



RAP

Energy solutions
for a changing world

Valuing the Environmental Benefits of Energy Efficiency

Capturing the Multiple Benefits of Energy Efficiency
Experts Roundtable on Energy Provider and Consumer Benefits
Ottawa, Ontario – October 15-16, 2013

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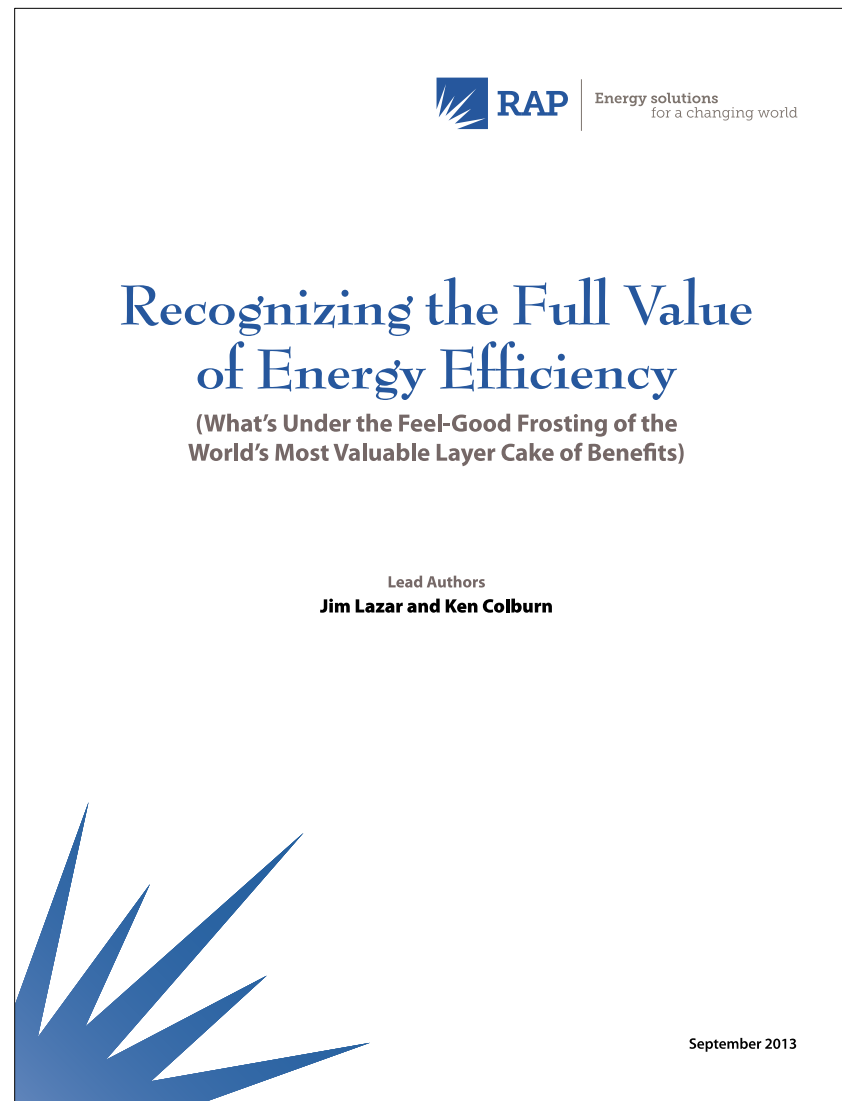
Introduction



- The Regulatory Assistance Project (RAP) is a global, non-profit team of energy experts, mostly veteran regulators, advising current regulators on the long-term economic and environmental sustainability of the power and natural gas sectors. (www.raponline.org)
- Ken Colburn is a Senior Associate at RAP; his experience as an air quality regulator came as Air Director for the US state of New Hampshire and as Executive Director of NESCAUM, an 8-state air quality group.
- Must recognize Jim Lazar's leadership of this work at RAP

