RAP Energy solutions for a changing world

Energy Regulation in Vermont: Purpose, Means, Trends

House Committee on Energy and Technology
Montpelier, Vermont

Frederick Weston & Richard Cowart
Regulatory Assistance Project

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The Regulatory Assistance Project
50 State Street, Suite 3
Montpelier, VT 05602
Phone: 802-223-8199
www.raponline.org

Why do we focus on power?

- Electricity is the defining feature of a modern economy
- The industry is undergoing terrific change
  - Technological changes
  - Changing economics of energy, and
  - Urgent environmental challenges
- Some of this is absolute (technology, costs, consumer choices) and will happen regardless of policy
- Some of this seems imperative (address environmental issues, retain fairness) but is a policy choice
- To meet today's challenges we must: align the private interest with the public good, and balance regulation with market forces

Vermont Matters

- A state, even a little one, can make a difference
- Exports:
  - Computer chips, maple syrup
  - Efficiency and integrated resource planning
  - *Efficiency Vermont*
  - The Regional Greenhouse Gas Initiative
    - Allowance auctions and revenues "recycled" into clean energy investment
  - Leadership on energy, environment and climate policy

    (among other things)

WHAT HAPPENS IN
VERMONT
GOES GLOBAL!

Who is RAP?

- Non-profit, non-partisan NGO
- Former utility and environmental regulators, consumer advocates, industry officials, and policymakers
- Mission: To help governments develop policies that will ensure the long-term economic and environmental sustainability of the power, gas, and energy 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

Your Rappers today

- **Frederick Weston**: Directs RAP's program in China (last 9 Years). Was key Hearing Officer on economic and energy policy at VT PSB for 11 years, worked on energy policy with the Conservation Law Foundation, private sector work with AIG in the Middle-East, holds advanced degree from the Fletcher School of Law and Diplomacy.
- **Richard Cowart:** Directs RAP's 10-person team in Europe (last 7 years). Was VT PSB Chair for 12 years, Chair of the US regulators' Committee on Energy Resources and Environment, was a law professor, recently finished 3rd term as Chair of the Electricity Advisory Committee of the US DOE, serves on the Board of VEIC and the International Energy Agency's Executive Committee on Demand-Side Management.

What is a Utility and What is its Role?

- It operates under a franchise granted by the state
- Some are natural monopoly; all provide an essential service
- It has “an obligation to serve”
- It must provide service at posted prices, available to all who qualify for them
  - Undue discrimination is illegal
- 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

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
- Expert bodies
- Quasi-judicial, not merely tribunals for dispute resolution, but charged with "promoting the public good"
  - They can look forward, anticipate issues and directions, and clarify and, in so doing, minimize risk
  - They can open investigations on their own motion

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**

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

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

1-Minute Lesson in Traditional Ratemaking

- The basic formula for determining rates is simple

Price = Cost of Service / Sales

- But, in its details, it can be very complicated
- Utilities make money by (1) cutting costs and (2) increasing sales
  - The "throughput" incentive

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 review
  - Before or after?
- 1980s-90s: Integrated Resource Planning
  - 30 VSA §218c(a)(1)
- More recently – Performance-Based Regulation

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

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

Performance Based Regulation

All regulation is incentive regulation

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

How Do Utilities Make Money under Traditional Regulation?

- Under traditional regulation:

  Price = Cost of Service/sales

- But:

  Actual Revenues = Price * Quantity
  Where: Quantity = actual sales

- Which means that:

  Profit = **Actual** Revenues – **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"

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)

PSB – Institutional Aspects

- Origins in legislative attempts to regulate railroads, then Railroad Commission
- "Public good" mandate across various regulated utilities (energy, water, telco, other)
- Quasi-judicial body, 3 Members with 6-year terms, screened by the Judicial Nominating Board
- Can open investigations on its own motion
- Can proceed via rulemakings, contested cases, or via informal proceedings (workshops, stakeholder dialogues, etc.)

Department of Public Service-Roles

- Executive Branch Utility Policy
- Statewide Planning
  - And data analysis
- Public Advocacy
  - With staff experts and billback authority
- Consumer Affairs (answering the 800-line)
- State Energy Office (liaison to US DOE)
- Safety

DPS and PSB assumed current structure in 1981 – Why?

Governor Snelling instigated the change. He wanted:

- Accountability for state's positions in regulatory matters, as the state's top elected official
  - Rather than a special council attorney making the decisions on how to represent the state
- Bring together key utility functions for synergies post Oil Embargo
- PSB would remain independent

Evolution of the Vermont power mix

- Early days – hydro and Village systems
- Fossil fuels critical for growth (Moran)
- Nuclear arrives
- Canadian hydropower
- Energy Efficiency and Renewables
- Natural Gas
- “Resource of the Decade”

