Clean Energy Emission Reduction Opportunities and Resources

Webinar for Ozone Advance Areas

U.S. EPA Office of Atmospheric Programs

October 25, 2012

Overview of Clean Energy Opportunities

- Energy Efficiency Emission Reduction Opportunities
- Renewable Energy Emission Reduction Opportunities
- Combined Heat and Power (CHP) Emission Reduction Opportunities
- Examples from Energy Efficiency/Renewable Energy SIP Manual
- Q&A

State and Local Climate and Energy Program

Key Efficiency Issues & Opportunities For State & Local Air Regulators

Niko Dietsch
EPA Office of Atmospheric Programs

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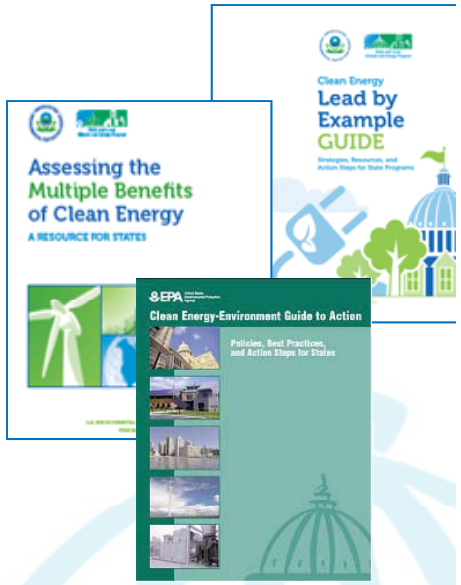
U.S. EPA's State and Local Climate & Energy Program

State and Local Climate and Energy Program

- We provide tools, resources and case studies:
  - EE/RE policy best practices and action steps
  - Measuring energy impacts of EE/RE policies
  - Measuring emissions, climate, and economic co-benefits
  - State-to-state peer exchanges
  - Direct assistance through training
- Find us online: http://epa.gov/statelocalclimate/



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Basic Info & Context

State and Local Climate and Energy Program

- Energy efficiency refers to efforts to provide the same level of energy service or performance with less energy input
- EE reduces criteria pollutant, hazardous air pollutant and greenhouse gas emissions
- At current and forecast levels of EE, there is a significant opportunity to reduce pollution from electric generators
- There are opportunities for air regulators to capture these reductions
- EPA is developing resources, case studies, and calculation methods

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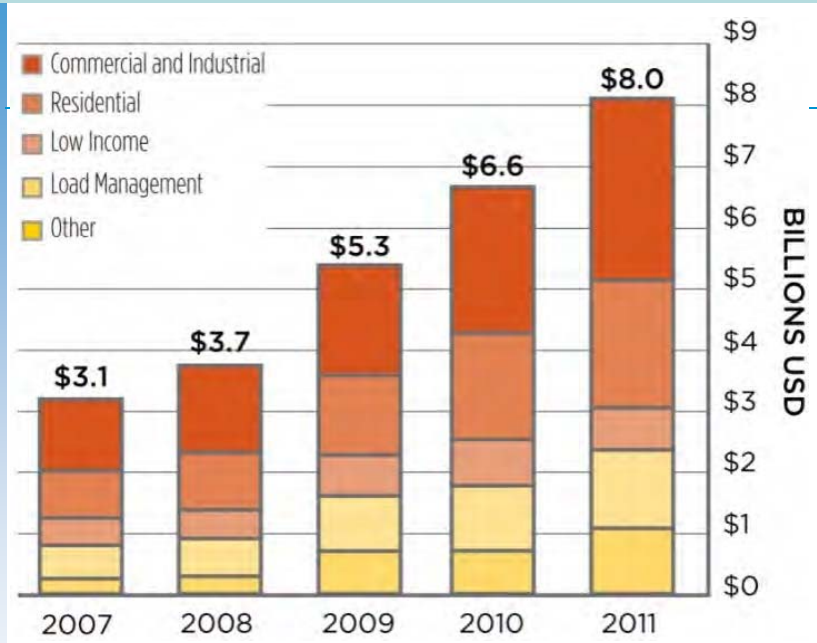
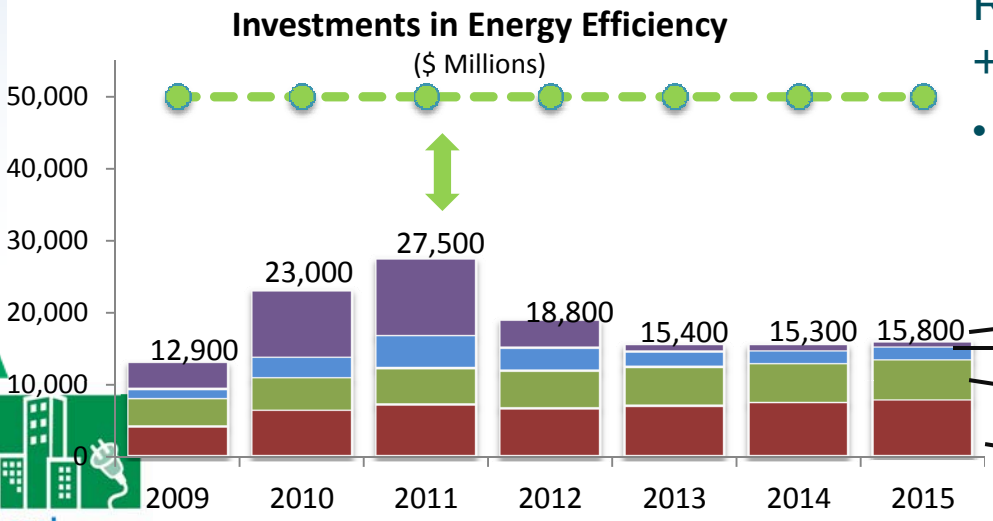
Current Investment in Cost-Effective EE



Ratepayer funded investment

- Grown to **$8 B**/year in 2011, more than 2.5x investment 4 years ago

Source: CEE Annual Industry Report March 2012



Ratepayer + private + consumer + federal investment

- Well below cost-effective potential (equivalent to **$50B**/year)

Source: McKinsey Global Energy and Materials (2009), *Unlocking Energy Efficiency in the U.S. Economy*

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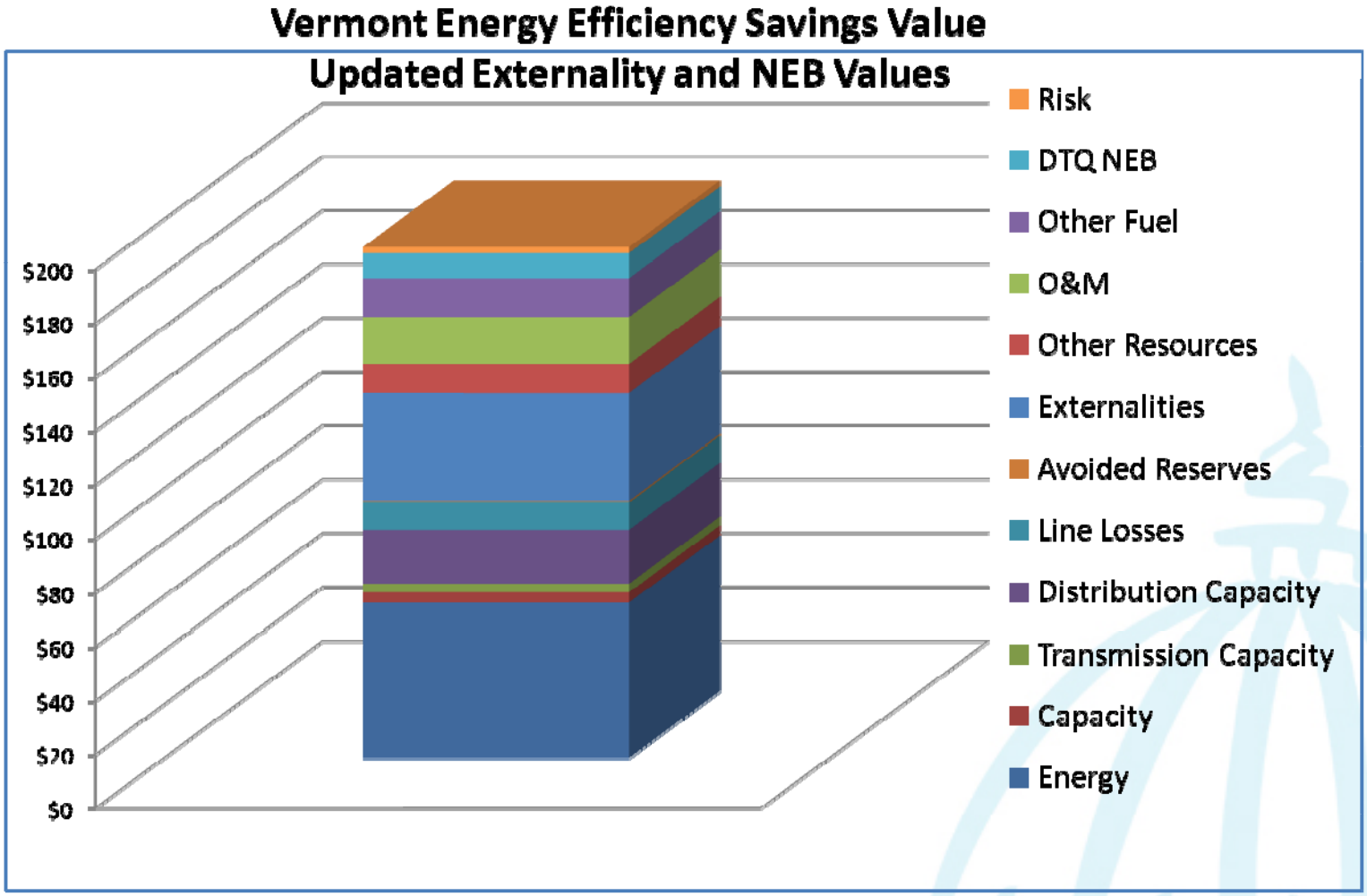
State and Local Climate and Energy Program

