U.S. EPA's State and Local Energy and Environment Webinar Series

United States Environmental Protection Agency

Quantifying Health Benefits of Energy Efficiency and Renewable Energy

May 16, 2019

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- Questions will be moderated at the end
- EPA will post responses to unanswered questions on the State and Local Webinar Series page

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Polling

- We'll ask several poll questions during the webinar
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  - Exit full screen mode
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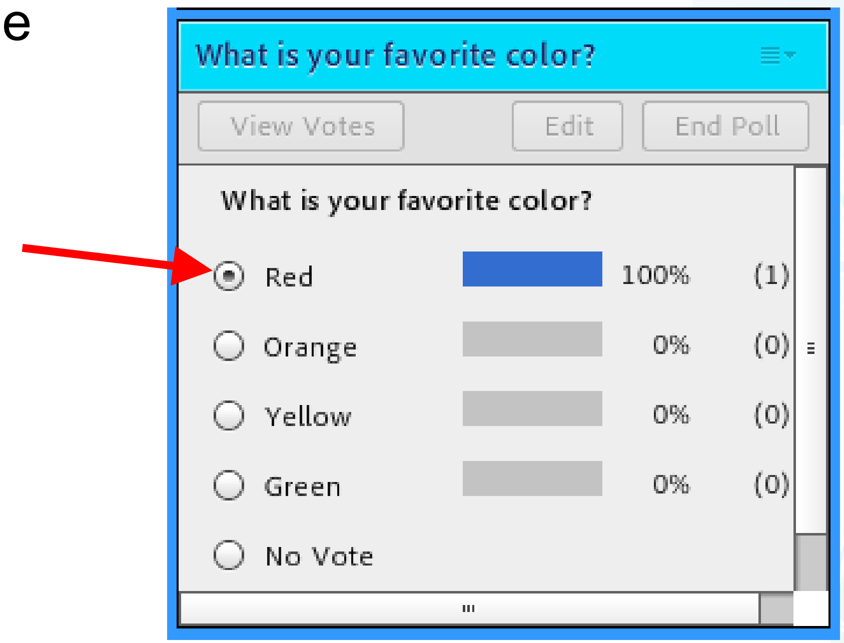
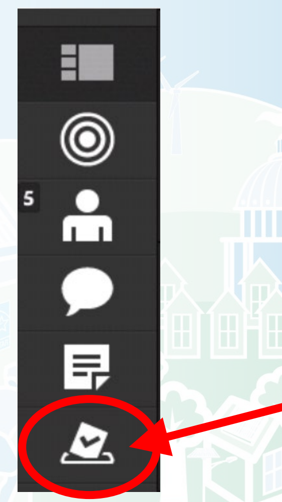




Today’s Agenda

- **Denise Mulholland**
  U.S. EPA State and Local Energy and Environment Program
- **Joy Morgenstern**
  California Public Utilities Commission
- **Cassandra Kubes**
  American Council for an Energy-Efficient Economy
- **David Abel**
  University of Wisconsin, The Holloway Group
- **Question and Answer Session**

Poll 1

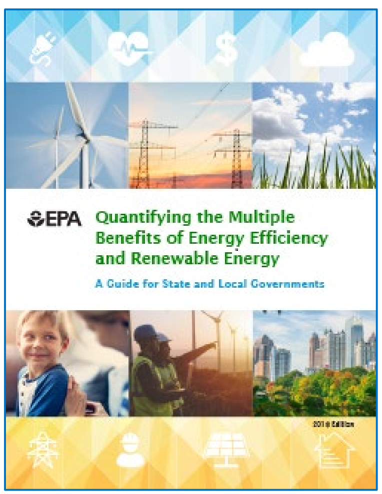
Methods for Quantifying the Multiple Benefits of Energy Efficiency and Renewable Energy: A Guide for State and Local Governments

EPA United States Environmental Protection Agency

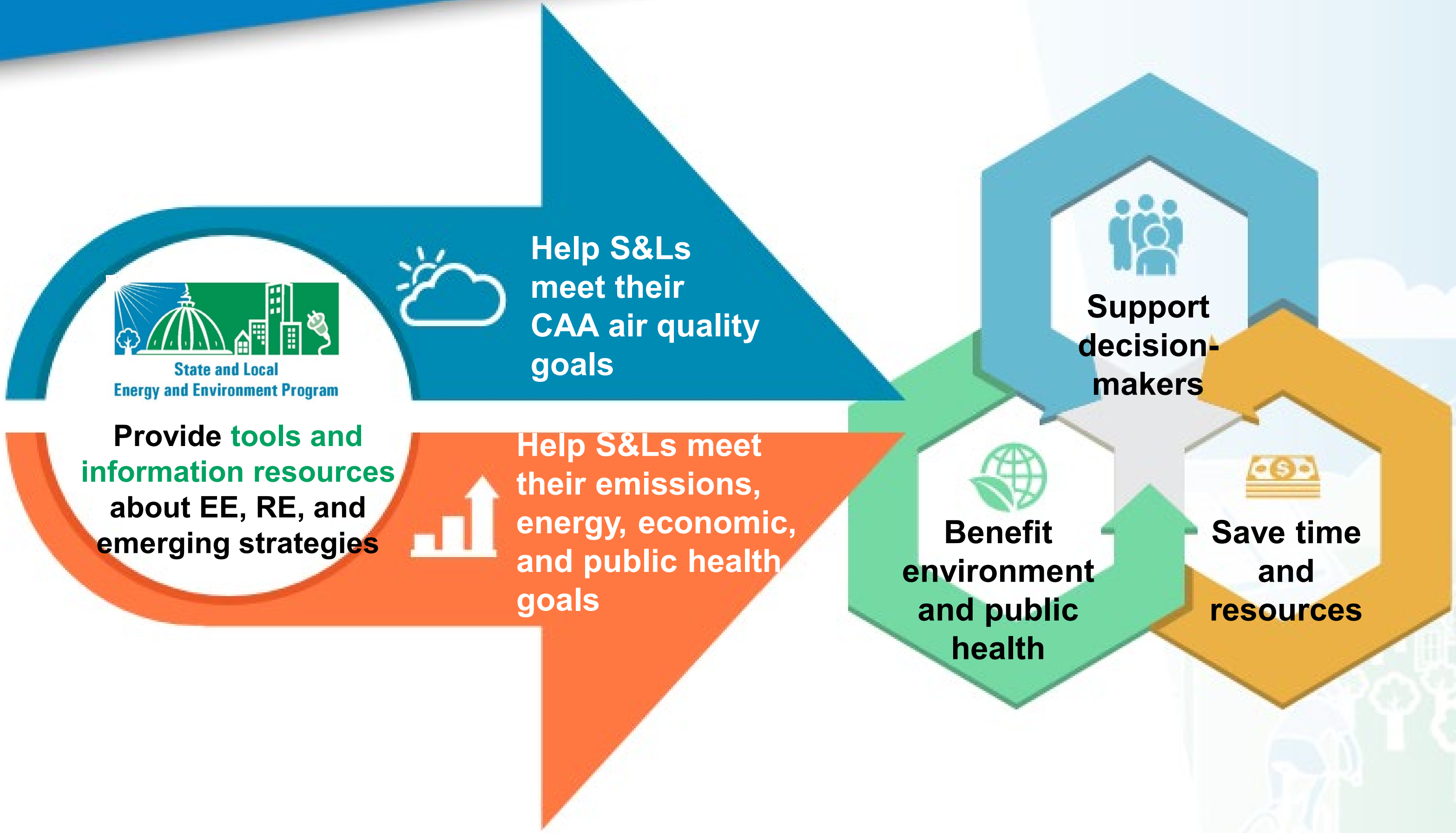
State and Local Energy and Environment Program

Denise Mulholland

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



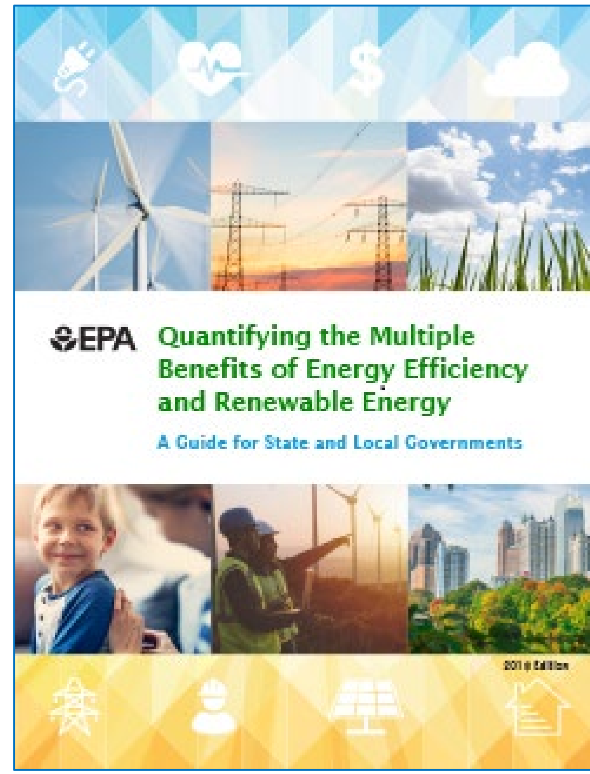
EPA's State and Local Energy and Environment Program



CAA: Clean Air Act
EE: Energy efficiency
RE: Renewable Energy
S&Ls: State and local governments

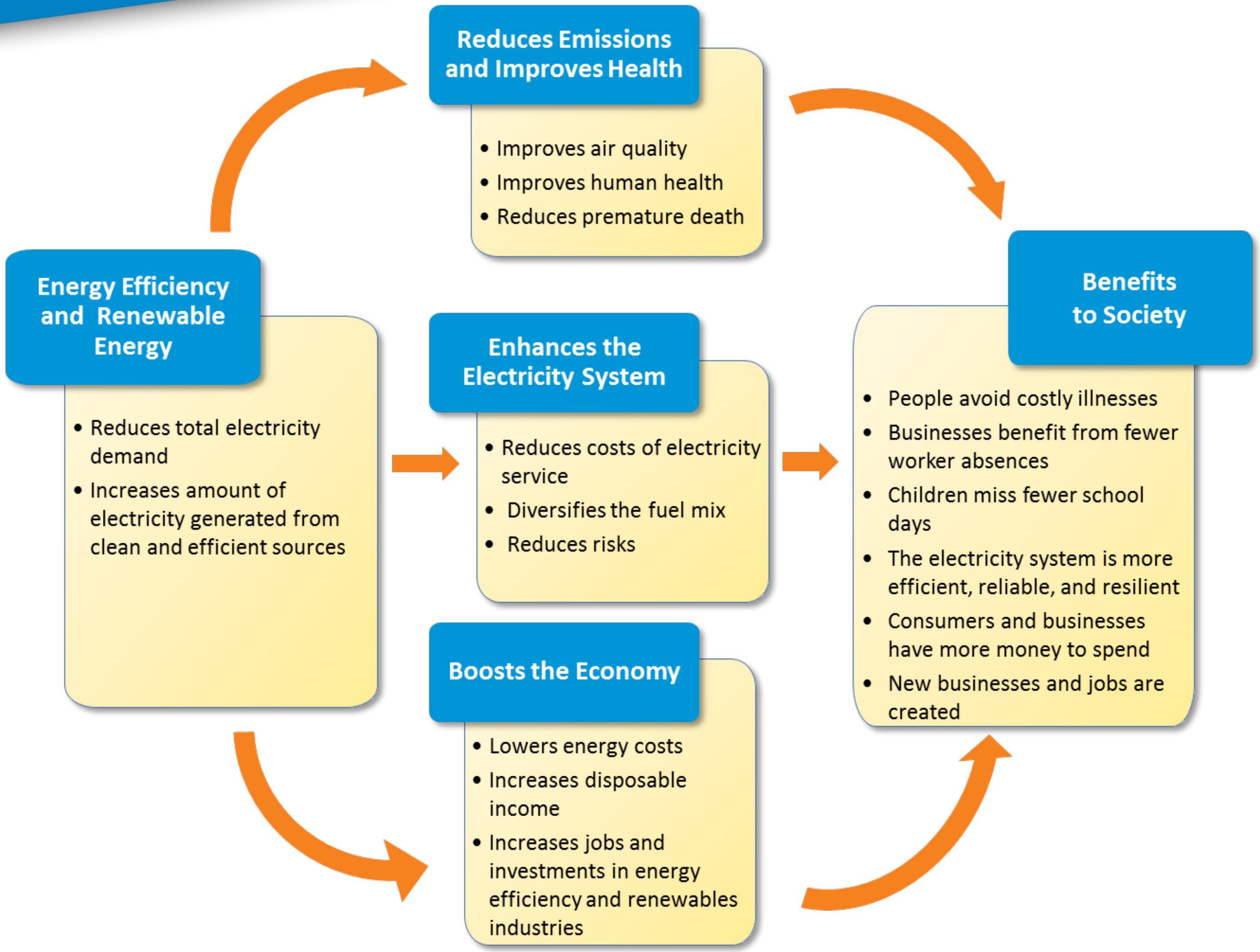
EPA's Multiple Benefits Guide

- Flagship resource, updated and expanded in 2018
- Part One: What, Why and When to Quantify Benefits
- Part Two: How to Quantify
  - Includes many figures and tables that:
    - clearly present methods, tools, and steps to quantify benefits,
    - make it easier to understand the process, and/or
    - help analysts compare across methods and tools.

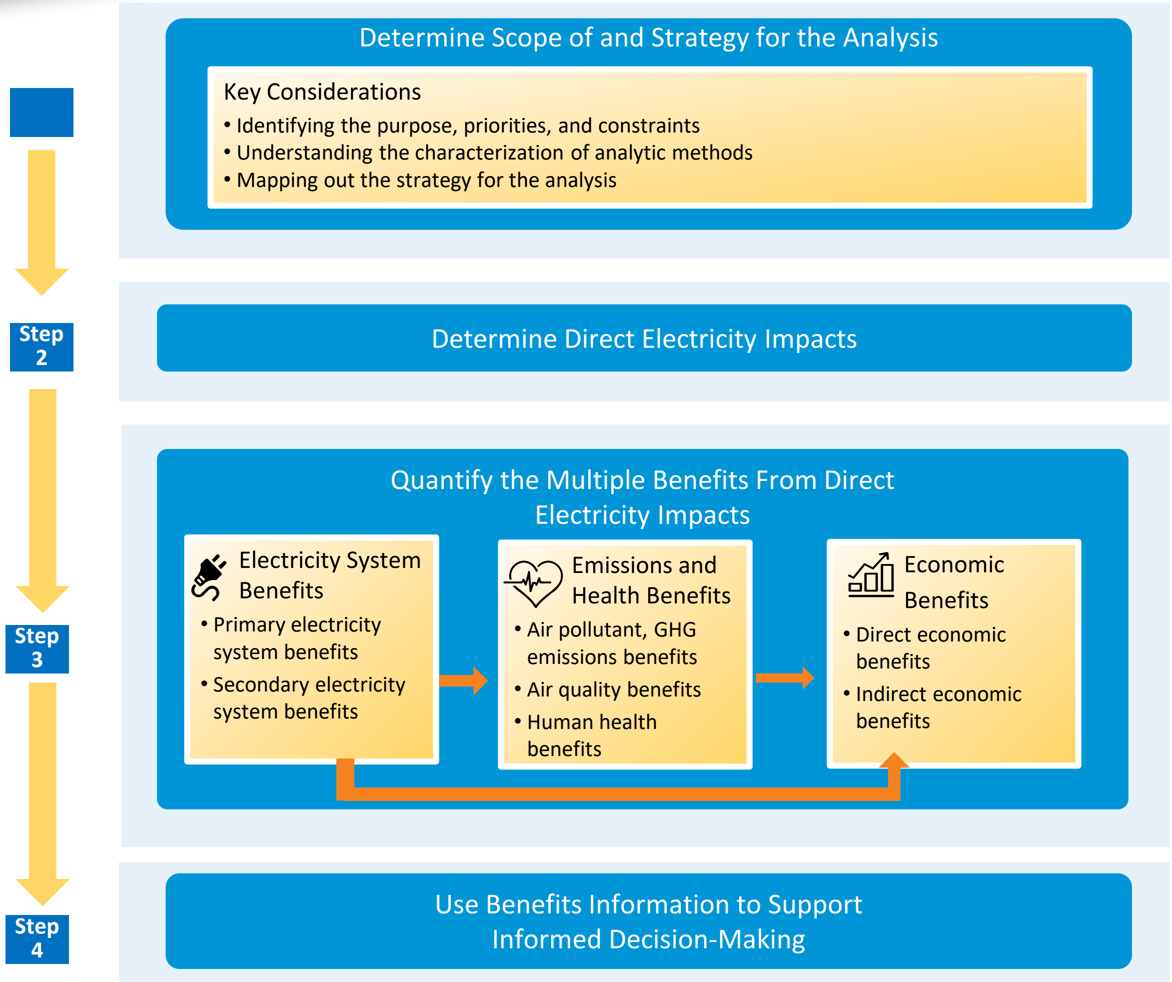


Quantifying the Multiple Benefits of Energy Efficiency and Renewable Energy: A Guide for State and Local Governments

Part ONE:
What Are the Benefits of Energy Efficiency and Renewable Energy?



