



# New York City Energy Policy For 2006 and Beyond

These policies have been endorsed by the undersigned organizations, businesses and community groups

- The American Lung Association • Bright Power Inc. • Clean Air Cool Planet • The Long Island City Business Development Council • Natural Resources Defense Council • New York Climate Rescue • NYPIRG • Quixotic Systems, Inc. •

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## Summary

New York is facing several major challenges in its near-to-mid term future. High energy prices combined with increasing energy demand threaten the city's economic viability, air pollution and the human health impacts it causes have gotten worse over time, not better, with asthma becoming an acute crisis in the community. Finally, global warming has begun to impact the region, alternating between significant drought (1996-2003) and a forecast of hotter and wetter summers. More ominously, tropical diseases, unheard of in the region previously, have begun to appear, such as West Nile Virus and Malaria. The long-term impacts of global warming on the New York region are likely to be severe and include sea level rise, increased incidence of mosquito-borne diseases, increased temperatures, and less-dependable hydrological cycles that will result in increased drought and flooding. All of these problems: energy dependence, pollution, human health, global warming, are both mutually reinforcing and yet solvable by the same policy approaches. This issue briefing aims to give policy makers a set of readily available policy tools that can be implemented immediately and are geared towards sensible, economical solutions to these challenges.

In 2004 the "New York City Energy Policy" report, issued by the Energy Policy Taskforce, under the auspices of the Economic Development Corporation, called for the creation of 2,600 megawatts of new electricity resources by 2008. Up to 300 MWs of this new need could be met by a mix of "distributed resources", a term which includes clean on-site generation, energy efficiency and demand reduction. More than a year later, City energy consumption continues to rise unabated and renewable resources remain undeveloped. Pursuing a policy that fundamentally relies on a 20th Century solution, construction of more conventional power generation capacity, will not be the way to meet the report's stated goal of "assuring reliable, affordable and clean electricity". New York needs leadership to ensure that our energy policy and emerging energy economy is safe, secure, and sustainable."

The legislation compiled in this paper is designed to lead New York City towards a sustainable energy policy by increasing energy efficiency; lowering carbon pollution and other air pollutant levels; improving the city's energy infrastructure and making New York more energy-independent; as well as by creating a framework for making all of these elements of public policy increasingly effective in the future.

This paper is divided into three sections; The summary introduces the problems and solutions; Appendix I contains articles and policy briefs that give background data and information on how these policies operate and why they are needed; Appendix II contains the language of each bill itself so that policy makers and concerned citizens can evaluate the bills in one convenient document.

The legislation compiled here forms a basic energy management plan for the City of New York and answers the question that the problems listed above insist that we ask: "So what can we do?"

The answers lie below.

### Curbing Greenhouse Gases

#### [Intro. 148 – Cap on CO<sub>2</sub> From New York City Power Plants](#)

This bill lowers the allowable emission rate of carbon dioxide (CO<sub>2</sub>) from the city's power plants. The emission rate baseline is established as the average of the total installed generating capacity from 1997-99 and is reduced annually by 1% for every 100 megawatts (MW) of electricity added. Power plants can meet the standard using a pollution credit trading system.

#### [Intro. 661 – Greenhouse Gas Reporting Requirement and Reduction Targets for City Operations](#)

This bill would require New York City Government to reduce its global warming pollution, create an inventory of global warming pollution for the entire city and establish incentive programs for non-governmental entities to reduce emissions with a citywide goal of 7% below 1990 levels.. While the private sector's programs are voluntary, it commits the City to ultimately a 30% reductions from a 1994 baseline by 2020. As a coastal city, New York is particularly susceptible to global warming impacts on our infrastructure, health, economy, environment and safety.

## **Building Energy Policy**

### **Intro. 324a - Sets "LEED Silver" Standards for City-owned Buildings**

This bill sets building standards for new city-owned or operated construction projects. This will help ensure that as the city builds new facilities or renovates old ones, that the minimum building standards include green building principles as set by LEED Silver rating.

### **Intro. 382 - Building Commissioning Energy Efficiency and Conservation Training**

This bill creates a commission from city agencies that uses training to ensure their buildings' systems are operating efficiently and according to original design. Many studies of energy efficiency point to the connection between energy use and human habits. The approximately 30% reduction in energy use from changes in behavior during the 2001 California energy crisis dramatically illustrate this fact. . The commission set up in this bill would help institutionalize a culture of energy efficiency and wise-use training building managers, building engineers, operations and maintenance staff and other appropriate employees of the City of New York. The training includes issues such as the use of energy-efficient heating, ventilation and cooling systems, the reduction of electric lighting loads, energy-efficient building and building system upgrades, the incorporation of energy efficiency into planning processes, operations and maintenance practices.

### **Intro. 438 – Expedited Permitting for Projects That Submit LEED Proposals**

This bill uses the economic incentive of an expedited permitting process for LEED certified building projects to promote the use of green building standards in the city. Permitting can be an expensive and long process, but by helping to lower the costs of permitting, the city helps to promote the use of green building standards.

## **City Energy Policy for Efficiency**

### **Intro. 375 – Establishing an Energy Policy Office**

This bill creates an Office for Energy Policy. New York City is unique as a large municipality in not having an energy policy office. This bill will help focus the City's executive branch's attention and responsibility on ensure a sustainable energy future. This office will also help promote energy efficiency both inside city government and with the public at large, making city residents aware of the money-saving and pollution cutting opportunities inherent in saving energy.

### **Intro. 536a – Purchasing of Energy Efficient Products**

This bill sets minimum energy standards for certain products purchased or leased by the City. By requirement energy efficient products, the City's will lower government operating costs., Dollars and power is wasted on inefficient lighting, computers and other equipment, but requiring the Energy Star logo will ensure a better operating, more energy efficient City government.

## **Renewable Energy**

### **Intro. 381 – Citing Survey of City Facilities for Renewable Energy**

This bill surveys City-owned facilities and property for their clean on-site energy generation applicability. There are many opportunities within city-owned and operated facilities to deploy renewable and clean energy systems. Such systems include solar panels for large roofs, fuels cells that run on waste gases at sewage facilities or natural gas in large buildings, co-generation, even wind turbines at select locations could be viable alternative energy generators. These systems will help the city save money in energy operating costs, reduce air pollution, and reduce dependence on fossil fuels. This bill gives policy makers the knowledge about what is possible on city government property.