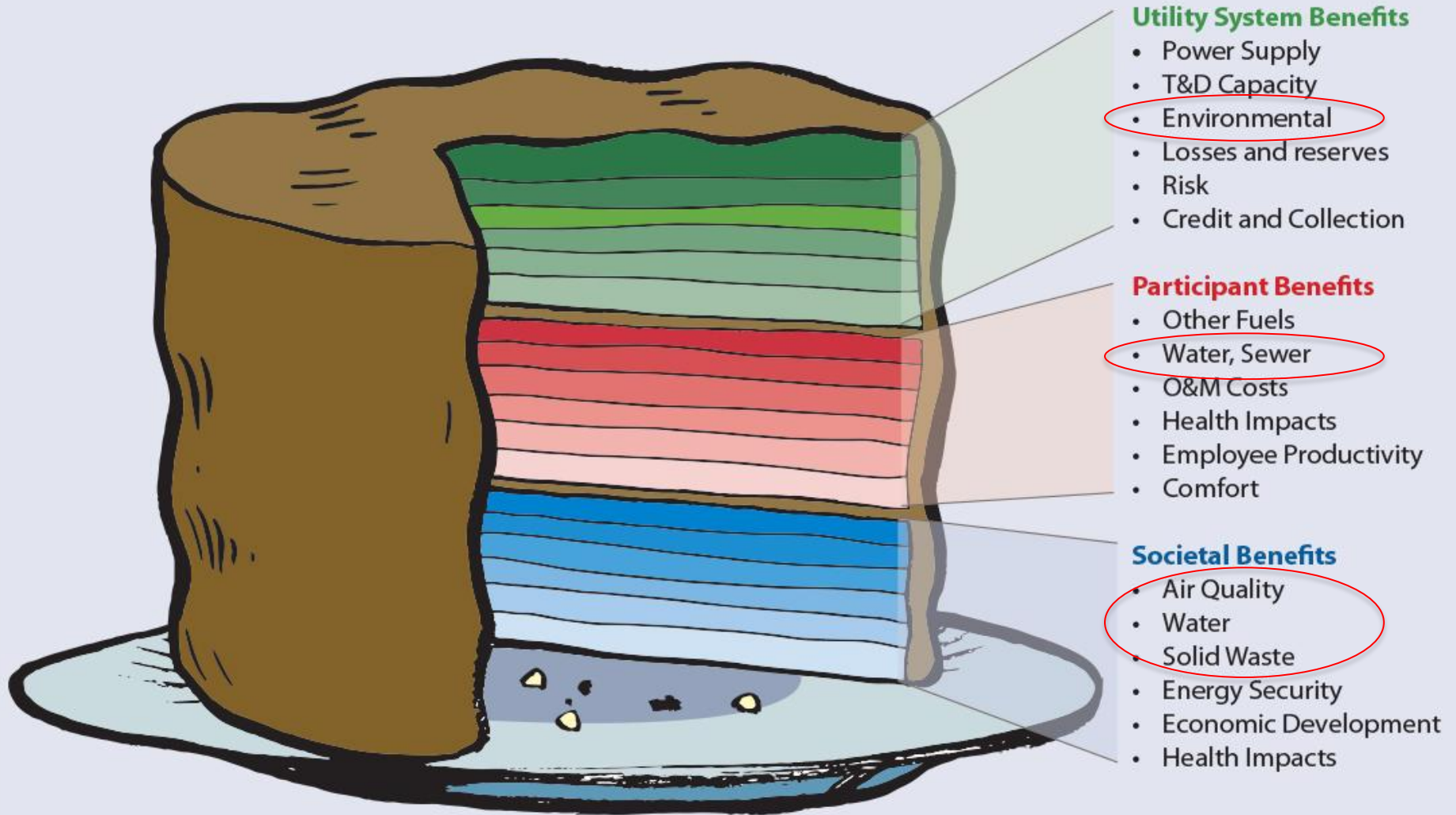
New RAP Paper on EE Benefits

- Main context: Using cost-effectiveness tests in the US
- Seeks to provide comprehensive listing, advice
- Includes detailed coverage of environmental benefits of energy efficiency (EE)



www.raponline.org/document/download/id/6739

A "Layer Cake" of Benefits from Electric Energy Efficiency



Utility System Benefits: Environmental Costs (1)