Part TWO:
How to Quantify Multiple Benefits?

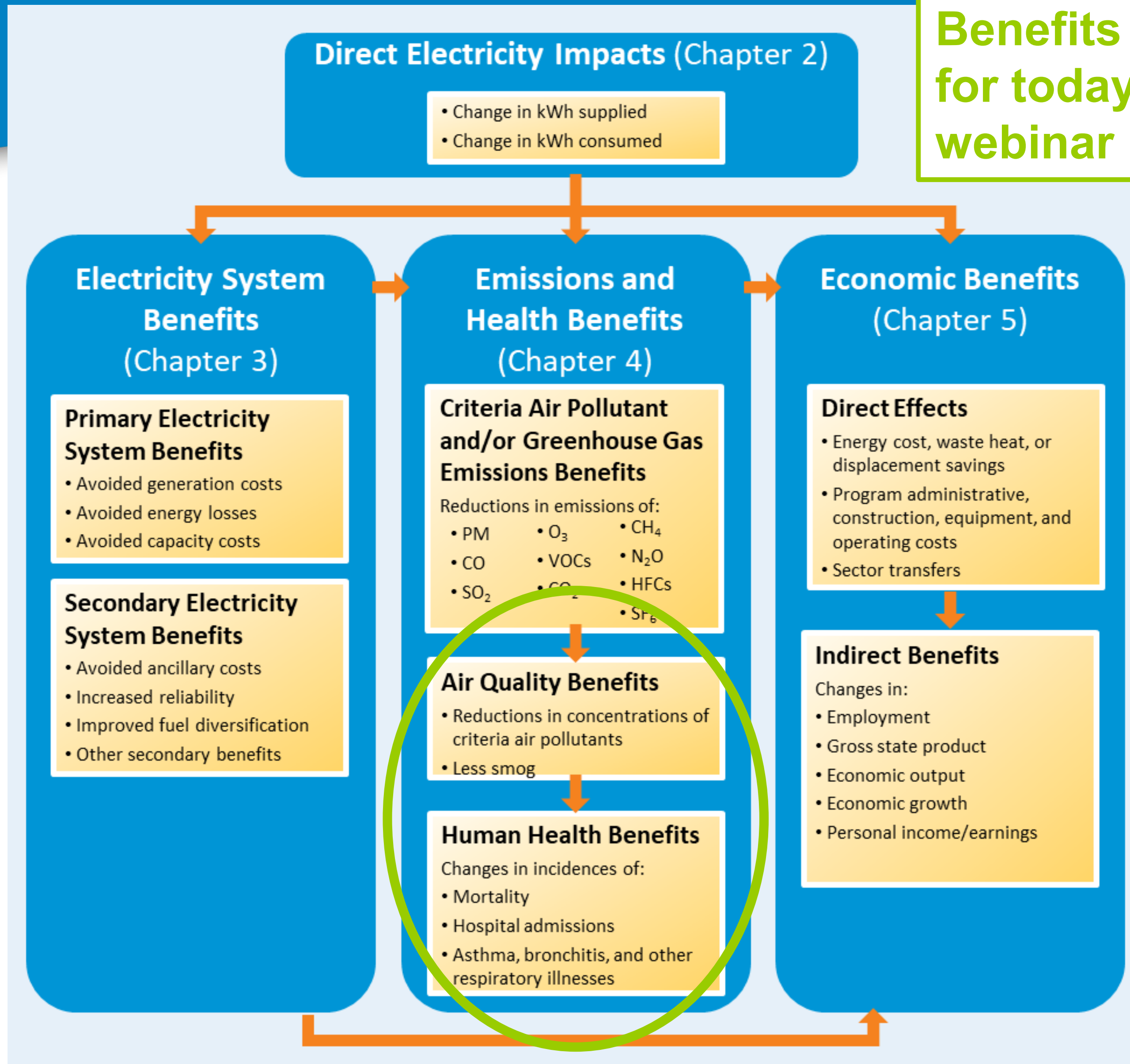


GHG: Greenhouse Gas

See Part Two, Chapter 1

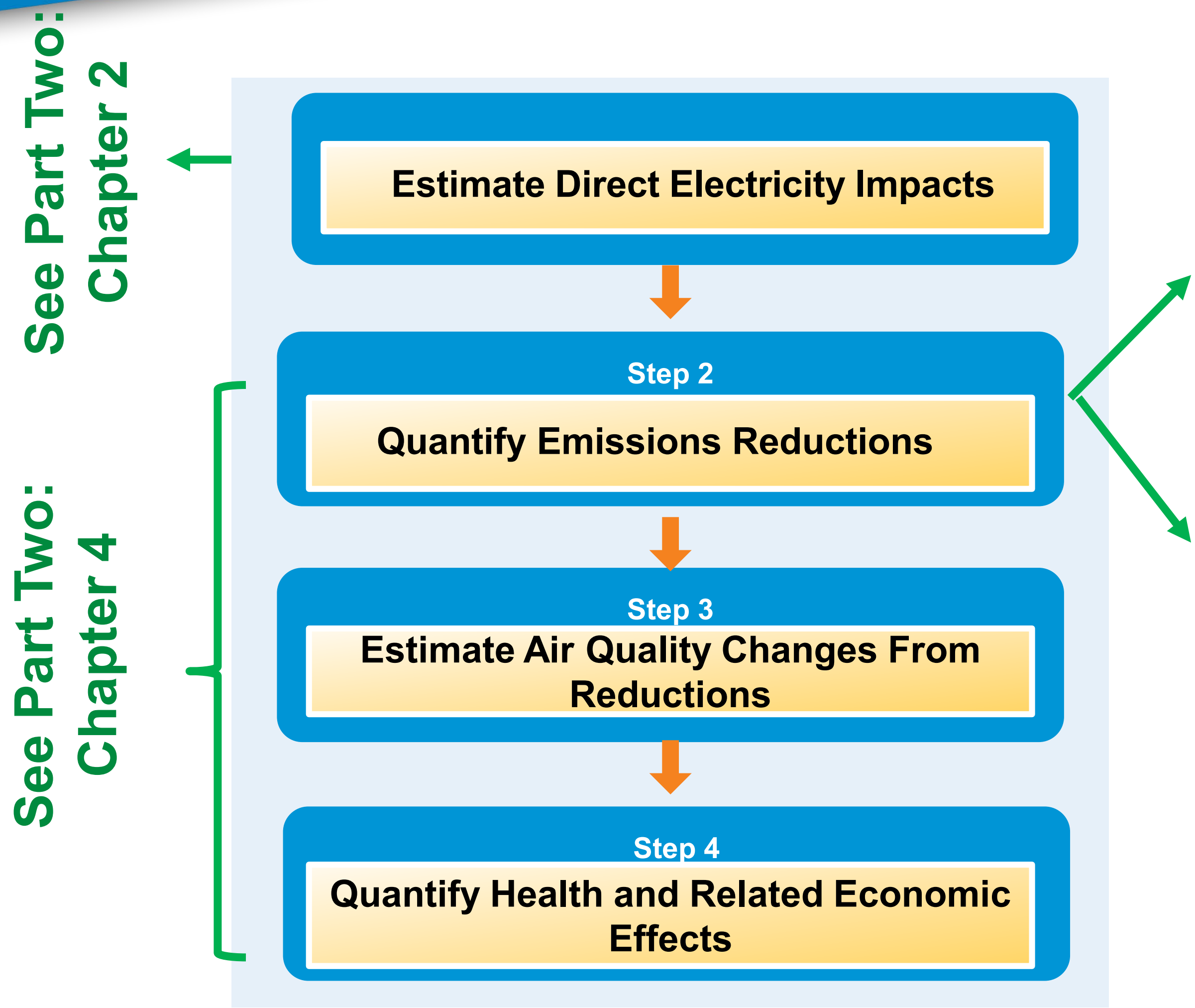
Map Out The Benefits to Quantify: Relationships

Each Chapter provides:
- Step by step instructions
- Range of basic to sophisticated approaches
- Key considerations
- Case Studies
- List of available tools, data and resources



Benefits for today's webinar

Use Flowcharts and Figures in the Guide to Navigate the Process



EPA Tools For Quantifying Emissions Reductions:

- BASIC level:
  [Emissions & Generation Resource Integrated Database (eGRID)]
- INTERMEDIATE level:
  [Avoided Emissions and geneRation Tool (AVERT)]

Choose a Method for Quantifying Impacts

- Basic, intermediate and/or sophisticated methods are typically available
- Key considerations when choosing:
  - What benefits do you care about and what methods are available to estimate them?
  - What level of rigor is needed?
    - e.g., screening-level vs. regulatory impact analysis
  - What is the time period of the analysis?
    - e.g. short term vs long term, prospective vs retrospective
  - What are the data requirements? What data is available?
  - What financial costs or technical expertise are required? What's available?

See Part Two, Chapter 1

Compare Method(s) to Evaluate Air Quality Changes

Method	Description	Examples of When to Use	Example Tools
Basic • Reduced-form air quality models	Screening tools based on a series of model simulations done with sophisticated models	• Short-term analysis • When time and resources are limited • Screening	• COBRA's Source-receptor matrix • APEEP: Air Pollution Emission Experiments and Policy
Sophisticated • Dispersion • Photochemical • Receptor	Characterized by extensive underlying data and relatively complex formulations	• Short- or long-term analysis; • When detailed estimates of impacts on concentrations of air pollutants is necessary	• AERMOD: American Meteorological Society/EPA Regulatory Model • CAMx: Comprehensive Air Quality Model with eXtensions • CMAQ: Community Multiscale Air Quality • CMB: Chemical Mass Balance

- Key considerations when choosing:
  - Pollutants of interest, Sources affected, Timeframe, Data availability and resolution, Geographic scope, Meteorological and topographical complexities
  - For more detail, see page 4-26

EPA Tools For Quantifying Health Impacts

Basic Approaches

- **Sector-based Benefit Per Ton estimates** derived based on model simulations done with sophisticated models

COBRA and BENMAP-CE HEALTH OUTPUTS
• Mortality
• Chronic and acute bronchitis
• Non-fatal heart attacks
• Respiratory or cardiovascular hospital admissions
• Upper and lower respiratory symptom episodes
• Asthma emergency room visits
• Asthma attacks: Shortness of breath, wheezing, and coughing
• Minor restricted activity days
• Work loss days

Sophisticated Approaches

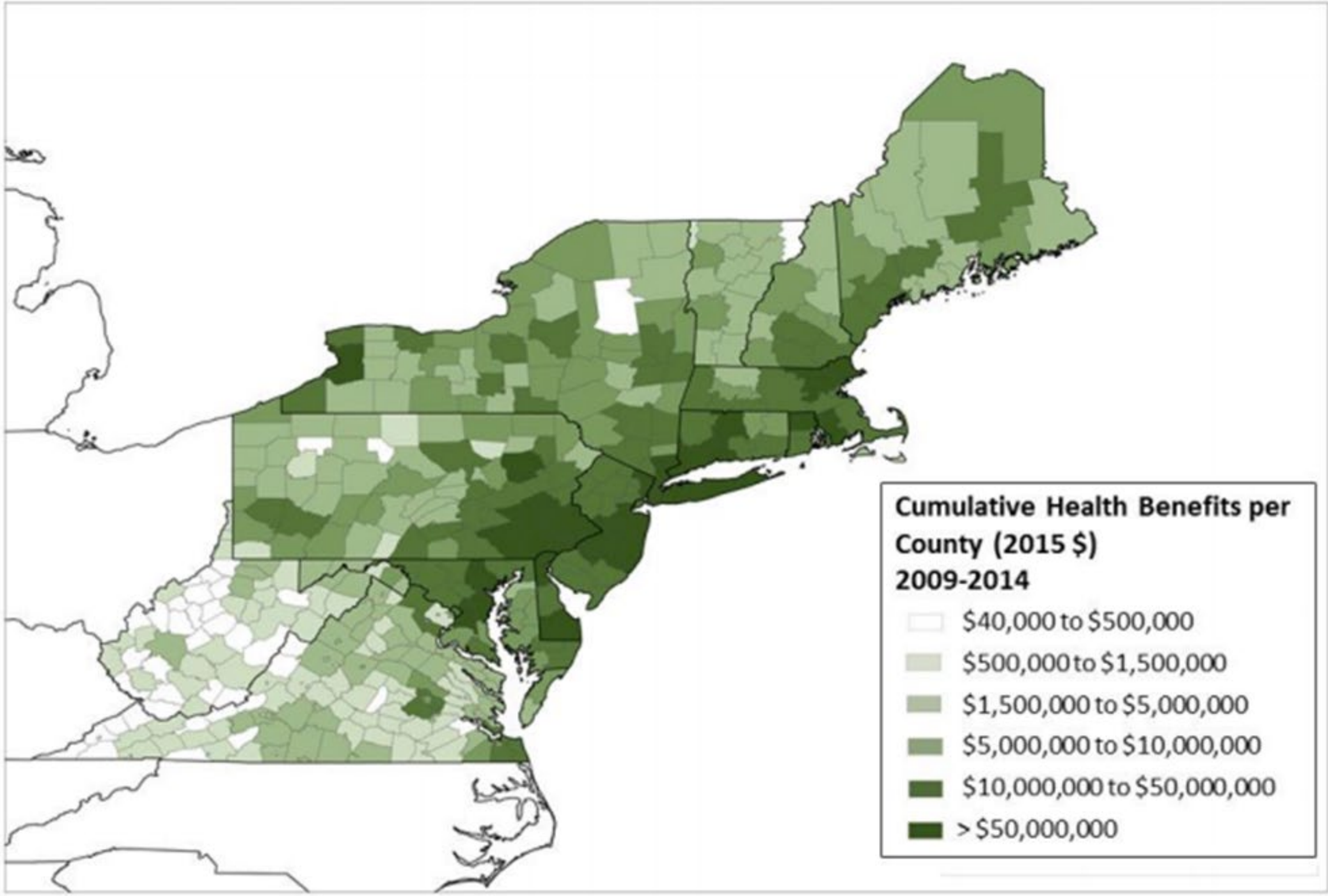
- **CO-Benefits Risk Assessment (COBRA) Health Impacts Screening and Mapping Tool** estimates and maps the particulate matter ($PM_{2.5}$)-related air quality and health impacts of changes in criteria air pollutants
- **Benefits Mapping and Analysis Program (BenMAP-CE)** estimates, monetizes and maps the effects on numerous health endpoints associated with changes in ambient ozone and PM concentrations.