EE Offers Multiple Benefits

State and Local Climate and Energy Program



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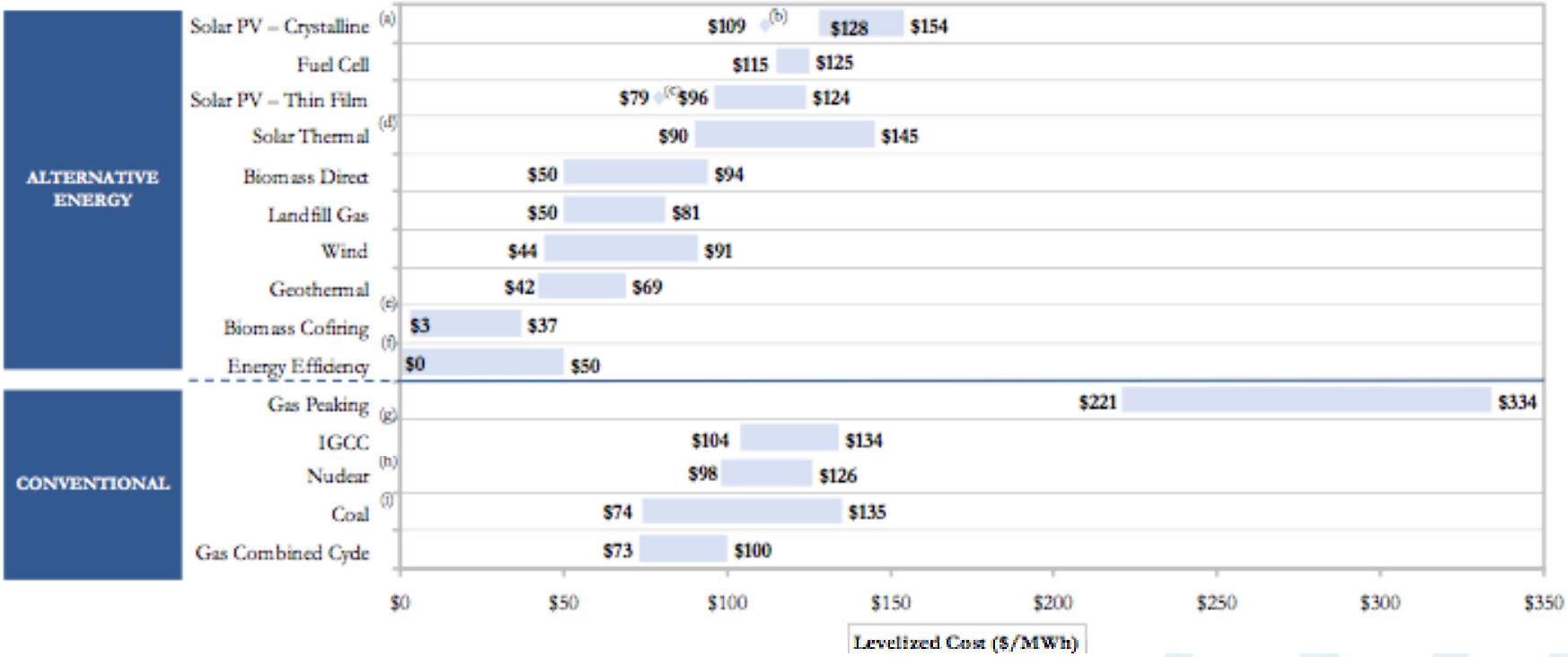
** Courtesy of the Regulatory Assistance Project*

Comparing the Cost of EE

State and Local Climate and Energy Program

Levelized Cost of Energy Comparison

Certain Alternative Energy generation technologies are already cost-competitive with conventional generation technologies under some scenarios, even before factoring in environmental and other externalities (e.g., RECs, potential carbon emission costs, transmission costs) as well as the fast-increasing construction and fuel costs affecting conventional generation technologies



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** Courtesy of the Regulatory Assistance Project*

The Importance of EE Policy

State and Local Climate and Energy Program

- Numerous barriers to energy efficiency
  - Information about opportunities
  - Upfront costs
  - Split incentives – distribution of costs & benefits
  - Supply-side bias – “through-put incentive”
  - Social norms – car vs. house tune-up
- Policies can help along market transformations that remove barriers

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State-Level Opportunities to Improve Energy Efficiency

State and Local Climate and Energy Program

- Energy Efficiency Resource Standards (EERS)
- Public funding mechanisms
  - Revenues from ISO capacity markets
  - ratepayer funding of clean energy programs
  - auction allowance revenue
- Appliance standards and building codes
- Customer financial incentives for EE
- Government “Lead By Example” initiatives
- Utility policies and programs

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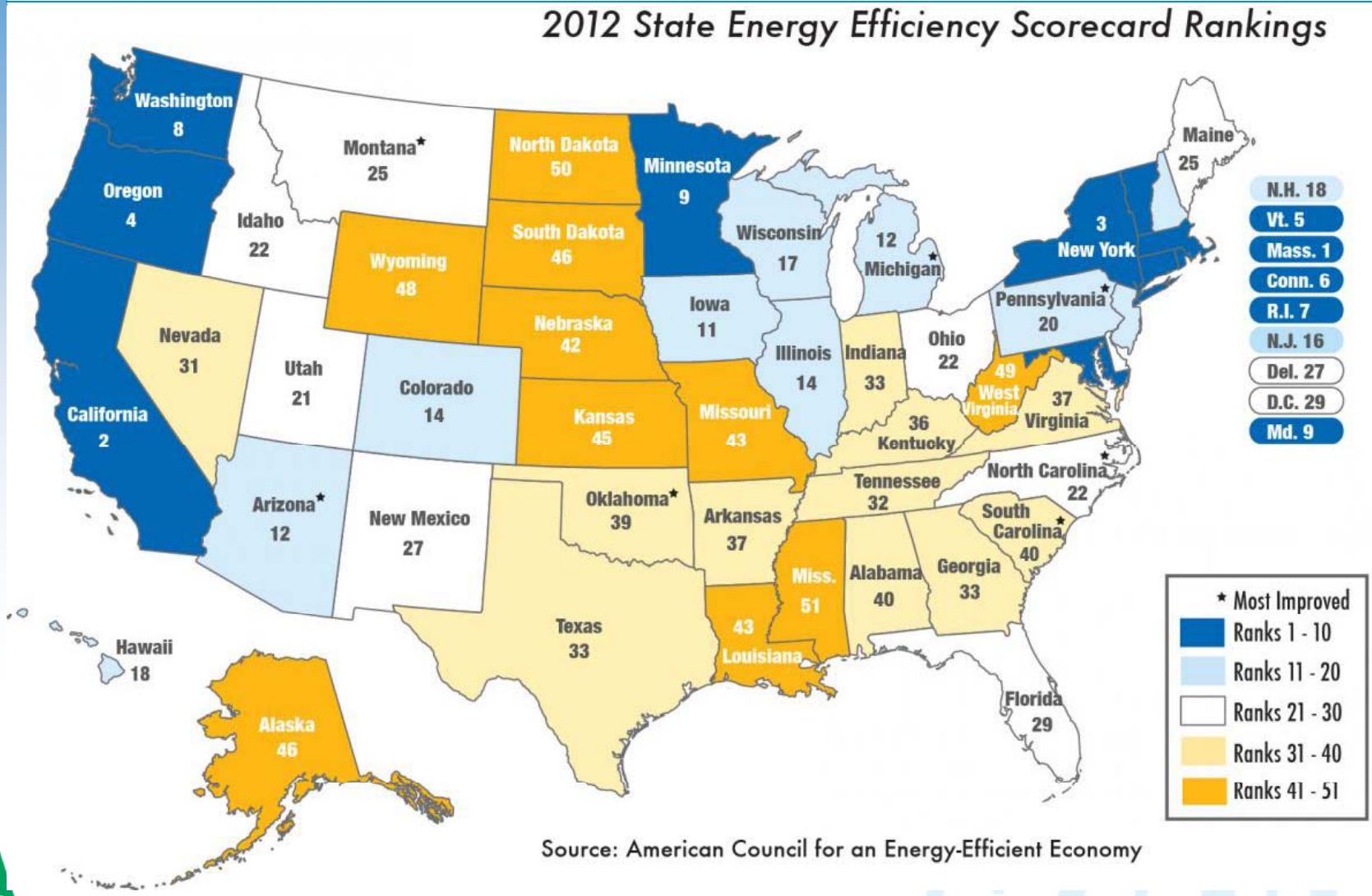
2012 ACEEE State Scorecard