- Environmental requirements on electric generating units (EGUs) are mandated under several federal statutes:
 - Clean Air Act (CAA)
 - Clean Water Act (CWA)
 - Resource Conservation and Recovery Act (RCRA)
 - Others
- Impose both immediate *and future* compliance costs:
 - Capital costs and fixed O&M costs for controls and monitoring
 - Variable O&M costs associated with equipment & activities
 - Allowance costs where a “cap-and-trade” program exists;
 - Permit fees
 - Emission fees
 - Other fees

Utility System Benefits: Environmental Costs (2)

- Existing control costs are included in utility prices, and **more** will be over time:
 - Pollution control costs will increasingly be internalized as new environmental regulations are adopted
 - Costs that are currently “externalized” – health and other damage costs of emissions -- should decline
- EE reduces the need to generate electricity, reducing air emissions, water discharges, and solid waste from EGUs
 - Reducing emissions may reduce environmental compliance costs for EGUs
- Monetizing avoided compliance costs and air quality benefits of EE can be challenging, but doable

Future Environmental Costs?

More Over Time?

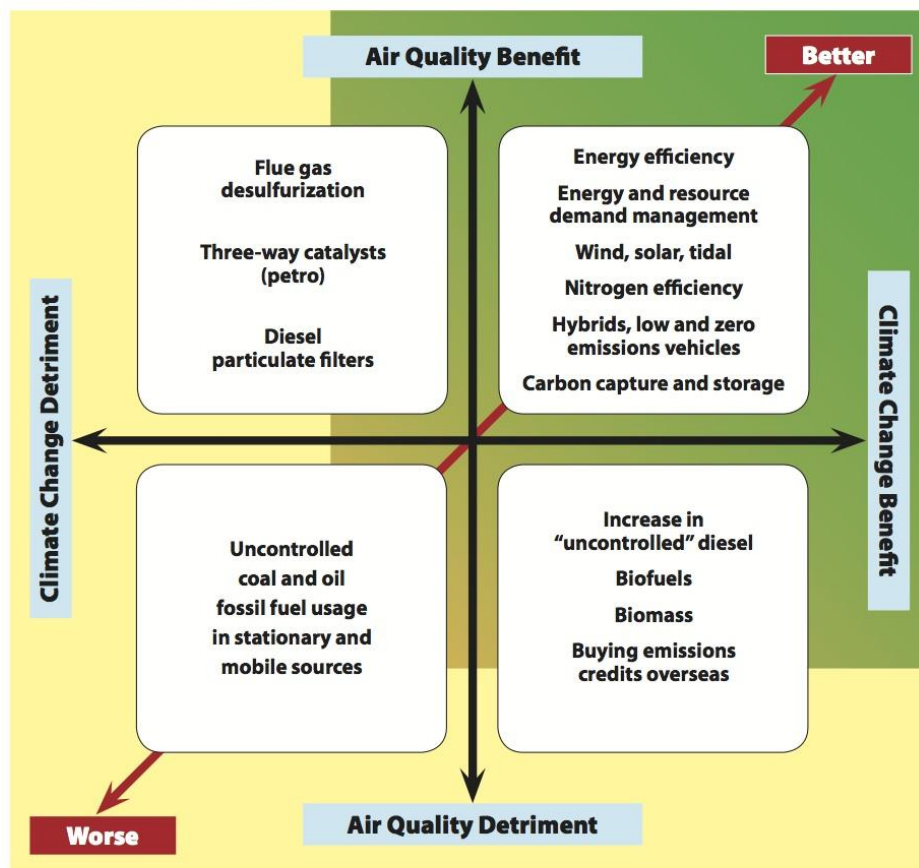
- Mercury & Air Toxics Standards (MATS)
- Transported pollution: “Son of CSAPR”?
- CWA 316(b) cooling water standards
- RCRA coal combustion residuals (CCR)
- CAA §111: Control of greenhouse gas (GHG) emissions
- New and forthcoming NAAQS revisions

