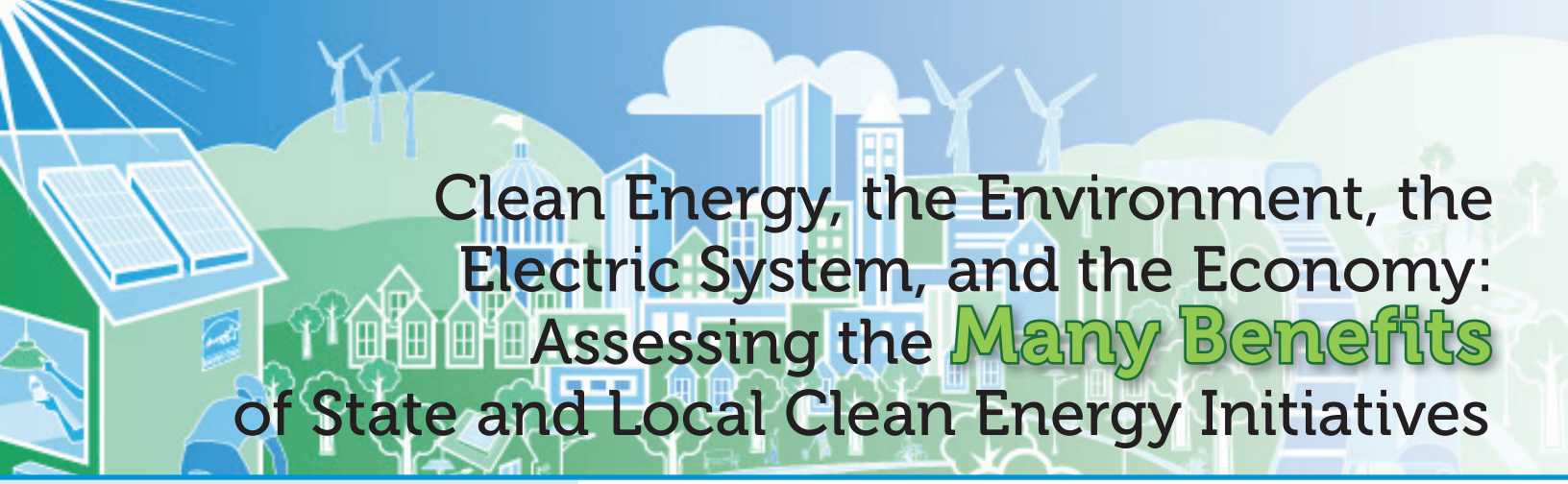


Clean Energy, the Environment, the Electric System, and the Economy: Assessing the Many Benefits of State and Local Clean Energy Initiatives

What are clean energy initiatives?

Policies and programs that governments can use to save energy, improve air quality, reduce carbon emissions, improve system reliability and security, and improve economic development. Examples include:

- **Energy efficiency policies** that reduce demand for energy: energy efficiency building codes and portfolio standards, public benefit funds for energy efficiency standards.
- **Energy supply policies** that increase the use of renewable and clean sources: clean distributed generation and net metering interconnection standards, output-based environmental regulations, public benefit funds for clean energy, and renewable portfolio standards.
- **Power sector initiatives** that limit or create incentives to reduce greenhouse gas (GHG) emissions: CO_2 offset requirements, GHG performance standards, and power sector GHG cap-and-trade policies.
- **Greenhouse gas reporting policies** that measure, such as: GHG registries and mandatory GHG reporting.
- **Planning and incentive structures** that advance clean energy: climate change action plans, clean energy and energy efficiency goals for public facilities, efficiency and alternative fuel goals for public fleets.
- **Transportation sector initiatives** such as GHG auto standards and low carbon fuel standards.

What's Inside:

EPA United States Environmental Protection Agency

State and Local Climate and Energy Program

What are the multiple benefits of clean energy initiatives?

- Increased electric system security, diversity, and overall reliability improvements for the electric system.
- Enhanced environmental quality, human health and quality of life.
- Improved economic growth through energy cost savings, avoided medical costs, higher disposable incomes, increased labor productivity and more jobs.

How do state and local clean energy initiatives result in multiple benefits?

Clean energy initiatives reduce demand for fossil-fuel powered electricity and increase electricity generated with clean, renewable energy. These initiatives can:

- **Reduce harmful air pollution.**
- **Improve air quality and people's health.**
- **Lower the costs of meeting federal air quality standards** and climate change mitigation goals in the long term.
- **Reduce health care costs** and enhance worker productivity from fewer illnesses, hospitalizations, sick days, and deaths.
- **Increase disposable income and revenues** for consumers, businesses, and utilities through lower energy or fuel costs.
- **Improve competitiveness** of local businesses by lowering costs.
- **Improve electricity system reliability** and avert blackouts.
- **Avoid or reduce need for construction of additional power plants.**
- **Avoid or defer transmission and distribution (T&D) investments** and avoid energy loss during T&D.
- **Stimulate economic development** in clean energy industries and the companies that support them, increasing income, jobs, and output.

