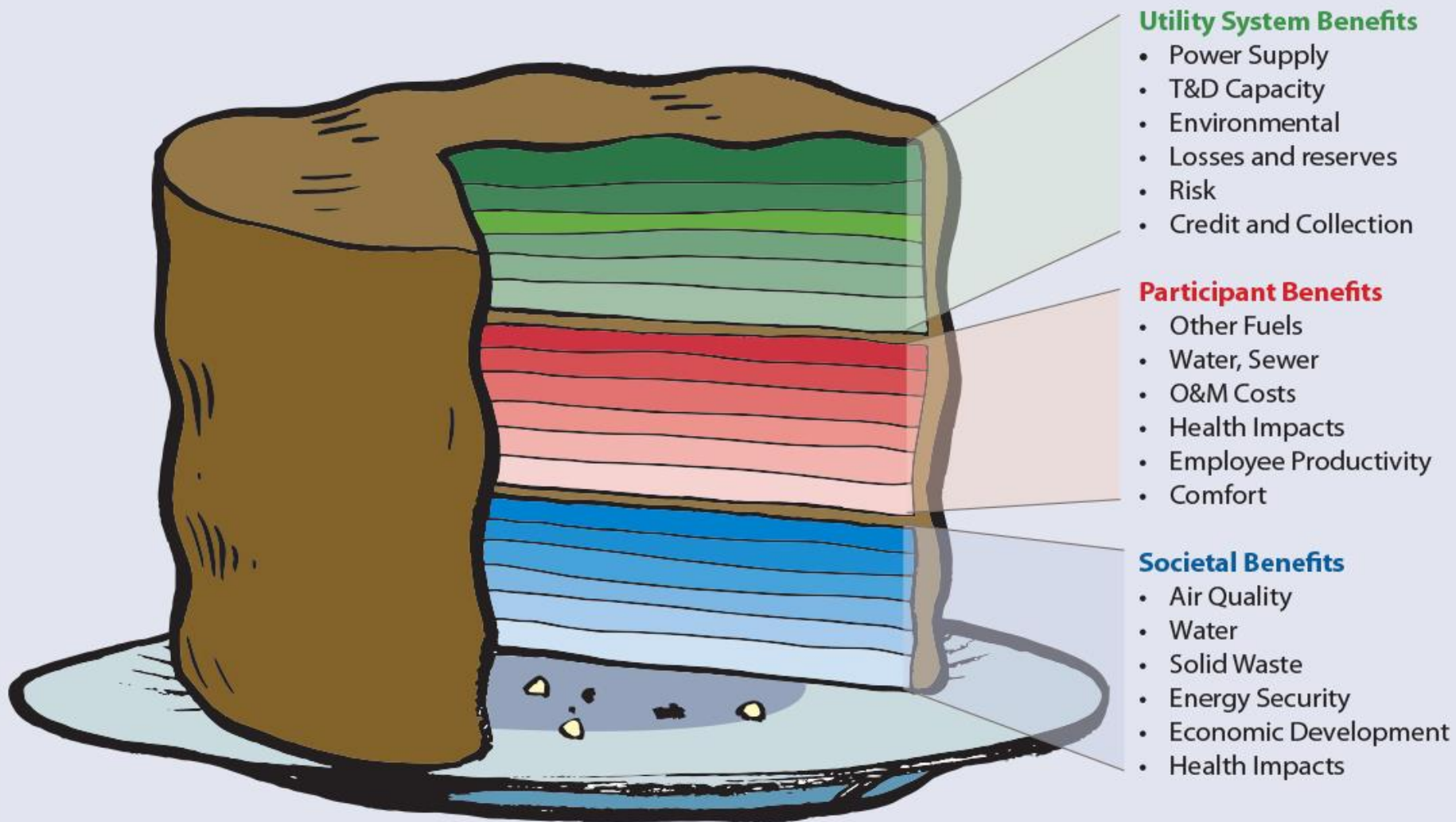
- Three decades of analysis and implementation have confirmed that energy efficiency is the lowest cost, lowest risk resource
- Barriers to it still remain
  - The “throughput” incentive
  - Higher up-front capital costs
  - Information
  - High private discount rates (short payback periods)
- Aligning private interest with public policy
  - How best to design and deliver EE programs?



