

December 5, 2019

Value Added: Measuring the Health Benefits of Energy Efficiency and Renewables

RAP Webinar

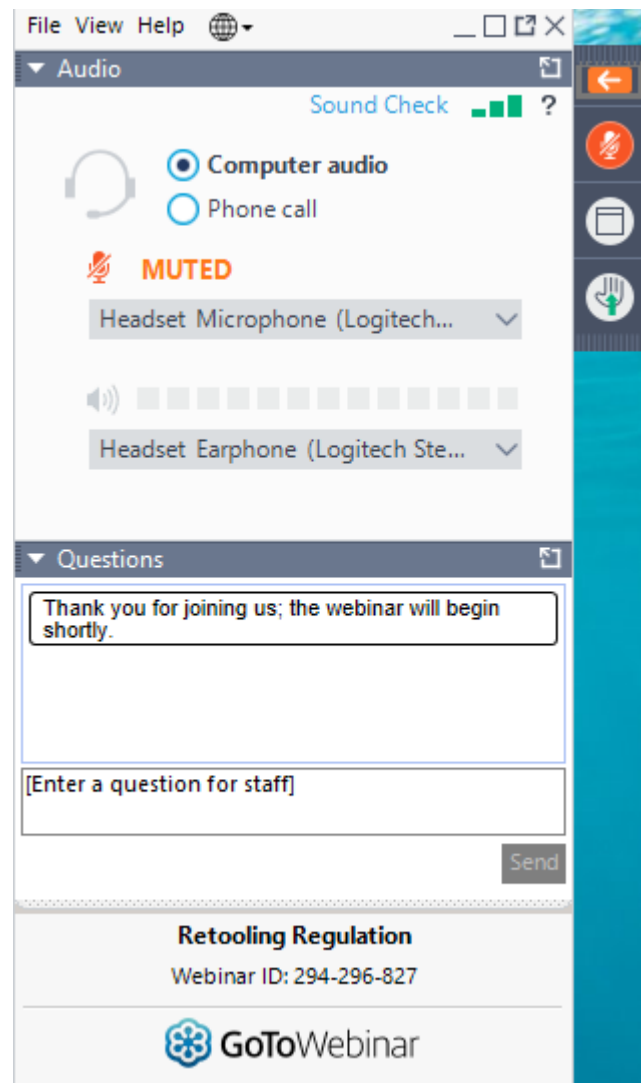
Emma Zinsmeister
Senior Community Programs Specialist
U.S. Environmental Protection Agency

Nancy Seidman
Senior Advisor
Regulatory Assistance Project

Jim Lazar
Senior Advisor
Regulatory Assistance Project

Questions?

Please send questions
through the Questions
pane





EPA Report: Benefits per Kilowatt Hour



Our Experts



Emma Zinsmeister



Nancy Seidman



Jim Lazar



Estimating the Monetary Value of Outdoor Air Quality Health Benefits from Energy Efficiency and Renewable Energy



Emma Zinsmeister, MPH CPH
RAP Webinar
December 5, 2019



EPA's State and Local Energy and Environment Program



EPA's new health benefits per kilowatt-hour (BPK) values



Use to quickly estimate the monetary value of health benefits from reductions in fine particulate matter ($PM_{2.5}$) due to energy efficiency (EE) and renewable energy (RE)

- ✓ Free
- ✓ Easy to use
- ✓ Peer-reviewed

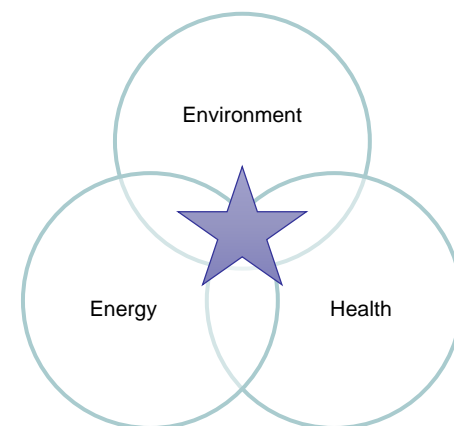
BPK values (¢/kWh) are available for:

- ✓ 10 regions of the United States
- ✓ Solar, wind, uniform and peak EE

Technical report provides details on methodology and appropriate uses

Efficiency and renewables provide air quality and health benefits

- **EE and RE deliver health and environmental benefits** by avoiding fossil-fired power plant emissions, which improves air quality and enhances public health
- State and local governments, and others are increasingly looking to quantify and document the **air quality and health benefits** of EE and RE, driven by:
 - **Policymaker and planner** interests in addressing local air quality and health concerns
 - **Energy regulators** seeking comprehensive assessments of costs and benefits of energy choices
 - **Green banking and EE/RE industries** looking to demonstrate public health benefits of investments



Air pollution is the 8th leading risk factor for mortality, accounting for almost 4% of deaths (107,500) in the United States in 2017 alone*

Health outcomes associated with PM_{2.5} assessed and monetized in BPK values:

Adult Mortality

Infant Mortality

Non-fatal Heart Attacks

Respiratory & Cardiovascular Hospital Admissions

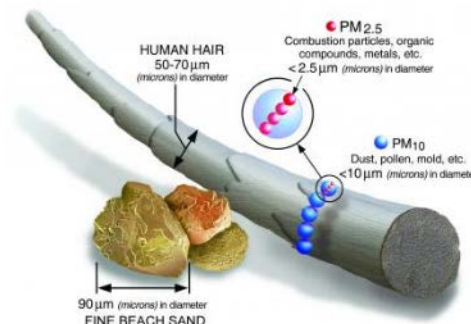
Acute Bronchitis

Upper & Lower Respiratory Symptoms

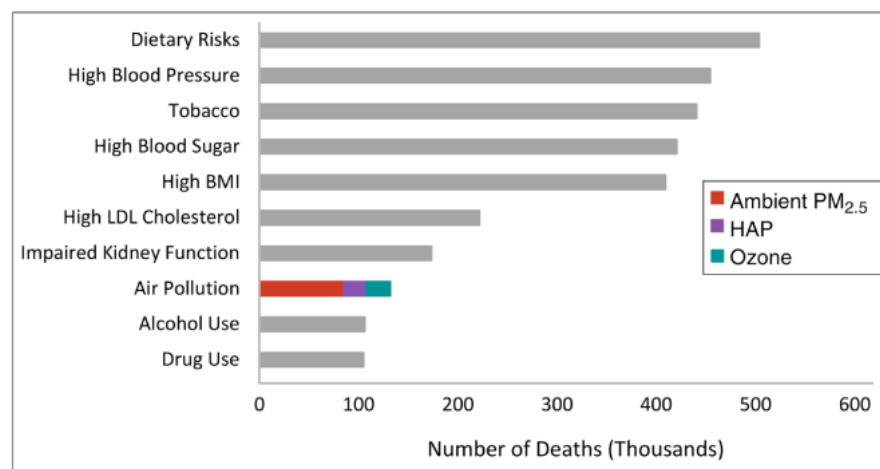
Asthma Exacerbations & Emergency Room visits