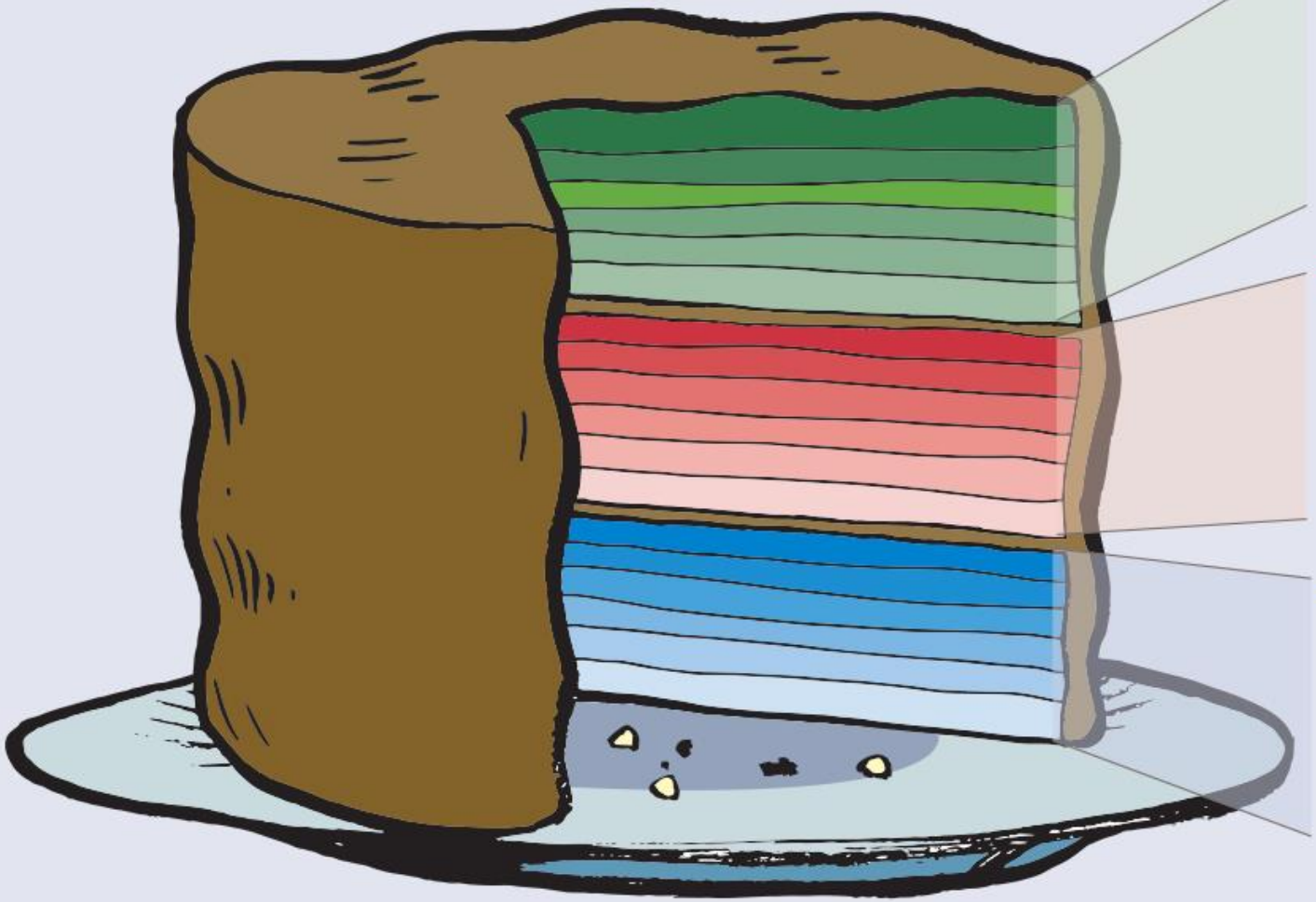
Integrated Resource Planning (IRP) and Efficiency (EE) as a Resource

- Docket 5270 opened 2/88; Order issued 4/90
  - Required all utilities to engage in IRP and to implement programs to acquire all cost-effective EE resources, as identified by the IRP
  - IRPs to be reviewed and approved by PSB
  - Prescribed ratemaking treatment for adverse financial impacts on utilities from EE
    - Potential rewards for superior performance
- Early to mid-1990s
  - Utility EE performance varied

End-Use Energy Efficiency: The "First Fuel"

- Three decades of analysis and implementation have confirmed that energy efficiency is the lowest cost, lowest risk resource
- Market barriers to efficiency:
  - Higher up-front capital costs
  - Information
  - High private discount rates (short payback periods)
  - The utility's "throughput" incentive
- Aligning private interest with public policy
  - How best to design and deliver EE programs?

A Layer Cake of Benefits from Investments in System Resources



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

IRP and EE in Industry Restructuring

1995-96: Restructuring debate

- Docket 5854: Report to Legislature
- Who should deliver EE in a restructured industry?
  - PSB concluded 3rd-party "energy efficiency utility"
    - Not government: political and budgetary entanglements
    - Not distribution utilities, given performance to date and the large number of small companies
    - 3rd party EEU: State-wide single purpose entity

Efficiency Vermont

- 1997-1999: Docket 5980
  - 2½-year investigation
  - Board order establishment of EVT in 9/99
- 2000: EVT established
  - Performance-based contract, since evolved into performance-based franchise
- Globally-significant model for delivering EE as a money-saving resource

Renewables in the Vermont Power Mix

- Historic hydro a significant part of the mix
- McNeil & Ryegate wood-chip generation
- PURPA and the independent power producers
  - Creative approaches by PSB and DPS
- Some utility hydro (Bolton Falls)
- Net metering and the growth of PV
- Searsburg – notable utility-built wind project
- Hydro-Québec
- Modern wind systems

The sweep of history

- Things change -- “resource of the decade”
- A Hydro and Fossil based power sector evolves to one dominated by natural gas regionally (49%)
- Nuclear power still important but declining (regionally)
- While wind and solar are growing exponentially, but remain a small fraction
- Economies of scale drove bigger plants for decades; this is now turning around
- And energy efficiency is lowering costs and minimizing supply risk

Net Metering

- Vermont among early adopters
- Simple for consumers to use
- Industry developed promptly
  - Exponential growth, energy fraction still small
- Innovation to include farms, and groups
- Utilities learning to plan for customer generation

ISO-New England: Paying for Reliability

- How does the region support reliability?
- Companies own supply resources
- Transmission links can improve reliability
- Demand side also supports reliability

History Lessons – Recurring Resource Battles

- Hydro and public power battles since the 1920s
- Churchill Falls vs. Vermont Yankee
- Seabrook, Millstone, and the era of nuclear cost overruns
- NYPA and the DPS role in power sales
- Hydro Quebec, HVDC line, and utility contracts

History Lessons (2)
Challenges of today's resource choices

- Searsburg and utility-scale wind
- PV and net metering
- Diversity as an issue – the challenge of too much gas-fired power
- ISO New England's transmission expansion process; socializing reliability

ISO-New England: Paying for Reliability

- What if the right answer to a reliability problem is an incremental dose of EE, DR, DG?
- FERC will not order ISO-NE to pay for the non-transmission solution(s)
  - Practice calls for cost of transmission solutions (not others) to be shared across all New England
- As a result, the region pays more for the line
- As this happens over and over, cost-effective solutions are bypassed for more costly and intrusive solutions

ISO-New England: Paying for Reliability

- Vermont policy on this is clear
- ISO-NE practice should be changed
- All substitutes should be eligible for ISO-NE tariff support, best set wins
- VELCO argues for this in ISO-NE governance
- More states would need to see how this raises costs for all and can be changed with consensus among states, which is lacking now