Compare Method(s) to Quantify Health Impacts

EPA Tool or Factor		Basic Approach		Sophisticated Approach	
		Benefit-per-Ton Factors	Benefit-per-kWh Factors	COBRA[a]	BenMAP-CE
Type of effect estimated	Changes in the number of health incidences			X	X
	Economic value of changes in number of health incidences	X	X	X	X
Emissions analyzed	Changes in $PM_{2.5}$	X	X	X	X
	Changes in ozone				X
Type of input data required	Changes in air pollution (e.g., tons)	X		X	
	Changes in electricity generation (kWh)		X		
	Changes in air quality (e.g., μg/m³)				X
Level of expertise required	Novice	X	X	X	
	Experienced	X	X	X	X
User flexibility	Includes/uses default functions and values	X	X	X	X
	Allows users to change assumptions and values			X	X

Explore Case Studies in the Guide

Figure 4-6: Cumulative Health Benefits of RGGI, 2009–2014

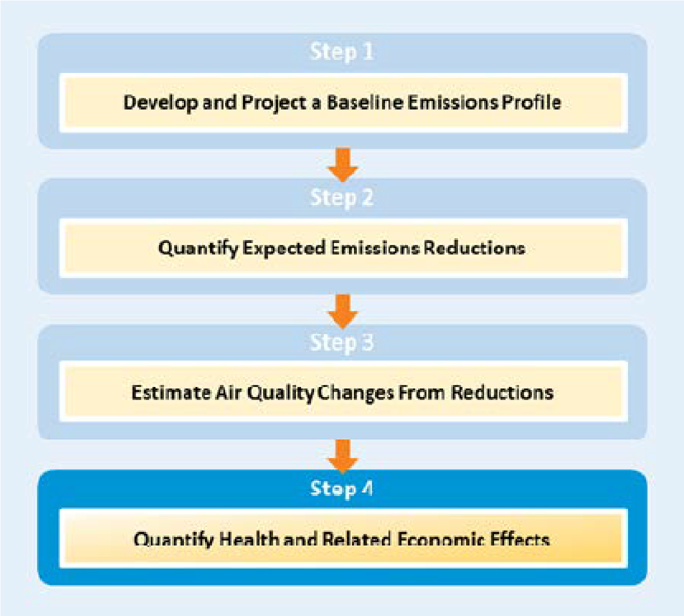


Source: Analysis of the Public Health Benefits of the Regional Greenhouse Gas Initiative (RGGI), 2009– 2014, Abt Associates, Inc.

Learn About Available Tools & Data Resources

4.4.4. Tools and Resources for Step 4: Quantify Health and Related Economic Effects

Analysts can use a range of available tools to quantify human health and related economic effects of air quality impacts from energy efficiency and renewable energy.



Health Benefit Factors

- **EPA's Benefit-per-kWh (BPK) Factors**. EPA is developing a set of factors to estimate the monetized public health benefits per kWh of energy efficiency or renewable energy projects, policies, or programs. EPA expects to release BPK factors for different regions of the country and different project types (wind, solar, and energy efficiency) in August 2018. Analysts will be able to multiply the BPKs by the estimated amount of kWh of electricity produced or reduced by the project or program to estimate the value of health benefits in dollars. https://www.epa.gov/energy/quantifying-health-and-economic-benefits-energy-efficiency-and-renewable-energy-policies
- **EPA's Response Surface Model (RSM)-based Benefit-per-Ton Estimates.** EPA used a reduced-form modeling approach to develop tables reporting the PM-related benefits of reducing directly emitted $PM_{2.5}$ and $PM_{2.5}$ precursors from certain classes of sources to an estimate of the monetized $PM_{2.5}$-related health benefits. Applying these estimates simply involves multiplying the emissions reduction by the relevant benefit per-ton metric. https://www.epa.gov/benmap/response-surface-model-rsm-based-benefit-ton-estimates

For More Information About EPA's Program, Tools, and Resources

United States Environmental Protection Agency

Download the Guide

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State and Local
Energy and Environment Program

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Using U.S. EPA's CO-Benefits Risk Assessment model to estimate the value of avoiding criteria pollutant emissions

Joy Morgenstern

California Public Utilities Commission

Using U.S. EPA's CO-Benefits Risk Assessment model to estimate the value of avoiding criteria pollutant emissions

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Integrated Distributed Energy Resources Proceeding

Goal: Develop a consistent, accurate, transparent cost-effectiveness framework for all distributed energy resources (DERs).

Proposal: Adopt a Societal Cost Test, which includes a social discount rate, social cost of carbon, and an air quality adder.

What are DERs?

Anything on the customer (demand) side of the meter (usually)

Which programs?

- Energy Efficiency
- Low Income Energy Efficiency (Energy Savings Assistance Program, or ESAP)
- Demand Response
- Distributed Generation/Customer Generation/Net Energy Metering/Self Generation (Storage, Fuel Cells, Rooftop Solar, etc.)
- Transportation and Building Electrification

Air Quality Concerns

When we reduce electricity demand

- How much are criteria pollutant emissions reduced?
- How much air pollution is reduced?
- What are the impacts of the reduced air pollution?
- What is the cost associated with those impacts?

Air Quality Adder

- Focuses only on human health-related effects of decreasing air pollution
- Will be incorporated into the Avoided Cost Calculator as an additional avoided cost of DERs
- Avoided Cost Calculator estimates avoided *marginal* costs (i.e., what is the impact of reducing one kWh in any given hour, based on the marginal unit of generation)
- Should be different for different locations and hours
- Difficult to determine actual, direct impact (i.e., decreasing consumption could lower emissions at any power plant)

Which criteria pollutants, from where, and from which type of plants?

- Coal
- Natural gas
- Biomass
- Geothermal

- Nitrogen Oxides (NO_x)
- Sulfur Dioxide (SO_2)
- Particulate Matter ($PM_{2.5}$)

- In-state power plants: *Which ones?*
- Out-of-state power plants (imports): *Where are they?*

Which databases to use?

Power plant emissions data:

- Emissions & Generation Resource Integrated Database (eGrid) eGrid (2014 version) [US Environmental Protection Agency]
- California Emission Inventory Development and Reporting System (CEIDARs) database [CA Air Resources Board (CARB)]

Supplemental data:

- Quarterly Fuel and Energy Report (QFER) [California Energy Commission]
- Energy Commission Power Plant ID Cross-Reference table (part of QFER)

Which model to use?

- BenMAP: Environmental Benefits Mapping and Analysis Program
- COBRA: CO-Benefits Risk Assessment
- AVERT: AVoided Emissions and geneRation Tool
- CARB Pollution Mapping Tool
- CARB Vision for Clean Air Model
- Cal EnviroScreen

How to sum the data?

- Emissions:
  - Total or Adjusted*?
  - Total, only in-state, only by regulated Investor-owned Utilities (IOUs)?
- Generation:
  - Total or Adjusted*?
  - Total, only in-state, only by regulated IOUs, only by emitters?

* Adjusted by multiplying emissions and generation by non-baseload factor

Assumptions and Steps

- First run: used 2014 eGrid (SO_2 and NO_x only) in COBRA with 3% discount rate and all statewide power plants. Initial results of $1.67 to $3.77/MWh; about 65% attributable to SO_2
    - About half of the SO_2 emissions from 4 coal plants; 3 have been shut down since 2014
        - Updated 2014 eGrid data, using QFER, to eliminate all decommissioned plants
            - Added $PM_{2.5}$ emissions from CEIDARS
                - Used adjusted emissions and generation; generation limited to in-state emitters

Results

- Results of $2.64 to $5.97/MWh; chose high end and rounded
- Proposed Interim Air Quality Adder of $6/MWh (0.6 ¢/kWh)

Table 3: 2017 Avoided Human Health Costs of 1 GWh Reduction in Electricity Generation*

Total Health Benefits (low estimate)	$2,638.07
Total Health Benefits (high estimate)	$5,964.78
Mortality (low estimate)	$2,594.11
Mortality (high estimate)	$5,887.68
Infant Mortality	$6.38
Nonfatal Heart Attacks (low estimate)	$4.00
Nonfatal Heart Attacks (high estimate)	$37.13
Hospital Admits, All Respiratory	$2.00
Hospital Admits, Cardiovascular (except heart attacks)	$3.25
Acute Bronchitis	$0.27
Upper Respiratory Symptoms	$0.34
Lower Respiratory Symptoms	$0.01
Emergency Room Visits, Asthma	$0.15
Minor Restricted Activity Days	$0.00
Work Loss Days	$0.07
Asthma Exacerbation	$19.24

**Includes only in-state non-zero emissions generation, adjusted for marginal generation. Results are in $2017 and represent the value per GWh of emissions reductions*

Outcomes and Impacts

- *Proposed* Commission decision to adopt a Societal Cost Test with an interim Air Quality Adder
- Interim value allows us to:
  - Better understand the impact of reducing electricity consumption
  - See the extent to which we might plan or procure electric resources differently when we consider air pollution reductions
- Will likely be more significant in future for electrification programs

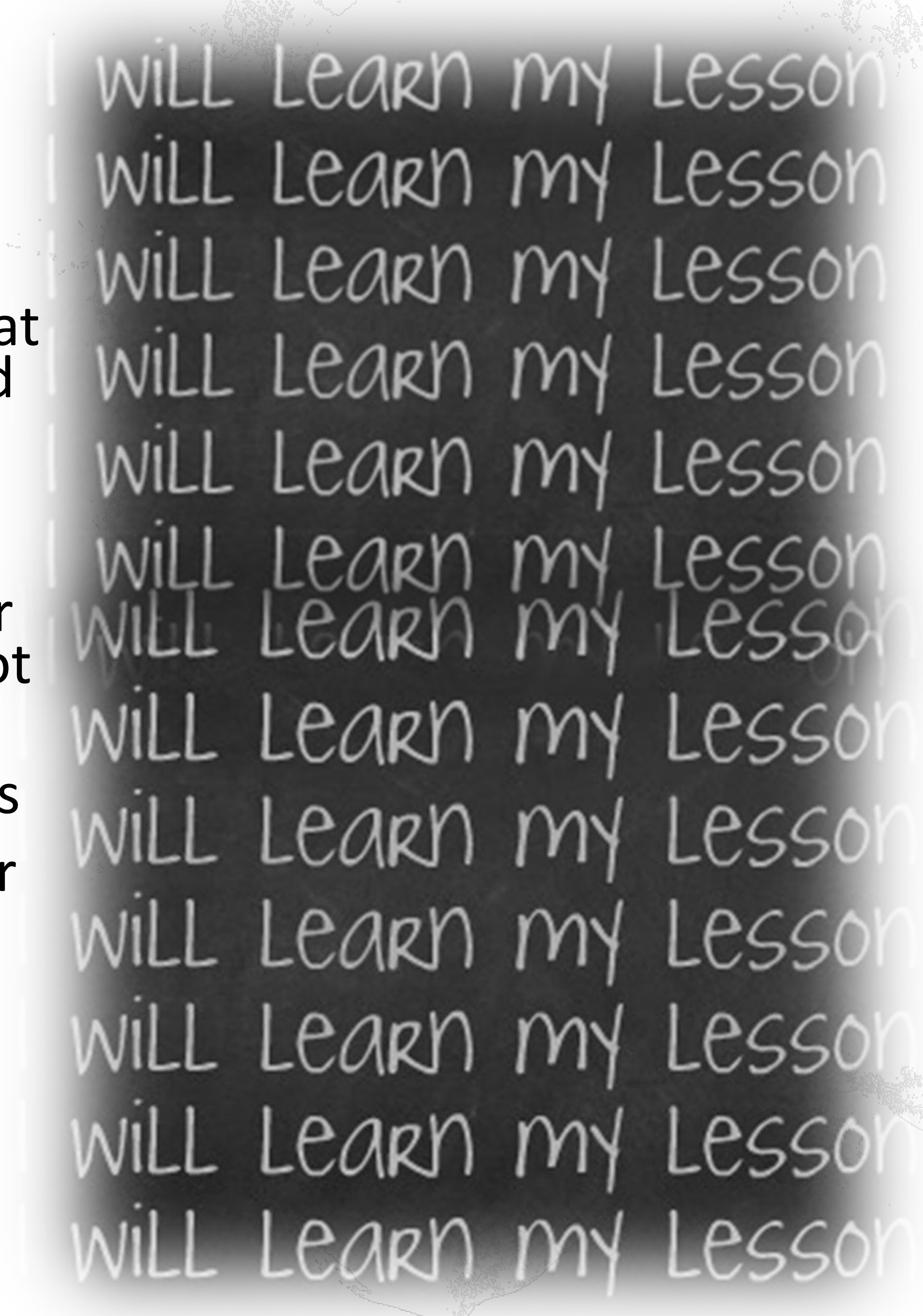
Challenges

- Inconsistent and old data
- How to account for imported electricity
- How to determine and account for when clean energy resources (hydro, renewable portfolio standard) are on the margin
- How to account for electrification (load-building)

- Statewide value has limited usefulness; air pollution levels vary widely across the state

Lessons Learned

- More in-depth study needed that uses local air quality models and more accurate data, possibly using BenMAP
- Determining relationship between DERs and actual power plant reductions is difficult, if not impossible
- Need to determine local impacts
- May need to change methods or assumptions for electrification
- Need to determine emissions from biomass and geothermal
- Need to take into account changes in plant dispatch



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Poll 2

Saving Energy, Saving Lives: The Health Impacts of Avoiding Power Plant Pollution with Energy Efficiency

Cassandra Kubes

American Council for an Energy-Efficiency Economy

Saving Energy, Saving Lives: The Health Impacts of Avoiding Power Plant Pollution with Energy Efficiency

EPA Webinar: Quantifying Health Benefits of Energy Efficiency & Renewables

Cassandra Kubes, Research Manager, Health and Environment, ACEEE

May 16, 2019

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The American Council for an Energy-Efficient Economy (ACEEE) is a nonprofit 501(c)(3) founded in 1980. We act as a catalyst to advance energy efficiency policies, programs, technologies, investments, & behaviors.

Our research explores economic impacts, financing options, behavior changes, program design, and utility planning, as well as US national, state, & local policy.

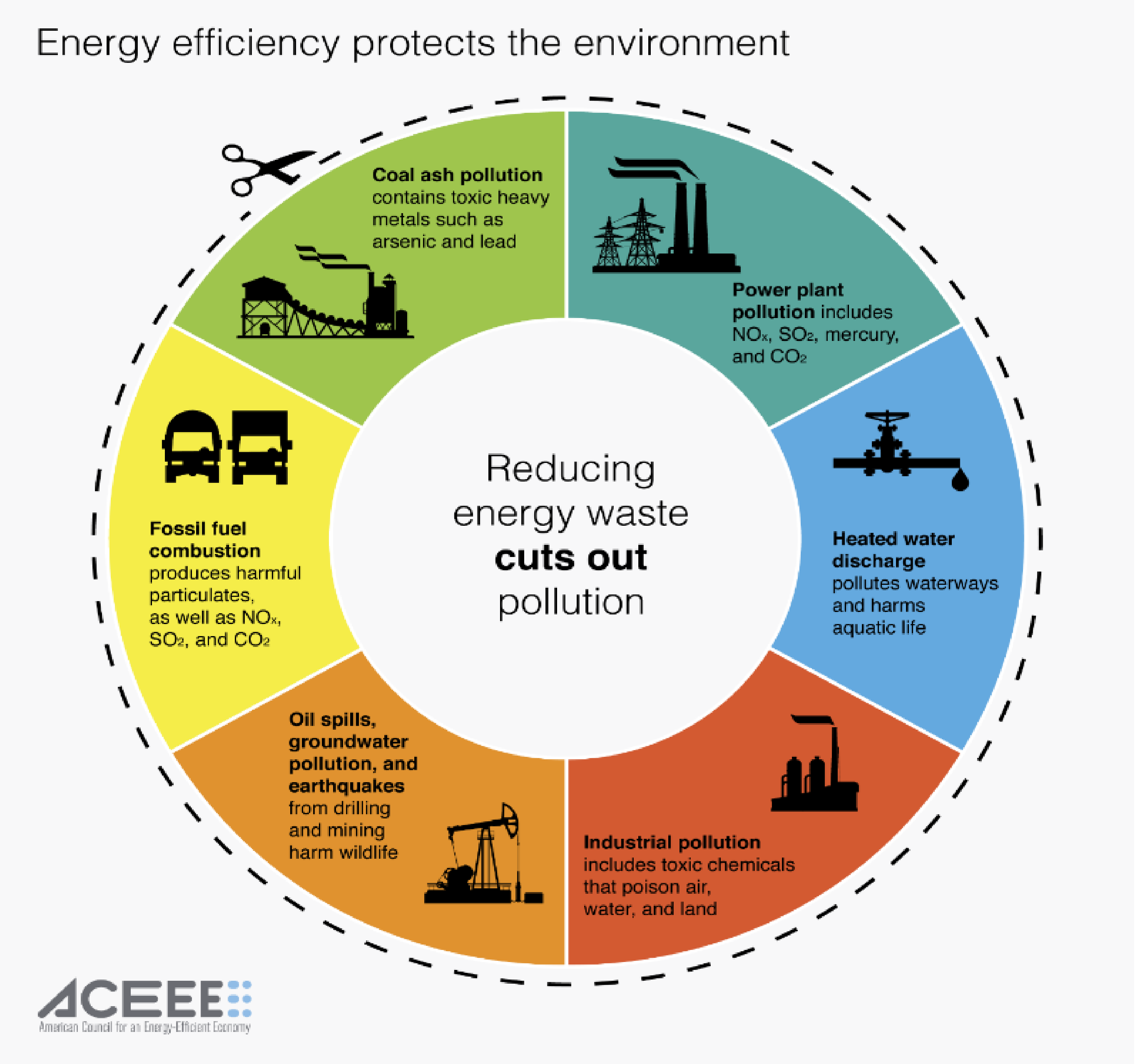
Our work is made possible by foundation funding, contracts, government grants, and conference revenue.