EPA's Ozone/PM "Advance" Programs



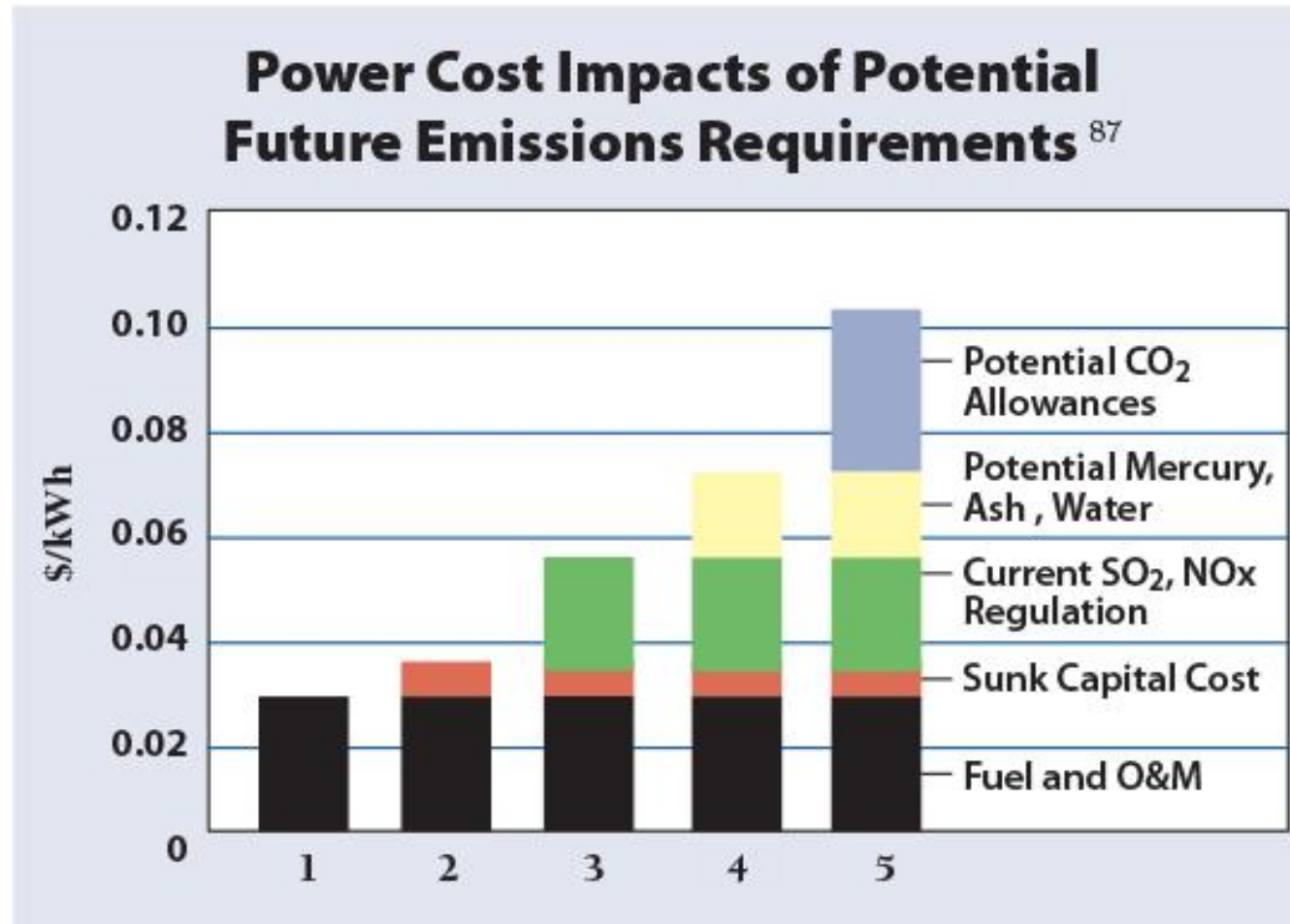
Air Quality and Climate Change Policies May Have Trade-Offs and Co-Benefits

Air Quality and Climate Change Trade-Offs and “Co-Benefits”



Utility System Benefits: Environmental Costs (3)

Some regulators consider only existing emission costs, not prospective emission costs for power plants.



Societal Benefits:

Valuing Emissions Reductions (1)

- Damage costs are larger than mitigation costs; why typically ignored?