Minor Restricted Activity Days

Work Loss Days

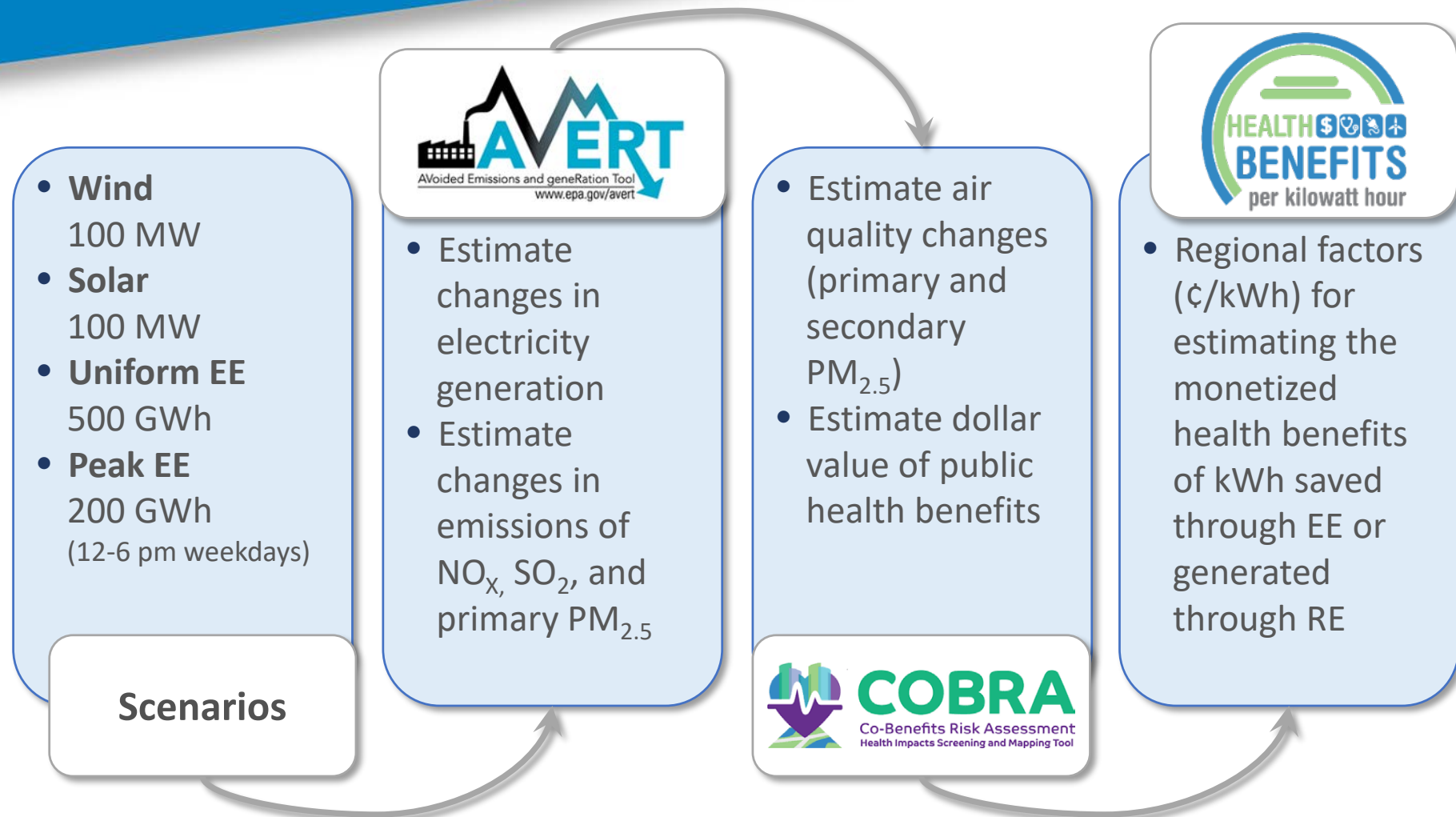


Leading risk factors for death and disability in the United States in 2017.



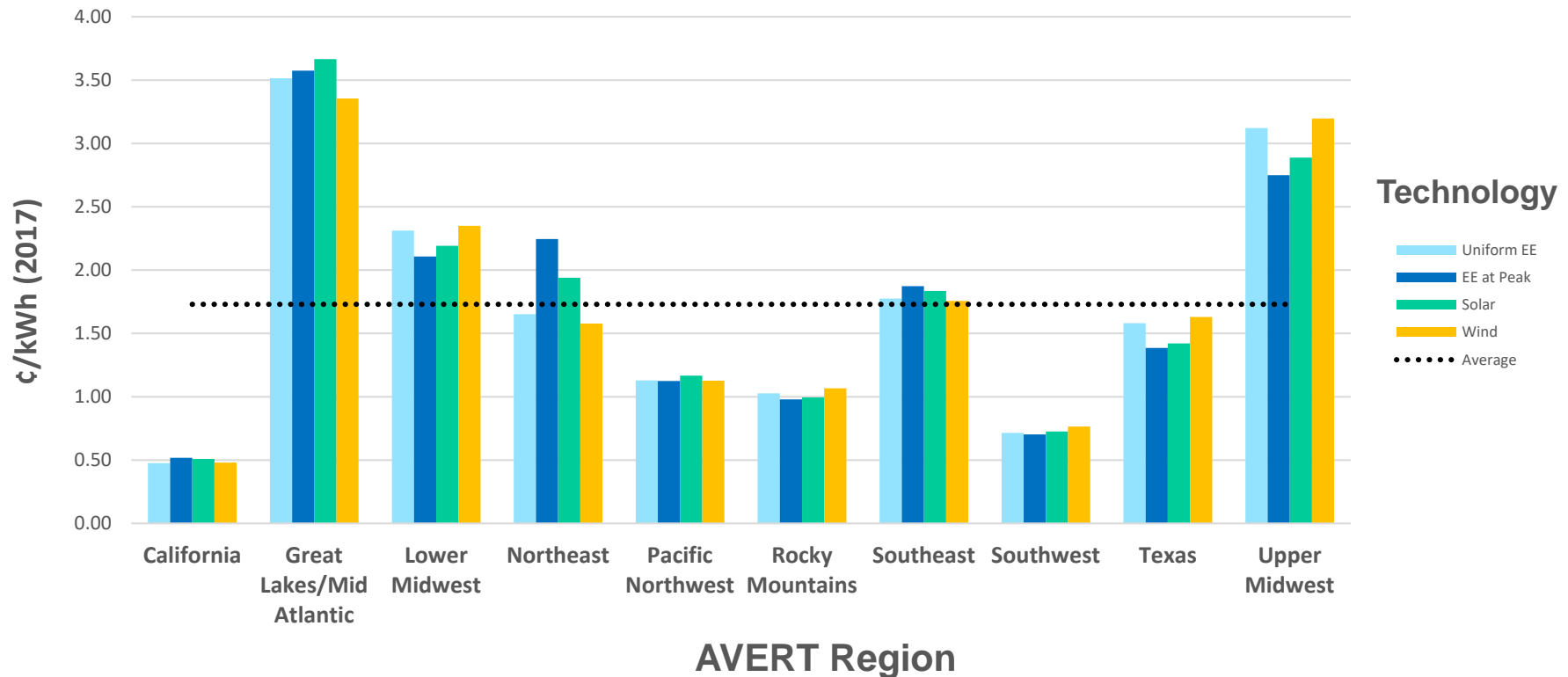
*State of Global Air 2019, USA Country Profile

EPA used existing tools and expert input to develop the BPK values



BPK values show greater variation by region than technology, based on existing fuel mix and population density

**2017 BPK Values
(3% Discount Rate, Low Estimate)**



How to use the BPK Values

$$\text{BPK} \times \Delta\text{kWh} = \text{Estimated Health Benefits (\$)}$$

■ To use:

- ▶ Select appropriate BPK value
 - Region, technology, sensitivity, discount rate (3% or 7%)
- ▶ Multiply BPK value by
 - kWh saved from EE
 - kWh generated by RE

■ Example analyses:

- ▶ Estimating the public health benefits of regional, state, or local-level investments in EE/RE
- ▶ Understanding the cost-effectiveness of regional, state, or local-level EE/RE projects, programs, and measures
- ▶ Incorporating health benefits in short-term regional, state, or local policy analyses and decision-making

View the full list of BPK values at:

<https://www.epa.gov/statelocalenergy/estimating-health-benefits-kilowatt-hour-energy-efficiency-and-renewable-energy>

Region	Project Type	3% Discount Rate	
		2017 ¢/kWh (low estimate)	2017 ¢/kWh (high estimate)
California	Uniform EE	0.48	1.08
	EE at Peak	0.52	1.17
	Solar	0.51	1.15
	Wind	0.48	1.09
Great Lakes/ Mid-Atlantic	Uniform EE	3.51	7.95
	EE at Peak	3.57	8.08
	Solar	3.67	8.29
	Wind	3.35	7.59
Lower Midwest	Uniform EE	2.31	5.23
	EE at Peak	2.11	4.77
	Solar	2.19	4.96
	Wind	2.35	5.32
Northeast	Uniform EE	1.65	3.73
	EE at Peak	2.24	5.07
	Solar	1.94	4.38
	Wind	1.58	3.56
Pacific Northwest	Uniform EE	1.13	2.55
	EE at Peak	1.12	2.54
	Solar	1.17	2.64
	Wind	1.13	2.55
Rocky Mountains	Uniform EE	1.03	2.32
	EE at Peak	0.98	2.21
	Solar	0.99	2.25
	Wind	1.07	2.41
Southeast	Uniform EE	1.78	4.02
	EE at Peak	1.87	4.24
	Solar	1.83	4.15
	Wind	1.76	3.98
Southwest	Uniform EE	0.71	1.62
	EE at Peak	0.70	1.59
	Solar	0.73	1.64
	Wind	0.77	1.73
Texas	Uniform EE	1.58	3.58
	EE at Peak	1.39	3.13
	Solar	1.42	3.22
	Wind	1.63	3.69
Upper Midwest	Uniform EE	3.12	7.06
	EE at Peak	2.75	6.22
	Solar	2.89	6.53
	Wind	3.20	7.23

BPK values demonstrate that the health benefits of EE/RE are substantial and quantifiable

- Air pollution remains an important health challenge in the United States
- EE and RE are critical strategies for improving air quality and public health
- EPA's new **BPK values** are a free, credible, and easy-to-use resource for incorporating the health benefits of EE and RE into decision making



For more information

- ▶ Access the BPK values and technical report at:
<https://www.epa.gov/statelocalenergy/estimating-health-benefits-kilowatt-hour-energy-efficiency-and-renewable-energy>
- ▶ More tools and resources are available on EPA's website:
www.epa.gov/statelocalenergy
- ▶ Sign up for our Newsletters:
www.epa.gov/statelocalenergy/state-local-tribal-energy-newsletters

Thank you!