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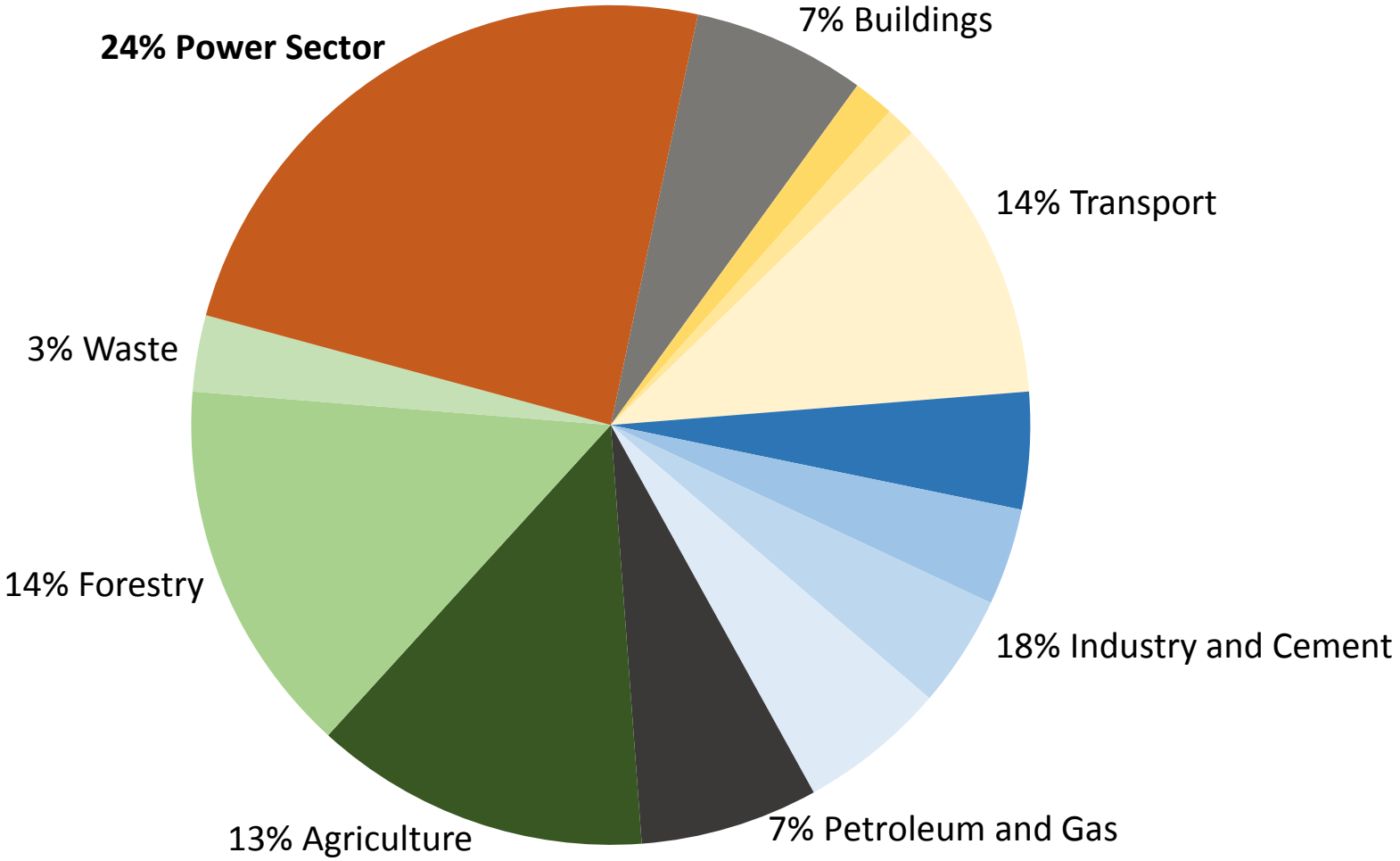
Climate Change and the Power Sector –