State and Local Climate and Energy Program



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Local-Level Opportunities to Improve Energy Efficiency

State and Local Climate and Energy Program

- Local Government Operations and Facilities
- Water and Wastewater Facilities
- Non–Governmental Buildings
- Building Energy Codes
  - Adoption & implementation (local role varies)
  - Local reach codes
- Land Use and Transportation Planning
  - Encourage efficient building types, non-vehicle transportation choices
- Waste management

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State and Local Cooperation

State and Local Climate and Energy Program

- There are key opportunities for state and local governments to partner to maximize energy efficiency gains
  - From ACEEE paper: *How States Enable Local Governments to Advance Energy Efficiency* (http://aceee.org/white-paper/state-enabling-local-ee)

States Enabling Local Energy Efficiency—The Who, How, and What

State Government Actors	→ Policy Mechanisms	→ Enabled Local Government Energy Efficiency Initiatives
Separate State Agency	Technical Assistance (TA)	Energy-Efficient Land Use and Transportation Planning
Departments of Economic or Community Development	Financial Assistance (FA)	EE in Government Buildings and Schools
Energy Offices	Comprehensive Program Combined TA and FA	EE in Residential and Commercial Buildings
Departments of Planning or Transportation	Legislative or Regulatory Mandate	
Environmental Agencies		

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PUC and SEO Roles with EE

State and Local Climate and Energy Program

- Public Utility Commissions (PUC)
  - Economic regulation of utilities
  - Ensure that utilities provide safe, reliable, affordable service to all customers in a manner consistent with the public interest
  - Set retail rates & terms (i.e., tariffs) based on cost of service
  - Review utility decisions

- State Energy Offices (SEO)
  - Oversee federal Dept. of Energy grants
  - Provide energy education and outreach
  - Implement EE programs and increase the use of proven EE practices
  - Promote new/innovative energy technologies and foster growth of emerging and sustainable energy industries and infrastructure

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Air Regulators Can Start By Engaging Their Energy Counterparts

State and Local Climate and Energy Program

- Partnering with energy counterparts can help air regulators:
  - Identify EE initiatives in the state
    - "On the books" policies & programs
    - Upcoming policies & programs
    - Opportunities for achieving deeper savings
  - Find and use EE impact data
    - EM&V reports
    - EE forecast data
    - Data gaps
  - Determine what EE policies & programs are accounted for in baselines
  - Estimate the emission benefits
    - EPA's draft Power Plant Emissions Calculator: http://epa.gov/airquality/eere/quantify.html

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EPA Wants to Help Air Regulators Use EE

State and Local Climate and Energy Program

- EPA resources, tools, and data can help air regulators:
  - Understand the value for EE policies and programs
  - Know where to find and how to use EE savings data
  - Access and use EPA guidance & tools to support EE accounting in air plans
  - Be aware of experience and examples from other jurisdictions
  - Where to get the right info

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EPA Estimates of State EE Policy Impacts

State and Local Climate and Energy Program

- EPA estimated the energy savings of existing State EE policies through 2020
- Intended to help states capture emission reductions of EE policies in SIP baseline emission projections
- Policies include:
  - Energy Efficiency Resource Standards (EERS)
  - EE programs financed by Public Benefits Funds
  - EE programs financed by the Regional Greenhouse Gas Initiative (RGGI)
- EE policy impacts (MWh) reduce demand ~ 3% in 2020
- For more information
  - Energy savings estimates: http://epa.gov/statelocalclimate/state/statepolicies.html
  - Methods & approach: Appendix J of the Roadmap Manual

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Additional EPA Programs and Resources

State and Local Climate and Energy Program

Additional EPA Programs and Resources related to Energy Efficiency:

- Energy Star
  - Portfolio Manager
- eGRID
  - Database of emissions and generation for power plants in United States.
- Water Sense Program
  - Provide resources to help reduce water and energy use
- Local Climate and Energy Program
  - Local government webinar series
    - Resource Conservation & Waste Management Webinar scheduled for early November

EPA

Questions?

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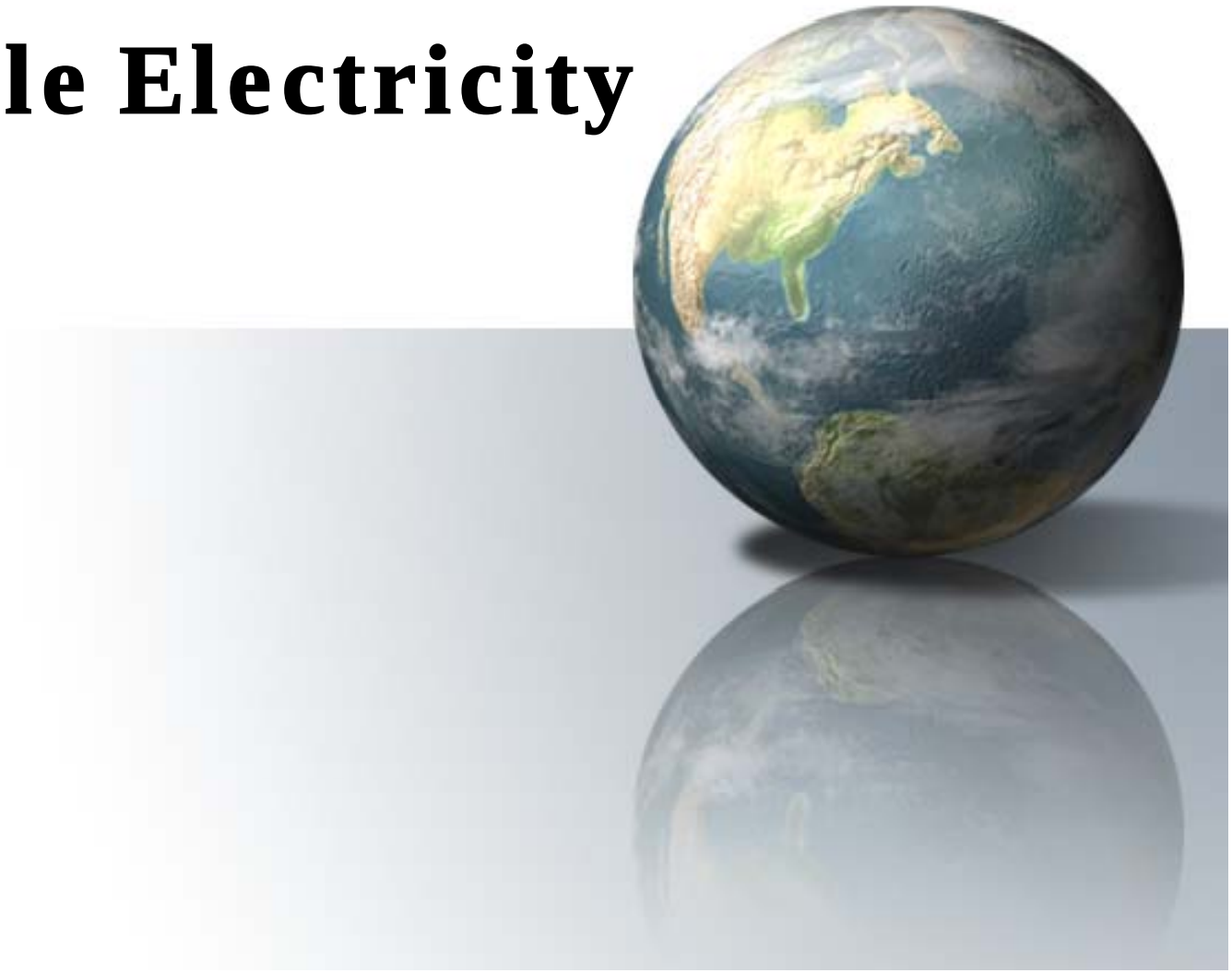
Emission Reductions via Renewable Electricity