Emma Zinsmeister, MPH CPH

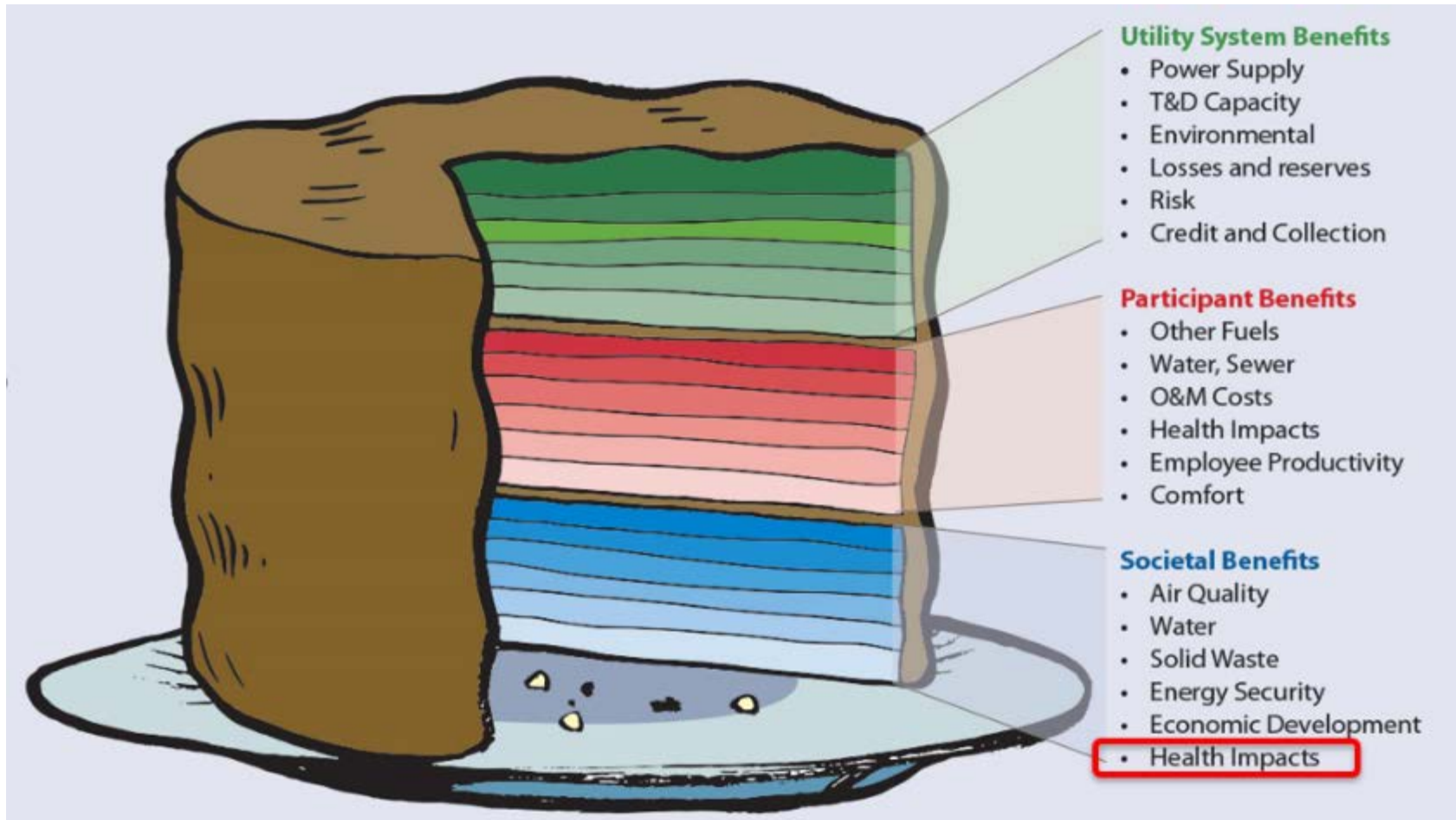
Senior Community Programs Specialist

U.S. EPA State and Local Energy and Environment
Program

zinsmeister.emma@epa.gov



RAP's “Layer Cake” Approach

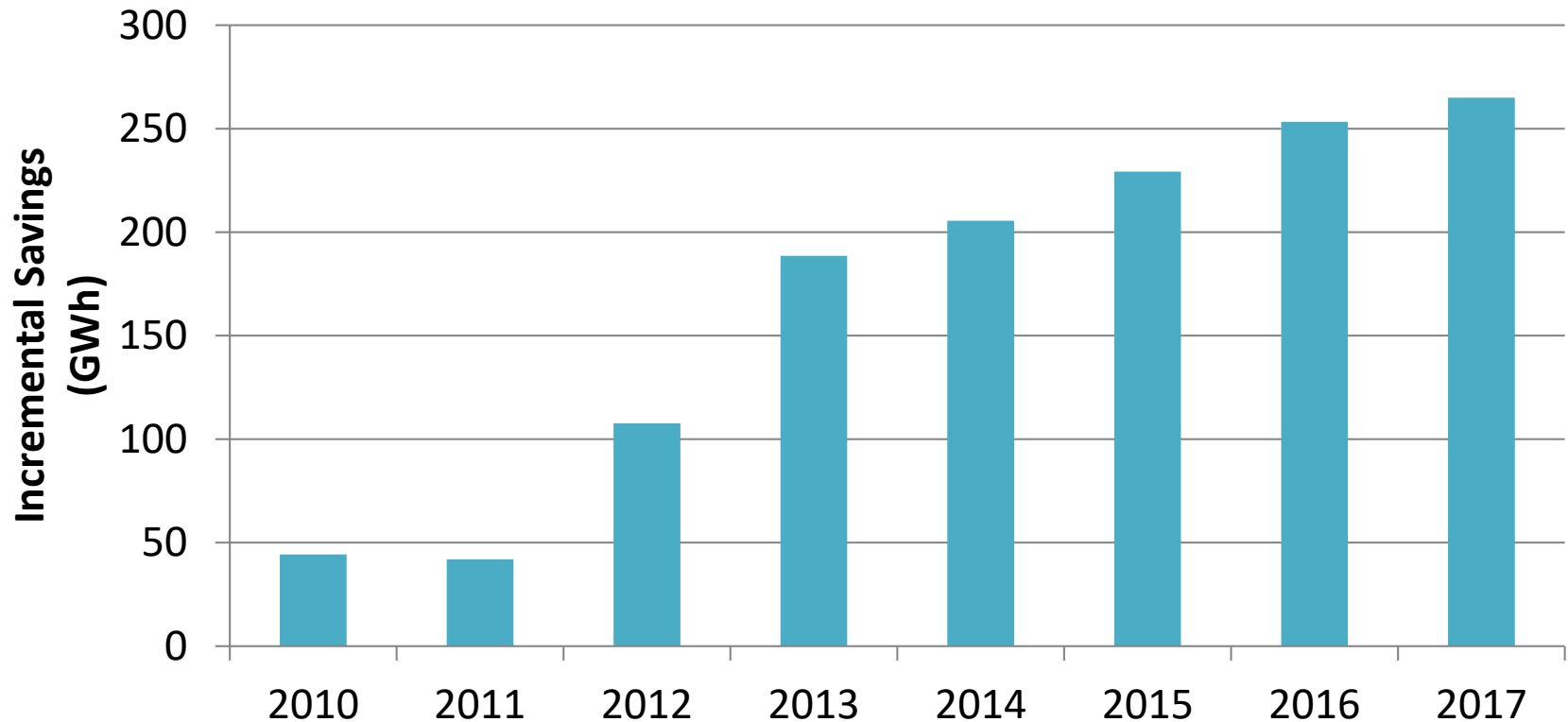


Source: <https://www.raonline.org/knowledge-center/recognizing-the-full-value-of-energy-efficiency/>

Energy Efficiency Improves Air Quality

- Complying with public health standards
- Complying with visibility standards
- Developing implementation plans
- Demonstrating “permanent, quantifiable, surplus, enforceable” reductions

Example: Arkansas EE Programs



Arkansas EE and BPK Benefits

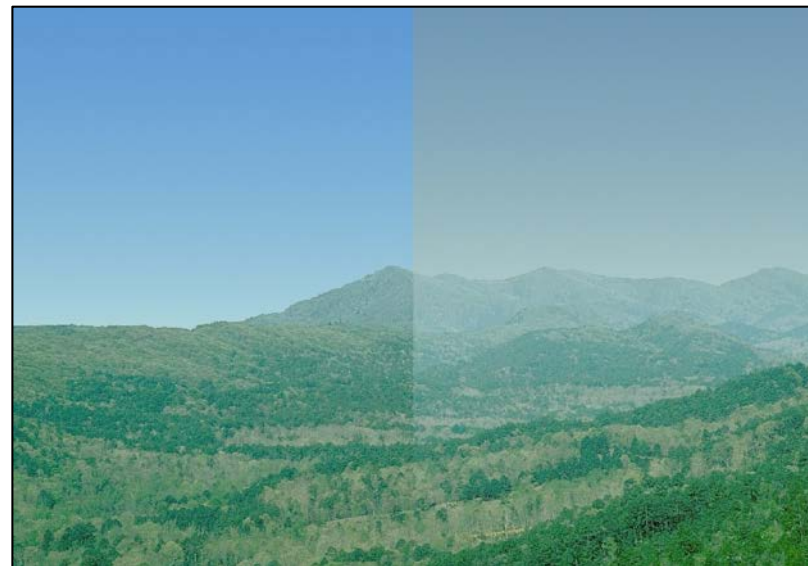
- EE program cost: \$73.5 million in 2017
- BPK health benefits in 2017: \$5.6 to \$12.7 million
- With 10-year measure life, the benefits likely exceed the costs!

Source for program costs: Arkansas PSC, Docket No. 07-077-TF

Air Quality Ideas for BPK

- EE is the first fuel!
 - What test does your state use for EE cost/benefit analysis?
 - Can BPK be used in that test?
- Ozone planning
- Regional haze planning

**Caney Creek Wilderness
AR– WinHAZE 2015
Modeled Visibility Conditions**



What's 100 MW Worth in Health Benefits?



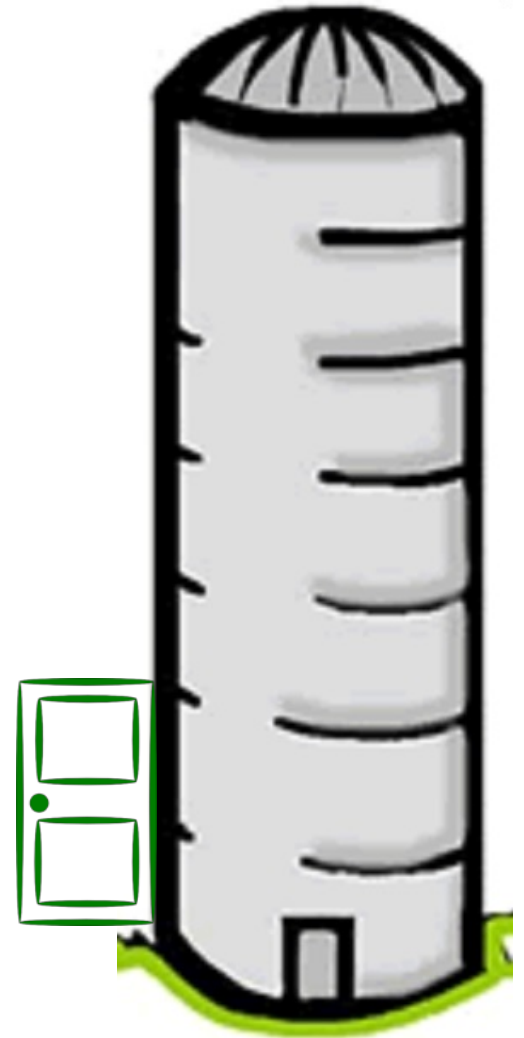
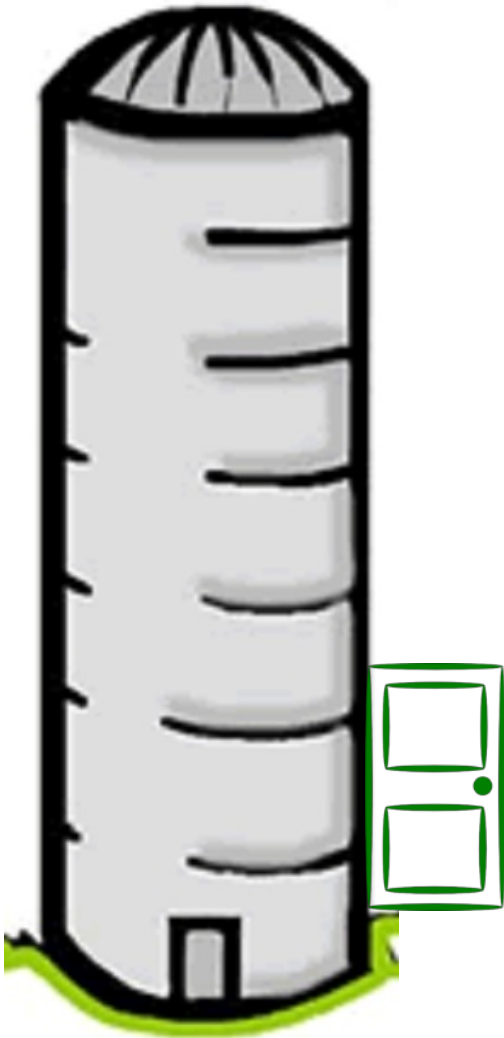
Annualized Capital Cost: \$20.2 million
(37% capacity factor)

