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

Multiple Benefits of Clean Energy Initiatives

Reducing energy demand and/or increasing renewable energy generation from state and local clean energy initiatives—such as goals, standards, codes, funds and programs—can generate many benefits including:

- **Security, diversity, and overall reliability improvements for the electric system.**
- Improved environmental quality, human health, and quality of life.
- Positive economic gains through energy costs saved, avoided medical costs, higher disposable incomes, increased labor productivity, and more jobs.

This brochure is part of a series and focuses on **electric system benefits.**

What's Inside:

- Why assess electric system benefits?
- How can state and local governments estimate potential electric system benefits?
- Quantitative examples of how clean energy initiatives result in direct energy benefits.
- How to find more information.

What are clean energy initiatives?

Clean energy initiatives are policies and programs that state and local governments are using to save energy, improve air quality, reduce carbon emissions, support electric system reliability and security, and improve economic development. Examples include:

Energy efficiency policies that reduce demand for energy, such as:

Building codes for energy efficiency in both commercial and residential buildings; energy efficiency portfolio standards; public benefit funds for energy efficiency; and appliance efficiency standards.

Energy supply policies that increase the use of renewables and clean sources, such as:

Clean distributed generation and net metering interconnection standards; output-based environmental regulations; public benefit funds for clean energy supply; combined heat and power; and renewable portfolio standards.

Greenhouse gas (GHG) related policies that measure or limit emissions, such as:

GHG registries, mandatory GHG reporting; CO_2 offset requirements; GHG performance standards; and power sector GHG cap-and-trade policies.

Planning and incentive structures that advance clean energy, such as:

Clean energy goals for public facilities; energy efficiency and alternative fuel goals for public fleets; energy efficiency in public facilities; and climate change action plans.

State and local governments can analyze their clean energy initiatives using methods and tools described in EPA's *Assessing the Multiple Benefits of Clean Energy: A Resource for States.*

How do clean energy initiatives benefit the electric system?

Clean energy initiatives reduce demand for fossil-fuel powered electricity and increase electricity generated with clean, renewable energy, contributing to a less polluting, more reliable and affordable electric system. Specifically, **energy efficiency and/or renewable energy** are resources that can:

Avoid costs typically associated with conventional generation, including:

Fuel, variable operation, and maintenance costs; emissions allowances; costs of emission control equipment; and/or wholesale electricity purchases.

Defer or avoid costs of power plants and/or transmission and distribution (T&D), including:

Capital costs; operation and maintenance costs; upgrade and construction costs.

Electricity losses associated with transmission and distribution.

Other benefits of clean energy to the electric system that aren't easy to quantify but are valuable nonetheless include:

Increasing reliability and power quality due to lower loads, an increase in electricity supply and enhanced technology.

Avoiding ancillary service costs (i.e., costs to maintain system stability) due to increased reliability.

Reducing wholesale market clearing prices as electricity demand decreases and supply increases.

Avoiding or reducing risks associated with long lead-time investment or from deferring investment in traditional centralized resources until environmental and climate change policies take shape.

Improving fuel diversity and energy security through the use of varied and domestically available clean energy resources.

To learn more about how the electricity system operates, please see *Assessing the Multiple Benefits of Clean Energy: A Resource for States, Section 3.1.1*, "The Structure of the U.S. Energy System."

Why assess electric system benefits?

Clean energy is often cheaper than, or just as cost-effective as, other energy options, while also delivering important electric system, environmental, and economic benefits to the state. Typically, however, only the costs—not the benefits— of clean energy are considered during policy decisions.

By quantifying and comparing the electric system benefits of clean energy initiatives to traditional grid electricity, policy makers can:

Identify opportunities to use clean energy to minimize costs, losses and risks and support reliability and diversity in the electric system

Understand the magnitude of the potential for clean energy co-benefits across the electric system as well as benefits to the economy, environment, and human health.

Increase recognition of the synergies between clean energy initiatives, the electric system and other state or local priorities, such as economic development and environmental quality.

Communicate clearly the comprehensive impacts of clean energy initiatives to their partners and stakeholders.

Demonstrate the full value of a clean energy program.

Information about clean energy benefits, as well as costs, is useful in planning and decision-making, including:

- Developing state and local energy plans and establishing clean energy goals.
- Conducting resource planning (by public utility commissions or utilities).
- Designing demand-side management (DSM) programs.
- Performing electric system planning, including new resource additions, T&D capacity, and interconnection policies.
- Planning and regulating air quality, water quality, and land use.
- Obtaining support for specific initiatives.
- Fine-tuning policy and program design.

Finding Data for Estimating Benefits

There are many sources of data and completed analyses states can use to estimate the electric system benefits of clean energy, including:

- utilities
- public utility commissions
- state energy offices
- U.S. DOE's Energy Information Agency
- U.S. Federal Regulatory Commission
- National Renewable Energy Laboratory
- U.S. EPA's e-GRID database
- regional transmission organizations
- independent system operators
- power pools
- regional reliability organizations
- Bureau of Economic Analysis
- Securities and Exchange Commission
- state studies and databases

To learn more about specific data sources for estimating benefits, see *Assessing the Multiple Benefits of Clean Energy: A Resource for States,* "Chapter 3: Assessing the Electric System Benefits of Clean Energy."

How can state and local governments estimate potential electric system benefits?

The most straightforward and easily quantifiable benefits to assess are avoided or deferred costs of generation and capacity and avoided transmission losses. State and local governments can estimate these electric system benefits using a range of *basic approaches* or *sophisticated approaches*.

Basic approaches provide relatively simple approximations of the impact of clean energy initiatives on the electric system. These basic estimates provide reasonable approximations for preliminary assessments or screening exercises or when time, budget and access to data are limited.

Sophisticated analyses are conducted using state-of-the-art power sector models that simulate and project power plant operations, additions and costs. These approaches are more complex and require additional inputs. They do, however, add the ability to estimate how the current system will respond and adapt to an initiative in both the short and long term.

References:

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- NRDC. Chang, Audrey. California's Sustainable Energy Policies Provide A Model for the Nation. March 2006.

- PJMLLC, RTO. 2006(a). "PJMRegion Sets Summer's Third Energy-Use Record: Energy Conservation Request Continues East." August 2, 2006.

- PJMLLC, RTO. 2006(b). "Early Aug. Demand Response Produces $650 Million Savings in PJM: Reducing Electricity Use Stretches Power Supplies, Lowers Wholesale Electricity Supplies." August 17, 2006.

- Synapse Energy Economics. 2008. Impacts of Distributed Generation on Wholesale Electric Prices and Air Emissions in Massachusetts, March 31.

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.
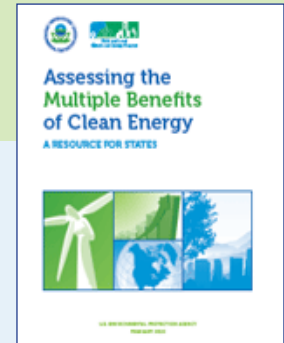
What the Guide includes:

- 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 estimates 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 is to do undertake.

- *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 Web site: http://www.epa.gov/statelocalclimate/resources/benefits.html
- State and Local Climate and Energy Program Web site: http://www.epa.gov/statelocalclimate/
- State and Local Climate and Energy Listserv: http://www.epa.gov/statelocalclimate/listservs/index.html
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