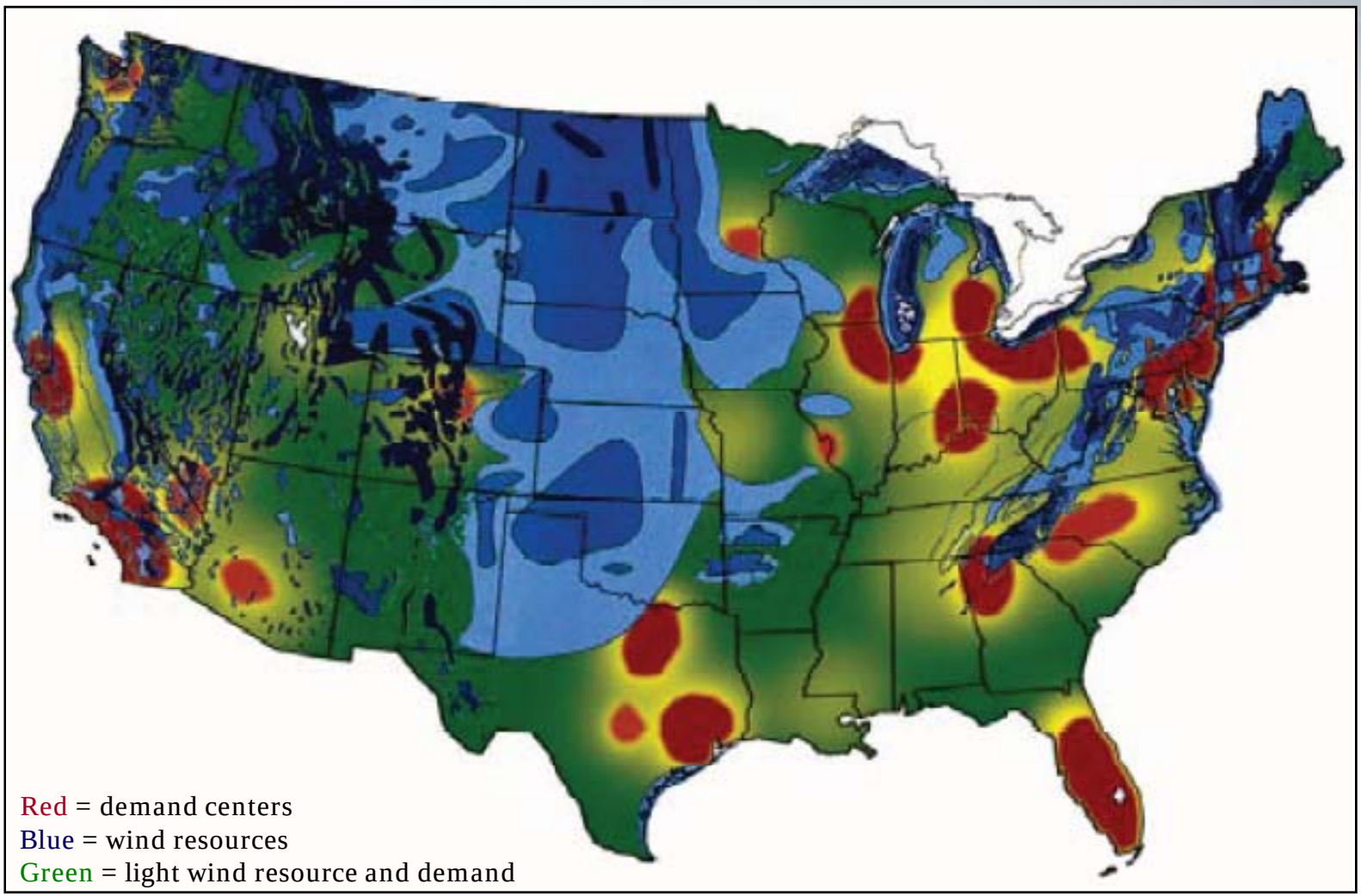


Importance of Renewables

- Renewables provide readily available, low carbon energy with a number of co-benefits including:
  - lower emissions of criteria air pollutants (e.g., NOx)
  - lower demand for cooling water and finite resources
  - enhanced national energy security
  - reduced exposure to fossil-fuel price volatility
  - economic benefits e.g., job creation and technology development
- Distributed renewables also help reduce peak electrical demand and grid congestion