Agenda

- Energy efficiency (EE) overview
- Environmental and health effects of EE
- Overview of analysis
- Methodology
- Results

Energy Efficiency Improves Public Health

- EE is achieved when outdated practices and technologies are replaced with new, less wasteful approaches.
- Long history of federal, state, and local governments implementing programs and policies to save energy.
- By saving energy in buildings and making vehicles more fuel efficient, we burn less fossil fuel and reduce the pollutants they emit, resulting in substantial environmental and health benefits.



Energy efficiency protects the environment
Reducing energy waste cuts out pollution
Coal ash pollution contains toxic heavy metals such as arsenic and lead
Power plant pollution includes NO_x, SO_2, mercury, and CO_2
Heated water discharge pollutes waterways and harms aquatic life
Industrial pollution includes toxic chemicals that poison air, water, and land
Oil spills, groundwater pollution, and earthquakes from drilling and mining harm wildlife
Fossil fuel combustion produces harmful particulates, as well as NO_x, SO_2, and CO_2
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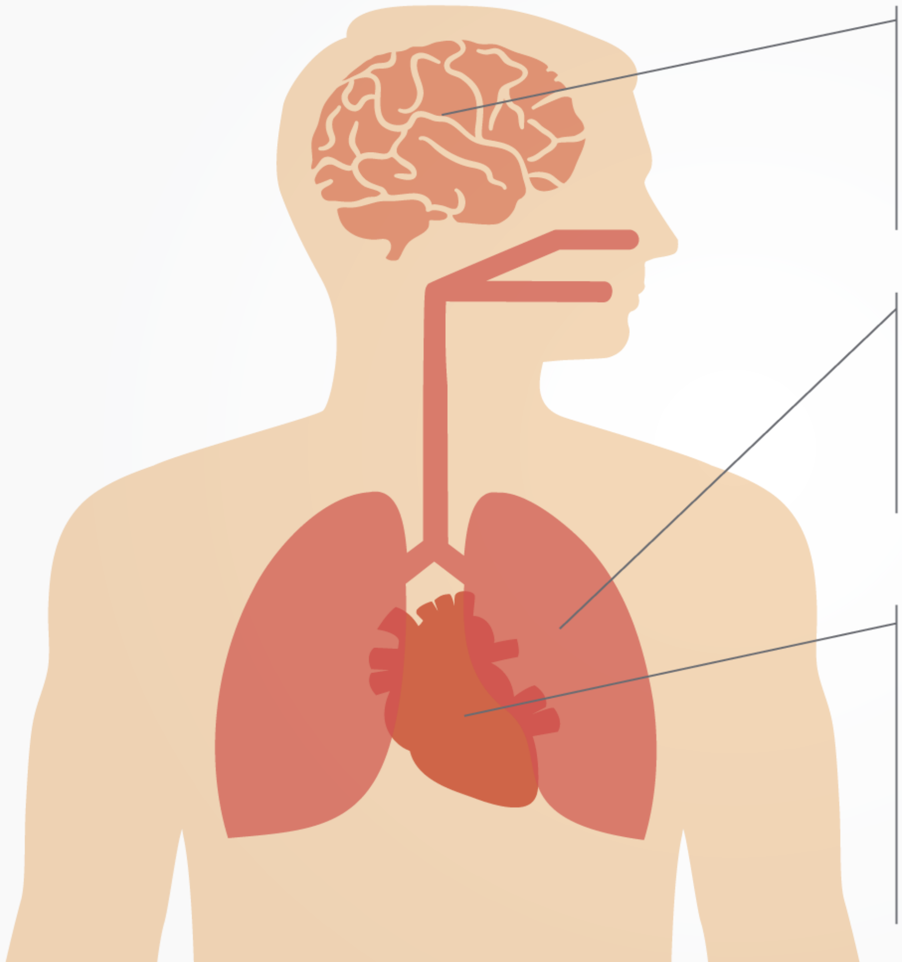
Health Effects of Fossil Fuel Pollutants



BRAIN Mercury and lead target the nervous system, particularly the brain, leading to serious neurological consequences. These include **stroke** and **loss of intellectual capacity**.

LUNGS Fine particulate matter, such as sulfur dioxide and nitrogen oxides, contribute to **lung cancer**; **COPD** (chronic obstructive pulmonary disease), and **asthma**.

HEART Air pollutants such as nitrogen oxides, sulfur dioxide and particulate matter harm cardiovascular health. They contribute to **coronary heart disease**, the leading cause of death in the U.S.; hospitalizations for heart attacks; and **congestive heart failure**.

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1985 NOBEL PEACE PRIZE

PSR® PHYSICIANS FOR SOCIAL RESPONSIBILITY®

U.S. affiliate of International Physicians for the Prevention of Nuclear War, recipient of the 1985 Nobel Prize for Peace

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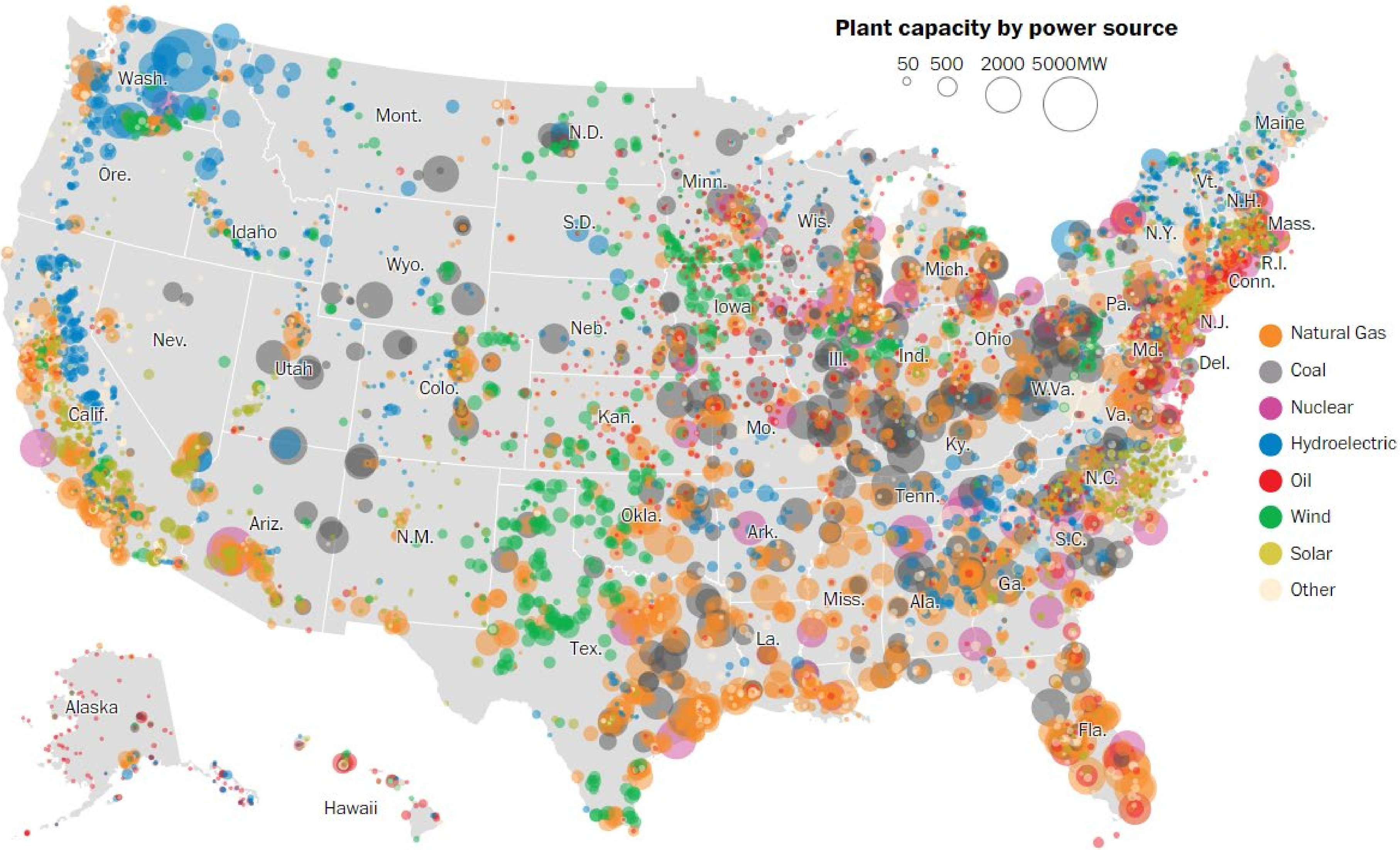
Source: Energy Efficiency (ACEEE)



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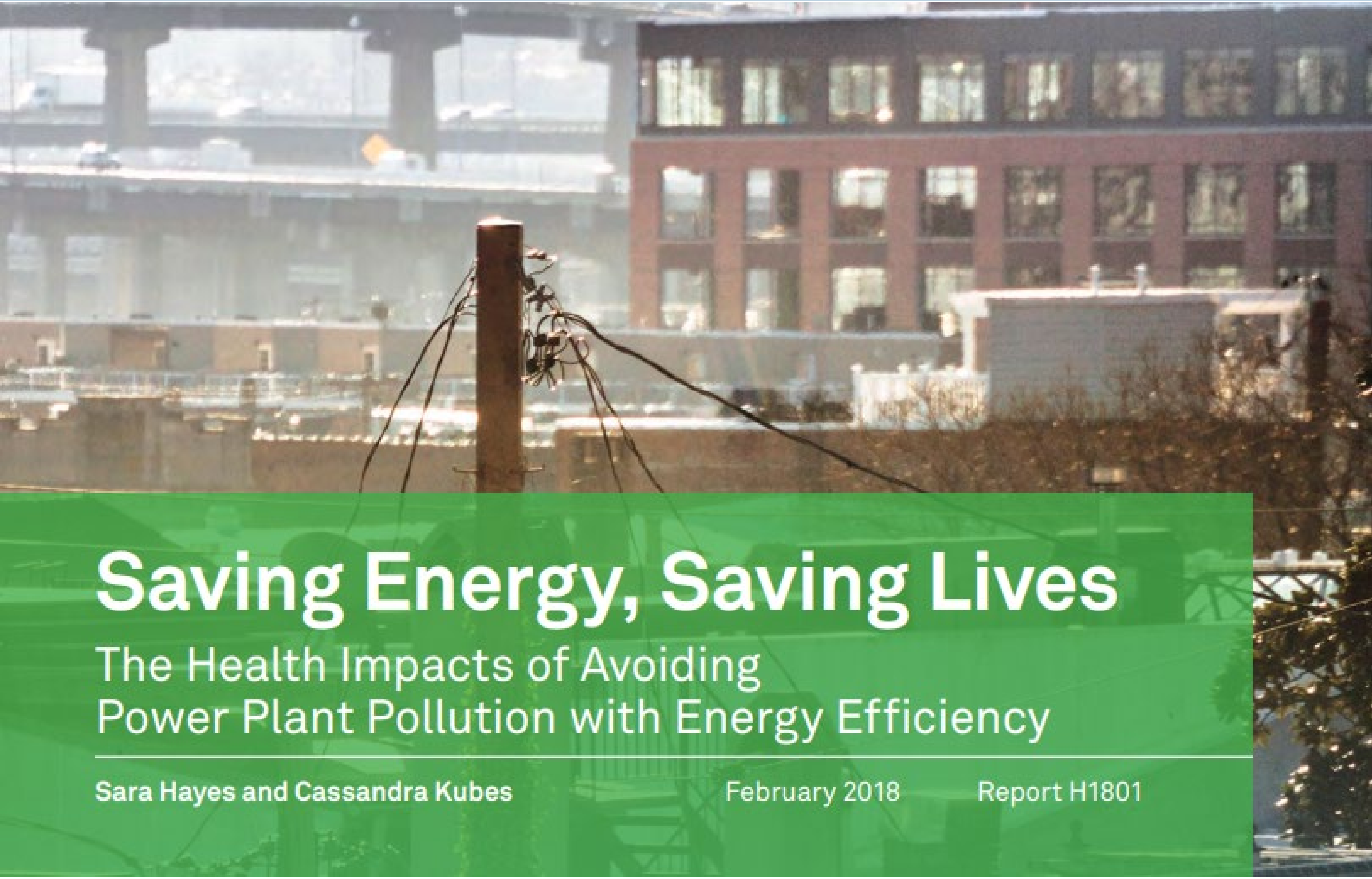
Source: Mapping how the United States generates its electricity (Washington Post)



[Saving Energy, Saving Lives]