Benefits Flash

This resource provides rules-of-thumb estimates for quick approximations of economic benefits, such as:

For income and output:

- Every $1 spent on concentrated solar power in California produces $1.40 of additional GSP.
- Every $1 spent on energy efficiency in Iowa produces $1.50 of additional disposable income.
- Every $1 million in energy savings in Oregon produces $1.5 million of additional output and about $400,000 in additional wages per year.

For employment effects:

- Every Gigawatt Hour (GWh) of electricity saved through energy efficiency programs in New York yields 1.5 sustained jobs.
- Every $1 million of energy efficiency net benefits in Georgia produces 1.6–2.8 jobs.
- Every $1 million invested in energy efficiency in Iowa produces 25 job-years, and every $1 million invested in wind produces 2.5 job-years.
- Every $1 million invested in wind or PV produces 5.7 job-years, versus 3.9 job-years for coal power.

Sources: See references section on page 3.

Why assess the many benefits of clean energy?

Understanding the range of ***environmental, economic*** and ***electric system benefits*** of clean energy can help planners:

- ***Comprehensively assess*** the full value of clean energy investments.
- ***Strengthen*** how benefits are incorporated in cost-benefit analyses.
- ***Demonstrate*** how clean energy initiatives achieve cross-cutting multiple energy, environmental, and economic goals.
- ***Identify*** specific opportunities where clean energy can support multiple goals.
- ***Design or select*** clean energy options that maximize benefits.
- ***Appeal*** to audiences with metrics and priorities they care about most.
- ***Build support*** among state and local decision makers.

What are the steps involved in estimating the benefits of clean energy initiatives?

- Choose which policies, activities, and programs to evaluate.
- Establish the goals and objectives of your agency's analysis. Consider:
  - Why is the analysis being conducted?
  - Which benefits will be analyzed?
- Determine how to conduct the analysis. Issues to consider include:
  - What financial and staff resources are available?
  - What other kinds of expertise (e.g., in-house staff and outside consultants) are available?
  - Do data exist from similar analyses or for other states or regions? Or will a new analysis be required?
  - Is the analysis retrospective (an historical assessment) or prospective (forward looking)?
  - What level of rigor is required? Is it for regulatory purposes or a preliminary screening of options?
  - Will the analysis entail an iterative approach, where the state explores a wide range of options using screening methods and then conducts a more comprehensive analysis of only the most promising options?
- Gather the appropriate data and estimate the benefits of clean energy.

Benefits Flash

A 2007 study by the American Solar Energy Society, found that in **Ohio** in 2006:

- **Gross revenues** for the energy efficiency (EE) industry totaled **over $50 billion** and supported **nearly 500,000 jobs**.
- **Gross revenues** for renewable energy (RE) industry totaled **nearly $800 million** and supported **more than 6,600 jobs.**

When assessing the potential for clean energy industries in Ohio, the study found that by 2030 the RE industry could yield:

- **$18 billion in revenues** annually and **support 175,000 jobs.**
- The EE industry could yield **$200 billion in revenues** annually and support **more than 2 million jobs.**

Source: Bezdek 2007.

A **New England** study analyzed clean energy benefits from Public Benefits Funds and Renewables Portfolio Statement programs. The study found clean energy resulted in a **reduction** between 2000 and 2010 of:

- **1,421 Megawatts**, or 5 percent, of peak energy demand
- **31.7 million tons (6 percent) of CO_2**
- **34,200 tons of SO_2**
- **22,039 tons of NO_x**

And a net increase of:

- **$6.1 billion economic output**
- **$1.04 million wage income**
- **28,190 job years**