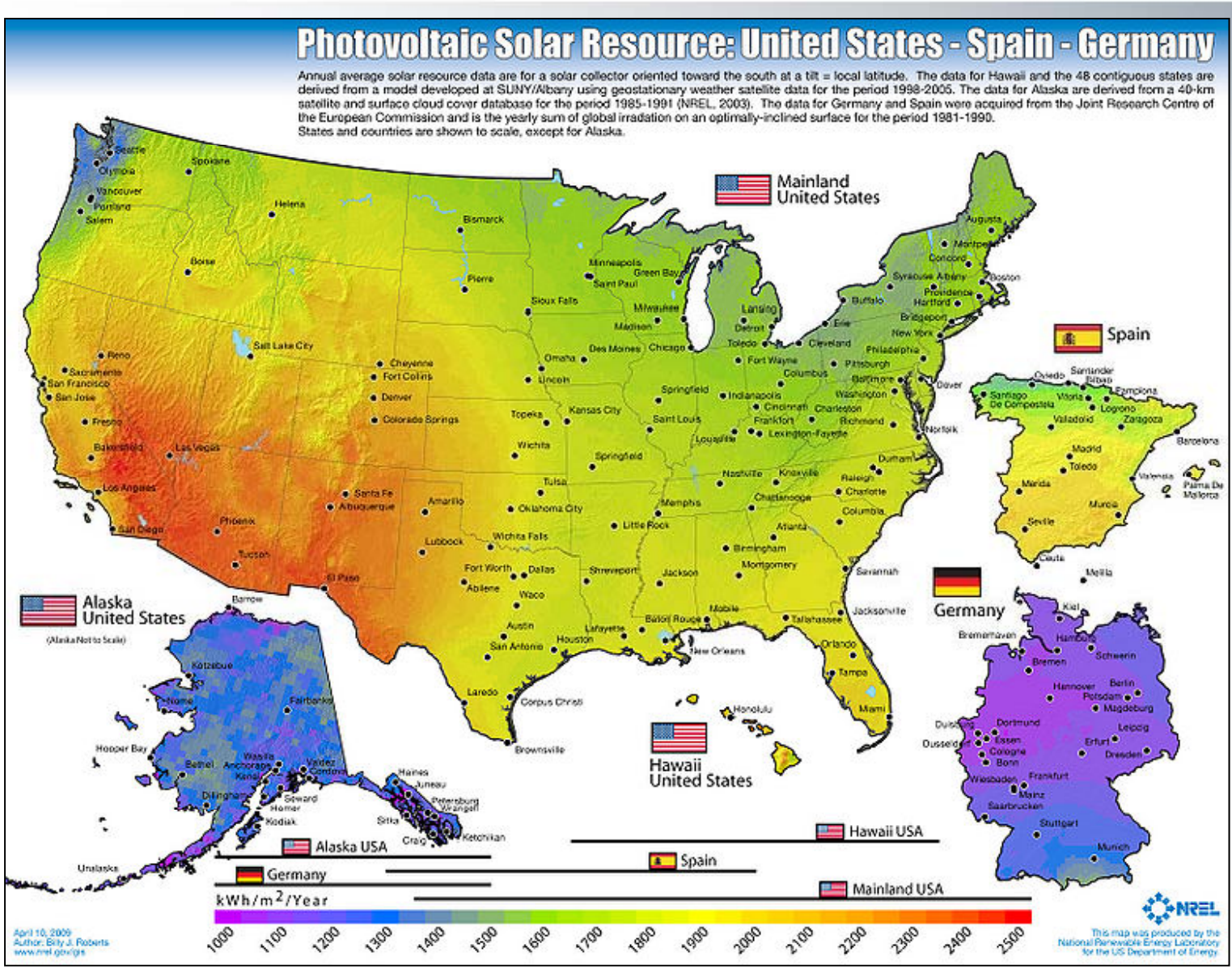
Wind Resource Availability

U.S. Wind Resource and Demand Centers

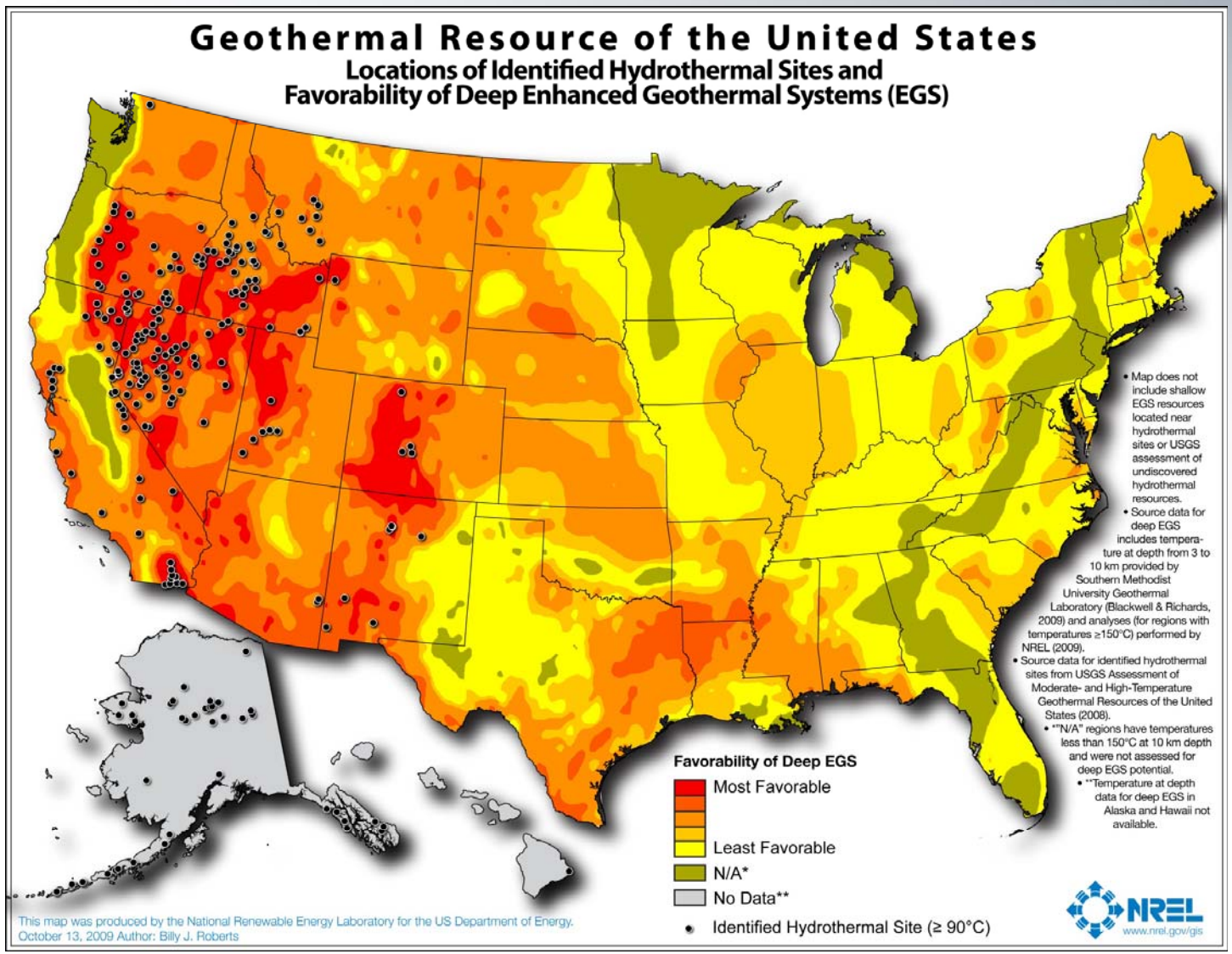


Source: *Accommodating High Levels of Variable Renewables*. NERC, 2009.

Solar Resource Availability



Geothermal Resource Availability



NREL
NATIONAL RENEWABLE ENERGY LABORATORY

General Policy Observations

- Supporting scale-up of renewable electricity development requires policies that are:
  - Designed for central station, distributed generation, and emerging technologies
  - Developed by federal, regional, and state/local levels of government
  - Updated to address changing barriers that come with growth
- These policies must address key challenges such as
  - Project economics or cost-competitiveness
  - Access to the grid (and potentially new transmission)
  - Integration of variable renewable energy generation

Federal & State Policies

Federal Policies

- Tax incentives
  - Accelerated depreciation
  - Production tax credit (PTC)
  - Investment tax credit (ITC)
- Research & development
- Commercialization
- Facility usage requirements

State Policies

- Renewable portfolio standards (RPS)
- Public benefit funds
- Feed-in Tariffs
- Interconnection standards
  - Clean distributed generation
  - Net-metering
- Electricity market rules/rate policy
- Allowance set-asides
- State implementation plan (SIP) credit
- Facility usage requirements

State & Local Opportunities

- Policies encouraging local private development
  - Property Assessed Clean Energy (PACE) programs
    - Allow property owners to finance clean energy upgrades to their property through a special assessment added to their property tax bills
    - Allow local governments to leverage their existing bond issuing authority
    - PACE financing is not a loan – these special assessments are the same mechanism by which local governments have financed other projects delivering public benefits, such as sewer and utility lines, street and traffic lights, and parks

State & Local Opportunities

- Other examples of local private development
  - Long-term wind power contracts
    - University of Oklahoma and University of Pennsylvania
  - Solar PV power purchase agreements
    - Kohl's Department Stores and Wal-Mart
- Direct investment or procurement of renewable electricity from nearby projects
  - Collaborative solar PV procurements
  - Montgomery County, MD aggregated REC purchases

EPA's Green Power Partnership

- **The Green Power Partnership is:**
  - Working to increase demand for renewable electricity
  - Reducing transaction costs and increasing the value proposition
  - Engaging organizations and business sectors to use renewable electricity or expand their usage
- **The Green Power Partnership offers:**
  - Trusted market information
  - Credible purchase requirements
  - EPA recognition
- **1,400 Partners are purchasing 23M MWh annually**
  - That's roughly 0.5% of 2011 U.S. electricity sales

EPA GREEN POWER PARTNERSHIP

Basic Procurement Options

- **Install a renewable electricity system on-site**
  - Generate electricity & renewable energy certificates (RECs) on-site
- **Purchase green power**
  - Buy electricity and RECs from a electric service provider
- **Purchase RECs separately**
  - Buy RECs from a REC marketer or broker

**** Please note: All of these options involve RECs ****

EPA GREEN POWER PARTNERSHIP

Renewable Energy Certificates

- **RECs are tradable commodities generated at renewable electricity facilities**
  - A REC represents the renewable attributes of a megawatt hour (MWh) of renewable energy generation
- **RECs are the "renewable" in renewable electricity**
  - Can be sold separately from the electricity, sold with the electricity, or sold with commodity electricity
  - Can be formally recognized by bilateral contracts or a tracking system
- **RECs are the basis for claims about renewable energy**

EPA GREEN POWER PARTNERSHIP

Advanced Procurement Options

- **Sign a multi-year contract**
  - Purchase renewable electricity from an existing facility on a multi-year basis
- **Sign a off-taker or power purchase agreement**
  - Support a new or existing facility by contracting for electricity and/or RECs
- **Collaborate in a joint procurement**
  - Reduce your costs + increase support for new or existing facilities
- **Invest directly or take an ownership stake**
  - Take a ownership/equity stake or in a new facility

EPA GREEN POWER PARTNERSHIP

Contact Information

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CHP
EPA COMBINED HEAT AND POWER PARTNERSHIP

Combined Heat and Power & Emission Reduction Opportunities

Neeharika Naik-Dhungel, Program Manager
EPA CHP Partnership Program

Presentation Overview

- Provide an introduction to CHP
- An understanding of its environmental benefits
- CHP as an emission reduction opportunity

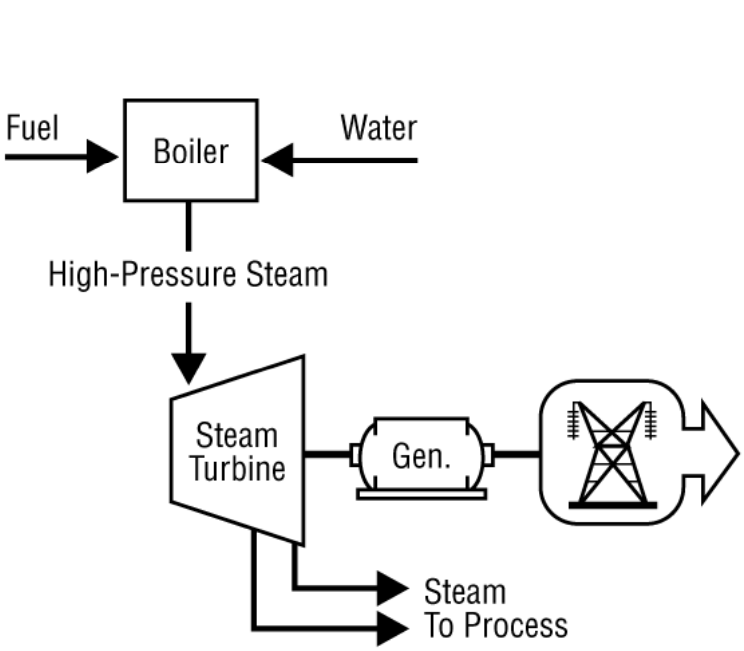
What Is Combined Heat and Power?