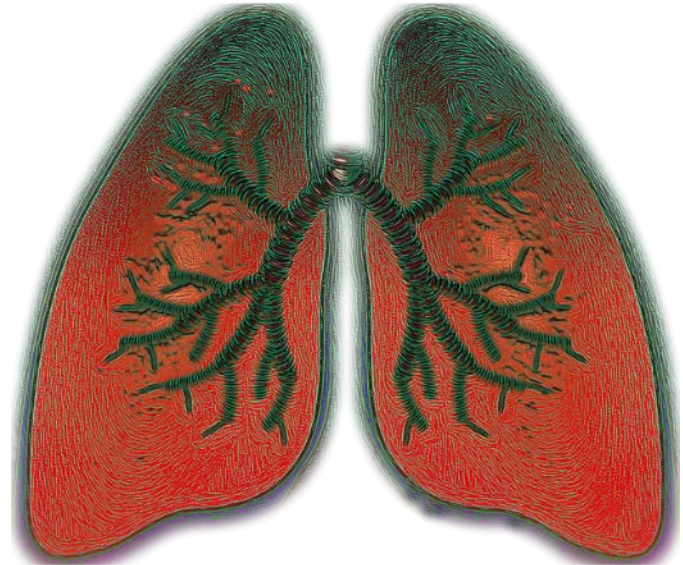


Annualized Capital Cost: \$12.2 million
(27% capacity factor)

Annual Health Benefits	Low values, 3% discount (\$ millions)	High value, 3% discount (\$ millions)
Upper Midwest (Wind)	\$10.1	\$22.8
Upper Midwest (Solar)	\$6.8	\$15.4

BPK and the Power of Collaboration





EPA Provides Range Estimates

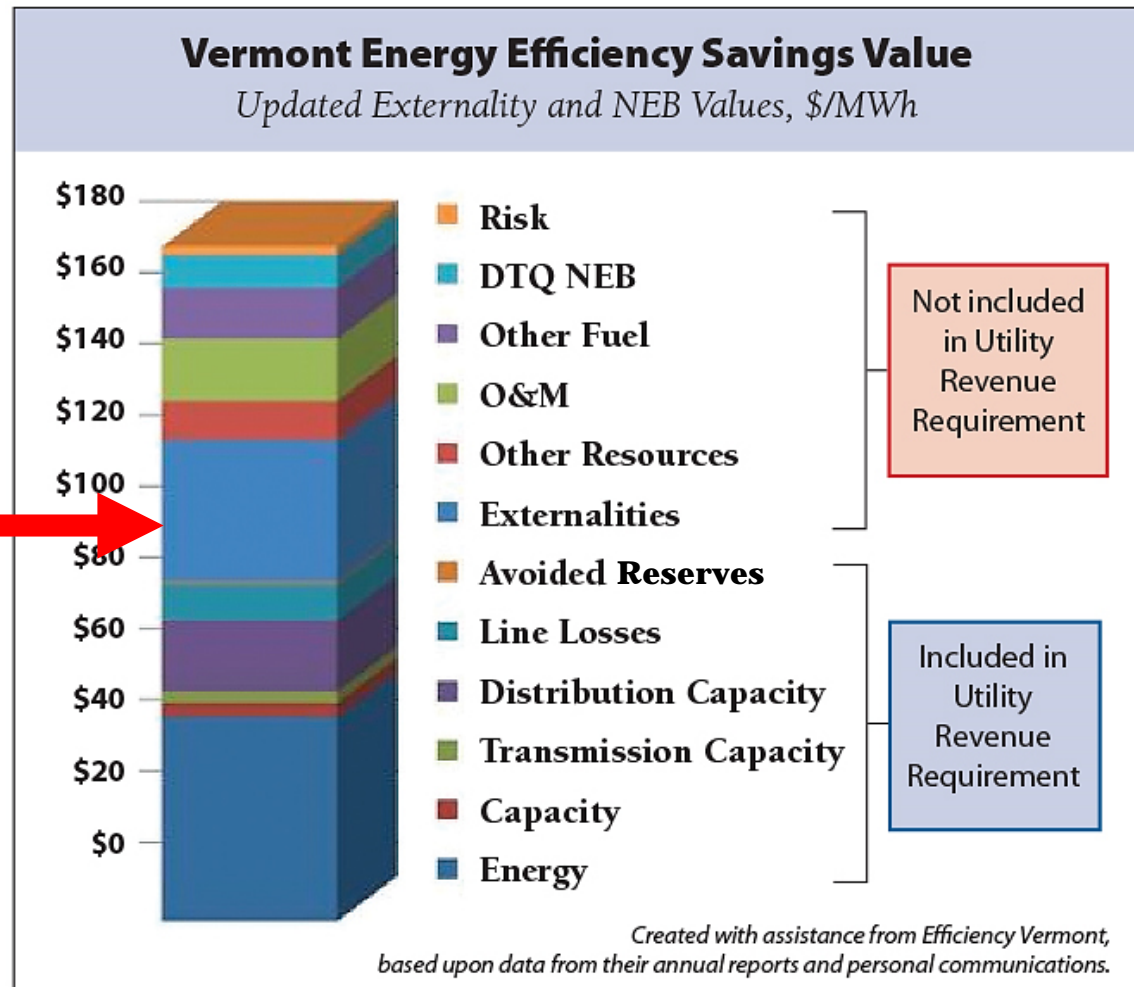
- Efficiency, solar, and wind
- Regional values
- Low to high estimates
- Different discount rates

Table ES.1. 2017 Benefits-per-kWh Values (cents per kWh, 2017 USD)¹

Region	Project Type	3% Discount Rate		7% Discount Rate	
		2017 ¢/kWh (low estimate)	2017 ¢/kWh (high estimate)	2017 ¢/kWh (low estimate)	2017 ¢/kWh (high estimate)
California	Uniform EE	0.48	1.08	0.42	0.96
	EE at Peak	0.52	1.17	0.46	1.04
	Solar	0.51	1.15	0.45	1.03
	Wind	0.48	1.09	0.43	0.97
Great Lakes/ Mid-Atlantic	Uniform EE	3.51	7.95	3.14	7.09
	EE at Peak	3.57	8.08	3.19	7.21
	Solar	3.67	8.29	3.27	7.39
	Wind	3.35	7.59	2.99	6.77