# Externalities

- A recognition that not all costs are monetized and reflected in market values
- Both positive and negative
  - Improved amenity and health
  - Environmental damage
- How best to account for these costs?

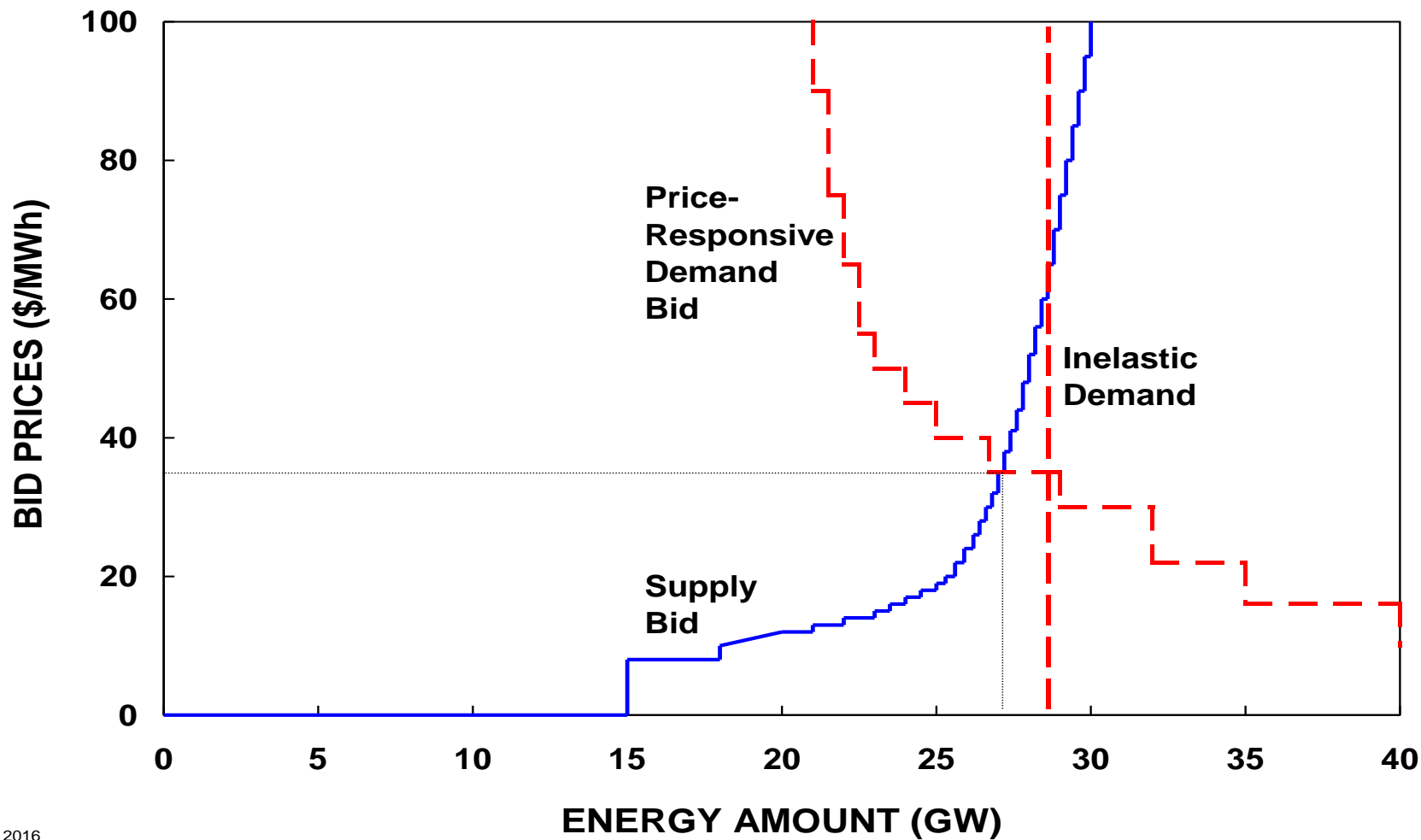
## A Layer Cake of Benefits from Investments in System Resources



# Wholesale Markets

- Technological change, generation is no longer a natural monopoly
- How wholesale works
  - Bid-based merit order dispatch; locational pricing; capacity markets, ancillary services
- Wholesale markets co-exist with
  - An imperative for reliability
  - With environmental regulation
  - States and their priorities
  - Planning can tie it all together