\*\*\*Note: Intro 381 includes recommendations on natural gas turbines which is not a solution supported by the signatories to this issue briefing. It is recommended that this legislation be amended to remove those clauses that promote the expanded use of natural gas microturbines.

### Intro. 546 – Renewable Portfolio Standard

This bill requires the City government to purchase increasing amounts of its electricity from clean and green renewable sources to 30% by 2020. The City of New York uses approximately 4 billion kilowatt-hours of electricity annually, much of it produced within the five boroughs, translating directly into greater local pollution. As a result of using old technologies, power plants contribute to respiratory disease, heart disease, smog, acid rain, and climate change. Creating a clean power requirement, means an increasing amount of our electricity will come from more sustainable sources that do not make people sick and pollute our environment.

## Appendix I: Articles and Background Data on Major Energy Related Issues

Appendix I contains several articles and position papers that add depth and context to the policy proposals compiled in Appendix II. Here is a list of the articles, grouped by subject matter.

- **Energy Efficiency/Demand-side Management:** Poland Efficiency Lighting Project  
Global Environment Facility, International Finance Corporation  
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- **Fuel Depletion:** Preparing New York City for the Coming Energy Crisis  
Dan Miner, Long Island City Business Development Corp.

- **Global Warming:** 20 low-cost things NYC can do to expand action on Greenhouse Gasses (GHG)  
The NYC GHG Working Group; The Scientific Consensus on Climate Change Naomi Oreskes, 3  
DECEMBER 2004 VOL 306 SCIENCE

- **Human Health:** Despite Modest Air Quality Improvements, Report Shows Half the Nation is Still Breathing Dirty Air – American Lung Association, April 28, 2005

[See also - Climate Change and Health in New York City: A Study by the New York Climate & Health Project <http://www.earth.columbia.edu/events/2004/nycch.htm>]

- **Renewable Energy:** Powering the Big Apple: Policy and System Factors Affecting the Deployment and Use of Renewable Power in New York City, Stephen A. Hammer

## **Despite Modest Air Quality Improvements, Report Shows Half the Nation is Still Breathing Dirty Air**

April 28, 2005

NEW YORK, NY – New evidence shows that more groups are at risk from air pollution and that the health risks are even more serious than experts previously believed, according to the annual American Lung Association State of the Air: 2005 report released today. The report also warns that continued threats to relax federal rules for corporate polluters will jeopardize public health.

“Dirty air threatens the lives and health of far too many Americans,” said John L. Kirkwood, president and chief executive officer of the American Lung Association. “Unfortunately, some of the largest producers of dirty air are big energy companies, who have worked with their friends in Congress on legislation to change the rules so they don’t have to clean up their pollution. Fortunately, the Senate recently blocked that bill, but the vote was very close. We need to ask ourselves: Why was Congress even considering a bill that protects corporate polluters instead of the public?” he said.

More than 152 million Americans live in counties where they are exposed to unhealthy levels of air pollution, according to the State of the Air: 2005 report. The report ranks the cities and counties with the dirtiest air, and provides county-level report cards on the two most pervasive air pollutants: particle pollution and ozone (more commonly called “smog”). According to the report, exhaust fumes from idling diesel trucks and buses, smoke from dirty power plants and factories, and soot released from indoor and outdoor wood burning combine to create particle pollution and are also the key raw ingredients of ozone pollution.

### **New Evidence Shows Air Pollution Can Cause Premature Death**

The State of the Air: 2005 report cites recently published studies showing that as ozone levels increase, the risk of premature death increases as well. Ozone is an extremely reactive gas that irritates the respiratory system and can kill people with severe respiratory problems such as chronic obstructive pulmonary disease (which includes emphysema and chronic bronchitis), and asthma. The studies also found that ozone causes shortness of breath and coughing, triggers asthma attacks and increases the need for emergency room visits and hospital admissions. Children, the elderly, and those with asthma or other lung diseases are most at risk from ozone.

In addition, the Lung Association now adds diabetics to the list of groups most at risk from particle pollution, based on increased evidence of their vulnerability to these tiny particles. Particle pollution is a mixture of microscopic solids and aerosols that has been found to take months to years off a person’s life. Other at-risk groups include children, seniors, those with asthma and lung diseases and those with cardiovascular diseases. Particle pollution has also been shown to induce heart attacks and strokes, cause lung cancer, trigger asthma attacks and increase the need for medical care and hospital admissions.

“Evidence is mounting each year underscoring just how dangerous air pollution really is,” explained Norman H. Edelman, MD, executive vice president and chief medical officer of the American Lung Association. “The more we learn, the more critical cleaning up the air becomes.”

### **Administration Delays and Proposals Jeopardize Public Health**

In the State of the Air: 2005 report, the American Lung Association cites threats to public health that target protections in the Clean Air Act. The Clean Air Act requires that the Environmental Protection Agency (EPA) and states clean up dangerous pollutants and ensures residents have air that is safe to breathe by 2010.



"Big energy companies are pushing Congress to change the law to let them get in an extra 10 years of pollution and to increase pollution at their oldest and dirtiest plants," said Janice Nolen, director of national policy at the American Lung Association. "In March, the Senate blocked a bill that would do just that, but the fight is not over. We must continue to be vigilant about protecting the Clean Air Act from the polluters," she said.

The Lung Association has taken legal action to stop this rollback, and encourages everyone to join them in supporting strong national, state, and local pollution control programs, by participating in community reviews of air pollution and sending e-mails or faxes to urge members of Congress to protect the Clean Air Act. To contact members of Congress to oppose revisions to the Clean Air Act, including loopholes for polluting power plants that would weaken existing laws, log onto [www.lungusa.org](http://www.lungusa.org).

#### Counties Across the Country Have Dangerously High Particle Pollution and Ozone Levels

The State of the Air: 2005 report shows that about 50.2 million Americans live in counties with unhealthy levels of both ozone and particle pollution. Here are some of the cities ranked among the worst in the nation for ozone and/or particle pollution:

- West: Los Angeles, Calif.; Bakersfield, Calif.; Fresno, Calif.; Hanford, Calif.; Visalia, Calif.
- Northeast: New York, N.Y.; Newark, N.J.; Bridgeport, Conn.
- Mid-Atlantic: Washington, D.C.; Baltimore, Md.; Pittsburgh, Pa.
- Midwest: Cleveland, Ohio; Columbus, Ohio; Chicago, Ill.; Detroit, Mich.; St. Louis, Mo.; Salt Lake City, Utah; Provo, Utah
- Southeast: Birmingham, Ala.; Louisville, Ky.; Atlanta, Ga.; Charlotte, N.C. Knoxville, Tenn.
- South: Houston, Texas; Dallas/Fort Worth, Texas
- Northwest: Eugene, Ore.; Springfield, Ore.

