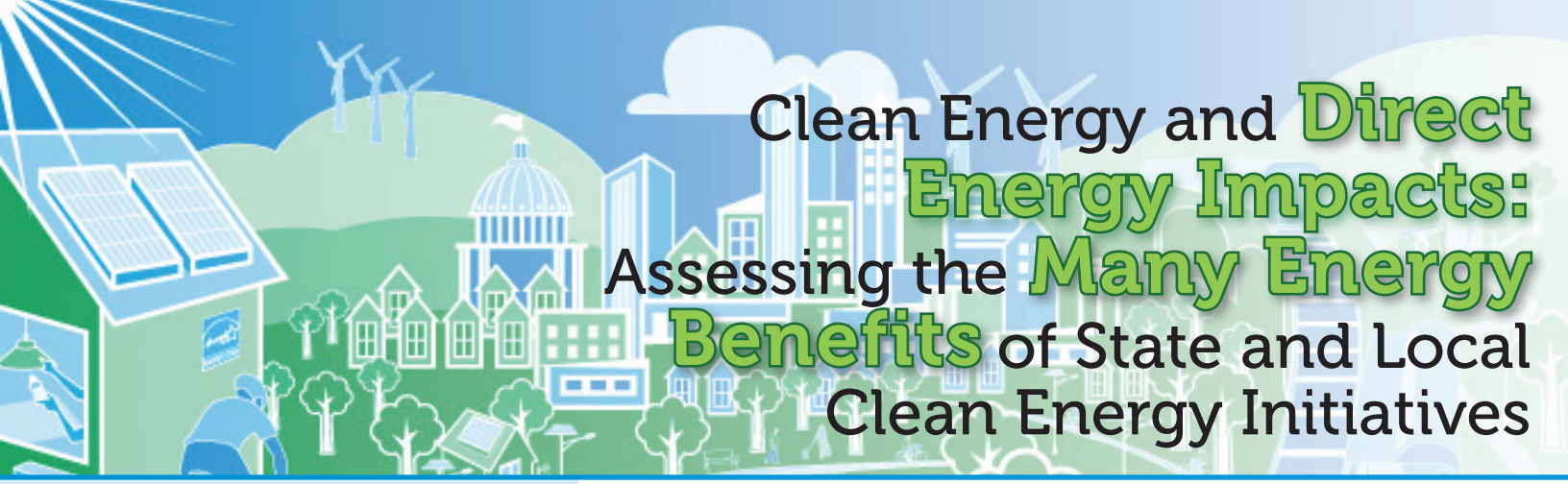

Clean Energy and Direct Energy Impacts: Assessing the Many Energy Benefits of State and Local Clean Energy Initiatives

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—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 **direct energy impacts**.

State and local governments can analyze their clean energy initiatives using methods and tools described in this brochure.

What's Inside:

What are the direct energy impacts of clean energy initiatives?

Clean energy initiatives, including those that advance energy efficiency, renewable energy and clean distributed generation, directly impact energy by:

- Reducing demand for conventional fossil-fuel-powered electricity,
- Reducing demand for natural gas used for heating, and/or
- Increasing the amount of electricity generated with clean, renewable energy sources.

How do direct energy impacts from clean energy benefit states and localities?

Reducing fossil fuel-based electricity—and generating more electricity from clean, renewable energy—benefits several state and local priority areas.

- **Environment:**
  - Clean energy initiatives reduce or avoid air pollution and greenhouse gas emissions, improving air quality, protecting people's health, and lowering contributions to climate change.
- **Economy:**
  - Energy efficiency can lower the cost of complying with national air standards by reducing air pollution.
  - Clean energy initiatives can reduce costs for fuel, energy, and new electric power plant construction, and improved air quality helps avoid illnesses which reduces medical costs.
  - Clean energy can also increase personal disposable income and revenues for business, increase labor productivity and support jobs in the clean technology sector as well as in the businesses that support it.
- **Electric System:**
  - Energy efficiency can reduce the need for additional generation and transmission assets.
  - Clean energy from domestic sources can increase energy security, diversity, and overall reliability in the electricity grid.
  - Diversified utility resource portfolios that include energy efficiency and renewable energy can reduce uncertainty associated with fluctuating fuel prices and reduce dependence on imported fuels and other risk factors.

EPA United States Environmental Protection Agency

State and Local Climate and Energy Program

Retrospective vs. Prospective Calculation of Energy Savings

State and local governments can assess energy impacts from two perspectives: retrospectively, to evaluate impacts of existing investments, or prospectively, to plan new or modified initiatives.

- **Retrospective** approaches are based on measurements of actual impacts that have already accrued from past clean energy actions. Actual energy savings from energy-efficiency programs, for example, are calculated using measurement and verification (M&V) methods, where measurements determine actual savings from measures implemented in an individual facility.
- **Prospective** techniques for estimating energy savings or renewable-energy generation include methods and models that calculate expected energy impacts resulting from proposed clean energy initiatives. Prospective analyses of energy impacts are appropriate, for example, when a state or locality is assessing the relative costs and benefits of alternative policies to select the most cost-effective approach or determining the budget level required to meet clean energy goals.

Benefits Flash

The **Texas** Emissions Reduction Plan (TERP) promotes energy-efficiency and renewable-energy measures to meet federal ambient air quality standards. Estimated cumulative annual energy savings from code-compliant residential and commercial construction in Texas were:

- **1,440,885 MWh of electricity each year** from 2001–2007.
- **Approximately 2.9 million MWh by 2013,** accounting for 10 percent of the cumulative total electricity savings under all energy efficiency and renewable energy programs implemented under the TERP (2008 and 2013).

