



Energy and Environmental Economics, Inc.

Adaptation of Cost-effectiveness Tests to Meet Policy Goals such as Greenhouse Gases

**ACEEE
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Priority of the Problems Ramping up EE

#1: Budget!

There is much more cost-effective energy efficiency to do, but we haven't allocated the budget.

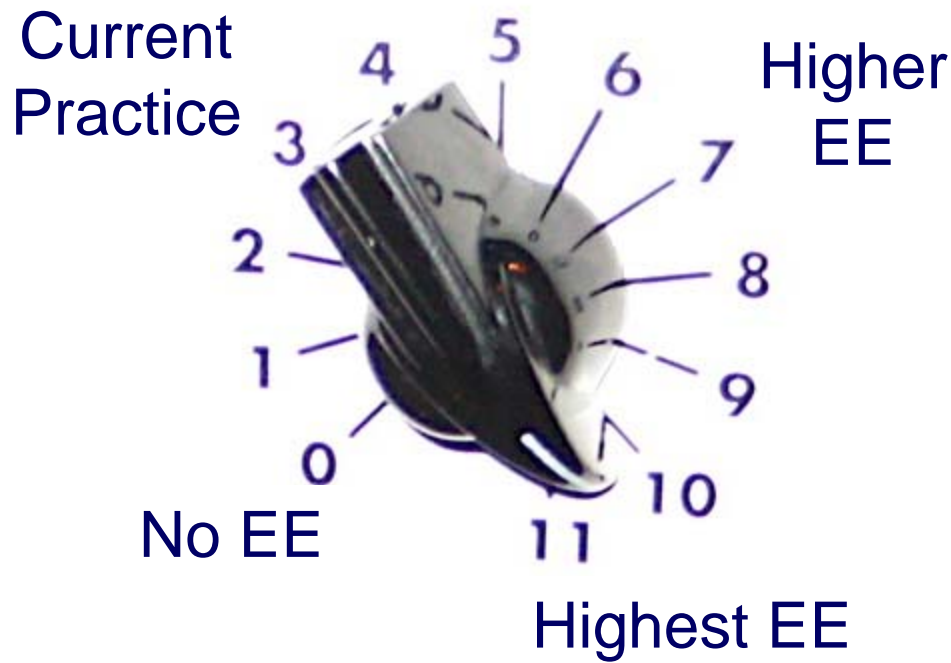
#2: Cost-effectiveness Measurement

Energy efficiency cost-effective measurement is not necessarily consistent with our emerging GHG and other policies.

Why it makes sense to modify existing cost-effectiveness framework

Incrementally Change
How TRC is Applied

Replace TRC with
A New Test





Why are incremental changes better?

- If we consider that...
 - GHG policy action will occur at many levels including federal, state, and local
 - Each entity has a different ability politically to increase energy efficiency and maintain a broad coalition of support
- ... then we need
 - A cost-effectiveness framework that can be increased along the spectrum from low to high



'Levers' to Tilt C/E Towards More EE

- TRC, PAC, RIM test modifications
 - Portfolio objective function change
 - Point of C/E measurement change
 - Include forecast of future market CO2 costs
 - Avoided supply plan including planned low carbon resources
- Societal cost test modifications
 - Recast as 'climate change test'?
 - Intergenerational discount rate / realistic EULs
 - Long-term CO2 price
 - Other non-energy benefits

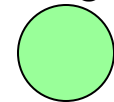
Comparison of Objective Function

Action Plan Goal: “All cost-effective energy efficiency”

■ Current Practice

- Maximize cost-effectiveness of available energy efficiency budget

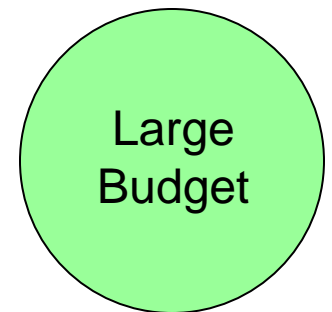
Small
Budget



■ New Practice

- Maximize savings of energy efficiency subject to portfolio cost-effectiveness

Large
Budget



Include the Value of CO2

- It is likely that there will be a federal system to price CO2 emissions in the electricity sector over the course of the measures we install today
- Simple calculation of impact