#### What People Can Do To Protect Themselves From Air Pollution

"The American Lung Association produced the State of the Air: 2005 report to help all Americans understand the quality of the air in their community. But it can't stop there," said Kirkwood. "Air, and the pollution carried in it, doesn't respect city and county boundaries. Americans have the power to protect themselves and the air we're all breathing. It's time for everyone to pitch in and help."

#### [State of the Air: 2005 Fact Sheet](#)

Air pollution levels improved in many parts of the nation during the years 2001-2003, but millions of Americans still faced dangerous levels of air pollution.

#### **Air Pollution Among the General Population**

Here is a data snapshot showing the growing number of Americans who are breathing unhealthy levels of ozone and particle pollution.

- More than 52 percent of the U.S. population lives in counties which have unhealthy levels of either ozone or particle pollution.
- Nearly half the U.S. population, or 49 percent, lives in areas with unhealthful levels of ozone.
- More than 26 percent of the U.S. population lives in areas with unhealthful short-term levels of particle pollution.
- One in five of the U.S. population lives in areas with unhealthful year-round levels of particle pollution.

- About 50.2 million Americans, or nearly 17 percent, live in 47 counties with unhealthy levels of all three types of air pollutants: ozone and short-term and year-round particle pollution.

### **Air Pollution Among High-Risk Groups**

Many groups are at greater risk because of their age or the presence of chronic lung or cardiovascular disease. Recent research adds people with diabetes to the list of high-risk groups, as they face risks from particle pollution's threat to their cardiovascular system. High-risk groups include:

- Adults age 65 and older
- Children under 18
- Adults or children with asthma
- People with Chronic Bronchitis or Emphysema (also known as Chronic Obstructive Pulmonary Disease, or COPD).
- People with any other chronic lung disease
- People with Cardiovascular Disease
- People with Diabetes

To find out what you can do to get involved, protect yourself, your family's health, and the Clean Air Act, go to [www.lungusa.org](http://www.lungusa.org).

#### About the American Lung Association

For 100 years, the American Lung Association has been the lead organization working to prevent lung disease and promote lung health. Lung disease death rates continue to increase while other leading causes of death have declined. The American Lung Association funds vital research on the causes of and treatments for lung disease. With the generous support of the public, the American Lung Association is "Improving life, one breath at a time." For more information about the American Lung Association or to support the work it does, call 1-800-LUNG-USA (1-800-586-4872) or log on to [www.lungusa.org](http://www.lungusa.org).

## Preparing New York City for the Coming Energy Crisis

**Dan Miner**, Long Island City Business Development Corp.

In the last two years the price of oil has risen from \$28 to over \$60 a barrel. If we used less, we would save a lot of money, while reducing air pollution, and slowing global warming. But the most compelling reason to cut down is because we'll simply have to. The world's demand for oil is about to exceed the capacity to produce it. With less oil to go around, the price will go up.

The world now uses over 83 million barrels of oil per day, with the U.S. taking nearly a quarter of that amount. Growth in global demand for energy shows no sign of slowing down. All oil fields are now pumping as fast as they can. The world's spare capacity has virtually disappeared, so even slight disruptions to supply can affect the global market and the U.S. economy.

Earlier this year, Goldman Sachs reported that oil could spike to \$105 barrel.<sup>1</sup>

In a recent oil crisis simulation exercise, a bipartisan panel of intelligence, military, and energy experts, chaired by Senators Lugar and Lieberman, were confronted by a series of supply disruptions and terrorist attacks. Although only 3.5 million barrels of oil per day were removed from the global market, the price of oil rocketed to over \$150 per barrel, bringing gasoline and heating oil to over \$5 per gallon, and causing widespread economic dislocation. One of the participants, former CIA Director Robert Gates, said that "the scenarios portrayed were absolutely not alarmist; they're realistic."<sup>2</sup>

Today we import most of the oil we use, but for a long time the U.S. was energy independent. The history of U.S. oil discovery and production illustrates the basic rules that apply to all oil producing regions. Oil was first discovered in the U.S. in the 1800s, and each year more new oil fields were found. Discovery peaked in the 1930s. After that point we extracted more barrels of oil than we found to replace depletion. Production of oil in the U.S. still continued to grow steadily until its peak in 1970, but ever since then, U.S. oil production has declined. Since then we have become ever more reliant on imported oil.

The U.S. Energy Information Administration and major oil companies say that global oil production will continue to grow to 126 million barrels a day by 2025.<sup>3</sup> There's broad agreement that this huge increase can only come from the OPEC nations of the Persian Gulf, because production elsewhere is already at peak, or like the U.S., in decline. According to the annual report of PFC Energy, an energy investment and consulting firm, even after factoring in new production from Canadian oil sands, and new fields in Africa, Central Asia and Russia, PFC expects the world to become increasingly dependent on OPEC for future oil production increases. Even ExxonMobil concurs, admitting that non-OPEC production will peak "in the next ten years or so."<sup>5</sup>

[How long can OPEC raise production?](#)

If we accept the fact that non-OPEC nations have just about peaked, it would be helpful to know how long OPEC members, and especially Saudi Arabia, can keep growing their supplies. EIA depends on Saudi Arabia, the world's largest oil exporter, to more than double its production from 9.5 to 22.5 mbd. However, there is increasing doubt that this growth is possible.