Utility Procurement – Efficiency

Quantification of externality costs



Add the Health Benefit of Efficiency to the Cost-Effectiveness Threshold

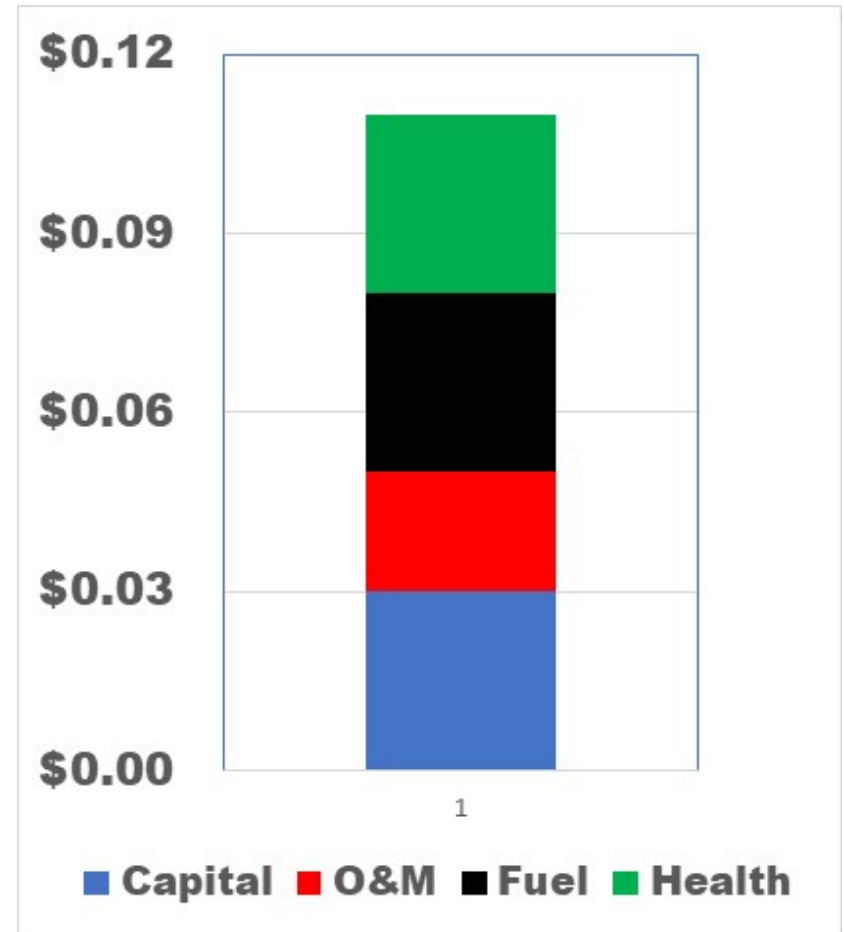
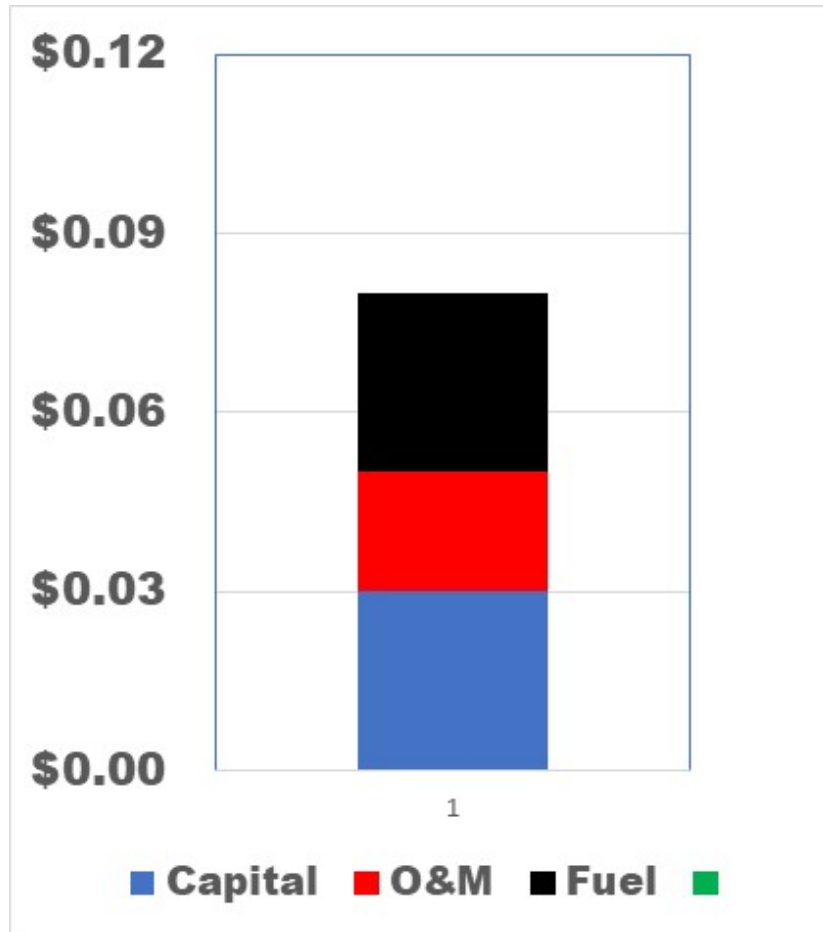
- Should change what measures are eligible under TRC and Societal Cost Test.
- May not change the amount the utility will pay.