CHP is an *integrated energy system* that:

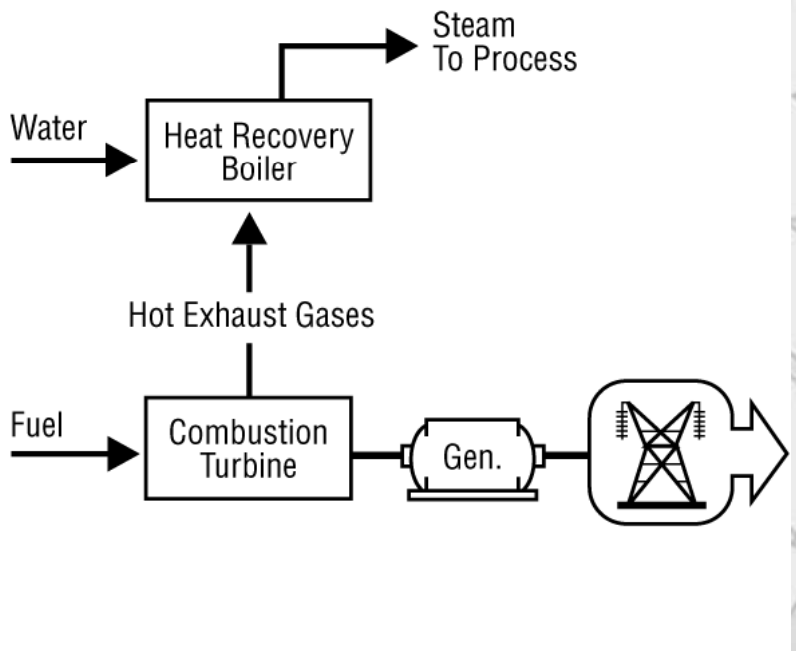
- Is located at or near a factory or building
- Generates electrical and/or mechanical power
- Recovers waste heat for
  - Heating
  - Cooling
  - Dehumidification
- Can utilize a variety of technologies and fuels
  - Fossil fuels
  - Biomass (wood, wood waste, ag. residue, crop plants)
  - Biogas

Typical CHP Systems

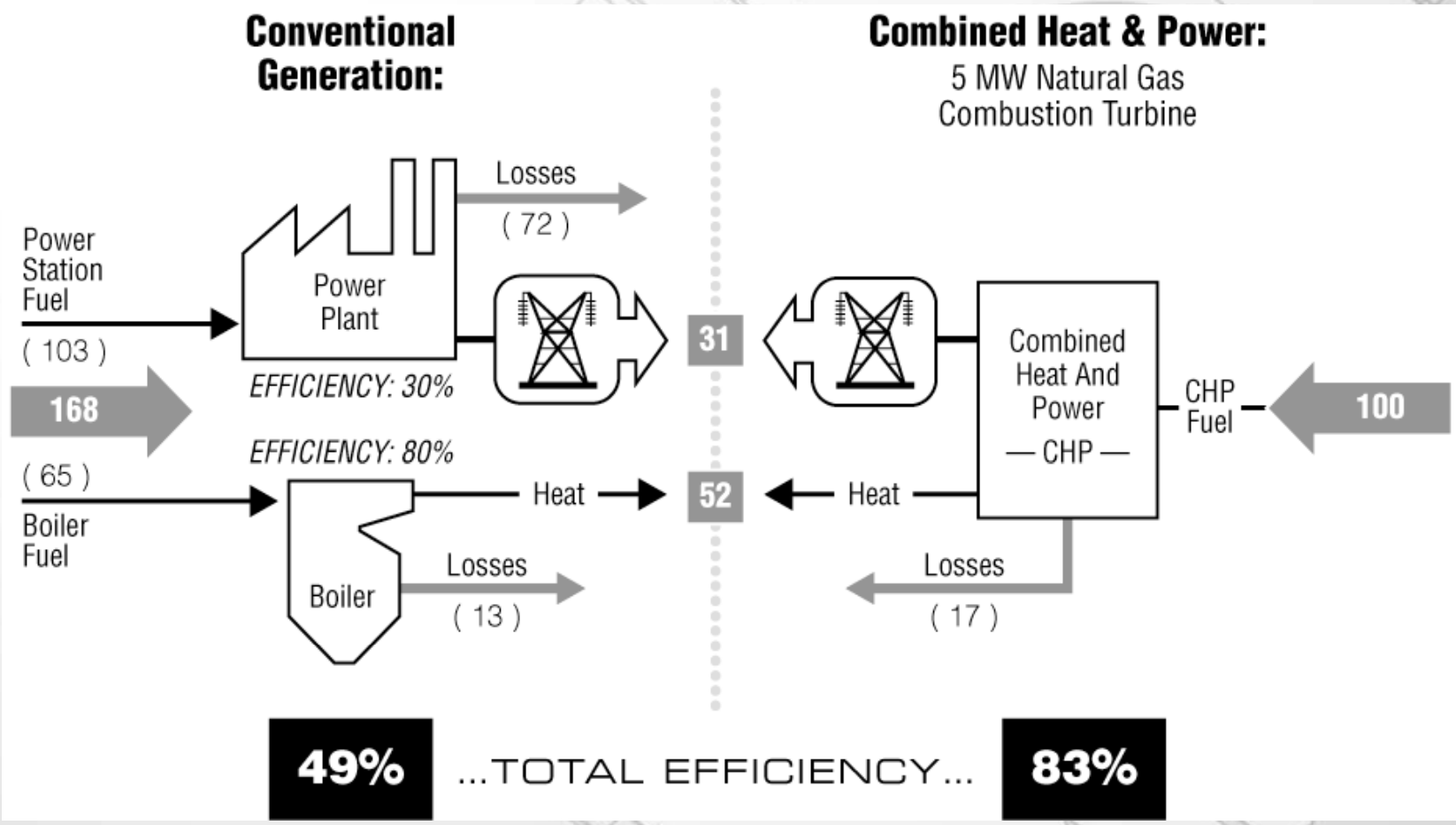
Steam Boiler/Steam Turbine:



Gas Turbine or Engine/Heat Recovery Unit:

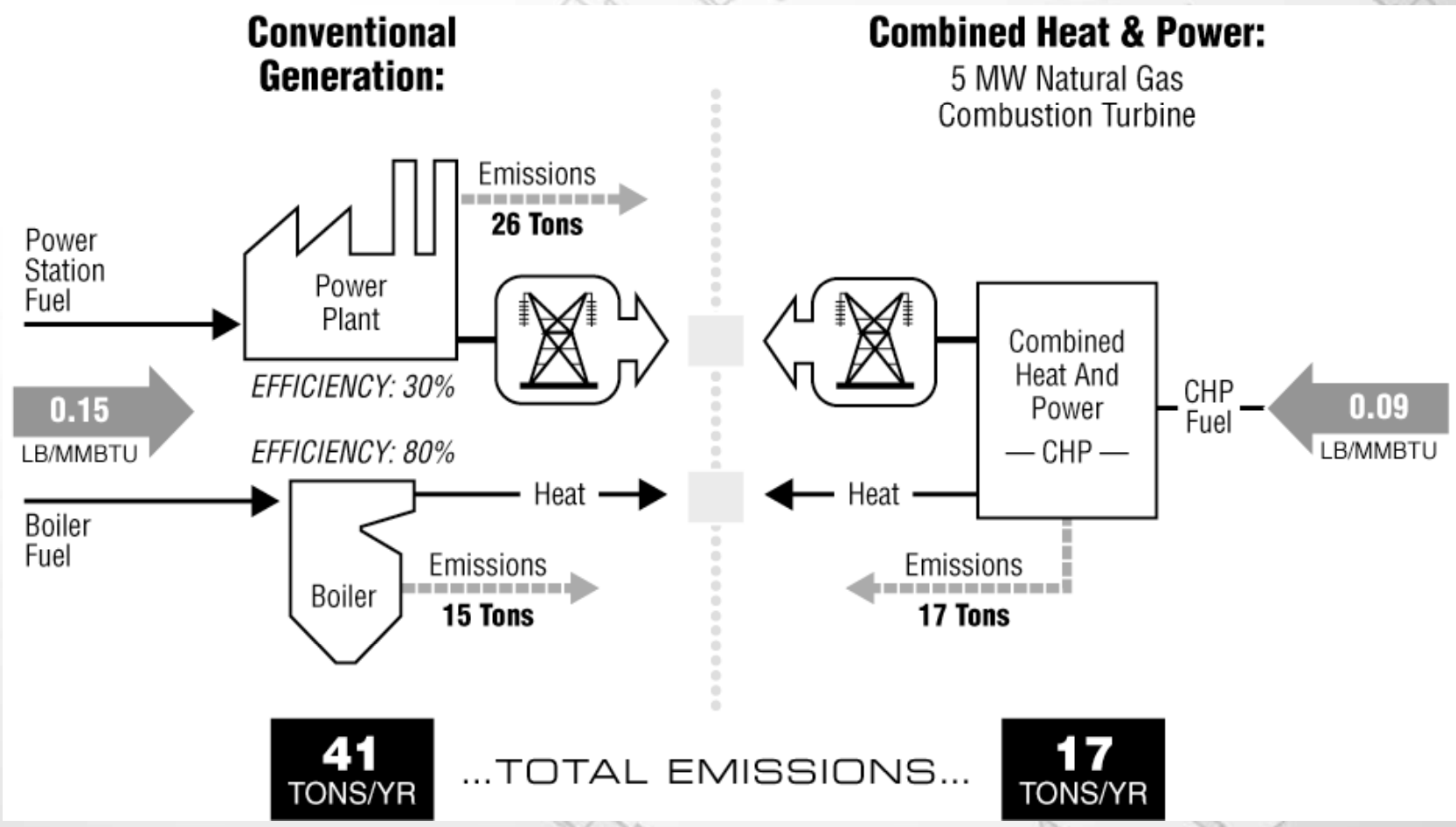


Efficiency Benefits of CHP



CHP EPA COMBINED HEAT AND POWER PARTNERSHIP

Environmental Benefits of CHP



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Common CHP Applications

- ***Industrial plants***
  - chemicals, refining, ethanol, pulp and paper, food processing, manufacturing
- ***Institutions***
  - colleges and universities, hospitals, prisons, military bases
- ***Commercial buildings***
  - hotels, casinos, airports, data centers, large office buildings, nursing homes
- ***Municipal***
  - district energy systems, wastewater treatment facilities, K-12 schools
- ***Residential***
  - multi-family housing, planned communities

EPA Combined Heat & Power Partnership

- Supports development of new CHP projects with credible and unbiased technical expertise
- Promotes CHP's environmental, economic, and other benefits
- Targets key regulatory, utility and information barriers
- Offers trusted tools, guidance, and technical assistance (examples)
  - CHP Project Development Handbook
  - CHP Emissions Calculator
  - Funding Database
  - Waste Heat-to-Power Primer
  - Spark Spread Estimator (simple financial analysis tool)
- Recognizes superior systems through ENERGY STAR CHP Awards
- Has over 400 Partners - developers, end users, manufacturers, federal agencies, state/local/tribal governments

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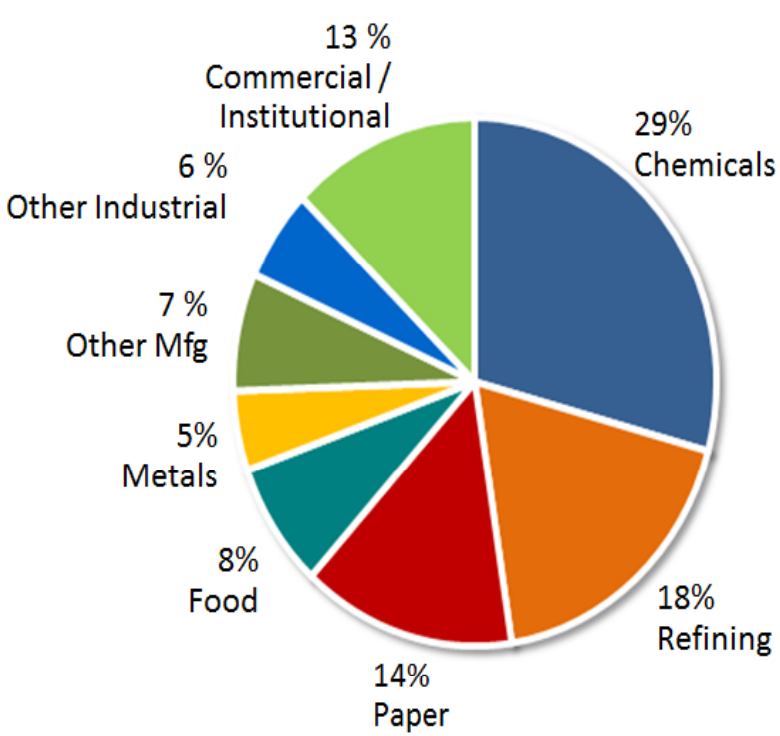
CHP Partnership Regulatory/Policy Support

- Inform regulators, policymakers, and utilities on CHP's value proposition.
- Provide examples of model state policies for promoting CHP, such as output-based emissions regulations, CHP-friendly utility rates, and renewable portfolio standards that include CHP.
- Develop tools and resources for state energy officials in partnership with NASEO.
- Collaborate with EPA offices and States to raise awareness on CHP and support the use of CHP when appropriate.
- Collaborate with other agencies and other research organizations to better characterize CHP.

CHP Is already an important resource for the U.S.



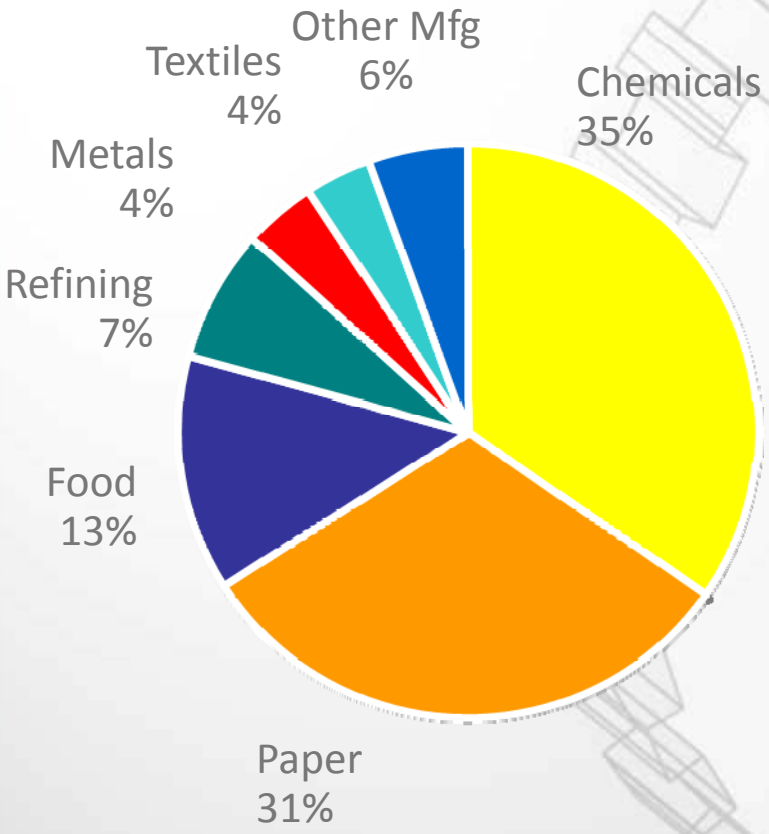
- 82 GW of installed CHP at almost 4,000 industrial and commercial facilities (2011)
- Avoids more than **1.8 quadrillion Btus** of fuel consumption annually
- Avoids **241 million metric tons of CO_2** as compared to traditional separate production
- CO_2 reduction equivalent to eliminating **forty 1,000 MW coal power plants**

Source: ICF CHP Database (as of September 2012)