Almost all the Saudi oil supply comes from just eight giant fields in a small geographic area. Half of Saudi production, almost 5 million barrels a day, comes from the 3,400 wells of Ghawar, the world's largest oilfield. After a study of hundreds of technical papers on Saudi oil, Matt Simmons claims the fields, all discovered fifty or more years ago, have given up much of their easily extracted petroleum. Matthew Simmons is chairman and CEO of Simmons and Company International, an energy investment banking firm in Houston. He has been an advisor to the Bush Administration and Vice President Cheney's 2001 Energy Task Force.<sup>6</sup> Simmons concludes that additional discovery is unlikely, claimed Saudi oil reserve figures are inflated, and that their production is on the verge of decline. Whenever Saudi production peaks, the world will have peaked.<sup>7, 8.</sup>

### Predicting Peak Oil Production

When half of all the oil that has ever existed on earth has been used up, production will decline. We won't run out for a long time, as there will still be vast amounts left, but increases in production to meet growing worldwide demand will no longer be possible. Further, the remaining oil will tend to be of lesser purity, limiting its use, and more expensive to extract and refine. When will this happen? Analysts fall into two camps. The U.S. Energy Information Agency predicts peak in 2037.<sup>9</sup> The Association for the Study of Peak Oil, an international group of scientists, predicts it in 2007.<sup>10</sup> PFC Energy has endorsed ASPO's general conclusions, putting the peak between 2010 and 2015.<sup>11</sup> A report prepared for the U.S. Department of Energy, while not choosing between the ASPO and EIA timetables, warns that peak oil is inevitable.

"The peaking of world oil production presents the U.S. and the world with an unprecedented risk management problem. As peaking is approached, liquid fuel prices and price volatility will increase dramatically, and, without timely mitigation, the economic, social, and political costs will be unprecedented. Viable mitigation options exist on both the supply and demand sides, but to have substantial impact, they must be initiated more than a decade in advance of peaking...If peaking is imminent, failure to initiate timely mitigation could be extremely damaging."<sup>12</sup>

Congressman Roscoe Bartlett (R-MD), a former research scientist, calls for a national effort to prepare, equivalent to World War II's Manhattan Project.<sup>13</sup> The issue was covered in a widely republished Associated Press article.<sup>14</sup>

Could the petroleum joyride - cheap, abundant oil that has sent the global economy whizzing along with the pedal to the metal and the AC blasting for decades - be coming to an end? Some observers of the oil industry think so. They predict that this year, maybe next - almost certainly by the end of the decade - the world's oil production, having grown exuberantly for more than a century, will peak and begin to decline. And then it really will be all downhill. The price of oil will increase drastically. Major oil-consuming countries will experience crippling inflation, unemployment and economic instability. Princeton University geologist Kenneth S. Deffeyes

predicts "a permanent state of oil shortage." According to these experts, it will take a decade or more before conservation measures and new technologies can bridge the gap between supply and demand, and even then the situation will be touch and go...

The coming shortages are not confined to oil. In the 1990s, natural gas became the fuel of choice for electric generation plants. It was erroneously believed to be extremely abundant, but now North American gas supplies appear to have already peaked.<sup>15, 16</sup> The U.S. is electing to become increasingly dependent on imports of liquefied natural gas (LNG), and on an extremely expensive international shipping infrastructure for it that has not yet even been built.<sup>17</sup>

### **What's to be done?**

Our energy supply and transportation systems are both at risk, and business as usual is not an option. The necessary responses to fuel depletion are similar to those required to slow down global warming. With meaningful action at the Federal level unlikely, states and cities are recognizing the need to act on their own.<sup>18, 19</sup>

Oil shortages and price hikes are likely to take place as we get closer to peak oil and certain to become chronic as we pass it. In the U.S., most oil is used for transportation, as well as for heating and the making of plastics.<sup>20</sup>

In the short term, NYC can expand public rail and bus systems, and set up fuel saving measures well before emergencies, including car pooling, driving bans, highway speed limits, reduced fees for public transit, telecommuting, compressing work weeks to fewer but longer days, and increased fuel taxes.<sup>21</sup> Many detailed plans for reducing car use in NYC already exist.<sup>22, 23, 24</sup>

Over the longer term, the DOE report calls for government crash programs to increase fuel efficiency standards, and mass production of alternative liquid fuels. NYSEDA has shown that an expanding biodiesel market would stimulate soybean farming.<sup>25</sup> Much of our food travels thousands of miles from farm to consumer. Higher transportation costs will create economic opportunities for farms and agricultural regions close to urban markets.

The 2004 NYC Energy Policy Task Force correctly recognized that growing demand for electricity is exceeding local generating capacity. Future surveys are needed to encompass larger questions about sustainability of fuel supplies, and the risk of growing dependence on imports. Energy efficiency and the promotion of renewable energy, especially the removal of barriers to distributed generation of small solar and wind systems, should be top priorities. These efforts will spur the growth of new industries and create new jobs.<sup>27</sup>

Fortunately, New York City is moving forward with efforts to conserve energy and expand the generation of power from renewable sources. City Council bills 148 (reduction in CO2 from city power plants), 324A (setting green building standards), 374 (creation of emergency energy plans), 375 (NYC energy policy office), 381 (survey of NYC renewable energy siting prospects), 382 (creation of a program regarding building commissioning, energy efficiency and conservation training), 536A (requiring the use of energy efficient products), 546 (requiring the use of green power), and 661 (inventory of the CO2 emissions of city operations) are worthy steps towards ensuring the a safe and stable future for New York City.

For detailed analysis of why solar, wind, hydropower and biomass can be sustainably developed, and why nuclear, hydrogen, coal and oil shales can not replace depleting supplies of oil and natural gas, refer to *The Party's Over* and *Power Down* by Richard Heinberg, *High Noon for Natural Gas* by Julian Darley, and <http://www.postcarbon.org/>. Articles and reports concerning fuel depletion are archived at [www.energybulletin.net](http://www.energybulletin.net) and at [www.peakoil.com](http://www.peakoil.com).

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<sup>1</sup> [http://www.fortune.com/fortune/streetlife/0\\_15704\\_1051267\\_00.html](http://www.fortune.com/fortune/streetlife/0_15704_1051267_00.html)

<sup>2</sup> <http://www.washingtonpost.com/wp-dyn/content/article/2005/06/23/AR2005062301896.html>;  
[http://www.secureenergy.org/news\\_news.php#](http://www.secureenergy.org/news_news.php#)

<sup>3</sup> [http://www.eia.doe.gov/oiaf/ieo/pdf/appd1\\_d6.pdf](http://www.eia.doe.gov/oiaf/ieo/pdf/appd1_d6.pdf)

<sup>4</sup> "PFC Energy's Global Crude Oil and Natural Gas Liquids Supply Forecast," Sept. 2004, p. 10 - 18;  
[http://www.csis.org/energy/040908\\_presentation.pdf](http://www.csis.org/energy/040908_presentation.pdf) .