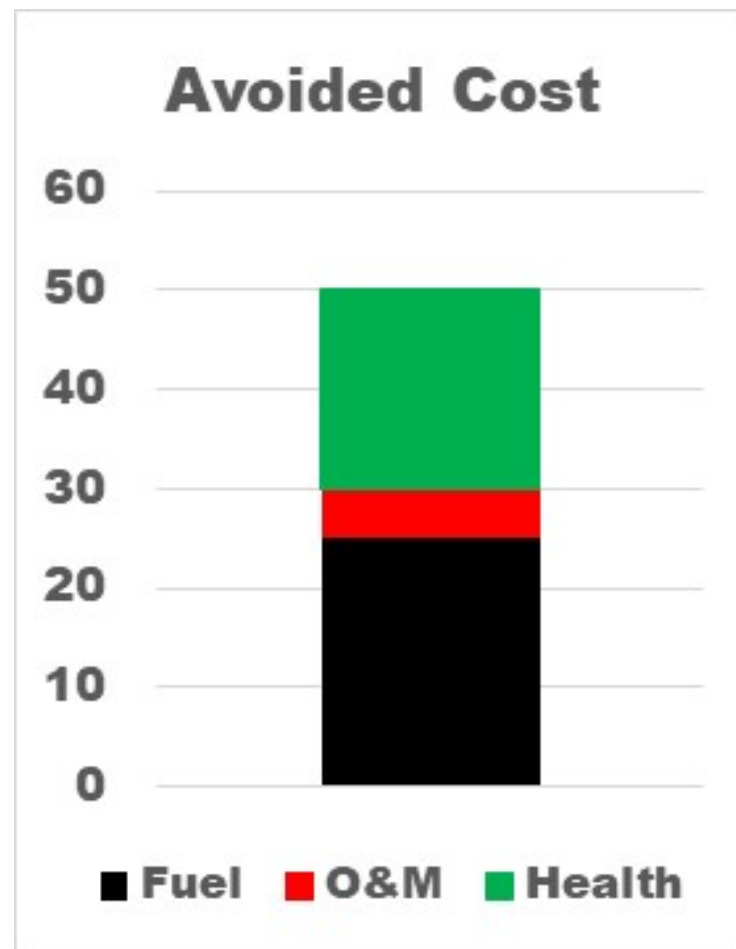
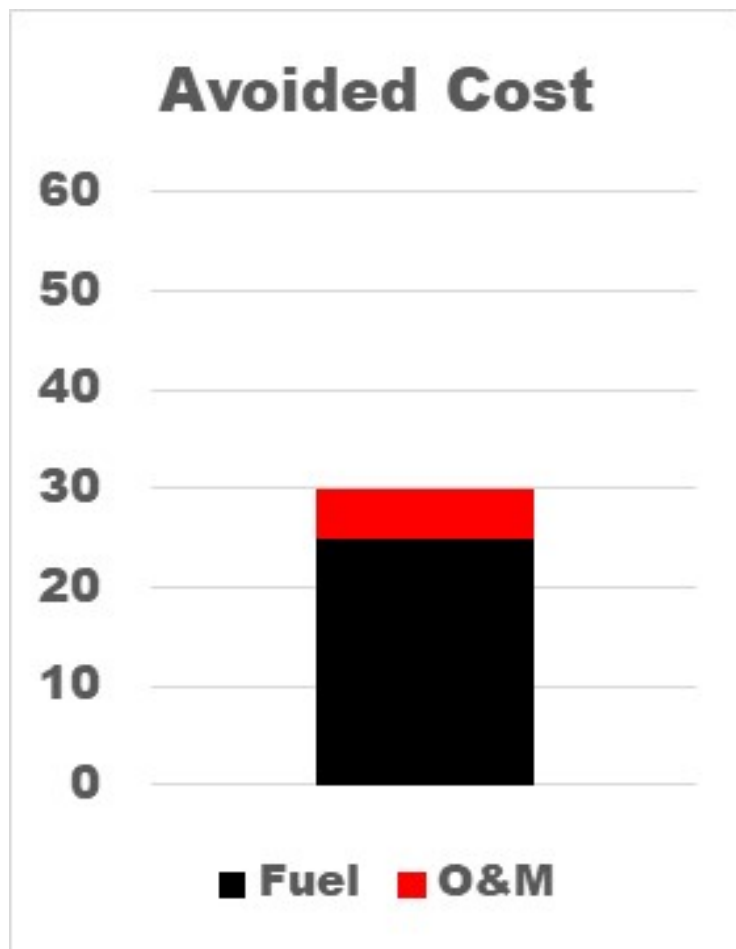
Peak-Oriented Efficiency



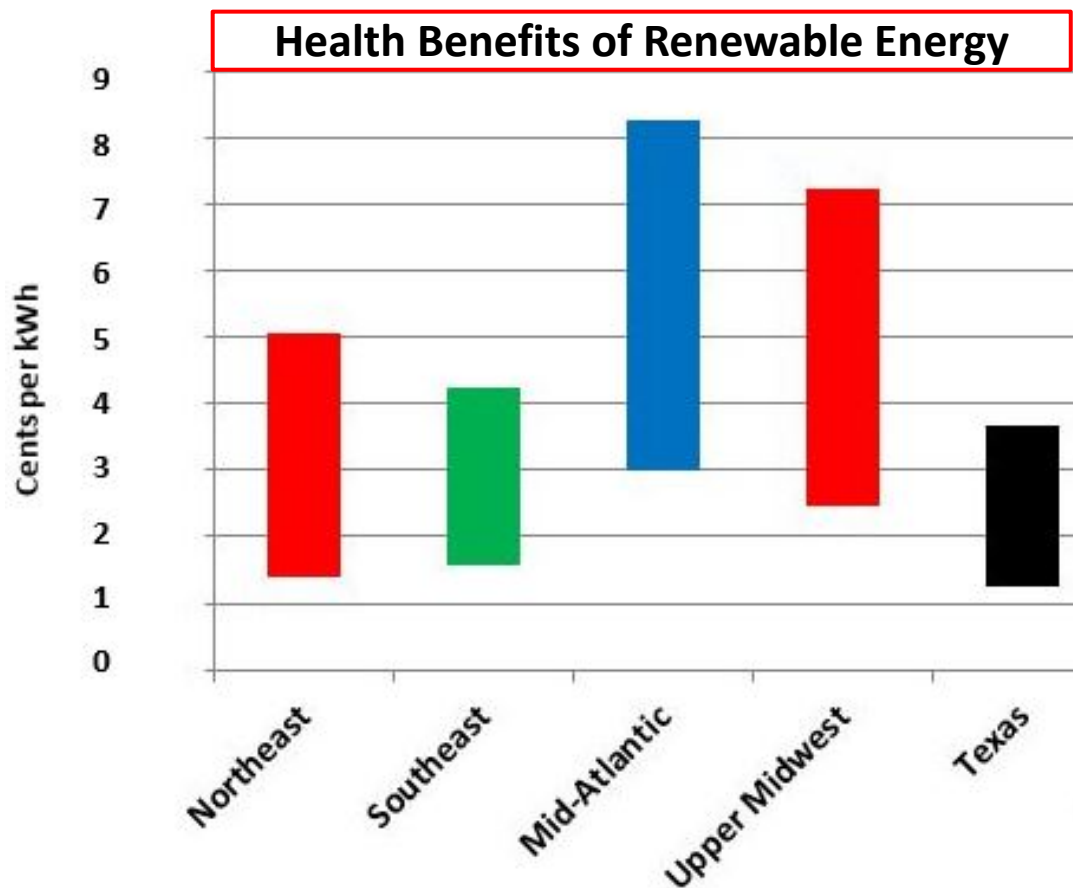
Utility Procurement: Consider Health Impacts in Avoided Cost



Utility Dispatch



New Wind and Solar Are More Than Cost-Effective



Rate Design: Residential

Rate Element	Typical Rate
Customer Charge	\$10.00
Energy Charge	\$0.12/kWh

Option 1: Higher Energy Charge

Rate Element	Typical Rate	Alternative Rate
Customer Charge	\$10.00	\$3.00
Energy Charge	\$0.12/kWh	\$0.13/kWh

Option 2: Resource-Based Rates

Example: Puget Sound Energy

Rate Element	Amount
Customer Charge	\$7.49
First 600 kWh (Hydro, Wind)	\$0.09/kwh
Energy Charge	\$0.11/kWh

Typical Large Commercial Rate

Rate Element	Amount
Demand Charge	\$10.00/kW
Energy Charge	\$0.10/kWh

Rate Reflecting Health Costs: Limit Demand Charges to Key Hours

Rate Element	Application	Amount
Demand Charge	5 – 8 PM ONLY	\$10.00/kW
Energy Charge	Off-Peak	\$0.10/kWh
	On-Peak	\$0.13/kWh