(1) The logic of carbon revenue recycling

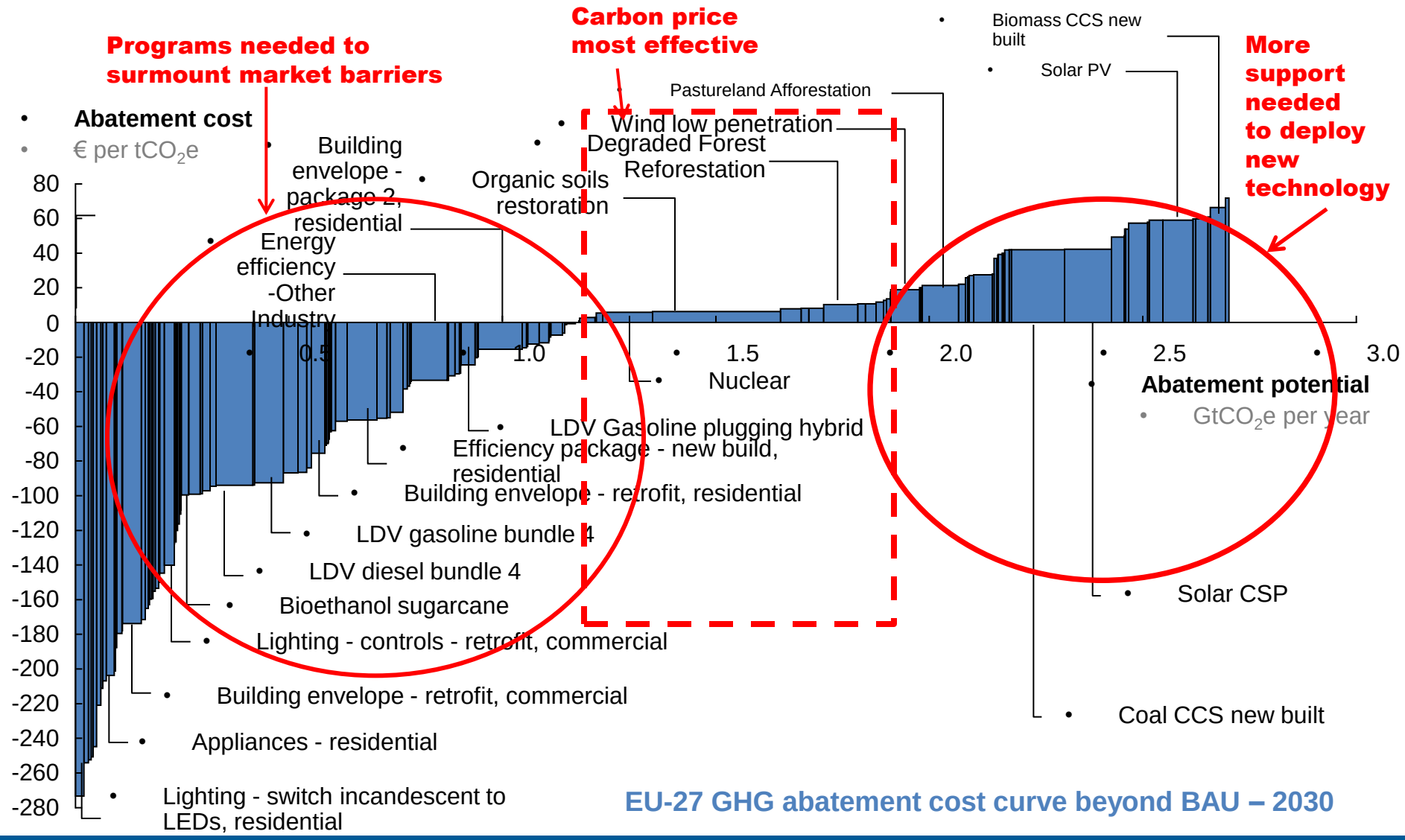
Daily Climate News -

Power Sector Contribution to Global GHG Emissions

51 Gt CO_2e in 2010



Carbon prices/taxes alone will deliver only a part of the abatement needed



EU-27 GHG abatement cost curve beyond BAU – 2030

Where do power sector reductions actually come from?

4 main possibilities:

- Reduce **consumption**
- **Re-dispatch** the existing fleet and/or
- **Shut down** high-carbon units
- Lower the emission profile of **new generation** (including repowering)

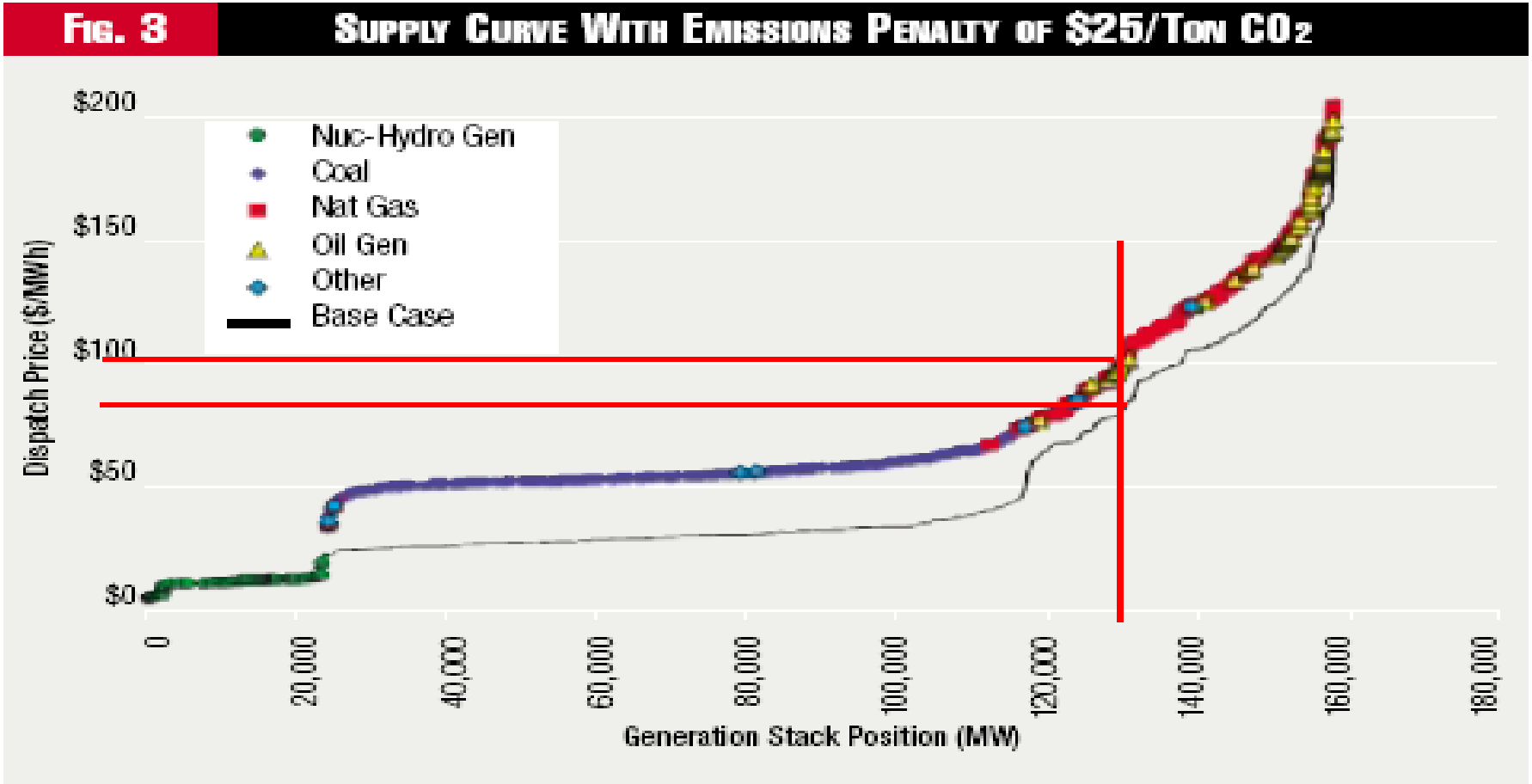
For each opportunity, ask:

1. How many tons will it avoid?
2. How much will it cost society *(or, cost consumers per ton)?*
3. What tools – including what kind of carbon caps -- get the best results on #1 & #2 ?