Illustrative Mitigation and Damage Costs

Emission Type	Mitigation Cost	Damage Cost
Mercury – lb.	\$33,000	\$181,500
PM2.5 – ton	\$13,000	\$60,000
CO2 – ton	\$5	\$80

Societal Benefits:

Valuing Emissions Reductions (2)

- Using weighted average may be appropriate

Table 7

Probability-Weighting of Prospective Emission Regulations

(Note: All values are strictly illustrative.)

Emission Type	Probability of Regulation	Mitigation Cost	Damage Cost	Probability Weighted PAC/TRC Cost	Probability Weighted Societal Cost
Mercury-Lb	75%	\$33,000	\$181,500	\$24,750	\$70,125
PM _{2.5} -Ton	50%	\$13,000	\$60,000	\$6,500	\$36,500
CO ₂ -Ton	25%	\$8	\$80	\$2	\$62

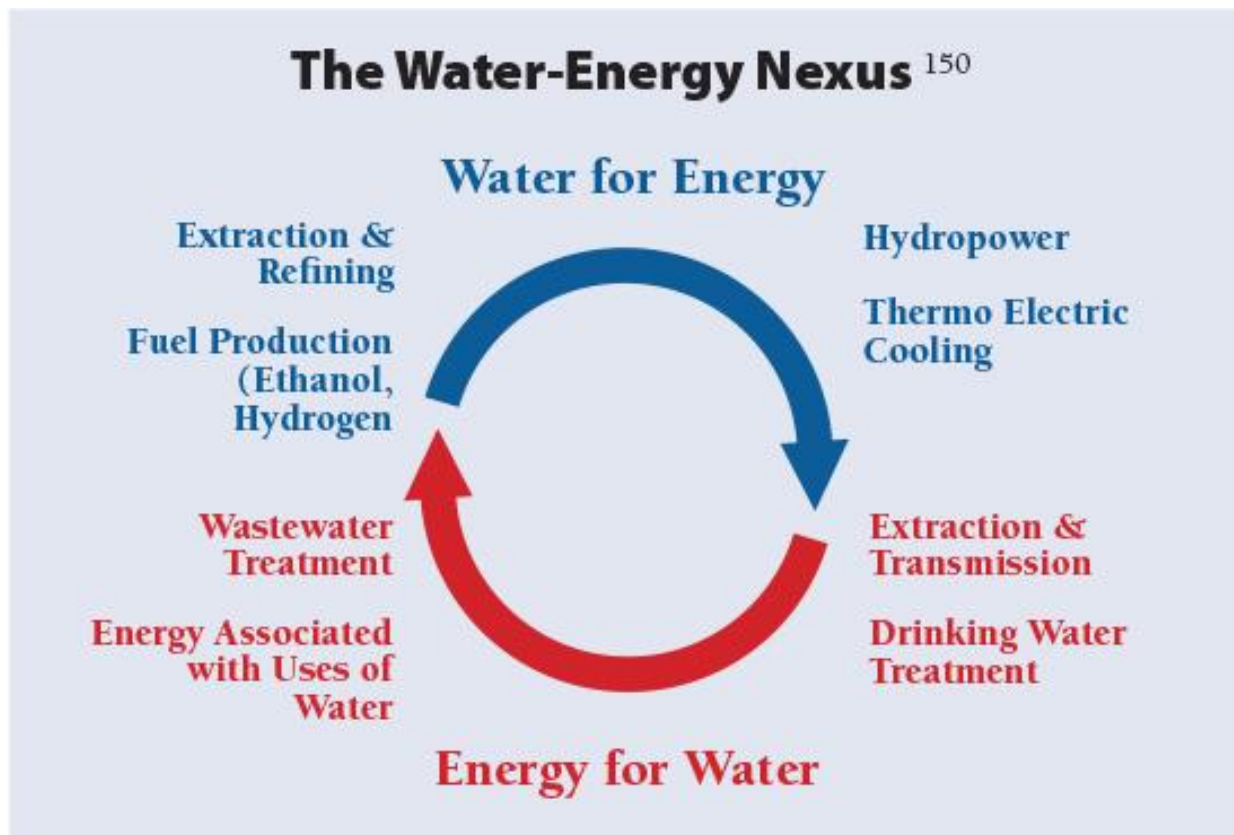
Societal Benefits: Water

Water–Energy Connection is Critical

Power production is the second-largest water user (after irrigation);

Water treatment and pumping, and wastewater treatment are huge users of electricity;

Anything that saves water OR electricity saves both water and electricity.