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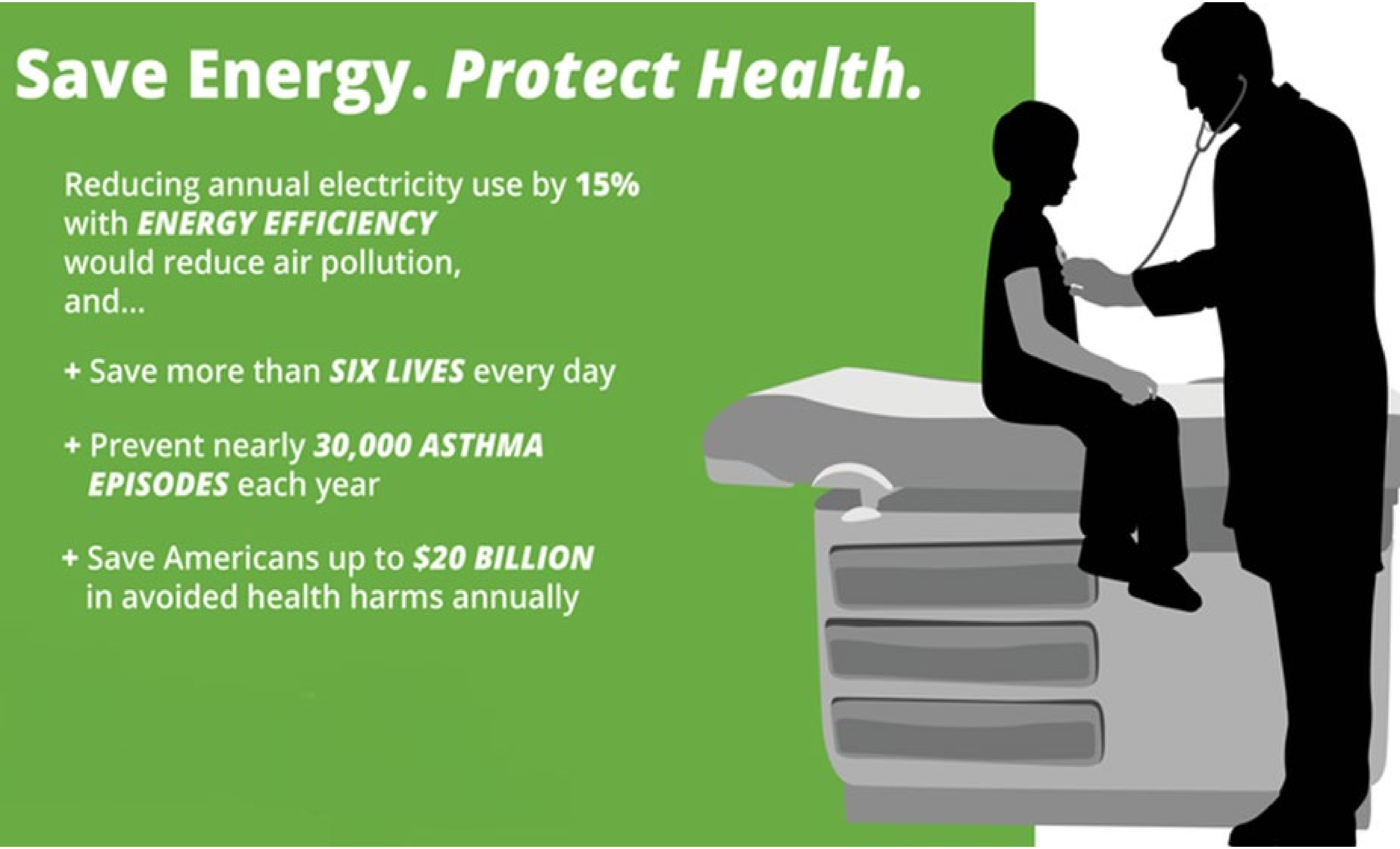
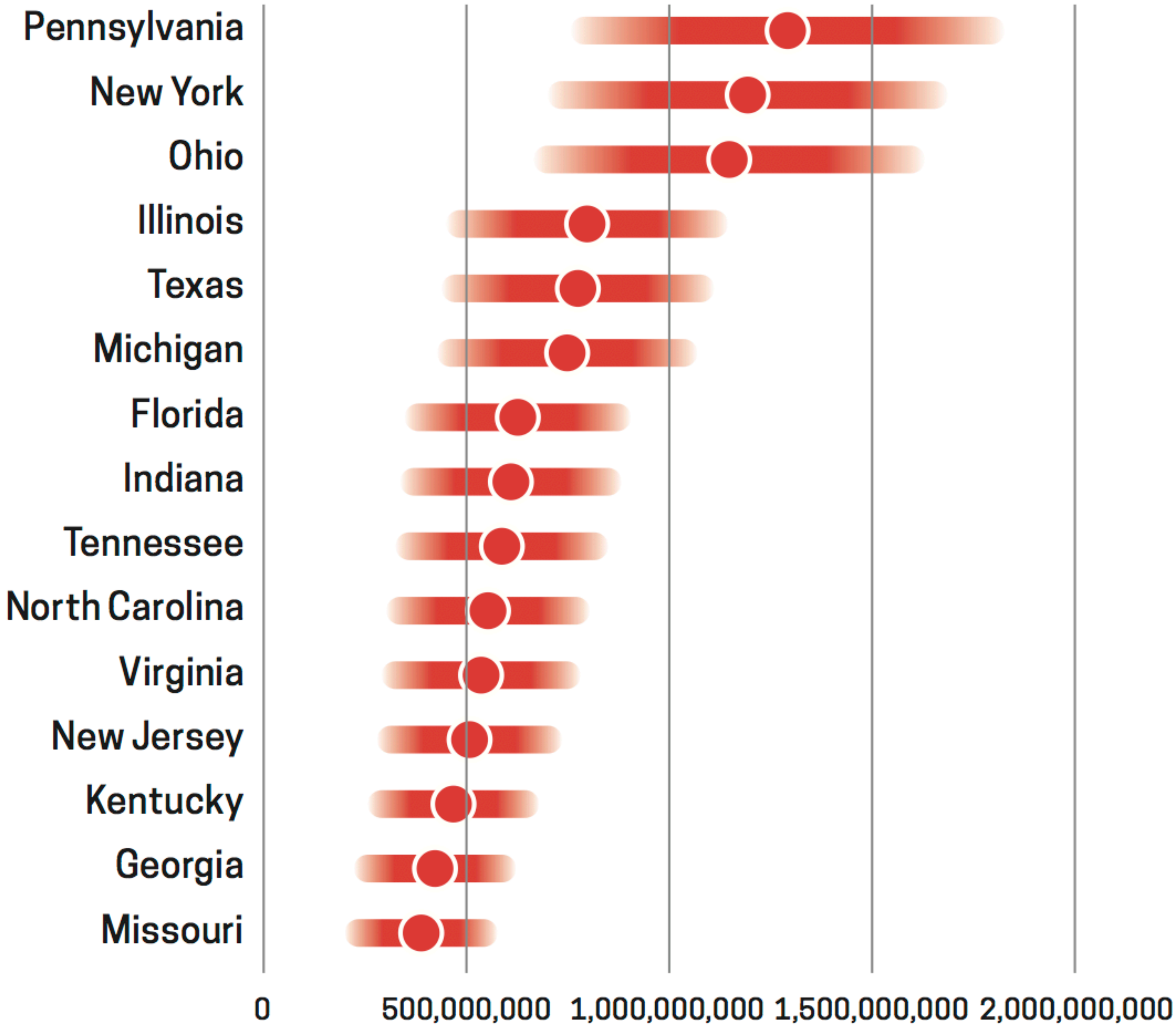
Methodology

- Applied a 15% reduction in annual electric consumption evenly across the country.
- Estimated emission reductions from power plants using EPA's AVoided Emissions and geneRation Tool (AVERT).
- Entered emission reductions for more than 3,000 counties into EPA's CO-Benefits Risk Assessment (COBRA) model to quantify the health harms avoided by our energy efficiency scenario.


Save Energy. Protect Health.
Reducing annual electricity use by 15% with ENERGY EFFICIENCY would reduce air pollution, and...
+ Save more than SIX LIVES every day
+ Prevent nearly 30,000 ASTHMA EPISODES each year
+ Save Americans up to $20 BILLION in avoided health harms annually

Top 15 states by avoided annual health harms, low and high range (US$)



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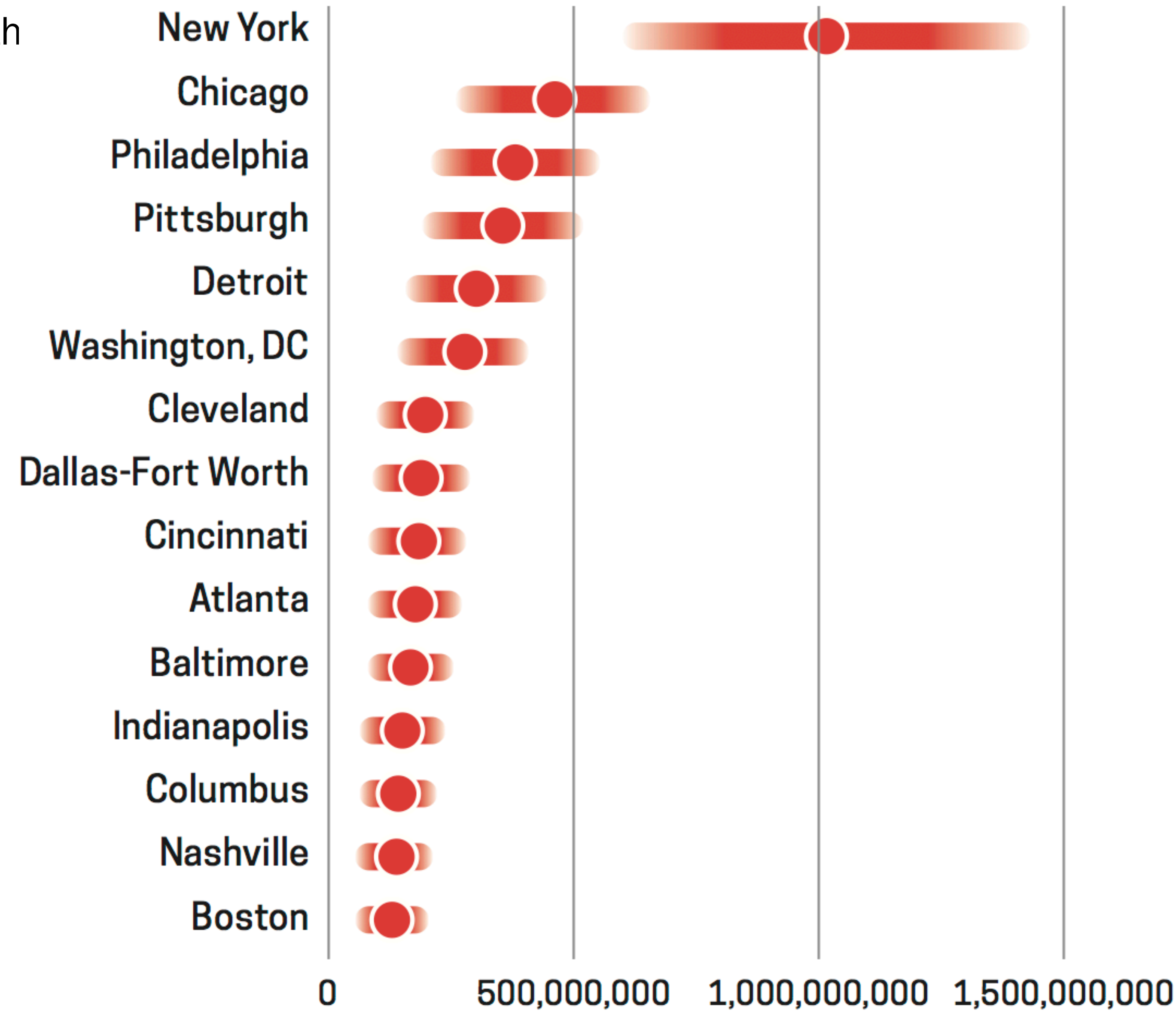
Top 15 states by avoided health harms per capita, low and high range (US$)

Rank	State	Dollars per capita
1	West Virginia	$184
2	Kentucky	$148
3	Pennsylvania	$140
4	Ohio	$137
5	Indiana	$128
6	Tennessee	$124
7	Alabama	$106
8	Michigan	$105
9	Delaware	$103
10	Arkansas	$98
11	Missouri	$89
12	Virginia	$89
13	Mississippi	$89
14	Illinois	$87
15	Maryland	$87

Top 15 cities by avoided annual health harms, low and high range (US$)



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Top 15 cities by avoided health harms per capita, low and high range (US$)

Rank	City	Dollars per capita
1	Pittsburgh	$210
2	Buffalo	$150
3	Louisville	$135
4	Cleveland	$132
5	Cincinnati	$119
6	Birmingham	$109
7	Indianapolis	$106
8	Nashville	$105
9	Columbus	$101
10	Memphis	$100
11	Detroit	$98
12	Richmond	$88
13	Philadelphia	$87
14	Baltimore	$86
15	Hartford	$73

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Using the Results

- Communicating the value of energy efficiency programs and policies to government decisionmakers.
- Describing the significance of energy efficiency to health professionals.
- Understanding opportunities for energy efficiency to improve public health for those most vulnerable.

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Thank you

Cassandra Kubes
ACEEE

Quantifying the Air Quality and Health Benefits of Power Sector Transitions

United States Environmental Protection Agency

David Abel
University of Wisconsin
The Holloway Group

Quantifying the Air Quality and Health Benefits of Power Sector Transitions

David Abel, PhD
University of Wisconsin – Madison
Nelson Institute for Environmental Studies
The Holloway Group

Webinar: Quantifying Health Benefits of Energy Efficiency & Renewables

May 16, 2019

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- Lena Tao
- Sara Hayes
- Cassandra Kubes
- Stacie Reese
- Josh Arnold