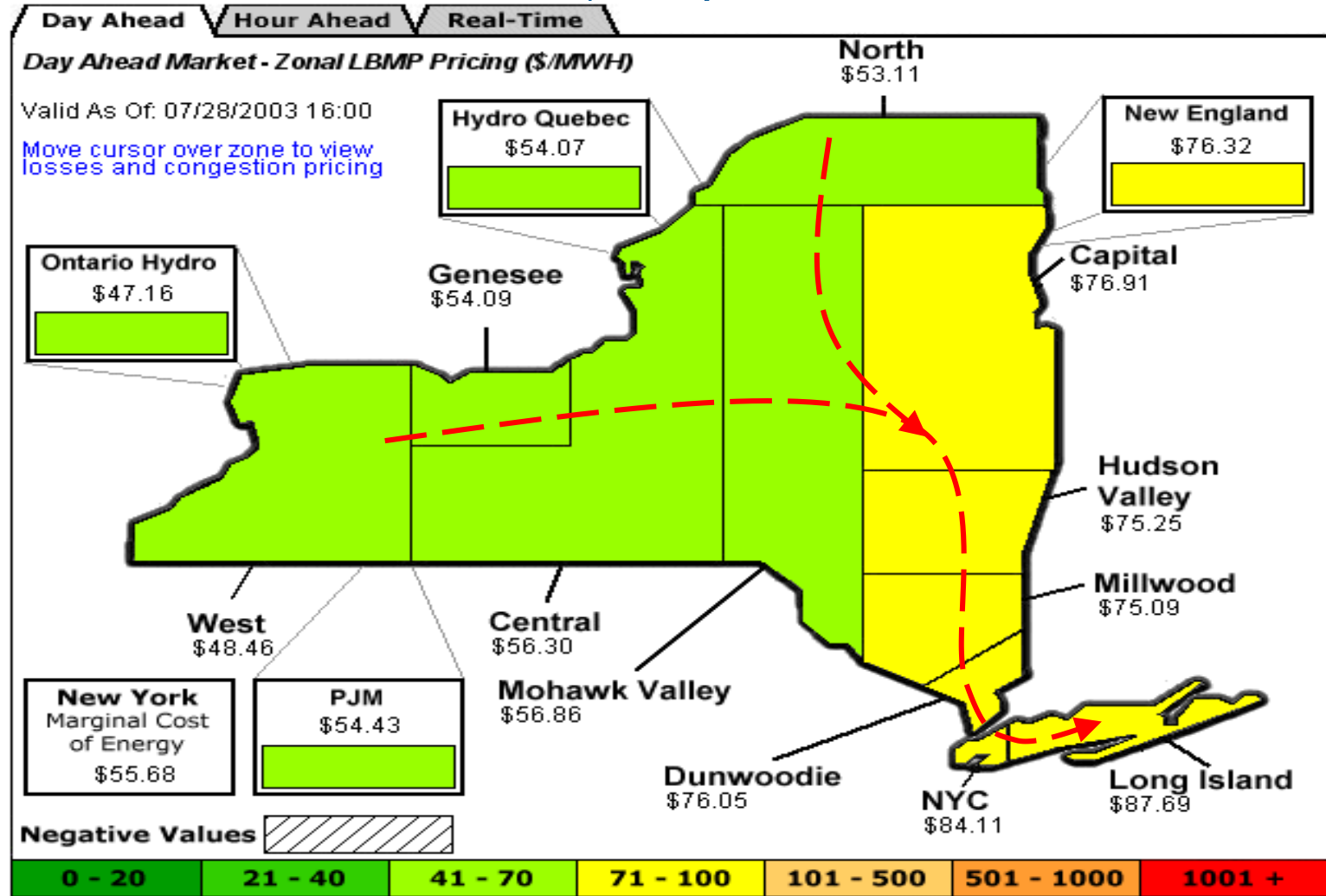
# Supply and Demand in the Wholesale Market