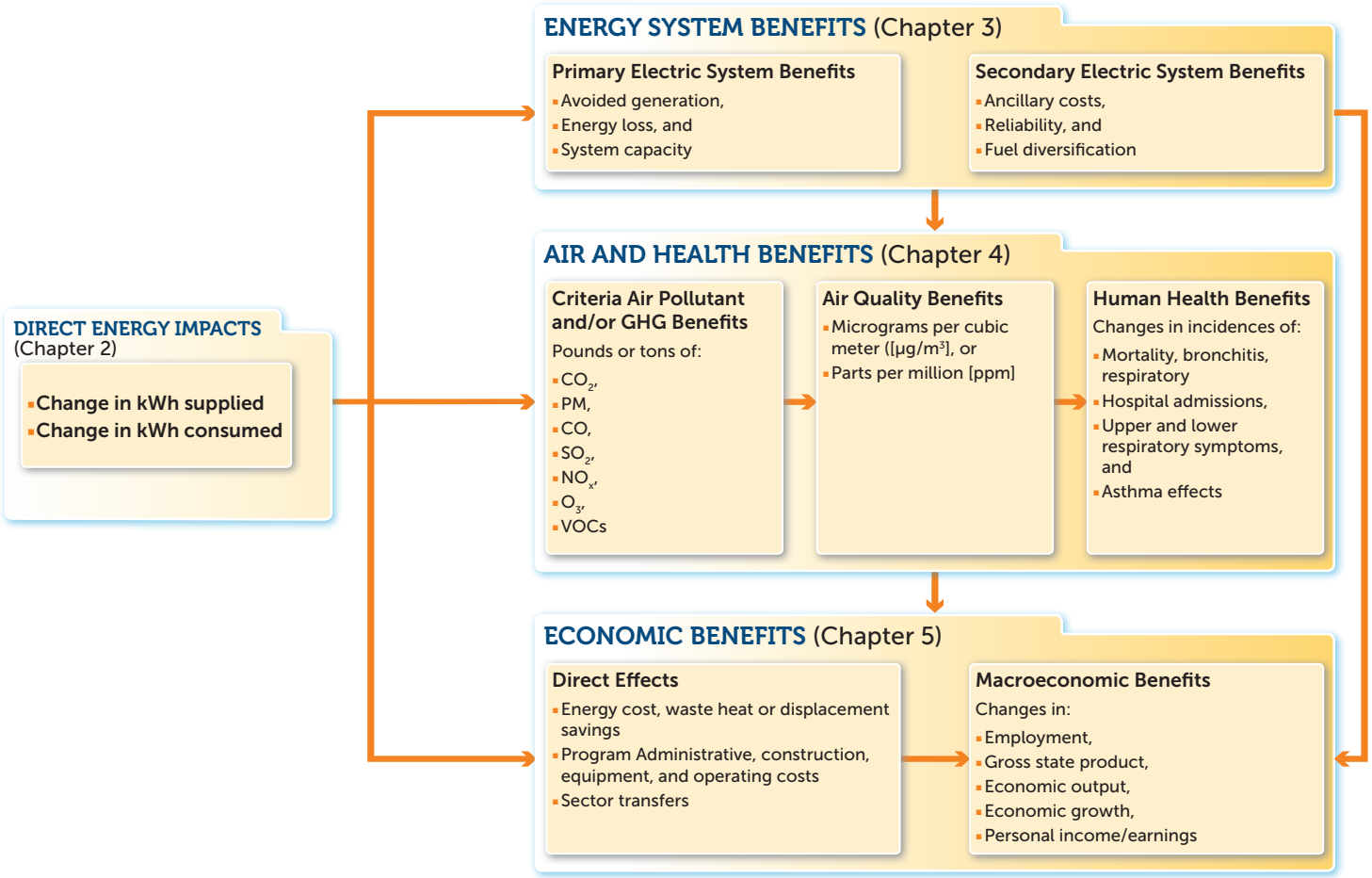
Source: Sedano et al., 2005.

Southwest Energy Efficiency Project found that investments of $9 billion in energy efficiency in the southwestern United States between 2003 and 2020 could result in:

- **Increased regional employment by 0.45% or 58,400 FTE jobs** per year versus 2020 baseline
- Increased salary income by **$1.34 billion per year** versus 2020 baseline
- **Avoided $10.6B capacity investment** (thirty-five 500 MW plants)
- **Avoided $25B electricity supply costs** per year by 2020
- **Avoided $2.4B end-use natural gas cost** per year by 2020

Source: SWEEP, 2002.

Relationship Between Energy Savings & Other Benefits of Clean Energy Initiatives



How can states and locals quantify the many benefits of clean energy initiatives?

State and local governments can use direct energy impacts to estimate the air and health, economic, and electric system benefits of clean energy, as illustrated in the graphic above, using a range of approaches and tools.

- ***Basic approaches*** approximate the impact of clean energy initiatives on energy, public health, the environment, the economy, and the electric system by adapting others' estimates of benefits or by doing spreadsheet analyses of related factors. Basic estimates provide reasonable approximations of the benefits and are appropriate for preliminary assessments or screening exercises or when time, budget and access to data are limited.
- ***Sophisticated analyses*** can be conducted using computer-based models that simulate and project energy, environment, economic and/or electric system benefits of clean energy initiatives. These approaches require more inputs compared with basic methods, but also provide additional detail, confidence and rigor that may be appropriate for some analyses, including thosethat support legislative action.
- ***Tools available:*** There is a range of tools to help states and locals quantify the benefits of clean energy. Some tools address single benefits while others estimate more than one.