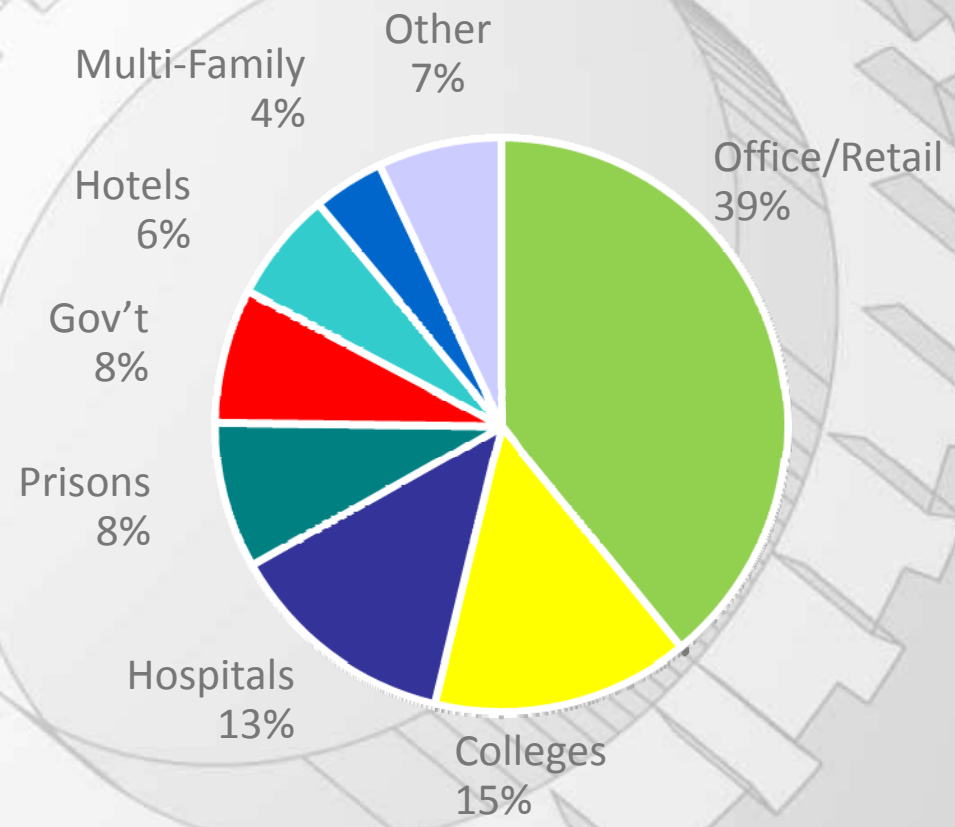
CHP EPA COMBINED HEAT AND POWER PARTNERSHIP

The Technical Potential for additional CHP at existing facilities is large

Systems greater than 1 MW



Industrial – 50 GW



Commercial/Institutional – 33 GW

Source: ICF Internal Estimates, 2012.

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Policies and Incentives for CHP Adoption

- Developing standard interconnection rules.
- Implementing reasonable utility rates such as standby rates, backup rates, and exit fees.
- Developing incentive programs for CHP in clean energy funds.
- Including CHP/waste heat recovery in renewable portfolio standards and energy efficiency portfolio standards.
- Establishing output-based emission regulations and incorporating other efficiency measures into state implementation plans.

CHP Partnership Contact Information

CHPP Website : www.epa.gov/chp

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Gary McNeil: McNeil.Gary@epa.gov

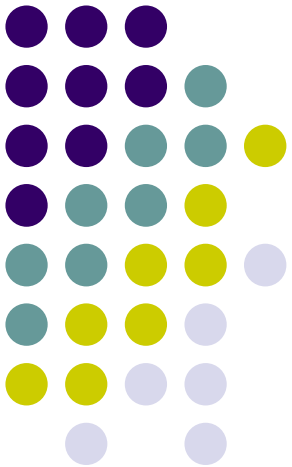
CHPP Help Line: 703/373-3108

CHP EPA COMBINED HEAT AND POWER PARTNERSHIP

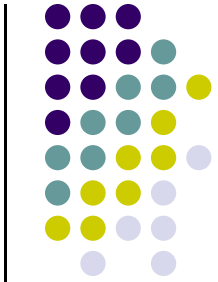
Energy Efficiency/Renewable Energy Roadmap Manual: Resources and Examples

Chris Stoneman

EPA Office of Air Quality Planning and Standards

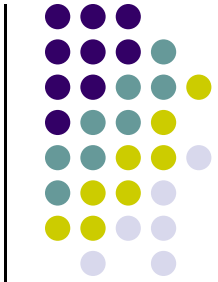


Presentation Contents



- EE/RE Roadmap Manual resources
- Roadmap-related EE/RE resources
- Examples from 1997 ozone SIP submittals (Appendix K)
- Renewable Energy Credits Example (Appendix K)
- Examples of EE/RE policies, programs and measures
- For More Information

EE/RE Roadmap Manual as a Resource

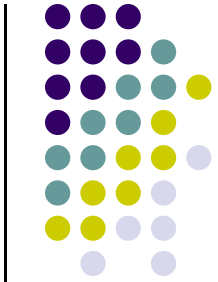


- Document intended for State and Tribal Implementation Plan users but it contains useful resources for Ozone Advance Program areas
  - 12 individual documents
    - Main body and 11 appendices covering a range of topics
  - Accessible and easy to read

Roadmap Resources

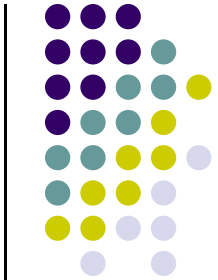
- Appendix B:
  - Overview of the U.S. Electric System
- Appendix D:
  - Understanding State Energy Efficiency and Renewable Energy Policies and Programs
- Appendix I:
  - Methods for Quantifying Energy Efficiency and Renewable Energy Emission Reductions
- Appendix K:
  - State, Tribal and Local Examples and Opportunities

Roadmap-Related EE/RE Resources



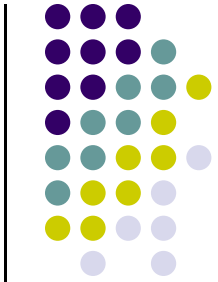
- Quantification tools – *Undergoing Peer Review*
  - Power Plant Emissions Calculator (draft)
  - Statistical Dispatch Emissions Model (in progress)
- Energy savings information for existing state EE policies
- Online training on the electric energy sector

Examples from 1997 Ozone SIP Submittals (Appendix K)



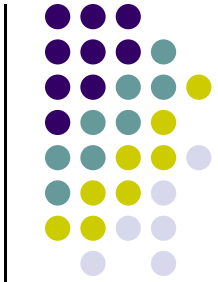
- Dallas-Fort Worth, TX area:
  - Texas legislation directed municipalities in ozone nonattainment counties (and near-nonattainment) to reduce electricity consumption by 5 % per year
  - DFW implemented EE measures in new construction for single and multi-family homes
  - Texas included impact of EE programs as control measure in Dallas, TX 8-hour ozone
  - NOx reductions achieved through reduced demand for fossil-fuel generation at power plants

Examples from 1997 Ozone SIP Submittals (Appendix K)



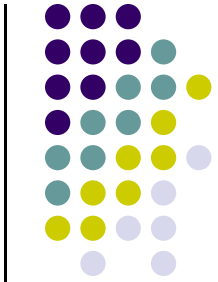
- Washington, DC Region (via the Metro Washington COG):
  - Bundled voluntary control measures
    - Purchase of Renewable Energy Certificates
    - LED traffic lights
  - Adopted in DC, VA and MD 8 hour SIPs
- Shreveport, LA area:
  - Installation of energy conserving equipment in City buildings
  - Adopted in 8 hour ozone early-action compact SIP

Examples from 1997 Ozone SIP Submittals (Appendix K)



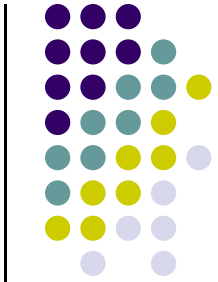
- State of Connecticut:
  - CT has a policy that uses an electricity user charge to fund utility-managed EE programs
  - CT also requires utilities to meet renewable energy targets under its Renewable Portfolio Standard
  - CT analyzed the effect that EE/RE projects resulting from these policies were having on NOx emissions at critical/peak times
  - Goal was to reduce NOx emissions at peak times on High Electric Demand days
  - CT included this analysis in their 8-hour ozone SIP

Renewable Energy Credits Example (Appendix K)



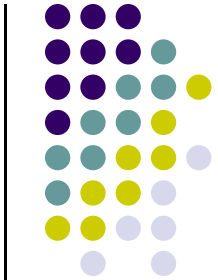
- Renewable energy certificates (RECs) represent property rights to renewable electricity generation
  - RECs are flexible and can be sold separately from the underlying physical electricity associated with a renewable-based generation source
- Organizations can support RE development and protect the environment when green power products are not locally available
- RECs can displace fossil fuel generation and displace emissions
- Need to quantify likely emissions benefits

Examples of EE/RE Policies, Programs and Measures



- Energy Efficiency Resource Standards (EERS)
- State energy efficiency appliance standards
- State-mandated municipal government electricity consumption reductions
- Renewable Portfolio Standard
- Local Renewable Energy Certificate purchases

For More Information



- Roadmap Manual:
  - Chris Stoneman
    - 919/541-0823
    - stoneman.chris@epa.gov
- Quantification tools:
  - Robyn DeYoung
    - 202/343-9080
    - deyoung.robyn@epa.gov
- EE/RE Roadmap Manual:
  - http://www.epa.gov/airquality/eere/
- Power Plant Emissions Calculator:
  - http://epa.gov/airquality/eere/quantify.html

A summary of Ozone Advance Program resources relating to clean energy policies/programs is available at:
http://www.epa.gov/airquality/advance/pdfs/2012_10_EERECHP.pdf

Questions?