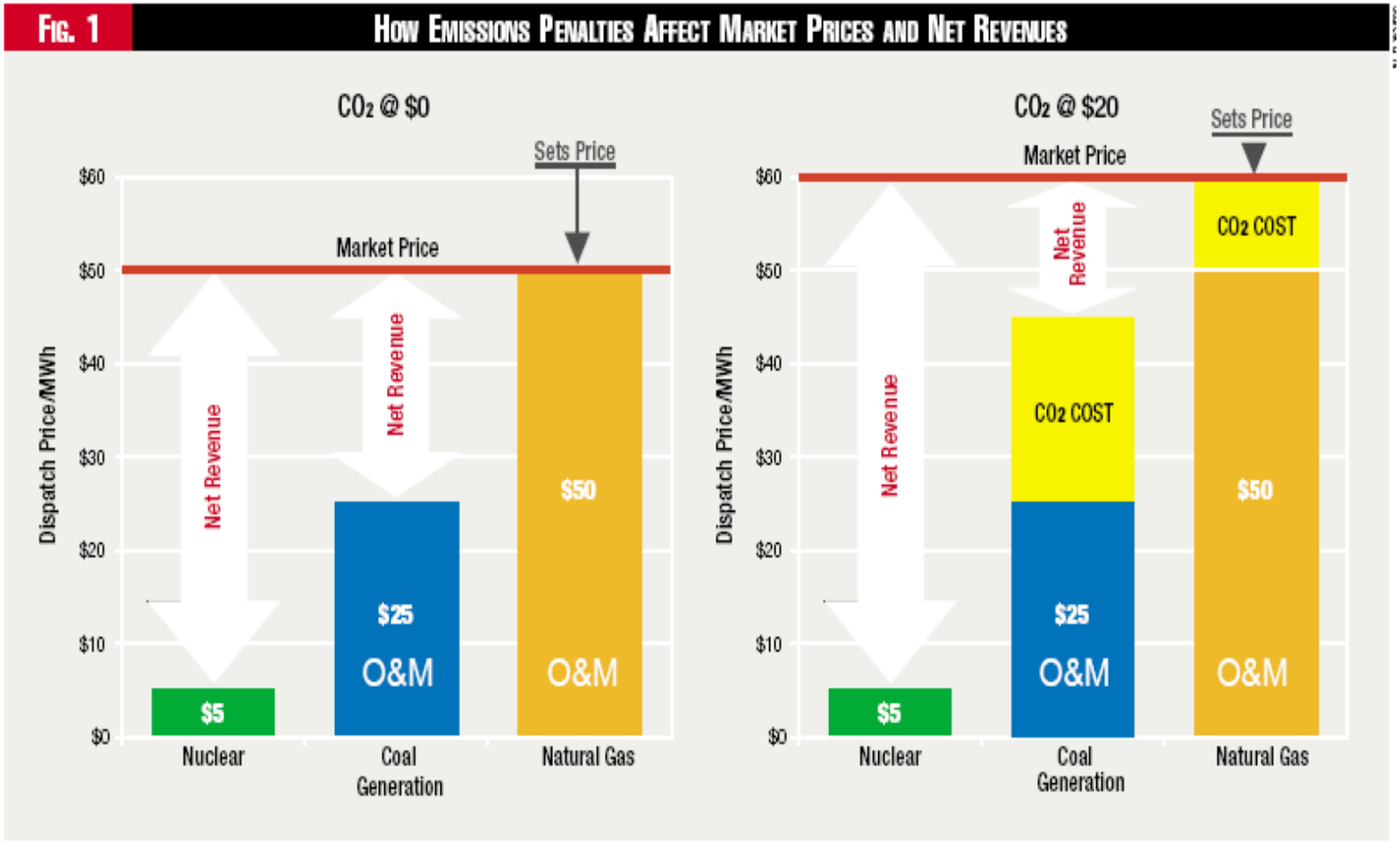
Challenge#1: It's hard to affect demand (enough) with carbon prices alone

- To decarbonise power while adding electric transport, BAU demand must be reduced by about 40% by 2050
- Demand for electricity is relatively ***inelastic***
- ***Long-term price-elasticity of demand*** *is about -0,2 to -0,3. (A +10% increase in price yields a 2% to 3% decrease in demand)*
- BUT: the ***income-elasticity of demand*** is positive (as incomes rise, so does demand)
- *What price increase would be needed to turn load growth negative in a Europe with rising incomes and modern economies?*

Challenge #2: Carbon prices to generators can increase wholesale power prices with little effect on dispatch or emissions



Carbon price Can Raise Prices without Changing Dispatch or Emissions
- Dispatch depends on 'gas Vs coal' price & CO2 €



Source: "The Change in Profit Climate" -- Public Utilities Fortnightly May 2007 --Victor Niemeyer, EPRI