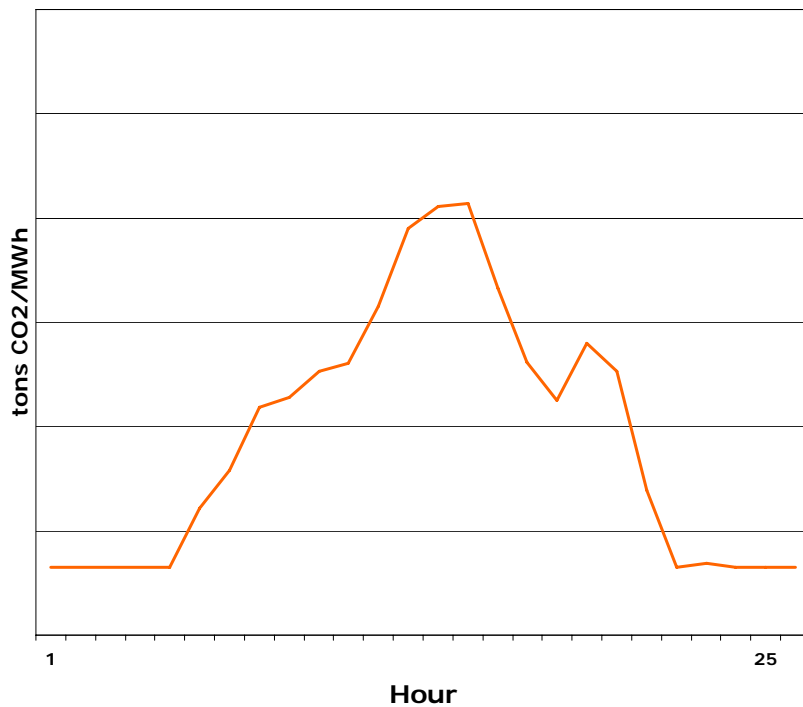
Incremental Avoided Cost of Conventional Generation (\$/kWh)							
		Marginal Emissions Source and Rate (Tonnes/MWh)					
		Natural Gas CCGT 0.4		Natural Gas CT 0.63		Coal with Steam Turbine 0.91	
CO2 Cost \$/tonne	\$ 10.00	\$	0.004	\$	0.006	\$	0.009
	\$ 20.00	\$	0.008	\$	0.013	\$	0.018
	\$ 30.00	\$	0.012	\$	0.019	\$	0.027
	\$ 50.00	\$	0.020	\$	0.032	\$	0.046
	\$ 100.00	\$	0.040	\$	0.063	\$	0.091
	\$ 150.00	\$	0.060	\$	0.095	\$	0.137
	\$ 200.00	\$	0.080	\$	0.126	\$	0.182

At \$30/tonne CO2, natural gas combined cycle costs increase about \$0.012/kWh and coal \$0.027/kWh