2016

# Market zones in NY - Sample Day

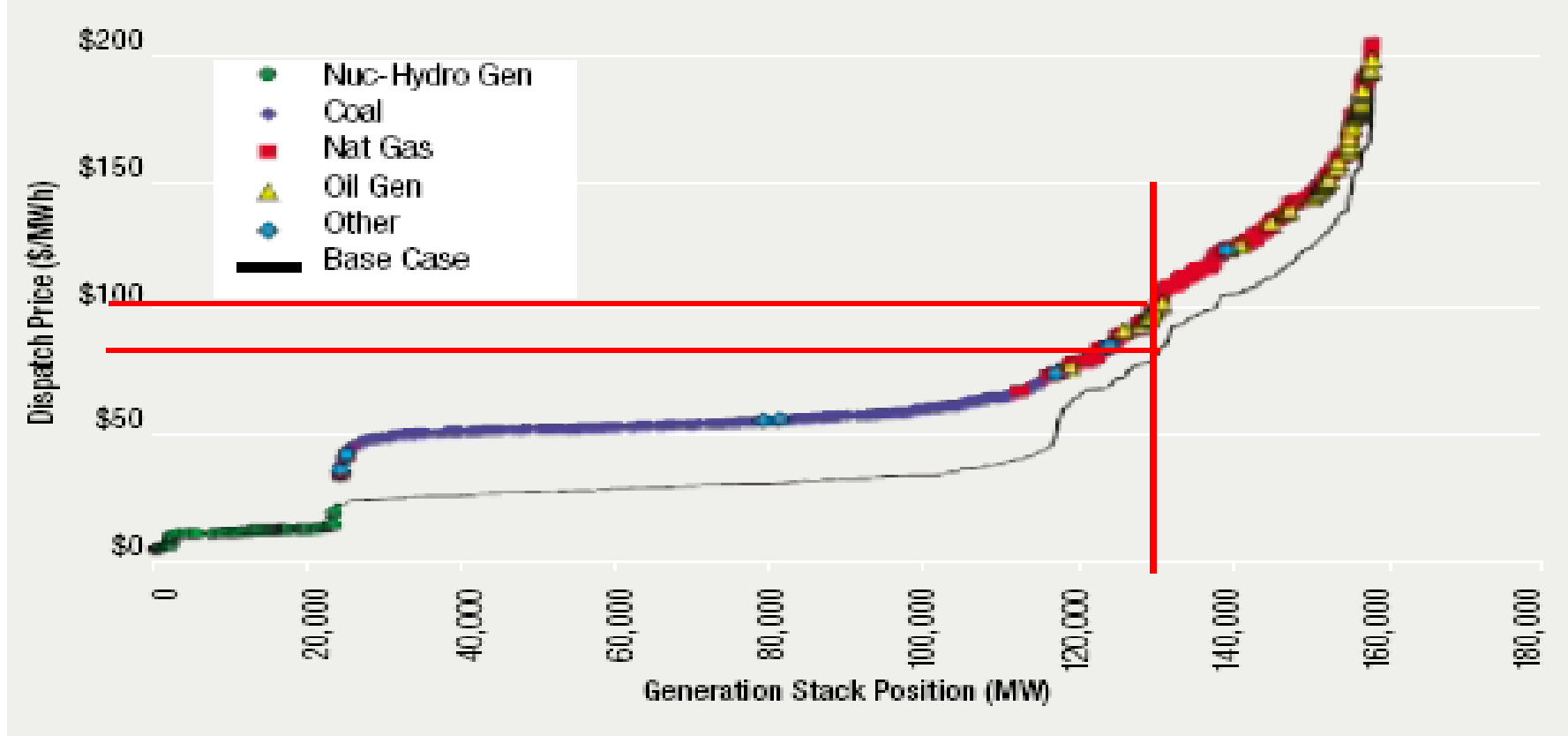
Note Western NY at \$48/MWH, Long Island at \$88/MWH



# Carbon prices to generators can increase wholesale power prices with little effect on dispatch or emissions

**Fig. 3**

**SUPPLY CURVE WITH EMISSIONS PENALTY OF \$25/TON CO<sub>2</sub>**



# Performance-Based Regulation: Aligning Incentives with Public Policy Goals

# All Regulation is Incentive Regulation

- The trick is simply to understand what the incentives are and how they affect behavior