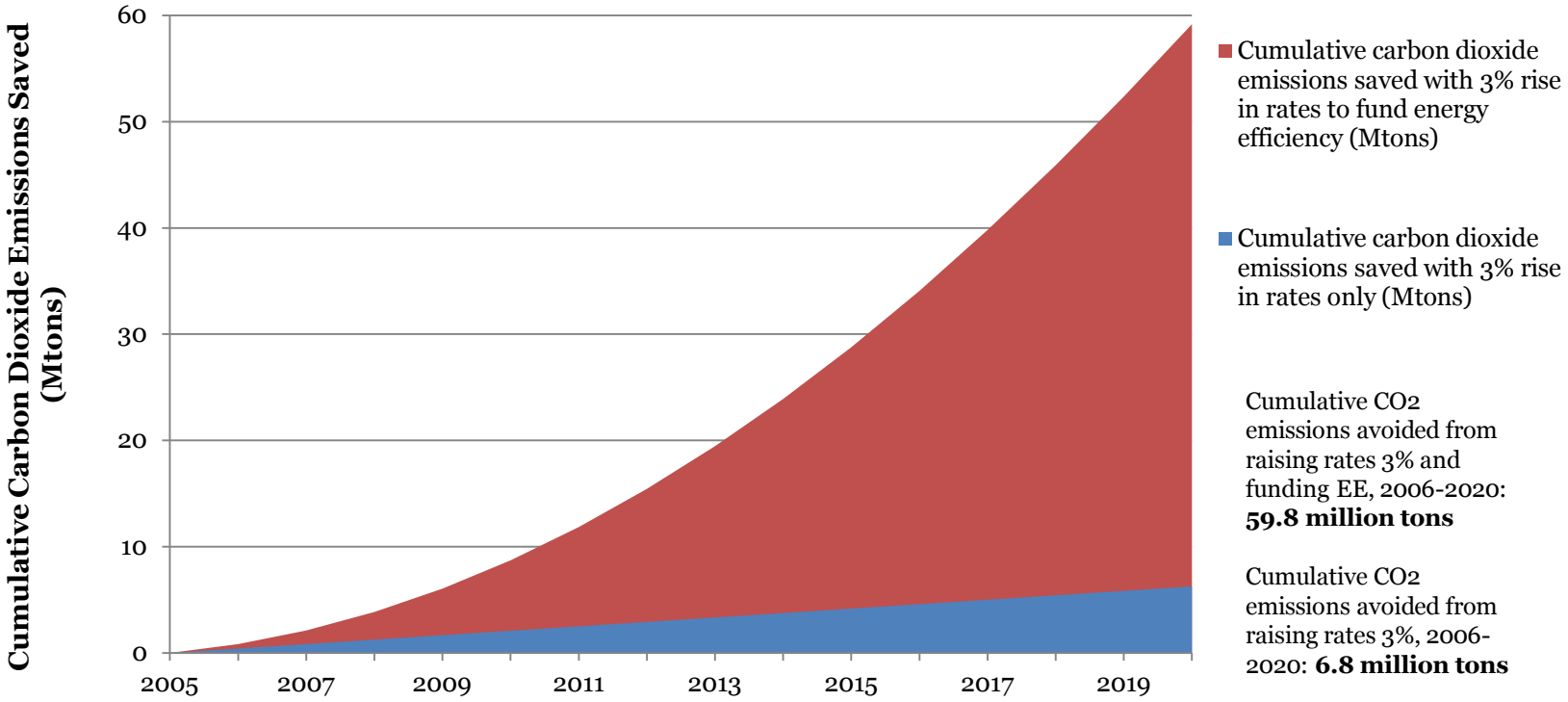
“High cost tons” in the US context

Study by PJM – the largest wholesale power market in the US

	Carbon @ $20	Carbon @ $40	Carbon @ $60
Power price increase per MWh	$15/MWh	$30/MWh	$45/MWh
Total consumer cost increase	$12 billion Per year	$24 billion per year	$36 billion per year
Number of tonnes reduced via redispatch	14 MT		
Consumer cost per tonne reduced	$850 /tonne	$348/tonne	$1440/tonne
Multiple of carbon price	>40 times	>8 times	

Efficiency Programmes Save 9x More Carbon Per Consumer GBP Than Carbon Taxes Or Prices

- **Cumulative CO_2 Emissions Saved by: Increasing Rates 3%; and Increasing Rates 3% to Fund Energy Efficiency (UK Example)**

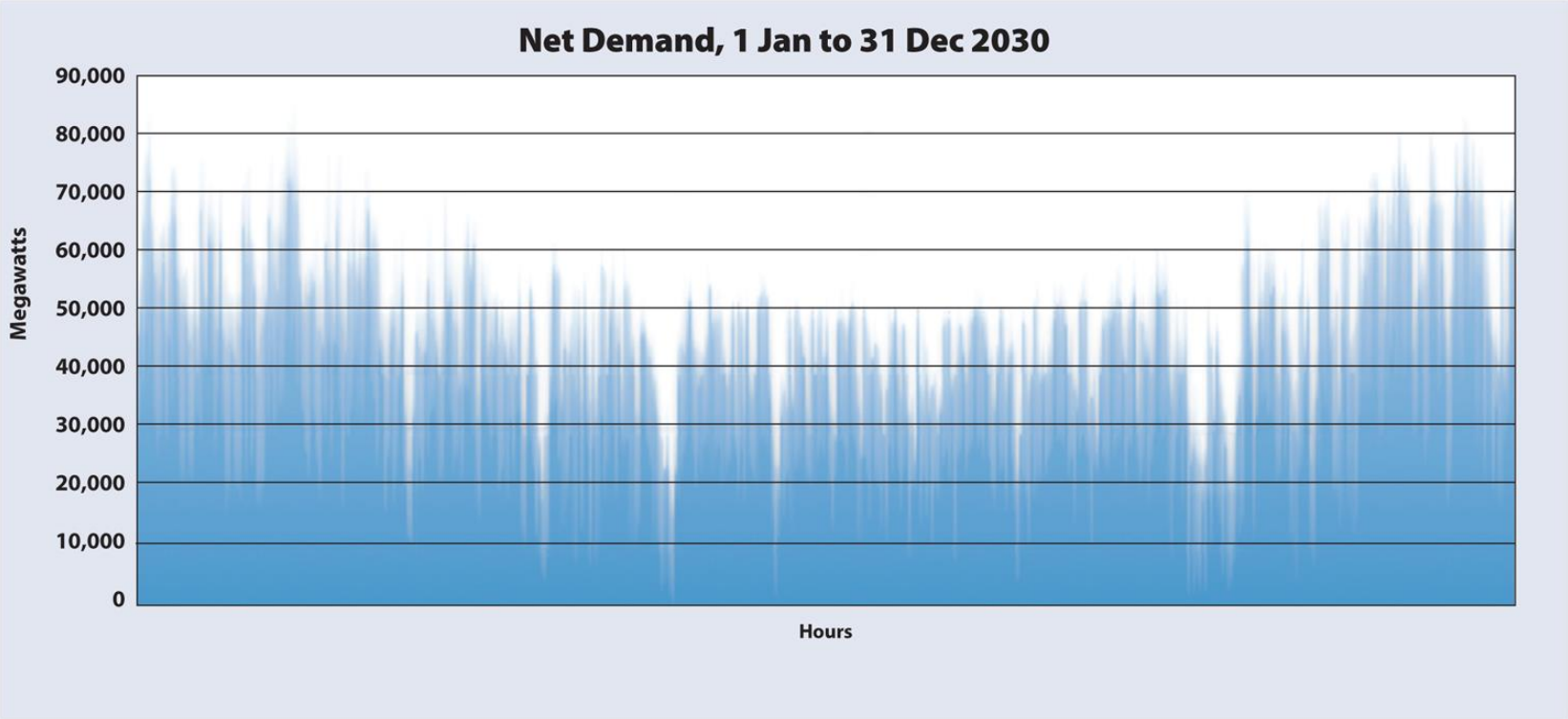


Carbon Revenue Recycling: Carbon revenues are a powerful tool to leverage carbon price

- Key idea: Sell allowances, invest carbon revenue in low-cost carbon reduction -- especially EE
- **Northeast US: 9 RGGI states** now dedicate >80% of allowance value to clean energy (~55% to EE)
- **Even with low (~$3/ton) CO_2 prices, RGGI has raised over $500 Million for EE programs – avoiding CO2 at a cost of (minus) $-73 per ton !**
- **So far: Adding $1.6 Billion to the regional economy, and supporting 16,000 new jobs**
- Political lesson: RGGI renewed 2013, cap lowered
- **Germany, France, Czech Republic** – have programs and/or plans to invest substantial carbon revenues in EE