State Tax Incentives: Efficiency



- Sales tax exemption



- Investment tax credit



- Direct purchase incentive grants from state funds



- Direct install program for low-income consumers

State Tax Incentives: Renewables



- Tax credit

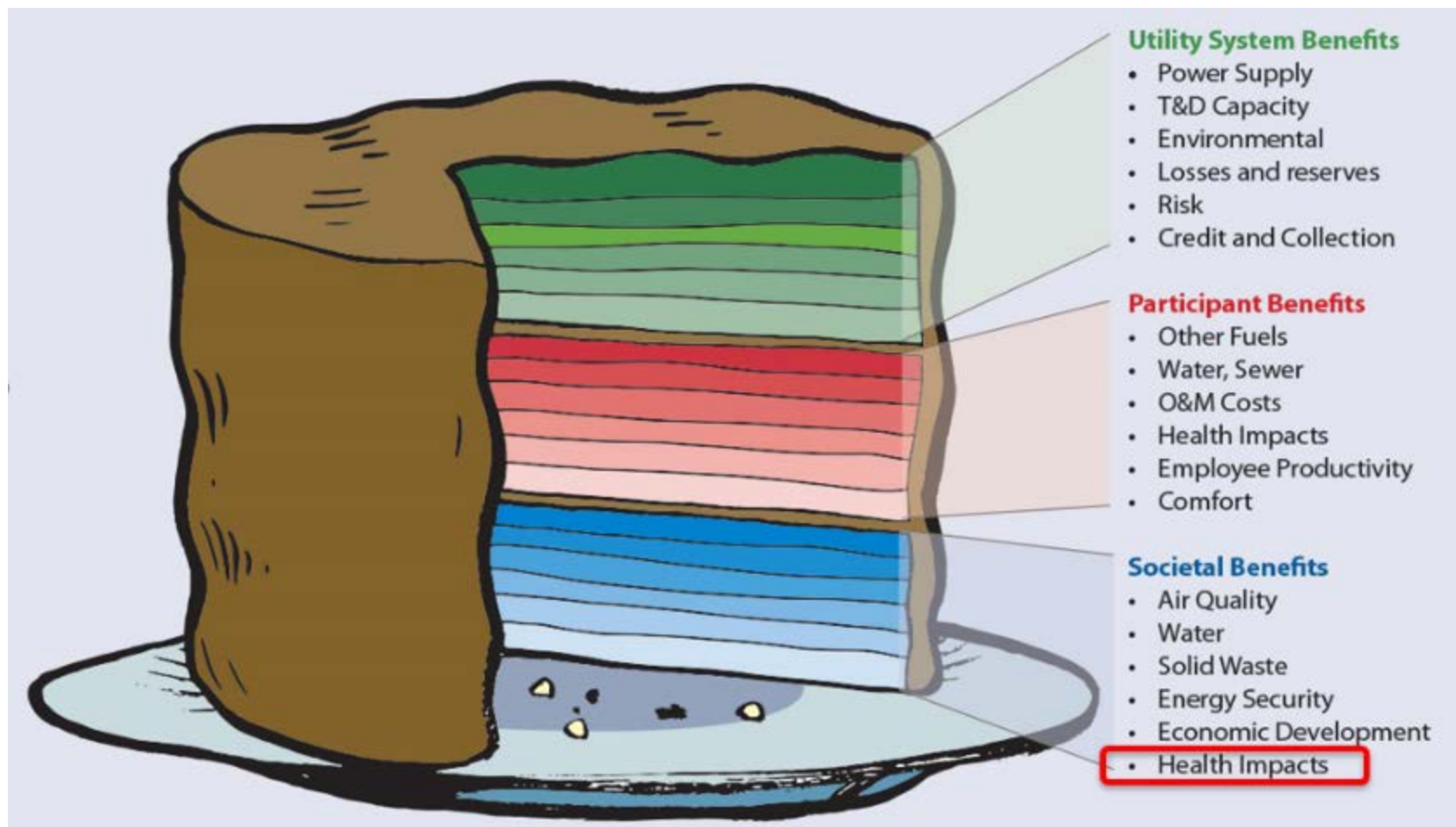


- Property tax exemption



- Sales tax exemption

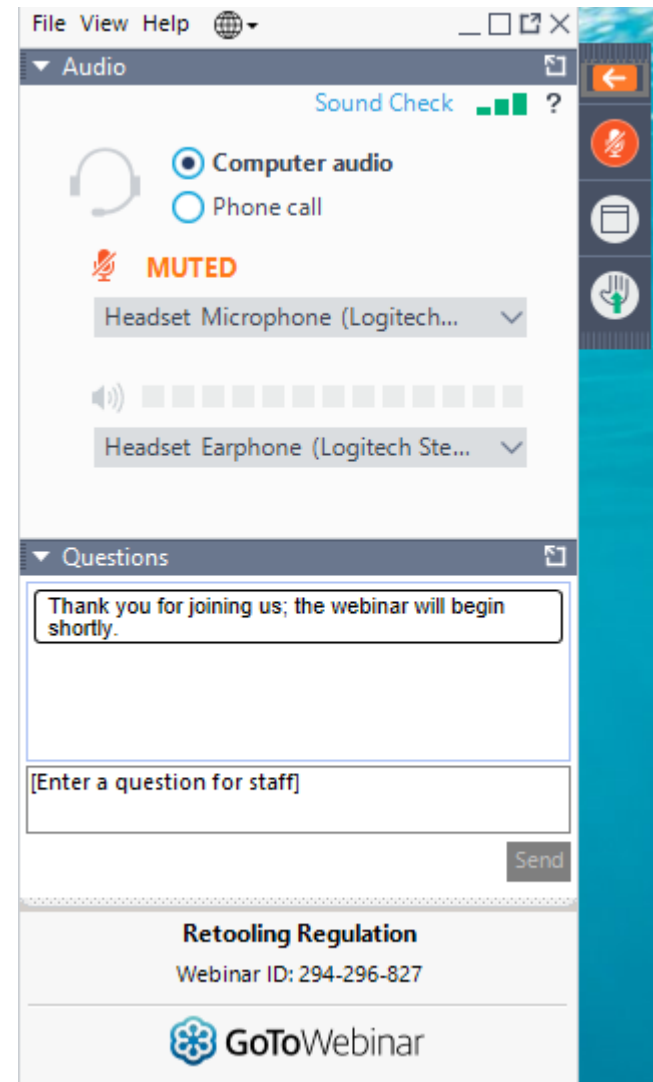
Bottom Line: More Frosting!



Source: <https://www.raponline.org/knowledge-center/recognizing-the-full-value-of-energy-efficiency/>

Questions?

Please send
questions through
the Questions pane



BPK: A Very Useful Tool

- This report reveals the sizable health benefits of efficiency and renewables.
- Regulators and policymakers can incorporate this data into planning, rate design, and more.
- EPA is interested in information about how these values are being used and welcomes questions.



Resources

- [Estimating the Health Benefits per Kilowatt-hour of Energy Efficiency and-Renewable-Energy](#)
- [Recognizing the Full Value of Energy-Efficiency](#)
- [Value Added: Measuring the Health Benefits of the Layer Cake](#)
- [Smart Rate Design for a Smart Future](#)
- [Smart Non-Residential Rate Design](#)
- Avoided Emissions and Generation Tool (AVERT):
 - [Home page](#) | [User manual](#)
- Co-Benefits Risk Assessment (COBRA) Health Impacts Tool:
 - [Home page](#) | [User manual](#)

About RAP

The Regulatory Assistance Project (RAP)® is an independent, non-partisan, non-governmental organization dedicated to accelerating the transition to a clean, reliable, and efficient energy future.

Learn more about our work at raponline.org

Contact us at:

jlazar@raponline.org

nseidman@raponline.org

What's 100 MW Worth in Health Benefits?

Three AVERT Regions

	Low values, 3% discount (\$ millions)	High value, 3% discount (\$ millions)
Upper Midwest (Wind)	10.1	22.8
Upper Midwest (Solar)	6.8	15.4
Southeast (Wind)	5.5	12.5
Southeast (Solar)	4.3	9.8
Northeast (Wind)	5.0	11.2
Northeast (Solar)	4.6	10.4

Assume 315,360,000 kWh/year for wind and 236,520,000 kwh/hear for solar