<sup>5</sup> [http://www2.exxonmobil.com/corporate/files/corporate/outlook04\\_18.pdf](http://www2.exxonmobil.com/corporate/files/corporate/outlook04_18.pdf);

[http://www.exxonmobil.com/Corporate/Citizenship/Corp\\_citizenship\\_energy\\_outlook.asp](http://www.exxonmobil.com/Corporate/Citizenship/Corp_citizenship_energy_outlook.asp)

<sup>6</sup> <http://www.simmonsco-intl.com/>

<sup>7</sup> "The Vanishing Mirage of Saudi Oil," LA Times, June 27, 2005.

[http://www.latimes.com/news/opinion/commentary/la-oe-klare27jun27\\_0\\_4666067\\_story?coll=la-news-comment-opinions](http://www.latimes.com/news/opinion/commentary/la-oe-klare27jun27_0_4666067_story?coll=la-news-comment-opinions)

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## **20 low-cost things NYC can do to expand action on Greenhouse Gasses (GHG)**

*~The NYC GHG Working Group*

There are a many on-going activities in NYC government that can become jumping-off points for environmental leadership that addresses the need for climate protection and promotion. Such leadership can be exercised at little cost to the City and in fact can bring substantial additional funding to the City and realize both short- and long-term savings to the City's operating budget and economic development for the City as a whole. Deepening NYC's energy efficiency is crucial not only for reduction of pollution, associated public health benefits, and climate change mitigation but also for continued economic development at the end of constrained gas and electric supply lines. Many locations can be highlighted to show NYC as a center of advanced design that actually can make it an eco-tourist destination.

### ***Save Energy/Dollars and Reduce GHG Emissions in the City's own buildings and facilities***

- Promote High Performance designs as part of all DDC projects in NYC government buildings, using state funding under the ENCORE program with NYPA.
- Get facility energy reimbursement policy aligned so that facility managers have proper incentives to conserve energy and to pursue efficiency projects.
- Develop the existing data management for NYC energy purchasing to enable true tracking and management of energy use.
- Highlight and expand gas recovery projects at landfills and wastewater treatment plants.

### ***Make Transportation Cleaner and Less Oil-dependent***

- Expand alternative fuel vehicle use in NYC fleets and make them "high visibility". Leverage support for alternative fueling stations. Focus on heavy vehicles and alternatives.
- Adopt efficiency and emissions standards for all City fleets and fuel purchasing.
- Reduce congestion, gridlock, and idling by aggressive enforcement of existing traffic regulations, variable pricing schemes, crosswalk re-location.
- Include bicycle stands and showers in new buildings, bicycle paths in road construction.

### ***Incorporate GHG analysis into existing City administrative procedures***

- Include GHG mitigation and climate change adaptation in environmental impact statements.
- Make energy and emissions reductions part of Mayor's Management Review .
- Include energy efficiency and emissions as explicit criteria in City purchasing for equipment, materials, building systems, fuels.

- Create an inter-agency GHG inventory and action plan and track progress, under the existing commitment to the ICLEI Clean Cities Program.

***Encourage the Private Construction Industry to Adopt Energy Efficiency & Renewables***

- Integrate enforcement of the State Energy Code with NYC Code, making engineers and architects more responsible for ensuring energy efficiency in their designs.
- Require private construction projects that receive City financial support to participate in NYSERDA energy efficiency programs.
- Highlight and endorse models of high-performance and green projects.
- Utilize sustainable design principles in Downtown reconstruction and elsewhere.

***Engage Partners in making NYC a Global Green Development Center***

- Promote an Urban Eco-Tourism campaign for NYC's tourist industry, highlighting advanced building, office and neighborhood designs, urban forestry etc.
- Channel power sector investment into efficiency and renewables to offset power plant emissions.
- Bring Wall Street focus and leadership on environmental markets and new clean technologies.
- Create an investment center of knowledge and activity for global environmental investing, utilizing the city's complementary strengths in finance, communications, design and engineering.

[Background and Discussion](#)

NYC already has a sophisticated set of "High Performance Building Green Design Guidelines" for its capital improvement projects. Developed and promoted by DDC with input and guidance from private industry and other agencies, these guidelines, though recognized world-wide, are presently voluntary and have had minimal impact on the full scope of NYC capital construction. Examples of green design elements incorporated in some current projects are extensive daylighting at the new Children's Center facility in Manhattan and a "living roof" for the St. George Staten Island Ferry Station. Additional cost is financed through the City's ENCORE contract with NYPA. This funding is structured so that cash flow is neutral for 10 years and positive after that so that the reduced energy costs more than offset the financing payments over the life of the installation. ENCORE is budgeted through DCAA at \$150 million 1995-2004, with 100 projects (\$98 million) to date, such as coal boiler conversions, high-efficiency lighting, motors, chillers, and energy management systems, saving over \$10 million in annual energy expense. It behooves the City to make even more use of this financing and to negotiate with the State to continue and expand its availability.

NYC has a central data management point for its purchasing of electricity and gas for all City buildings, additionally including the Board of Education, City University,



Health and Hospitals Corporation and Department of Corrections. Upgrade the system capabilities so that it can truly be used for aggregated and disaggregated energy monitoring and management. With tracking capabilities in place, it becomes realistic to set progressive goals for energy-use reductions with associated impacts on the City budget. To have this really work means getting the incentives right for facility decision-makers – by having a share of the savings remain at the facility level.

Besides buildings, the city also operates a large number of waste facilities. Methane is emitted from landfills and wastewater treatment plants. Recovery and utilization is a growing technology nationwide. DEP is presently implementing its first seven fuel cell installations under NYPA's ECORE program. At DOS's Fresh Kills facility gas is being recovered from a section of the landfill and in 1998 a private concession was arranged, worth \$3.5 million annually in revenue to the City, for recovery from all four sections. Where recovery systems in place use flaring (the US EPA recommended means to control emissions and odors), additional investment can make this gas a renewable resource put to productive use.