# How Do Utilities Make Money under Traditional Regulation?

- Under traditional regulation:

$$\text{Price} = \text{Cost of Service/sales}$$

- But:

$$\text{Actual Revenues} = \text{Price} * \text{Quantity}$$

Where: Quantity = actual sales

- Which means that:

$$\text{Profit} = \text{Actual Revenues} - \text{Actual Costs}$$

- The utility makes money by:
  - Reducing costs and
  - Increasing sales

# Traditional Regulation: The Problem

- Traditional ROR regulation sets *prices*, not *revenues*
  - The revenue requirement is only an estimate of the total cost to provide service, used only as the basis for determining rates
- By themselves, consumption-based rates (\$/kWh and \$/kW) link profits to sales
  - The more kilowatt-hours a utility sells, the more money it makes
  - This is because, in most hours, the price of electricity is greater than the cost to produce it
    - Utility makes money even when the additional usage is wasteful, and loses it even when the reduced sales are efficient]
- The incentive to increase sales is *extremely powerful*
  - This is the “throughput incentive”

# How Changes in Sales Affect Earnings

% Change in Sales	Revenue Change		Impact on Earnings		
	Pre-tax	After-tax	Net Earnings	% Change	Actual ROE
5.00%	\$9,047,538	\$5,880,900	\$15,780,900	<b>59.40%</b>	17.53%
4.00%	\$7,238,031	\$4,704,720	\$14,604,720	<b>47.52%</b>	16.23%
3.00%	\$5,428,523	\$3,528,540	\$13,428,540	<b>35.64%</b>	14.92%
2.00%	\$3,619,015	\$2,352,360	\$12,252,360	<b>23.76%</b>	13.61%
1.00%	\$1,809,508	\$1,176,180	\$11,076,180	<b>11.88%</b>	12.31%
0.00%	\$0	\$0	\$9,900,000	<b>0.00%</b>	11.00%
-1.00%	-\$1,809,508	-\$1,176,180	\$8,723,820	<b>-11.88%</b>	9.69%
-2.00%	-\$3,619,015	-\$2,352,360	\$7,547,640	<b>-23.76%</b>	8.39%
-3.00%	-\$5,428,523	-\$3,528,540	\$6,371,460	<b>-35.64%</b>	7.08%
-4.00%	-\$7,238,031	-\$4,704,720	\$5,195,280	<b>-47.52%</b>	5.77%
-5.00%	-\$9,047,538	-\$5,880,900	\$4,019,100	<b>-59.40%</b>	4.47%

# What is Performance-Based Ratemaking (PBR)?

- Not a new concept: It refers to any variation on traditional (price-based) regulation that aims to encourage, by the application of specific rewards or penalties, identified outcomes and behavior
  - Used extensively in telecom regulation
- New twist for gas and electric PBR: “Decoupling”
  - Breaking the link between profits and sales
  - GMP and VGS both operate under PBRs that decouple cost recovery of the network (wires and pipes) from sales of kWhs and therms

# Decoupling's Simple

- Prices are set the old-fashioned way: through a rate case
- But now the amount of revenues that the company will receive is fixed
  - The “revenue requirement” becomes the company’s “allowed revenue”
- Differences between actual revenues and allowed revenues are trued-up through periodic rate adjustments (monthly, quarterly, yearly)

# Revenue-Sales Decoupling

- Breaks the mathematical link between sales volumes and revenues
  - Makes revenue levels immune to changes in sales volumes
  - It enables recovery of the utility's costs, including return on investment, in a way that doesn't create perverse incentives for unwanted actions and outcomes
- Two objectives:
  - To protect the utility from the financial harm associated with least-cost actions and
  - To remove the utility's incentive to increase profits by increasing sales
- Preserves the utility's incentive to improve its operational efficiency
- This is a revenue issue, not a pricing issue: it is not intended to decouple customers bills from consumption
  - Customers continue to see the cost implications of their consumption decisions
  - Use more, pay more. Use less, pay less

# Conclusions

- Decoupling eliminates the key financial barrier to utility support for customer-sited resources
  - Stabilizes utility revenues
  - Reduces or eliminates a host of risks for both utility and customers
- Decoupling in Vermont has worked well
  - “Now we can focus on customer service instead of worrying about revenue levels.”

## About RAP

The Regulatory Assistance Project (RAP) is a global, non-profit team of experts that focuses on the long-term economic and environmental sustainability of the power and natural gas sectors. RAP has deep expertise in regulatory and market policies that:

- Promote economic efficiency
- Protect the environment
- Ensure system reliability
- Allocate system benefits fairly among all consumers

Learn more about RAP at [www.raonline.org](http://www.raonline.org)

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