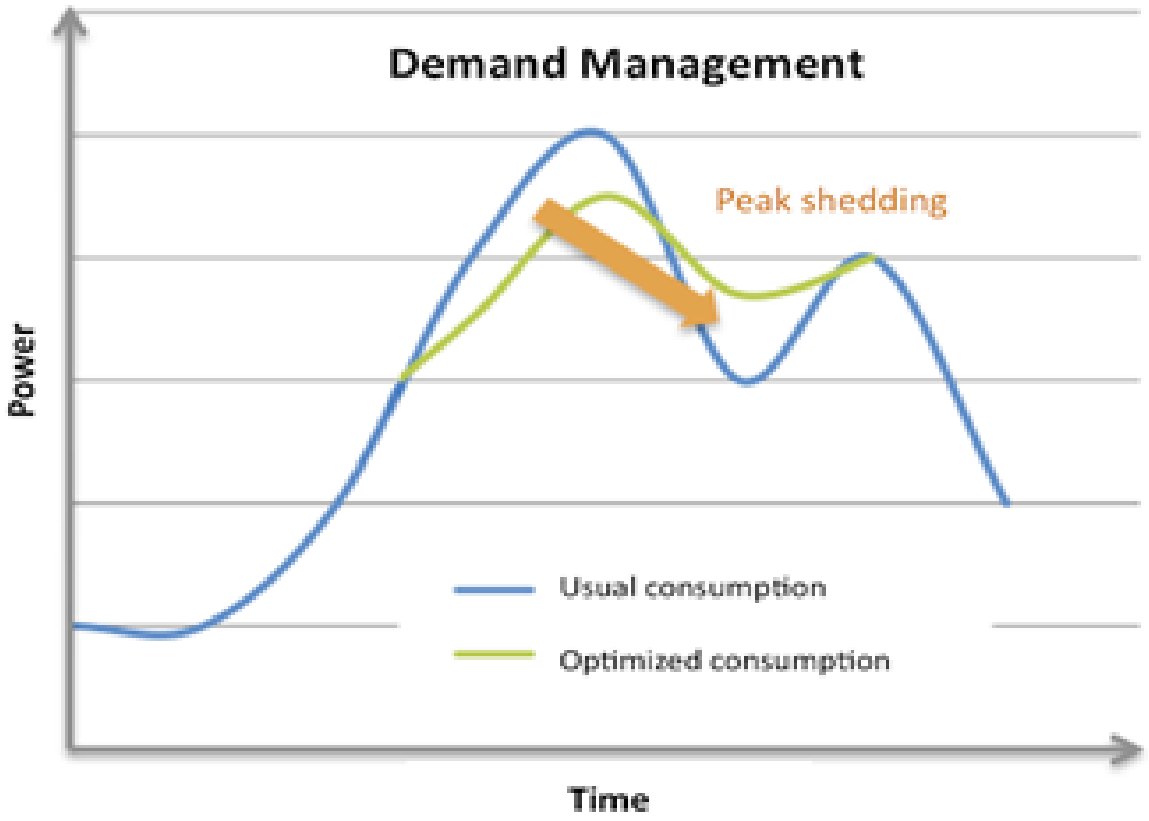
Climate change and the power sector (2): Integrating renewables

The Challenge of Renewables' Variability



Net demand = gross demand minus demand effectively served by low-marginal-cost, variable RES supply. <Southern UK 2030 w 28% PV & wind>