NYC already has one of the most intensively used mass transit systems in the country, contributing significantly to NY State's claim as the most energy efficient state in the country. In coordination with the MTA, NYC DOT has been promoting the largest pilot alternate fuel vehicle program in the country, that replaces diesel buses with clean-burning natural gas. NYC itself directly operates numerous departmental fleets, with Local Law 6 of 1991 requiring use of alternative fuel vehicles. There are presently several thousand alternative vehicles of various kinds in use. Make them stand-out on the street by bold signage and distinctive appearance while continuing to expand their number by promotion of fleet standards for efficiency and emissions.

A major barrier to private sector use of natural gas vehicles is the availability of fueling stations. As the City expands its own fleet it should make sure to obtain full leverage by working with local utilities and gasoline stations to increase the convenience of CNG fill points. Creating the infrastructure would set the stage for negotiating with private fleets such as large taxi companies.

The City's heavy vehicles are a source of diesel particulates, increasingly believed to have climate as well as well-known health impacts. City purchasing specifications should require California-certified low Nox/low particulate equipment which is readily available. DOT has been part of pilot work with filter retrofits. DOS should follow this work closely and should be strongly encouraged to pursue its own initiatives for fuel efficiency -- dual bin trucks for recycling pick-ups, rail and barge connections to replace trucking for garbage export, and source reduction. Diesel fuel can also be blended with renewable bio-diesel, helping to boot-strap this significant new industry.

All steps to reduce auto congestion have multiple environmental quality impacts. Aggressive application of existing regulations could go a long way towards eliminating

grid-lock with short-term revenue to the City. The experiment with relocating midtown cross-walks is a good example of thinking outside-the-box. Congestion pricing at bridges, tunnels, on-street parking, and municipal lots, and idling devices also bear careful consideration, as does the ban on rush-hour single-occupancy vehicles in midtown/lower Manhattan.

Cleaner, oil-independent transportation cannot overlook bicycling, which is increasing in the City despite limited facilities. Relatively small measures, such as including bicycle stands and showers in new building construction and paths in road construction, can go a long way in promoting this healthy trend.

Administrative procedures provide a key process where environmental impacts of programs and projects get taken into consideration. The complex of mandated environmental impact statements, however, fail to include greenhouse gas emissions and climate change mitigation or adaptation. Procedures are broadly established by the National Environmental Policy Act (NEPA) and the NYS Environmental Quality Review Act (SEQRA) but the City directly controls its own recently instituted process and guidelines as the City Environmental Quality Review (CEQR), coordinated through the Mayor's Office. Here consideration of GHG impacts and climate change scenarios could be incorporated to show the City's commitment.

Similarly activities such as those under the ENCORE program and progress in alternative vehicles can become part of the Mayor's Management Review (MMR). This process makes NYC government activity more public and accountable.

A necessary part of addressing GHG is understanding the scope and detail of sources so that actions can then be planned, tracked and monitored. This procedure, currently called a GHG inventory, is part of the Clean Cities Program promoted by the International Council for Local Environmental Initiatives (ICLEI). NYC is a member of ICLEI and City Council Resolution no.1992, unanimously adopted last year, commits the City to move ahead with the Clean Cities Program. The inventory process will provide an important way for the various agencies involved to coordinate around the issue, managing data collection and subsequent action.

NYC already has one of the most sophisticated design, construction, and real estate development industries in the world. Licensed professionals manage compliance with a detailed building code. The NYC Code, however, does not require compliance with the NYS Energy Code which is, essentially, un-enforced by the State within the City. The City, through Department of Buildings rules, can require compliance by the architects and engineers who are already responsible for self-certification of Code compliance.

NYSERDA administers \$150 million per year (through 2006) in cost-sharing programs under the state's "System Benefit Fund" to achieve promote energy

efficiency. It should be mandatory for private projects that receive NYC support (such as tax abatements) to demonstrate utilization of NYSERDA programs, generally exceeding State Energy Code requirements. The additional investment in energy efficient systems will result in lower energy costs not just for the specific projects but, since we live at the end of constrained electricity and gas lines, for all New Yorkers and New York businesses. Reduced energy usage in turn reduces emissions from buildings and power plants.

Some of the most advanced office designs in the world have been implemented by NYC not-for-profits such as NRDC and the Audubon Society. These should be highlighted along with advanced design properties such as those developed by the Durst Organization (4 Times Square) and the Battery Park City Authority under its "zero-emissions" standard. These precedents make it clear that Green Design is, in fact, ready for "prime time" -- and prime time here means explicit inclusion into the principles applied to the redevelopment of the downtown and Ground Zero site as well as throughout all five boroughs.

NYC has the opportunity to take on a leadership role in promoting clean technology on a global scale. The events of 9/11 have reinforced NYC's identity as a world capital. Downtown redevelopment can be a striking symbol of such a commitment.. Urban eco-tourism can become a keystone of a reinvigorated tourist industry. New York as a center of advanced design for clean technology worldwide can be incorporated into the City's Olympic invitation.

NYC is also a laboratory-by-necessity of coping with economic growth under conditions of constrained electric supply. The easy road is "survival of the dirtiest", pumping more juice out of old and inefficient plants. The challenge is to create the right incentives so that NY's utilities and deregulated market participants make cost-effective investments in clean energy that will be affordable. Cap-and-trade of emissions is one mechanism, implied by a current bill with the City Council. Partnerships for distributed generation, renewables, cogeneration and efficiency-based megawatts are another way to get incentives right for utilities, so that they are rewarded not solely for the amount of electricity throughput on the grid. This can bring new investment into the City, both private and state, while helping address NYC's unfortunate position of paying among the highest rates in the country for electricity.

Going beyond urban eco-tourism and the transformation of local utilities, there is a global role that NYC is positioned to play by virtue of its vast resources as an investment center. Wall Street has been left at the starting gate in the development of emissions trading markets. New York State has begun its environmental technology development strategy with an industrial park upstate near Saratoga. Projections of world economic and energy growth paint a clear picture that while action is required at home in the industrialized world, at least equal action is necessary in the majority of the world that we consider "developing". Far-sighted leadership is required to bring Wall

Street's economic might into this arena. Doing so will create new sources of activity for the City's large engineering, architecture, and communications professions. Doing so can bring Wall Street much closer to its 42nd Street neighbor, the United Nations, and can give NYC a new, progressive role in the transfer of environmental technologies to the world.