For more on estimating the benefits of clean energy, and the tools available, see *Assessing the Multiple Benefits of Clean Energy: A Resource for States at http://epa.gov/statelocalclimate/resources/benefits.html*

References:

- Bezdek, Roger. 2007. Renewable Energy and Energy Efficiency: Economic Drivers for the 21st Century. Prepared for the American Solar Energy Society.
- Chicago Climate Action Plan website.
- Grover, S. 2007. Economic Impacts of Oregon Energy Tax Credit Programs (BETC/RETC). Prepared by ECONorthwest for the Oregon Department of Energy. May.
- Jensen, V., and E. Lounsbury. 2005. Assessment of Energy Efficiency Potential in Georgia. Prepared for the Georgia Environmental Facilities Authority by ICF Consulting. May.
- NYSERDA. 2008. New York Energy $Martsm Program Evaluation And Status Report; Year Ending December 31, 2007.
- Sedano R., and C. Murray. 2005. Electric Energy Efficiency and Renewable Energy: An Assessment of Existing Policies and Prospects for the Future.
- Singh, V. and J. Fehrs. 2001. The Work That Goes Into Renewable Energy. Renewable Energy Policy Project Research Report. November.
- Stoddard, L., J. Abiecunas, and R. O'Connell. 2006. Economic, Energy, and Environmental Benefits of Concentrating Solar Power in California. Prepared by Black & Veatch for U.S. DOE National Renewable Energy Laboratory. April.
- Weisbrod, G., K. Polenske, T. Lynch, and X. Lin. 1995. The Economic Impact of Energy Efficiency Programs and Renewable Power for Iowa: Final Report. Economic Development Research Group, Boston, MA. December.

Where can state and local governments and policy makers go for more information about tools, methods, and resources available to estimate the benefits of clean energy initiatives?

Assessing the Multiple Benefits of Clean Energy: A Resource for States, an essential manual to help estimate and communicate the benefits of clean energy, provides tools and approaches for state and local governments.

What the Guide includes:

- A **framework** for determining which benefits to estimate and how.
- **Tools** and methods for estimating energy systems and environmental economic benefits across varying levels of rigor.
- **Easy-to-read tables** that present the range of tools and approaches, their strengths and limitations, and suggestions on when to use them.
- **Benefits estimates** derived using various methods.
- **Analyses** that illustrate benefits to promote clean energy.
- **Case studies** that profile how states use available tools to develop and implement clean energy policies and programs.

How the Guide is organized:

- ***Chapter 1*** introduces the assessment of multiple benefits of clean energy and highlights the relationships between energy savings and other benefits of clean energy initiatives. Included in the chapter are discussions of what the multiple benefits of clean energy are, why states should assess the many benefits of clean energy, and how states can assess the multiple benefits of clean energy.
- ***Chapter 2*** provides policy makers with methods to estimate the potential direct energy impacts of electricity-related clean energy initiatives and policies for planning:
  - Steps to estimate energy impacts of clean energy.
  - Sample framework for developing an energy forecast.
  - Energy data sources.
  - Comparisons of basic and sophisticated forecasting methods and tools.
  - Resources for retrospective data and potential studies.
  - Available tools for estimating impacts.
- ***Chapter 3*** presents detailed information about the energy system to help policy makers understand how to identify and assess the benefits of clean energy initiatives on electricity systems based on their state's needs and resources:
  - An overview of how the electricity system operates.
  - Information on how to select which benefits to evaluate.
  - Steps for estimating electricity system benefits.
  - Descriptions and comparisons of basic and sophisticated forecasting methods and tools.
  - Considerations for determining whether to analyze the various benefits, who typically estimates the specific benefits, and when it is the most effective time to do so.
- ***Chapter 4*** provides help for agencies to assess the greenhouse gas, air pollution, air quality, and human health benefits of clean energy options:
  - Various methods to estimate air and health benefits.
  - Comparisons of different models and tools, including advantages, disadvantages, and when to use them.
  - Data needs and data sources.
- ***Chapter 5*** presents simple to sophisticated methods and tools for assessing the economic benefits of clean energy options so that state and local governments may:
  - Conduct and manage analyses.
  - Review cost-and-benefit estimates.
  - Understand the potential job effects of clean energy initiatives.
  - Make recommendations about clean energy options and appropriate evaluation approaches and tools.

How to access the Guide and get more information:

- ***Assessing the Multiple Benefits of Clean Energy: A Resource for States*** website: http://www.epa.gov/statelocalclimate/resources/benefits.html
- State and Local Climate and Energy Program website: http://www.epa.gov/statelocalclimate/
- State and Local Climate and Energy Newsletter: http://www.epa.gov/statelocalclimate/newsletters
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