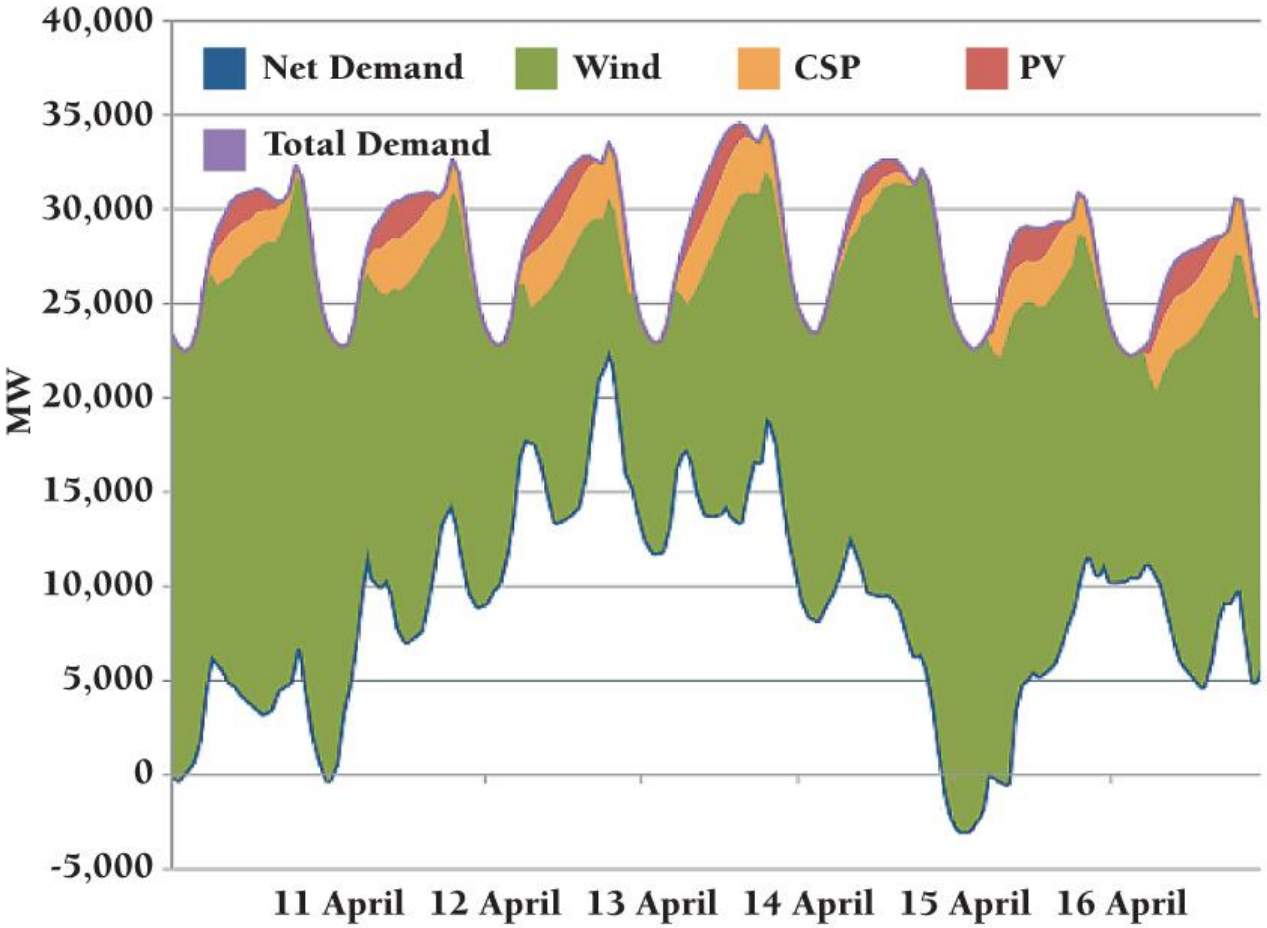
Traditional DR: Peak Shaving



Source: www.ijenko.com

Challenge #3: Variable Renewable Power -- Net demand is more volatile than overall demand, and lacks a repeatable daily pattern.

A challenging week for West Connect, USA, assuming 35% wind penetration

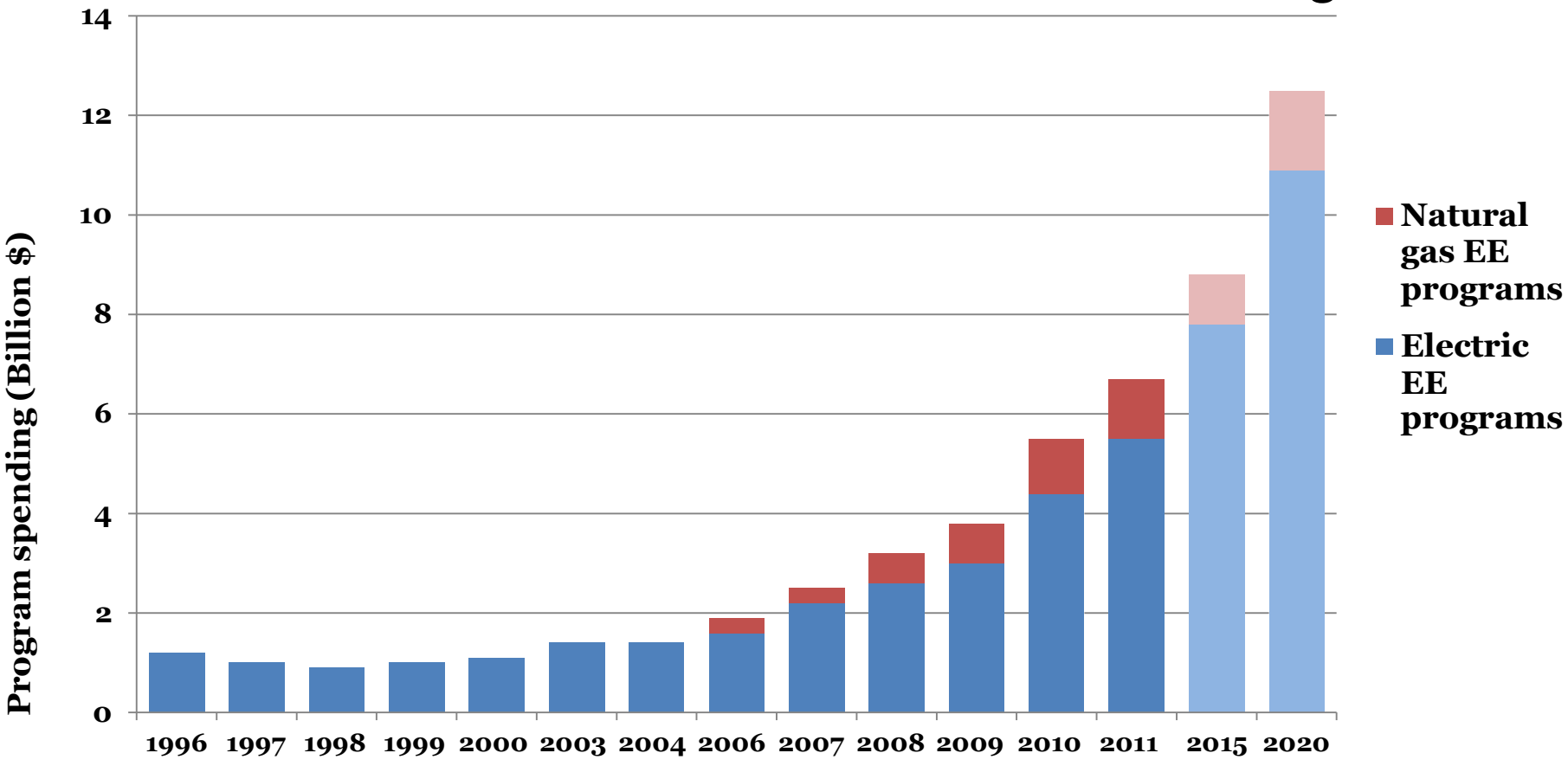


“If a problem cannot be solved, enlarge it”
-- Dwight Eisenhower

Finale: Recent Legislative Milestones

- Balance between legislative policy-making and inappropriate detailed interventions
- Some leading modern examples:
  - Least-cost utility planning
  - All-fuels charge and weatherization
  - Decision not to adopt retail competition
  - Creation of the Efficiency Utility
  - SPEED and Net Metering
  - Alternative regulation
  - RGGI and “carbon revenue recycling”

U.S. Utility EE Program Spending Now Over $7 Billion/Year and Still Growing



Note: 1993 - 2008 represents spending; 2009 represents spending among CEE members reporting to CEE; 2010 and 2011 represent budgets of CEE members reporting to CEE; 2015 and 2020 represent LBNL "high case" projections

Sources: ACEEE, The 2010 State Energy Efficiency Scorecard, October 2010; CEE, *State of the Efficiency Program Industry*, December 10, 2010, and March 14, 2012; LBNL, *The Shifting Landscape of Ratepayer-Funded Energy Efficiency in the U.S.* , 2009.

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.raponline.org

rweston@raponline.org

The Regulatory Assistance Project
Beijing, China • Berlin, Germany • Brussels, Belgium • **Montpelier, Vermont USA** • New Delhi, India
50 State Street, Suite 3 • Montpelier, VT 05602 • *phone:* +1 802-223-8199 • *fax:* +1 802-223-8172
www.raponline.org