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# Powering the Big Apple: Policy and System Factors Affecting the Deployment and Use of Renewable Power in New York City

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## Introduction

New York City is a city in love with electricity. The home of Thomas Edison's first electric utility back in 1882, and the current home of Times Square with its "spectacle" lighting, New York City owes its reputation as a city that never sleeps to its electricity supply. There is currently 8,800 MW of installed large-scale power generation capacity in New York City, all relying on various types of fossil-fuel based sources.<sup>1</sup> There is an additional 2-3 MW of installed renewable power system technology in the City, including anaerobic digesters and rooftop and building integrated solar photovoltaic systems. The amount of power generated from renewable sources is expected to grow in the next few years, but only marginally. Why is this the case? Large portions of the city consist of flat-topped roofs and parking structures, which are ideal for solar deployment. The Hudson and East Rivers enjoy powerful tidal flow twice per day, and for a city whose waterfront was once lined with windmills built by Dutch settlers, urban wind systems also seem a possibility.

## Renewable Power in New York City

The majority of the renewable power generated in New York City today is by technology located on government property. Eight anaerobic digesters located at municipal sewage treatment plants capture methane gas that is then used by fuel cells to generate electricity. The largest solar photovoltaic (PV) system in the city is on the roof of a subway car maintenance facility; two smaller systems are to be installed on subway stations undergoing major renovations. Other prominent PV installations are on a large commercial office building in Times Square and a system integrated into the building façade of a "green" high rise apartment building in lower Manhattan. There are 30-40 small PV systems installed on homes and small apartment buildings around the city. In the next few years, several prominent renewable power installations are anticipated. The Freedom Tower, rising from the ashes of the World Trade Center, plans to install wind turbines at the top of the building to produce electricity; a few miles north, the new football stadium proposed for Manhattan's west side will similarly feature wind turbines lining the top rim of the stadium. In the East River, a private company is planning to install hundreds of underwater turbines, generating 5- 10 MW of electricity from the powerful river currents.<sup>2</sup>

Despite these proposed new installations, research done for the State of New York shows the level of proposed or current installed renewable power generation capacity in New York City is just a fraction of what is technically possible. In particular, solar PV systems are seen as capable of providing up to 7,700 MW of power in New York City by 2022 under certain market conditions, a reflection of the large amount of unused rooftop space and relatively high insolation levels in the city. Biomass and wind systems are seen to have far less potential, totaling 83 MW and 12 MW respectively.<sup>3</sup> These numbers represent theoretical maximums for all three technologies, however. The amount of power actually anticipated is generally far lower than these forecasts of theoretical potential. For instance, solar PV deployment is realistically expected to total between 330-396 MW of capacity by 2022, both on rooftops and as part of new building facades.<sup>4</sup> Wind system contributions to the city's overall power supply are expected to

remain small over the next 20 years, primarily because the low wind speeds found in the city limit the potential for large wind turbines or wind farms.

### Key Factors Affecting Renewables Deployment in NYC

Why have renewable power systems made such a minor contribution to New York City's electricity picture thus far, and will these problems continue to plague future efforts to promote renewable power system deployment in the city? Interviews with more than three dozen city and state policymakers, industry officials, and community and environmental advocates have identified several key factors influencing the current level of renewables deployment and green power use in New York City:

- *Cost:* One factor with a clearly favorable impact is the availability of financial incentives from the New York State Energy Research and Development Authority. Since 2000, NYSERDA has established three incentive schemes reducing the per watt installation costs of solar PV systems by between \$2-\$5/watt. As of the end of March 2004, **NYSERDA** has provided more than \$2.4 million in incentives to 32 photovoltaic project installations in New York City with a combined peak power generation capacity of 609 kilowatts.<sup>5</sup> Additional funding has been made available to the tidal power project in the East River, and to the fuel cell installations at sewage treatment facilities around the city. Several renewable power project developers cite **NYSERDA** funding as critical to their decision to move ahead with the project;<sup>6</sup> other developers similarly report the failure to obtain **NYSERDA** funding was instrumental in their decision to cancel the renewable power component of their project.<sup>7</sup> These incentives are necessary because like most consumers, there is a strong 'least cost' preference among local consumers when it comes to electricity. 'Green' power offerings by local Energy Service Companies cost roughly one-half cent more per kilowatt hour than power from traditional sources,<sup>8</sup> and this higher cost may be one of the reasons for the current low rate of enrollment in these programs. Because New York City already has very high electricity costs – among the highest in the nation – anything that increases the cost of power is viewed skeptically. In their comments to State regulators on the proposed structure of a statewide Renewables Portfolio Standard, City energy officials expressed concern the RPS could drive up local electricity costs, harming the city's economic competitiveness.<sup>9</sup> Firms involved in the installation of renewable power systems in New York City report that without subsidies, power from solar PV can be two to six times as expensive as the current retail price of electricity.<sup>10</sup> With NYSERDA rebates and other tax breaks, this cost can drop to a level where it is equal to or slightly more costly than the current retail price of electricity.
- *Environment as Secondary Consideration:* Related to the least cost preference is a general focus on cost rather than environmental considerations in electricity policy decision-making. The New York Independent System Operator decides which power sources will feed the statewide and local grid based on day-ahead and hour-ahead price quotes submitted by power generators, a policy sanctioned by U.S. Government regulators. In New York City, this has meant that for many years, grid managers have called on highly polluting power plants to provide power. Had these plants not received dispensations from clean air rules, the city would have lost a sizable portion of its generation capacity, at the risk of dire reliability and cost consequences. There is no guarantee, of course, that had power generation decisions been made primarily on environmental grounds, there would have been a dash to develop renewable power schemes. The extent to which renewables deployment would have been promoted depends on the local perspective to the question, "How clean is clean enough?" Efforts to 're-power' older, highly polluting power plants in New York City with new natural-gas fired turbines have won plaudits from city and state policymakers and local advocacy groups. To date, these groups have not been willing to insist on more drastic – and possibly more costly – steps promoting or requiring

the widespread installation of renewable power systems as an even cleaner approach to local power generation.