There Can Also Be a “2-Way Street”: CO₂=>EE=>Benefits



\$1.6 billion in growth.

The 10-state RGGI regional economy gains more than \$1.6 billion in economic value.



\$912 million in allowance proceeds.

Power plant owners have spent roughly \$912 million from mid-2008 through September 2011 to buy allowances from states. Proceeds are disbursed to states and spent on different projects.



\$1.3 billion in energy savings to consumers.

Customers save nearly \$1.1 billion on electricity bills, and an additional \$174 million on natural gas and heating oil bills. Over time, customers will save nearly \$1.3 billion.



Power plant owners lose revenue.

Power plant owners experience \$1.6 billion in lower net revenue over time from reduced demand, although overall had higher net revenues during the 2009-2011 period.



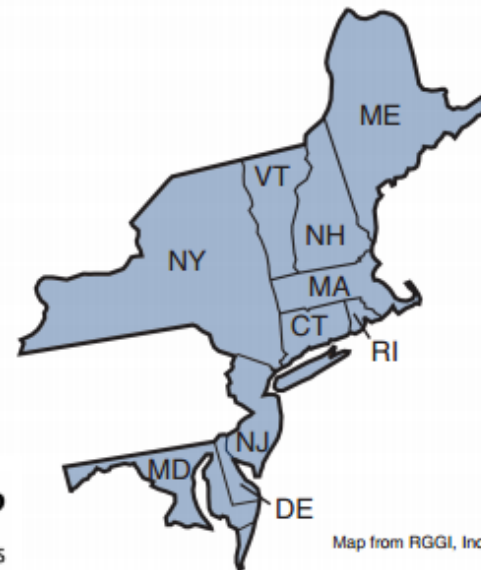
Reduced fossil fuel use keeps more money local.

Reduced demand for fossil fuels keeps more than \$765 million in the local economy.



More than 16,000 net jobs are created.

Based on economic savings and investments, 16,000 net jobs are created regionwide.



Map from RGGI, Inc.



ANALYSIS GROUP
ECONOMIC, FINANCIAL and STRATEGY CONSULTANTS

Another EE Benefit: Displacement of RPS Obligation

- EE reduces total load, thus reduces renewable energy required to satisfy a typical RPS.
- In some states, EE can also be used to satisfy the RPS directly.
- Value may reflect a “premium cost” resource, not just a system “avoided cost” one
 - If so, base value on the cost of a renewable resource (or a renewable energy certificate (REC) where used)



A Framework for Valuing Benefits

- **Identify** all benefits
- **Quantify** those that are quantifiable
- **Measures** that pass TRC always go forward
- **Vendors and manufacturers** have duty to justify difficult-to-quantify (DTQ) benefit values
- **Use Judgment**: regulators can establish default values for DTQ benefits (*“Zero is the wrong value”*)
- **Find funding partners** where cost-effectiveness depends on non-electricity benefits
- **Programs** must ultimately be cost-effective

Related RAP Publications

- **Energy Efficiency Cost-Effectiveness Screening** (2012)
www.raponline.org/document/download/id/6149
- **US Experience with Efficiency As a Transmission and Distribution System Resource**, (2012)
www.raponline.org/document/download/id/4765
- **Valuing the Contribution of Energy Efficiency to Avoided Marginal Line Losses and Reserves** (2011)
www.raponline.org/document/download/id/4537
- **Preparing for EPA Regulations** (2011)
www.raponline.org/document/download/id/919
- **Incorporating Environmental Costs in Electric Rates** (2011)
www.raponline.org/document/download/id/4670
- **Clean First: Aligning Power Sector Regulation With Environmental and Climate Goals** www.raponline.org/document/download/id/12
- **Integrating Energy and Environmental Policy** (2013)
www.raponline.org/document/download/id/6352

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

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