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Climate/Weather

Energy Efficiency

Renewable Energy

Health

Buildings

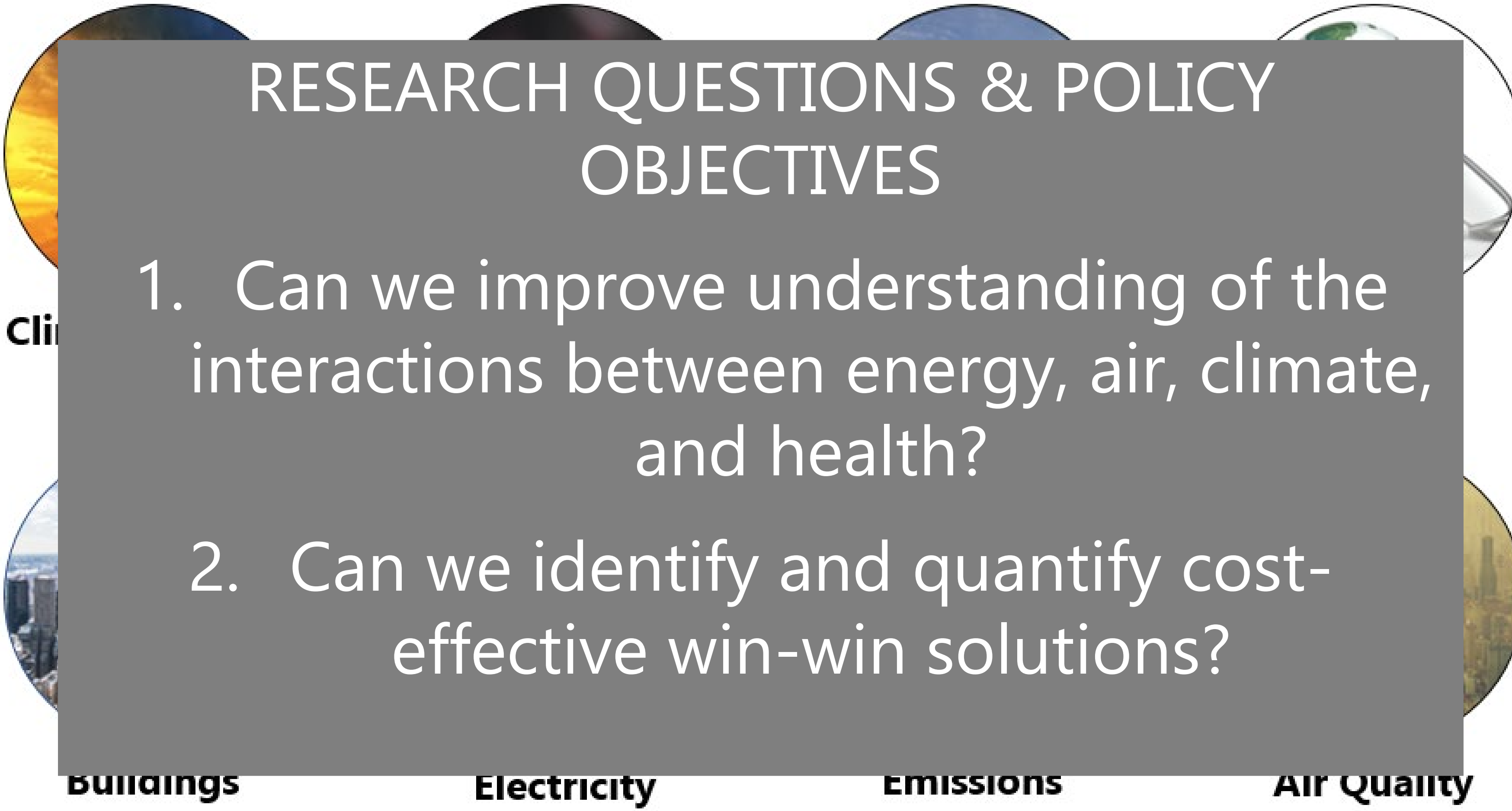
Electricity

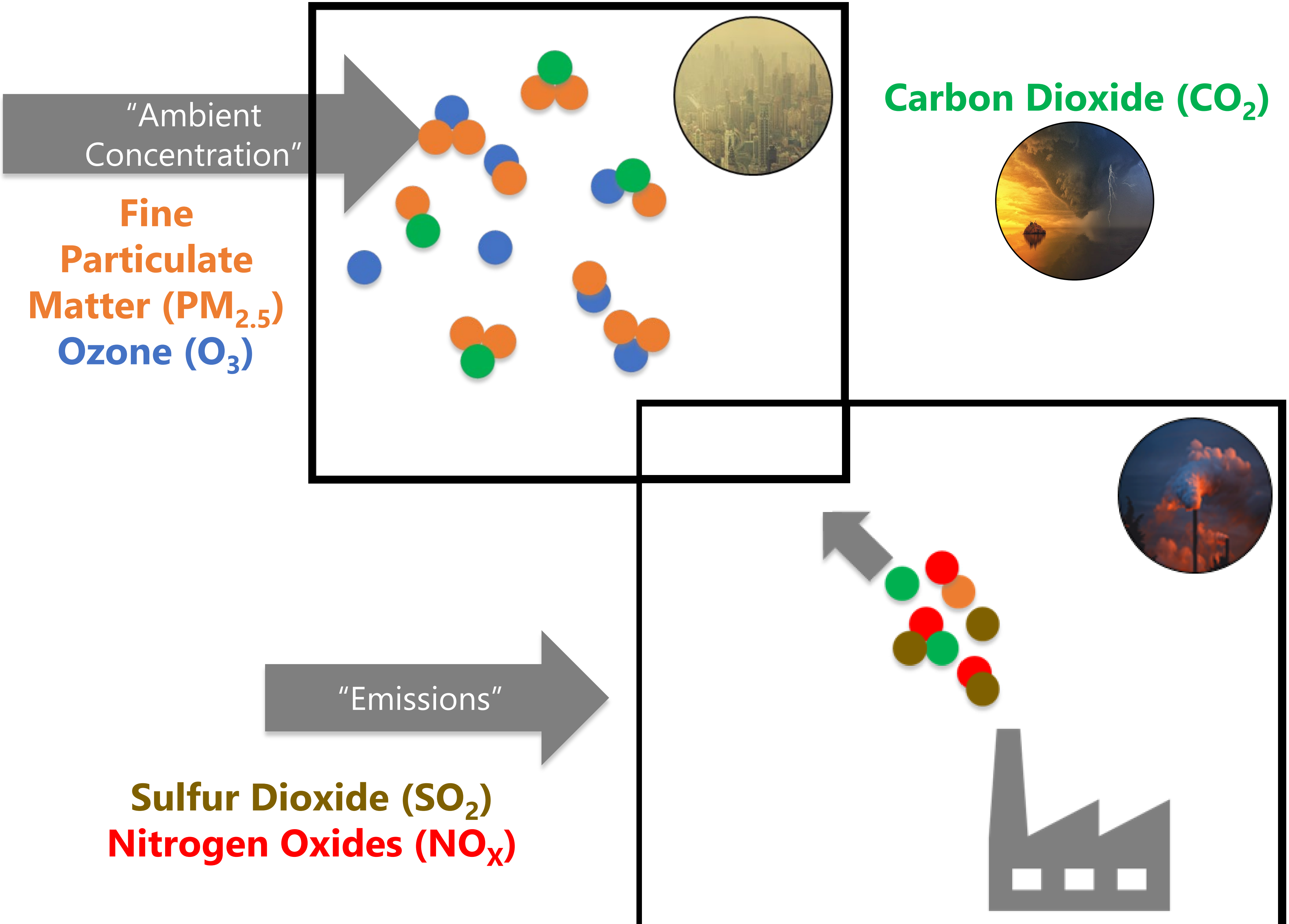
Emissions

Air Quality

RESEARCH QUESTIONS & POLICY OBJECTIVES

1. Can we improve understanding of the interactions between energy, air, climate, and health?
2. Can we identify and quantify cost-effective win-win solutions?

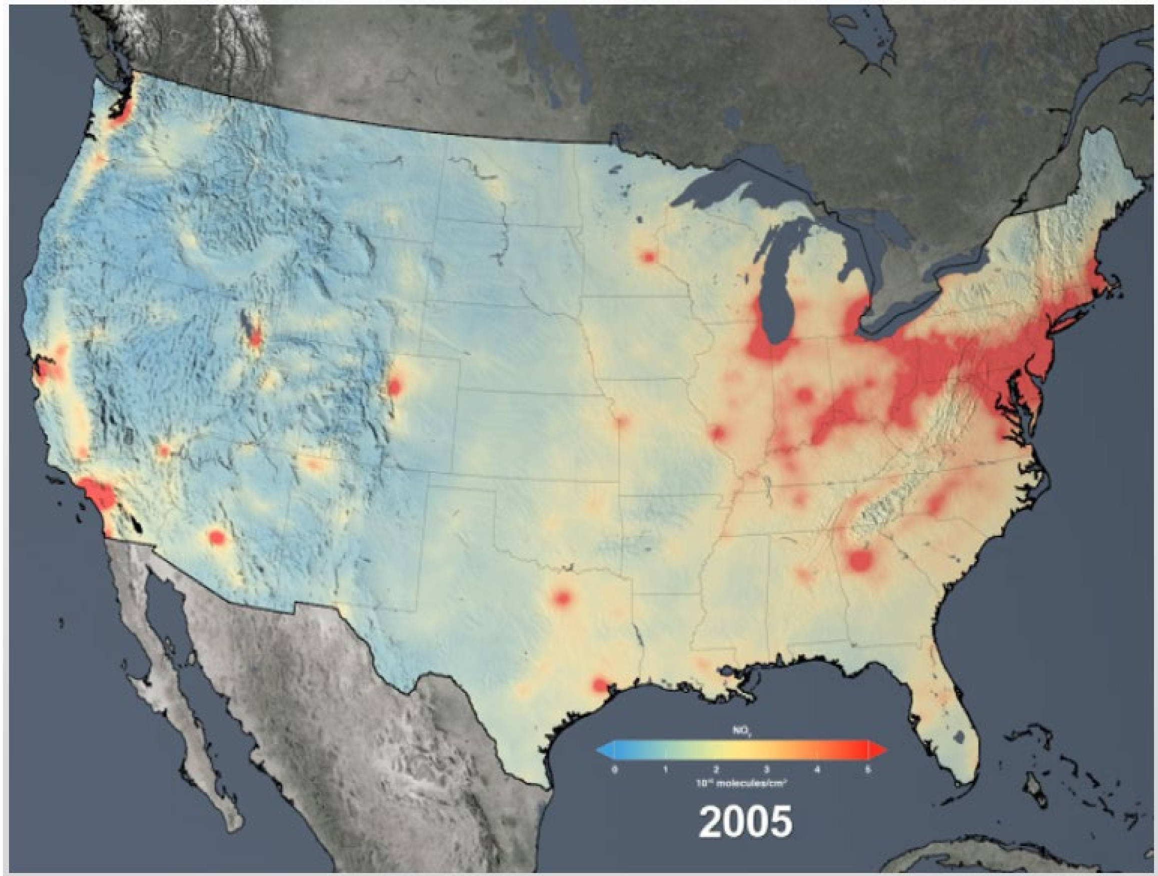




Slide adapted from Tracey Holloway

Why Care?

- **$50 Billion/year** achieving U.S. clean air standards
- ≈**30:1** return in U.S. health benefits
- ≈**100,000 deaths/year** in the U.S.
- **4th highest risk factor** for death globally, ≈7 million deaths/year
- **91% exposed to unhealthy pollution** above World Health Organization air quality guidelines globally.



Lamsal et al., NASA Ozone Monitoring Instrument (OMI), Aura Satellite

World Health Organization | Air Pollution GBD Compare EPA | Progress Cleaning the Air and Improving People's Health

Why Care?

- **$50 Billion/year** achieving U.S. clean air standards
- ≈**30:1** return in U.S. health benefits
- ≈**100,000 deaths/year** in the U.S.
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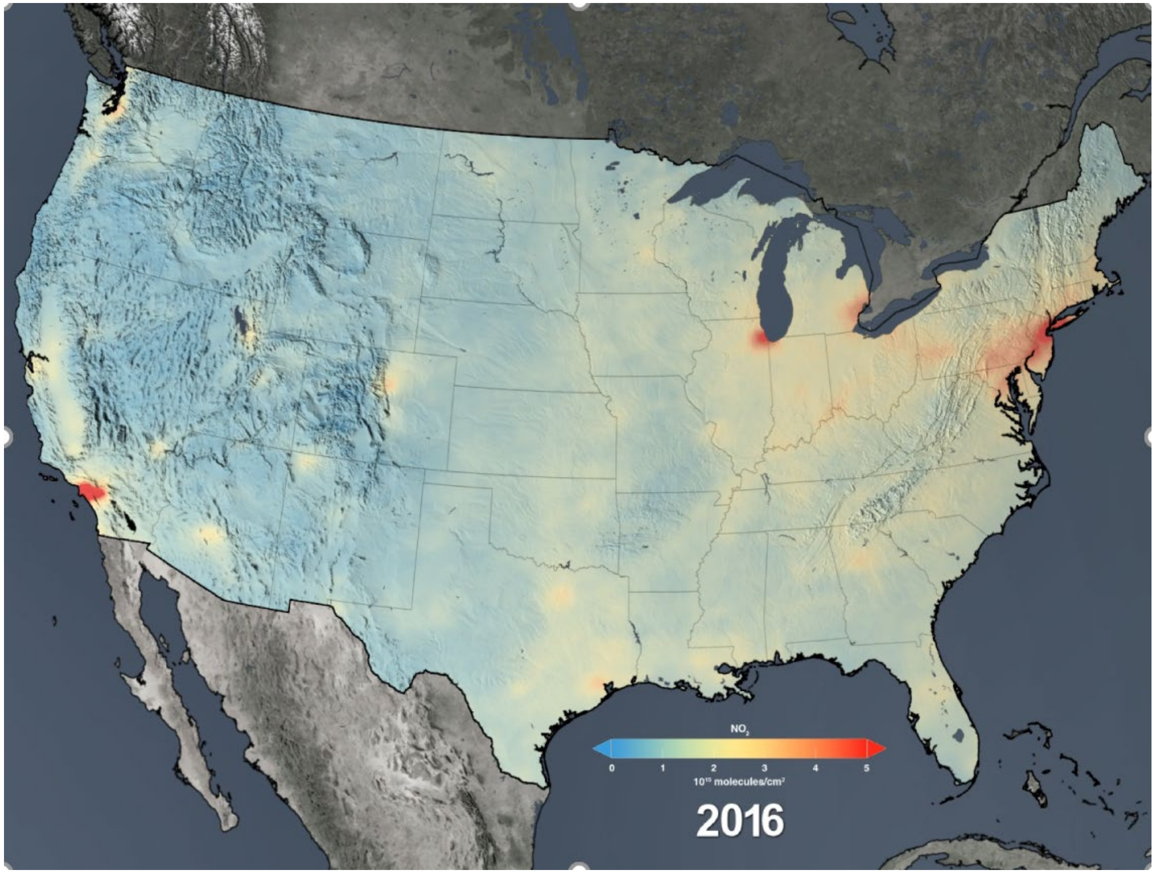

Lamsal et al., NASA Ozone Monitoring Instrument (OMI), Aura Satellite

World Health Organization | Air Pollution   GBD Compare   EPA | Progress Cleaning the Air and Improving People's Health

QUANTIFYING THE POTENTIAL BENEFITS OF ENERGY EFFICIENCY ON US ELECTRIC POWER-SECTOR EMISSIONS, AIR QUALITY AND PUBLIC HEALTH

Presented at the 2018 Conference on Health, Environment and Energy

ACEEE American Council for an Energy-Efficient Economy

David Abel
University of Wisconsin - Madison

Center for Sustainab... and the Global Envir... NELSON INSTITUTE FOR ENVIRONM...

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American Council for an Energy-Efficient Economy

Including Energy Efficiency Projects into SIP Development

CenSARA Fall Business Meeting

October 2, 2018

Cassandra Kubes, American Council for an Energy-Efficient Economy (ACEEE)

David Abel, University of Wisconsin-Madison

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Central States Air Resource Agencies Association
CenSARA

Environmental Science & Technology

Air Quality-Related Health Benefits of Energy Efficiency in the United States

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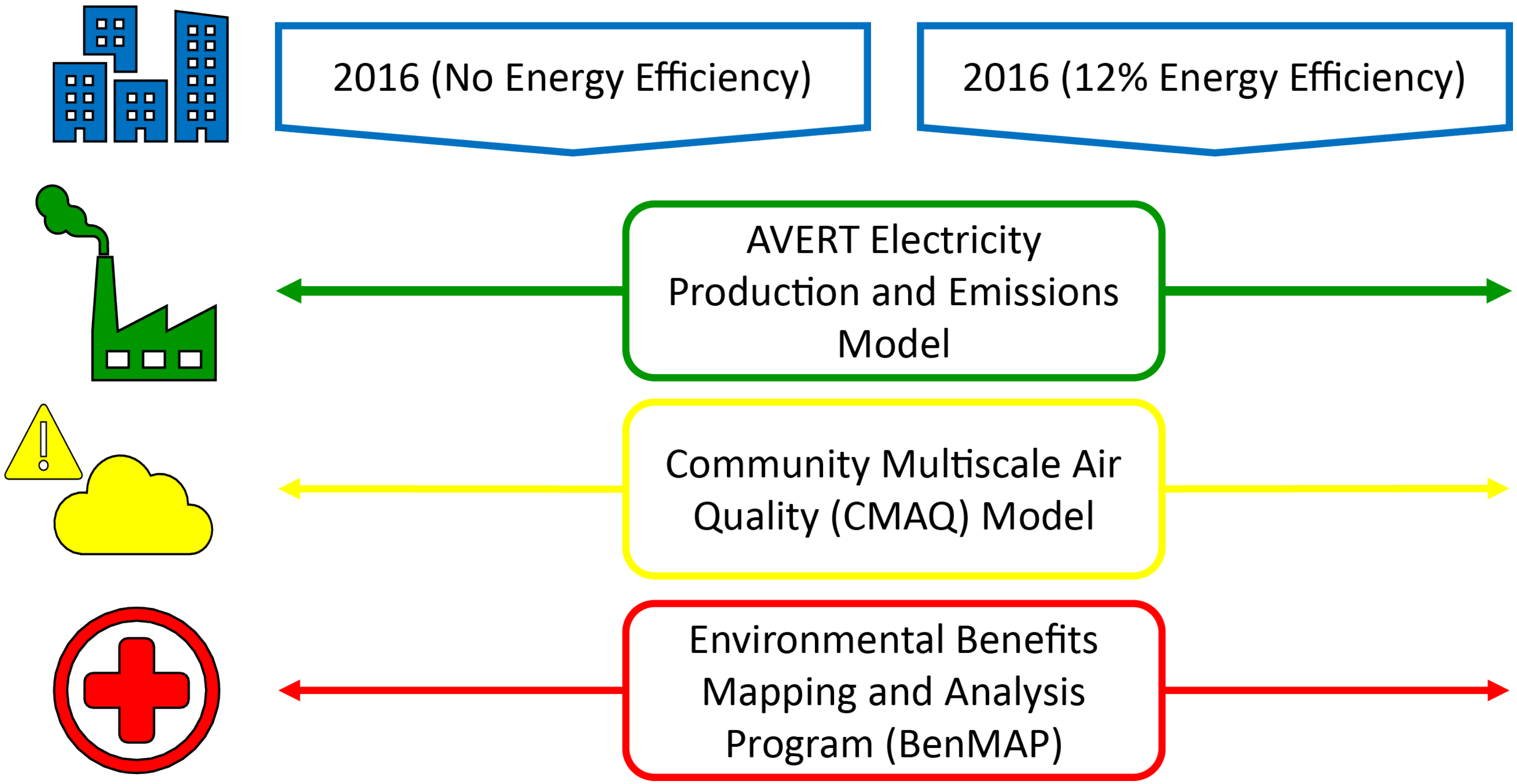
What is the impact of 12% Energy efficiency nationwide?