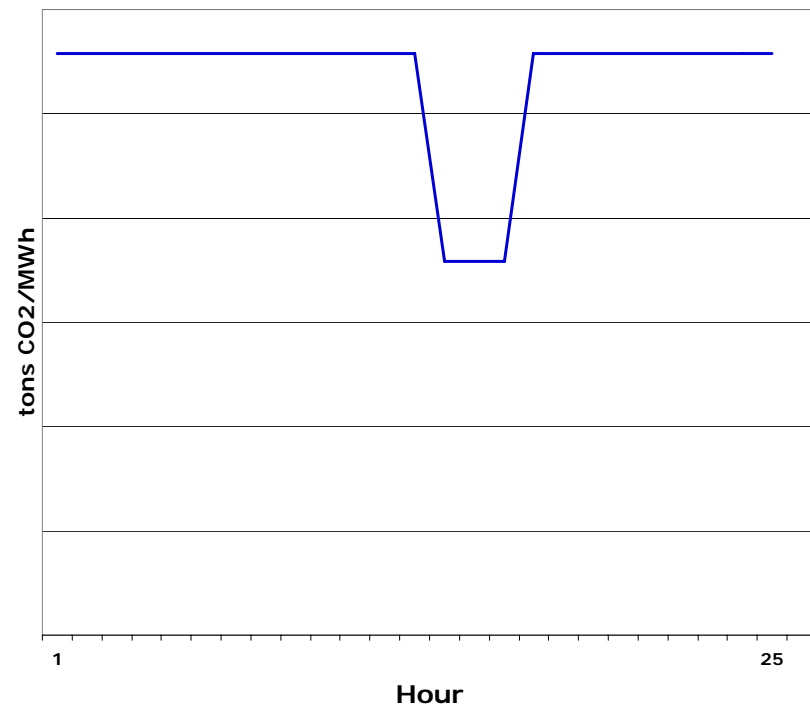
GHG Emissions Savings from EE

- Carbon savings profile can vary significantly

California Marginal CO2 Emission Rate

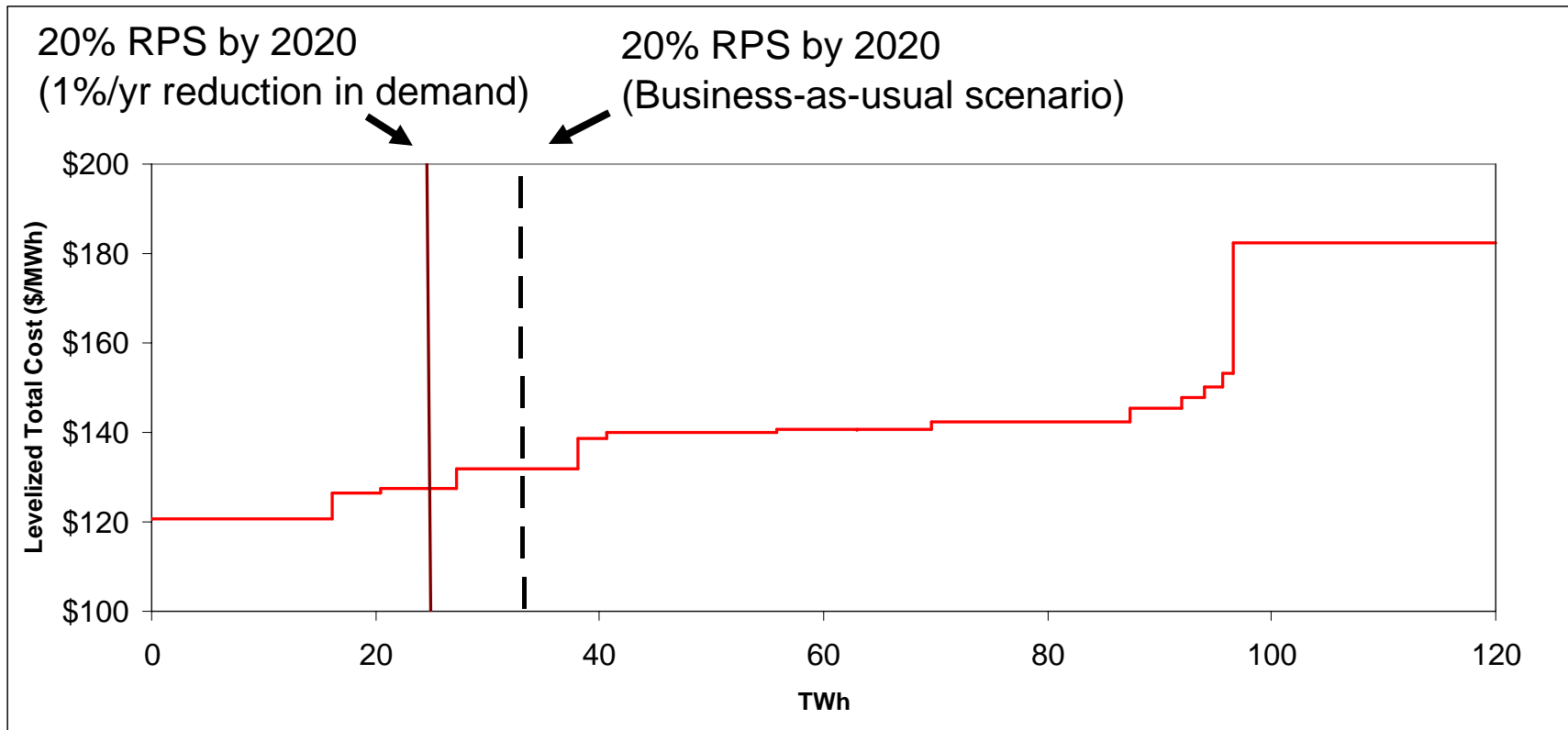


Wisconsin Marginal CO2 Emission Rate



Including RPS in Avoided Cost

California Example Assuming a 20% RPS Target



- Reducing demand 1%/yr saves 9 TWh of RPS generation @ \$0.123/kWh
 - Results in ~\$8.03/MWh higher avoided cost if included

$$\text{Change in avoided cost} = (\$124/\text{MWh} - \$82.75/\text{MWh}) * 20\%$$



How to go to the highest level?

1. Redefine the societal cost test
 - Keep other tests in place to measure cost-effectiveness from other perspectives and link to utility and societal monetized cost
2. Use new test to set EE budget based on 'all cost-effective energy efficiency'
3. Turn all levers we discussed on the TRC
 - Change objective function
 - Include avoided costs of displaced zero carbon generation
 - Measure C/E at the portfolio level and encourage transformation
4. Use long-run projection of CO2 value
 - CO2 exists in the atmosphere on the order of 100 years. Therefore, we should value emissions savings now at the cost it will take to displace CO2 in the long-run.
 - Estimates in the \$200/tonne range
5. Use a zero discount rate
 - Essentially, we value resources for our children the same as we value our own
 - Encourages investments with a long time frame

Does not require inclusion of 'damage' from climate change, nor benefits that are highly uncertain such as increased well-being

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