Estimated **reduction of NO_X emissions**:

- 1,014 tons /year in 2007.
- 2,047 tons/year by 2013.

Analysis of data from the Texas Commission on Environmental Quality and EPA (including eGRID) provided an estimate of the energy savings and NO_X reductions from energy code compliance in new residential construction.

Source: Texas A&M Energy Systems Laboratory (ESL). 2008.

Why estimate the direct energy impacts of clean energy initiatives?

Direct energy impact estimates are the foundation for calculating and communicating the potential cost savings and other benefits to the economy, energy system, environment, and human health.

By understanding the direct energy impacts of clean energy initiatives, policy makers can:

1. **Evaluate** the implications of new goals, targets, or legislative actions.
2. **Measure** progress toward meeting clean energy- and other related goals.
3. **Review** the actual and potential effectiveness of technology- or sector-specific clean energy initiatives in achieving energy savings.
4. **Estimate** the actual and potential co-benefits of clean energy policies, including benefits to the energy system, economy, environment, and human health.
5. **Communicate** clearly the *comprehensive* impacts of existing and potential clean energy initiatives to their partners and stakeholders.
6. **Demonstrate** the full value of a clean energy program.

How can state and local governments estimate the potential direct energy impacts of clean energy policies?

There are a series of steps state and local governments can take to estimate the direct energy impacts of clean energy:

STEP 1: Develop a business-as-usual (BAU) energy forecast

State and local governments can compile, adopt, or develop the historical, current and projected pattern of energy supply and demand using basic or sophisticated approaches. This creates a baseline against which to measure the energy impacts of policies.

Sources of data include: Utilities; consumer energy profiles; state energy offices; public utility commissions; independent system operators, North American Electric Reliability Corporation; US DOE's Energy Information Administration; National Renewable Energy Laboratory; and US EPA.

STEP 2: Quantify implications of targets and goals

Targets and goals are often presented in percentages that don't necessarily specify the quantities of energy reductions or generation desired, such as:

- Achieve a rate of zero load growth by 2020.
- Reduce electricity demand by 2 percent per year by 2015, and 2 percent every year thereafter, with reductions to be based on prior three years of actual sales.
- Meet 20 percent of generation requirements or sales through renewable energy sources by some date in the future.

It can be helpful to estimate the potential implications of a target or goal and determine how much energy must be saved or generated before evaluating specific clean energy programs and implementation options.

STEP 3: Estimate potential direct energy impacts

There are a range of basic to sophisticated approaches available for estimating the potential direct energy impacts of clean energy, including:

- Extrapolation of energy efficiency or renewable energy potential studies,
- Adapting the results of similar programs in other states or localities to local conditions, and
- Understanding the amount of clean energy equipment in the market to determine the feasible amount of investment a new initiative could induce.

Resources available to facilitate estimation include: Market Assessment and Program Evaluation (MAPE) Clearinghouse, Lawrence Berkeley National Laboratory (LBL), Renewable Energy Policy Project (REPA), American Council on Energy Efficient Economy (ACEEE), Tellus Institute, National Renewable Energy Laboratory (NREL), California Database of Energy Efficiency Resources (DEER), Regional Technical Forum (RTF) deemed savings database, and Entergy Texas Deemed Savings.

Tools available include: ENERGY STAR® Savings Calculators, ENERGY STAR Roofing Comparison Calculator, ENERGY STAR Target Finder, and ENERGY STAR Portfolio Manager.

Key assumptions to consider include: Program period, program target, anticipated compliance or penetration rate, annual degradation factor of the measure, transmission & distribution loss, non-program effects, funding, and administration.

STEP 4: Create an alternative policy forecast

Once the direct energy impacts are estimated, an alternative policy forecast is created to reflect the new energy supply or demand conditions expected after the implementation of a new clean energy initiative. All BAU forecasts and energy savings projections should be reevaluated periodically (every one to two years) and it is important to document all sources and assumptions.

For more information about these steps, please see the next page.

References:

- New York Energy $MARTSMProgram, Evaluation and Status Report for the Year Ending December 2007. New York Public Service Commission and New York State Energy Research and Development Authority. March, 2008.
- Texas Engineering Experiment Station, Texas A&M University System. Volume I—Summary Report: Annual Report to the Texas Commission on Environmental Quality. January 2007–December 2007. August 2008, Revised December 2008. Energy Systems Laboratory.

Benefits Flash

New York's Energy $mart℠ Public Benefits Program was implemented in 1998 to improve the state's energy reliability, reduce energy costs, mitigate environmental and public health effects related to energy use, and enhance the state economy. Between 1998 and 2007, the overall program had:

- Achieved more than **3,000 GWh of electricity savings**;
- Created and retained **4,700 jobs**;
- **Reduced nearly 2,600 and 4,700 tons of NO_X and SO_X** , respectively;
- **Decreased annual CO_2 emissions by 2 million tons**; and
- **Reduced annual energy bills by $570 million** for participating customers.

By 2027, the program is expected to:

- Create more than **7,200 jobs**.
- **Increase labor income more than $300 million each year.**
- Increase total **annual output in the state by $503 million**.

Each year, the New York State Energy Research and Development Authority (NYSERDA) collects data on progress toward meeting the program's energy savings goals.

Source: New York State Energy Research and Development Authority. 2008.

Vermont's Department of Public Service (DPS) forecasts energy demand and energy efficiency program savings as part of its state energy policy and planning process. The 2008 forecast showed growing energy demand and a potentially large supply gap if major power contracts were not replaced. As a result, Vermont committed to pursuing aggressive energy efficiency measures.

The forecast projected that without new DSM measures, electricity demand would grow an average of 0.93 percent on an average annual basis until 2028.

When new DSM measures are implemented, the DPS anticipates that energy demand will

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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