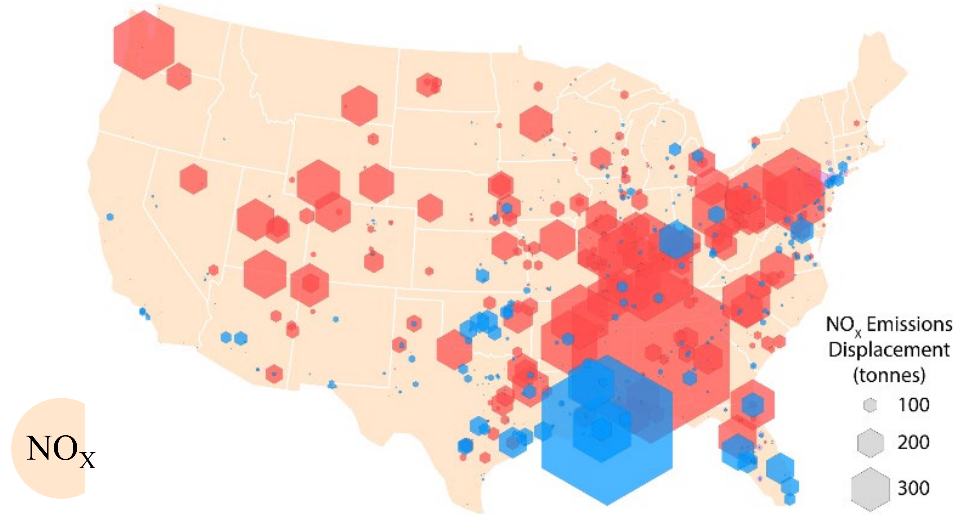
Abel et al., 2019 *ES&T*

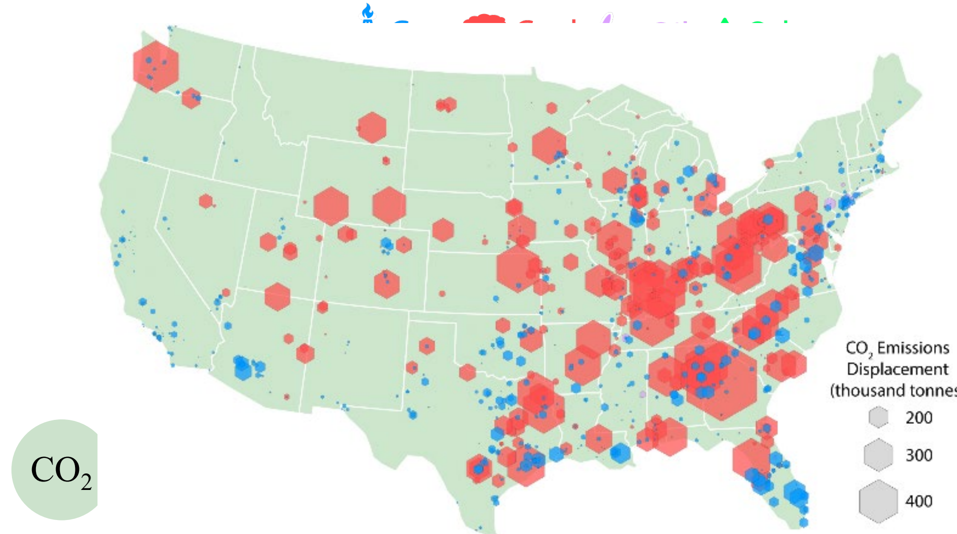
National Summertime Displacement:

Gen: 91.7 TWh (11.9%)
NO_X: 44.8 kt (13.2%)
SO_2: 56.2 kt (12.6%)
CO_2: 64.5 Mt (11.6%)

Displaced Emissions Rate:

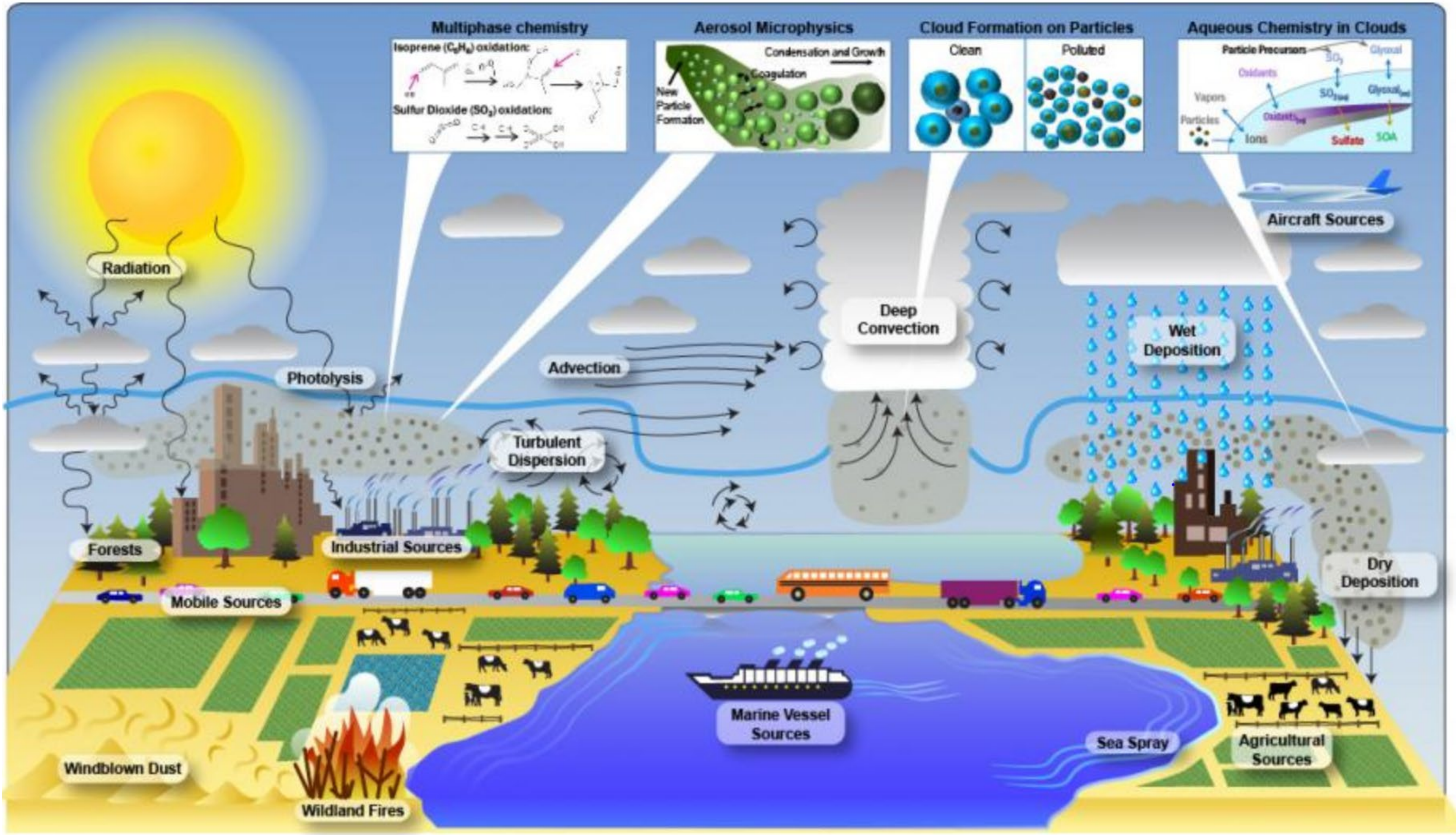
NO_X: 0.49 kg/MWh
SO_2: 0.61 kg/MWh
CO_2: 0.70 tonnes/MWh





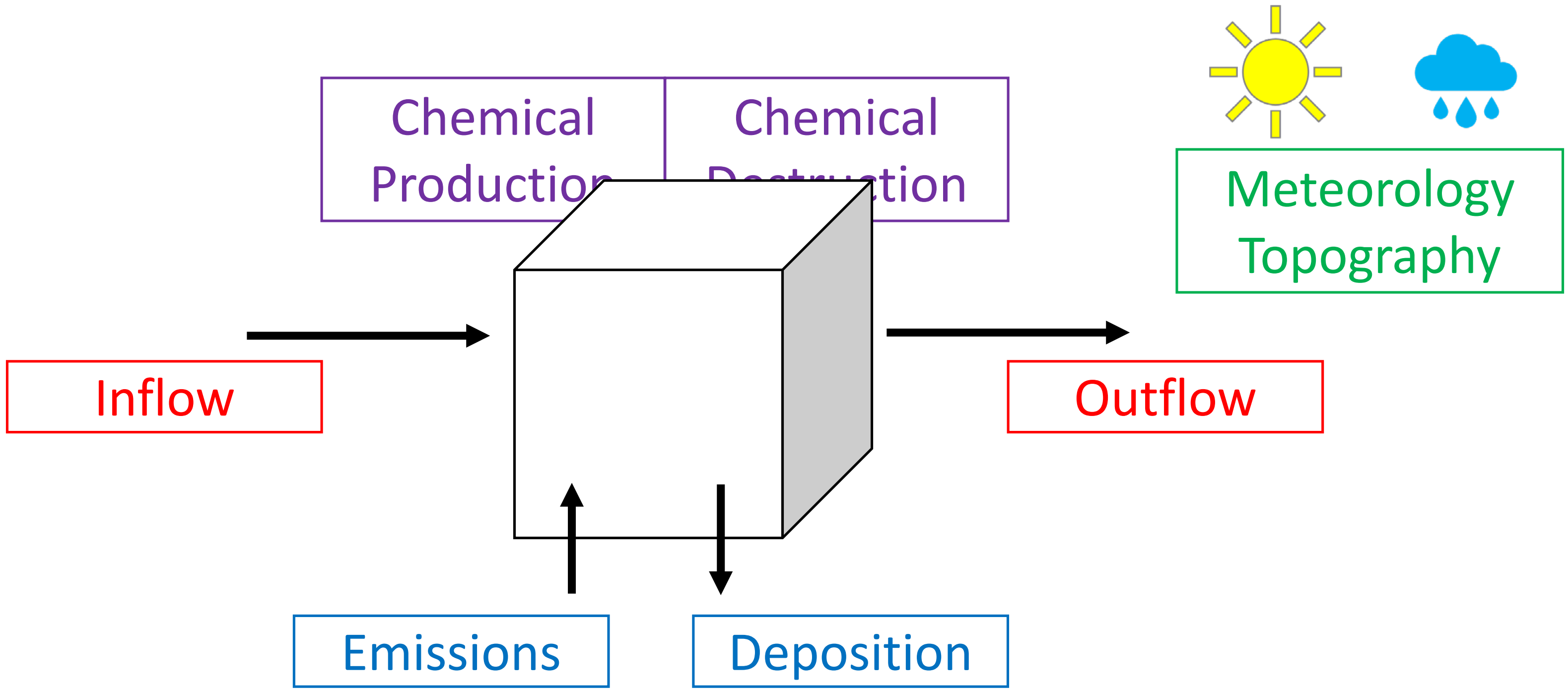
Abel et al., 2019 *ES&T*

Chemical Transport Modeling



Source: U.S. EPA | Overview of Science Processes in CMAQ

Chemical Transport Modeling

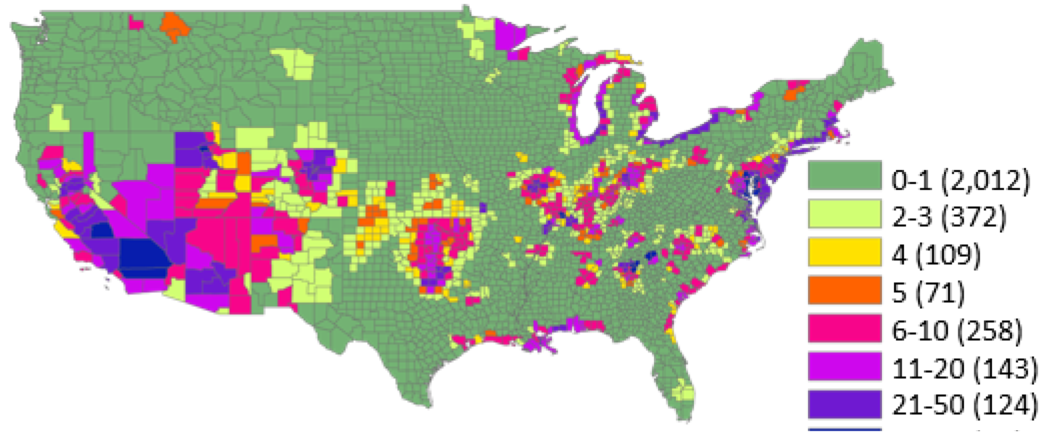


<u>45 (6.2%)</u> Non-Attainment Counties Gain Compliance

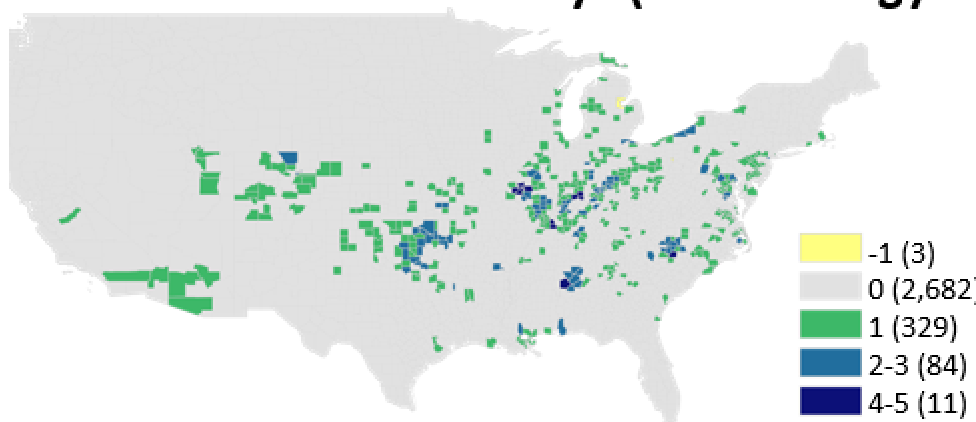
In those counties,
<u>Avg. 1.107ppb</u> change
<u>Avg. 1.49 less days</u> exceedance
<u>Max 2.871ppb</u> change and 4 less exceedances

Overall, 0.179 less exceedance days on average by county

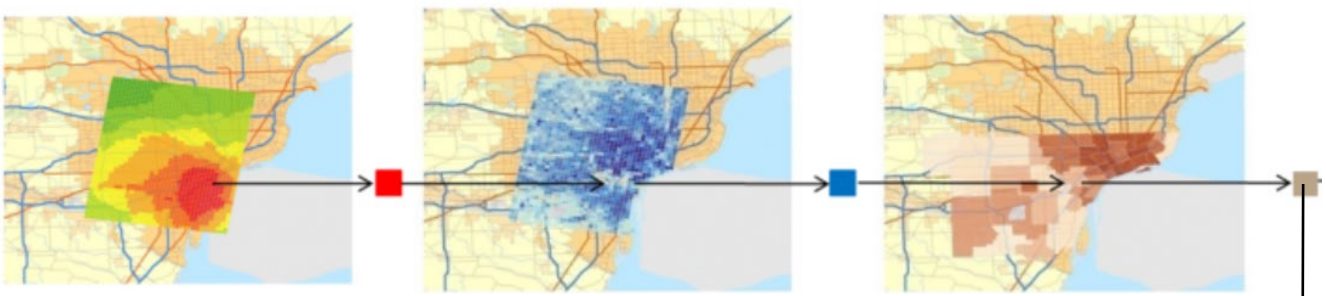
Exceedance Days per County (Base Case)

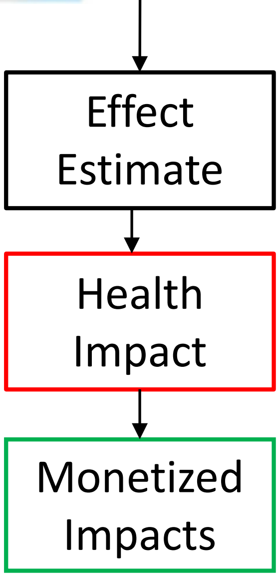


Avoided Exceedance Days (From Energy Efficiency)

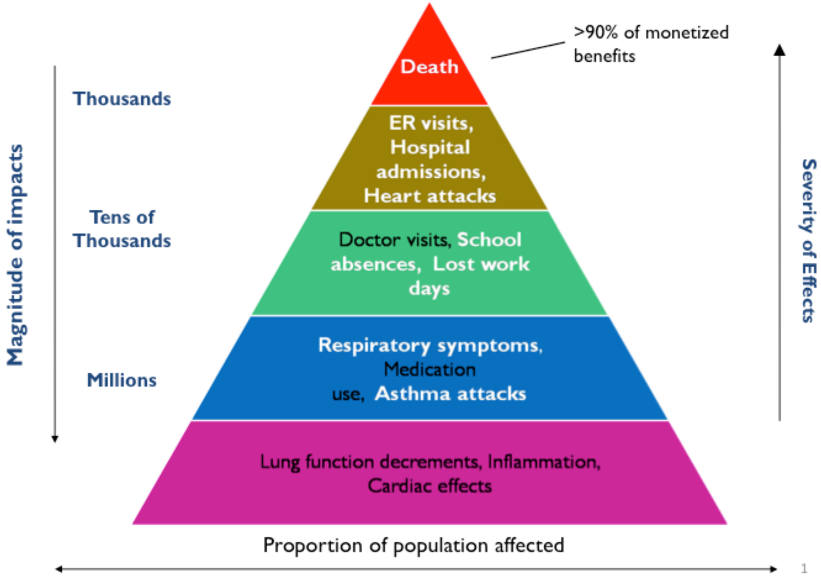


Abel et al., 2019 *ES&T*





A "Pyramid of Effects" from Air Pollution

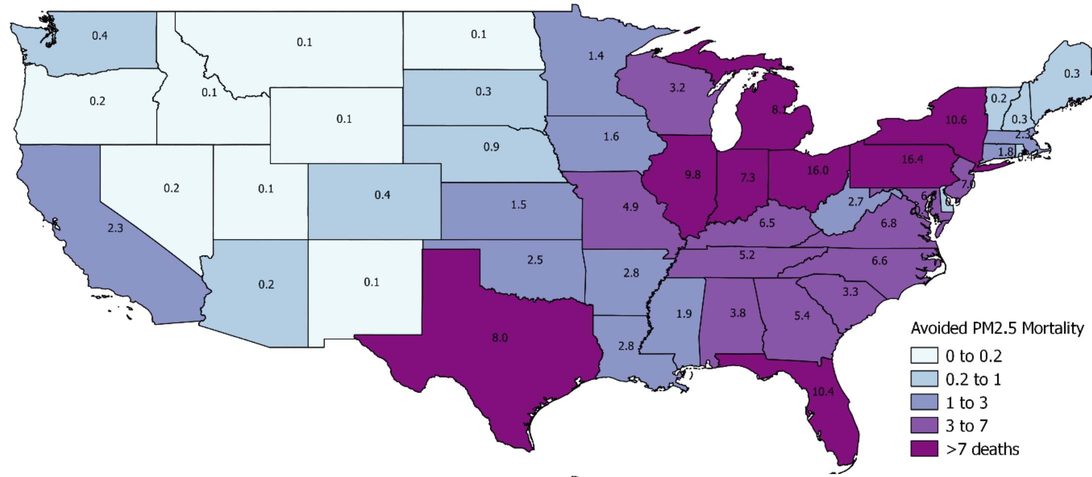


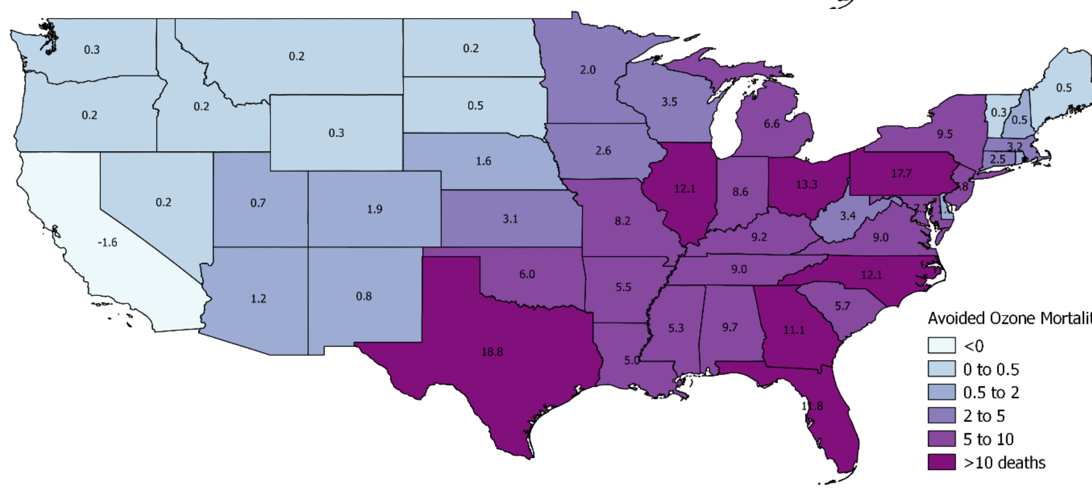
U.S. EPA | How BenMAP-CE Estimates the Health and Economic Effects of Air Pollution

New York Time | The Mother Who Wants to Put Air Pollution on Her Daughter's Death Certificate

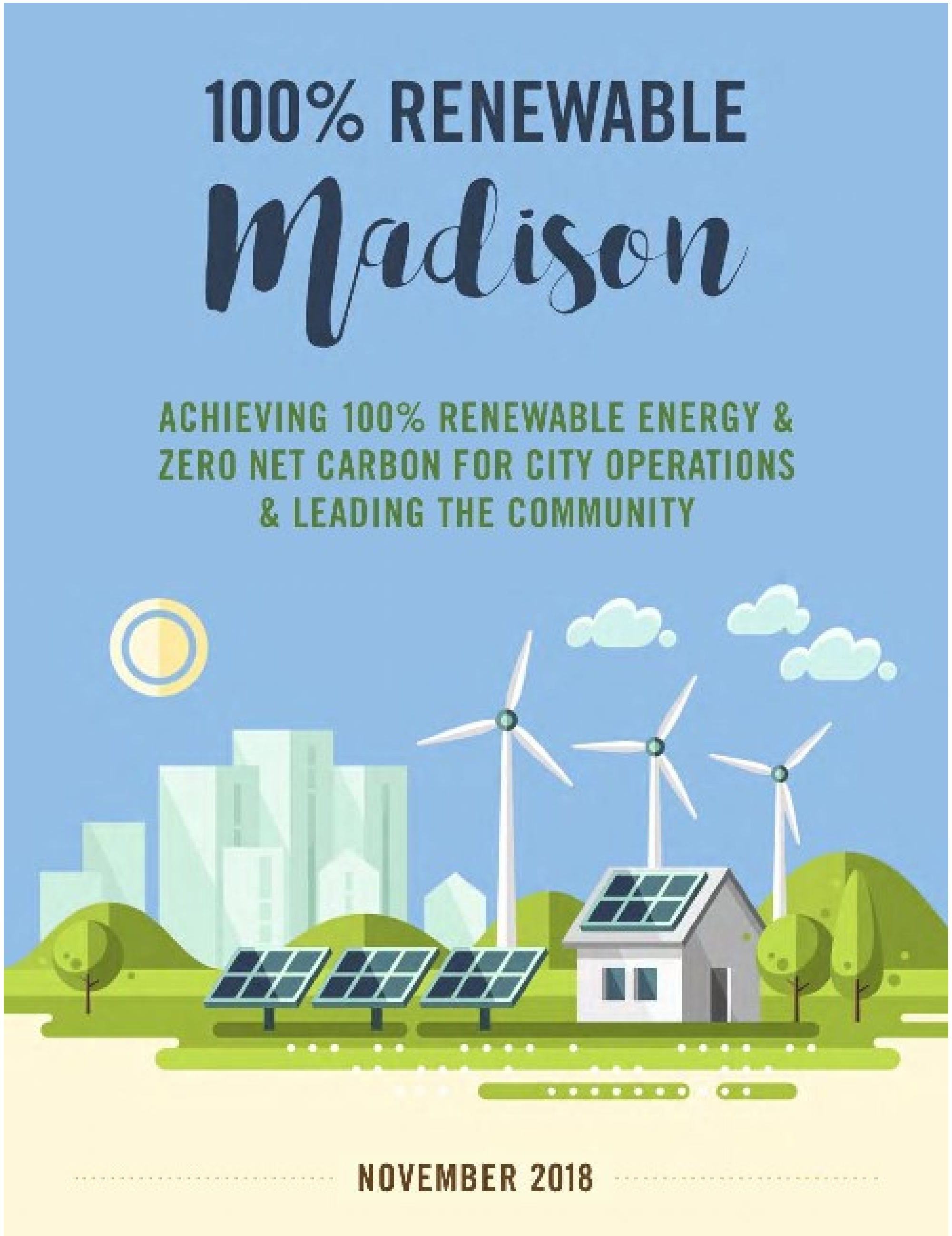
$PM_{2.5}$ Mortality	O_3 Mortality
300 deaths (60-580)	**173 deaths** (101-244)
$2.8 billion ($0.1-$9.3)	**$1.6 billion** ($0.1-$4.5)
Average of 13 studies	Average of 3 studies
$0.031/kWh	**$0.018/kWh**

Nearly 50% of typical retail prices





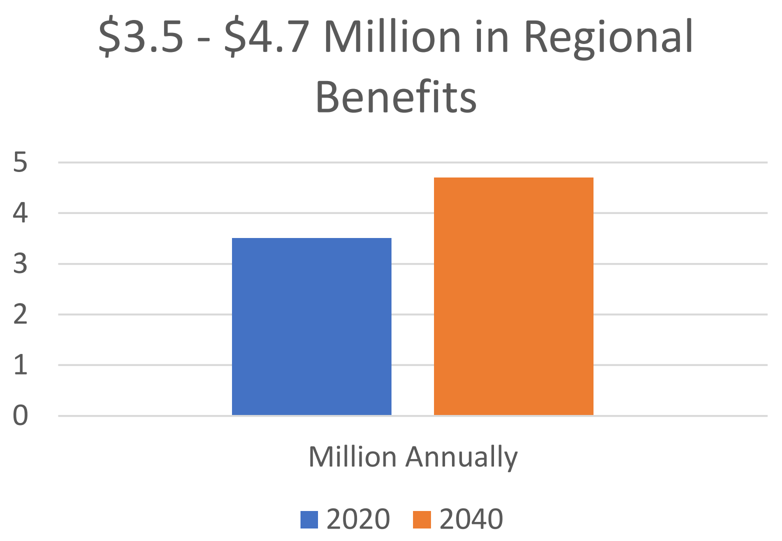
Abel et al., 2019 *ES&T*



What would be the air quality and health benefits of pursuing 100% renewable operations in Madison, WI?

100% Renewable Madison will save dollars and lives through reductions in air pollution

Changes to City Operations



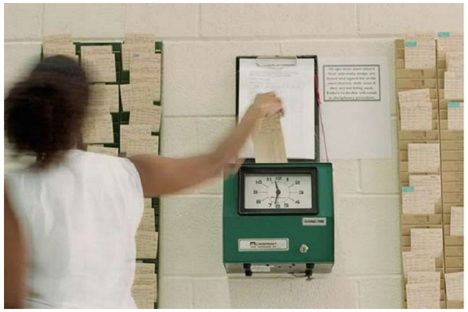
United States Environmental Protection Agency

Sector-based PM2.5 Benefit Per Ton Estimates

100% Renewable Madison will save dollars and lives through reductions in air pollution

Changes to City Operations

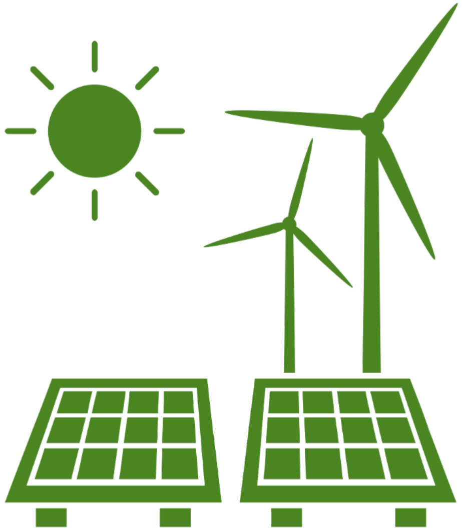
25-32 work-loss days avoided per year



150-190 mild reduced-activity days avoided per year

One avoided premature death every 2-3 years

100% Renewable Madison will save dollars and lives through reductions in air pollution



Emissions Benefits	2020	2025	2030	2035	2040
Direct NO_X reduced (lbs)	16700	43900	57500	57700	57900
Direct SO_2 reduced (lbs)	8100	17100	14600	14400	14300
Direct $PM_{2.5}$ reduced (lbs)	1000	2200	2300	2300	2200
Direct NO_X reduced + RECs (lbs)	63600	84000	99600	99900	100300
Direct SO_2 reduced + RECs (lbs)	69000	69200	69400	69400	69400
Direct $PM_{2.5}$ reduced + RECs (lbs)	6100	6600	6900	6900	6900

Table 2: Emissions reductions by pollutant for key years in implementation.

"A significant portion of the benefits are from emissions avoided through investment in Renewable Energy Credits (RECs), and thus the RECs should be purchased from sources within the regional electric grid whenever possible to maximize the benefit to Madison residents."

Future studies to account for additional criteria pollutants and sources are warranted.

COWS

BUILDING THE HIGH ROAD

Study: transition to renewable energy could create 162,000 jobs in Wisconsin

CHRIS HUBBUCH chubbuch@madison.com Feb 9, 2019

Report Considers Effect Of Using Renewable Energy On Jobs, The Economy In Wisconsin

By Breann Schossow
Air Date: Tuesday, February 12, 2019, 4:30pm | Tuesday, February 12, 2019, 6:30pm

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Peter Saundry
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If Wisconsin switched to in-state #renewables (#wind & #solar) for #electricity + #ElectricVehicles (+ #biofuels), it would keep $14 billion/yr in-state; generate ~$570 million/yr in additional tax revenue; & create 162,000 net jobs. @dwabel & Katya Spear. cows.org/_data/document…

Renewables Mean More Jobs For Wisconsin

Wisconsin is another state that gets most of its electricity from burning coal but it has little of its own. Its utility companies spend more than $14 billion a year to buy coal from other states, especially Wyoming. What if Wisconsin didn't buy all that coal but spent that money to install renewable energy facilities within its borders? That's the question the county of La Crosse asked COWS, a think tank based at the University of Wisconsin – Madison to answer.

Conservative group urges Wisconsin lawmakers to embrace renewable energy

CHRIS HUBBUCH chubbuch@madison.com Feb 20, 2019 0

"We're a net energy importer, which means we're a net money exporter," said Maria Redmond, director of the state's Office of Energy Innovation, which is charged with securing the state's energy needs while improving the economy and environment. "How can we keep the money here in the state?"

Research Question:

Wisconsin spends billions of dollars to import energy each year. If the state were to eliminate this cost by supplying 100% of its energy in-state, what would the effect be on the environment, economy, workforce, and health?

Emissions Benefits:

Avoided CO_2:
95.6 Mt
$4.6B at $42/ton

Avoided Air Pollution ($PM_{2.5}$) Damages:
92.5% SO_2
95% NO_X
28.5% $PM_{2.5}$

$18.2B based on EPA's Benefits-per-Ton study

Estimated $2.9B in O_3 benefits

Emissions and Health Savings (# cases unless otherwise specified)	TOTAL
Health Savings (Billion $2015)	18.2
Emissions (thousand tonnes in 2017)	274
Adult Mortality	1,910
Respiratory ER Visits	650
Acute Bronchitis	1,580
Lower Respiratory Symptoms	20,200
Upper Respiratory Symptoms	29,200
Minor Restricted Activity Days	873,000
Work Loss Days	148,000
Asthma Exacerbation	34,400
Cardiovascular Hospital Admissions	290
Respiratory Hospital Admissions	280
Non-Fatal Heart Attacks	650
Estimated Ozone Savings (Billion $2015)	2.9

Cli

1. Interdisciplinary computer models of varying complexity are useful for analyzing energy, air, climate, and health.

2. Cost-effective solutions for energy, air, climate, and health management exist

THANK YOU

David Abel, PhD
davidwabel.abel@gmail.com

Poll 3

Question and Answer Session

Upcoming Webinar!

United States Environmental Protection Agency

Part 3: Quantifying Economic Benefits of Energy Efficiency and Renewable Energy

Coming soon!

Sign-up for our [Webinar Newsletter]

Connect with the State and Local Energy and Environment Program

Webinar Feedback Form

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U.S. Environmental Protection Agency
Mulholland.Denise@epa.gov

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