- *Preference for Voluntary Action on Renewables Deployment Rather than Mandates:* In 1999, the City of New York developed a series of High Performance Building Guidelines intended to serve as a menu of "green" ideas that consultants and architects can voluntarily draw from when designing a new building or retrofit project for a City agency. Included in the guidelines is a brief mention of renewable energy resources, including PV systems. To date, use of the guidelines has been voluntary, and only a few of the dozens of projects undertaken by the City's Department of Design and Construction since the guidelines were issued have included any renewable power component.<sup>11</sup> This refusal to mandate renewables or green power use stands in stark contrast to the requirements of the Battery Park City Authority (BPCA), a state agency with authority over a 92-acre plot of land in lower Manhattan featuring extensive residential and commercial development. Under guidelines developed by the BPCA in 2002 and 2003, new buildings in Battery Park City must generate a minimum of 5% of their own power on-site from renewable sources such as solar PV or wind power. 30% of the power consumed in the building must be provided by green power sources in or outside of the City.<sup>12</sup> The Solaire high-rise apartment building, featuring building integrated and rooftop PV systems, was the first building to be constructed under these guidelines. The BPCA is currently soliciting bids from developers for two more large commercial and residential buildings, with construction due to commence in 2005.
- *Interconnection Rules:* Blackouts and other power outages bring home in a very stark manner how New Yorkers depend on electricity. Subway trains, traffic signals, elevators, and complex computerized financial transactions involving parties from around the world all require access to a stable, reliable power supply. Over the years, state regulators have imposed operating requirements on the local load-serving utility (Con Edison) to ensure the reliability of the local grid. However, the majority of the grid's reliability comes from Con Ed's network system design, built to ensure that a failure on a single line does not automatically darken an entire block or borough. Because of this system design, renewable power sources linked to the Con Ed grid can run into problems if the device produces more power than is used by the customer owning the unit. Con Ed technical specifications for distributed generation technologies limit the size of interconnected renewable power systems or require them to install equipment that can swiftly disconnect the device from the grid if it violates certain key operating protocols, such as the maintenance of a one-way flow of electricity from Con Edison to the customer.<sup>13</sup> These requirements have forced a reduction in the size of several solar PV installations around the city; another installation opted to install a costly battery system to absorb any surplus electricity.<sup>14</sup> Such steps may still not eliminate a requirement by Con Edison to install a reverse power relay which can shut down the PV unit in a millisecond if it feeds power back into the grid. Regardless of the path chosen, these technical fixes all adversely affect the cost-effectiveness of renewable schemes installed around New York City. There are ways to circumvent the grid connection problem. The first is to treat the renewable power device as a miniature power plant, and rather than using the system to displace Con Ed's power supply to a single consumer, power generated by the system can be fed directly into Con Edison's high voltage feeder lines, earning the owner a fee equal to the locational based marginal price for power. This rate varies on a daily basis; during 2003, it ranged from \$0.05-\$0.082 per kilowatt-hour.<sup>15</sup> Though technically feasible, this approach may only make sense for larger installations, as the cost of a transformer to boost the voltage of power created by these systems to the voltage level flowing on the primary feeder line can be significant. A second solution is to continue to use the device to provide power to a single consumer, and to sell any surplus power to one or more neighboring consumers using a micro-grid superimposed on top of Con Ed's existing electrical grid. Though technically feasible, such an approach is not currently allowed in New York State. Tariffs detailing the rate to be charged to customers for the surplus power must first be established by State regulators, and permission must also be granted by the City of New York. The type of permission granted by the City, and

the complexity of the process involved in granting this permission, would vary significantly based on whether wiring to the neighboring consumers passes under or over City-owned streets or sidewalks.

### Analysis/Conclusion

Like most cities, New York's involvement in electricity matters is limited. The City does not operate its own large-scale electric generating facilities, and overall responsibility for regulating Con Edison and the many electric power plants around the city has been in State hands since 1910. Today, the City's official role largely involves submitting comments to state officials on different regulatory matters, conducting research on energy issues of interest to state and local policymakers, serving as a conduit for low-cost power designed to promote business retention, and exercising zoning and permitting authority to influence the siting of major electricity projects in the city.<sup>16</sup> As the user of large amounts of power, the City can also serve as a role model for other energy users, or attempt to use its purchasing power to leverage change in the marketplace. Given these roles, it is reasonable to question how much capacity the local government has to influence green power use or the level of renewables deployment in the community. Certain of the factors influencing renewables use locally do fall within the City of New York's purview – City officials could, for instance, follow the BPCA's lead by mandating on-site renewables use in new City government buildings or major retrofit projects. The City could also take the politically more difficult step of mandating on-site renewables deployment by private buildings applying for building permit approval.

On the other hand, forcing Con Edison to modify its interconnect rules or sanctioning the development of new micro-grids generally involves powers that rest with State regulators. Rules governing the order in which different power sources are dispatched to supply power are set at the state and federal levels, again limiting the City's ability to intervene. Finally, although electricity industry restructuring in New York kept a portion of a consumer's electric bill (i.e., delivery charges and taxes) under State regulatory control, the marketplace now sets the price customers must pay for electricity generation. The City could choose to supplement State financial incentives to bring down the cost of renewables deployment in New York City, but this is a political decision that might face opposition given a general public preference for least-cost power sources. In sum, New York City's experience highlights many of the structural challenges policymakers and advocates face if they seek to promote greater levels of urban renewables use. These challenges exist not because cities lack renewable resource potential, but because regulatory, political, and technical factors limiting renewables use extend beyond a Mayor or City Manager's span of control.

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# POLAND EFFICIENT LIGHTING PROJECT

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The International Finance Corporation (IFC)/Global Environment Facility (GEF) Poland Efficient Lighting Project (PELP), was a two-year, US \$5 million greenhouse gas reduction initiative funded through GEF and administered by IFC. The initiative was designed to replace incandescent light bulbs with energy-efficient compact fluorescent lamps (CFLs) in households in Poland. By reducing residential lighting electricity consumption, PELP reduced the need for electricity generation in Poland and reduced the emission of greenhouse gases from coal-burning Polish power plants. PELP employed a combination of direct subsidies, distribution channel development, product promotions and consumer and professional education to promote the widespread adoption of CFLs in the residential sector in Poland. The initiative began in November 1995 and ran through May 1998. Major components of PELP included:

- CFL Subsidy program
- Luminaire Subsidy program
- Pilot Demand Side Management (DSM) program
- Public Education program
- PELP Administration, including an extensive Monitoring and Evaluation program.

In addition, in 1998, a Cooperative Promotion program was initiated to build upon the apparent success of the earlier PELP activities.

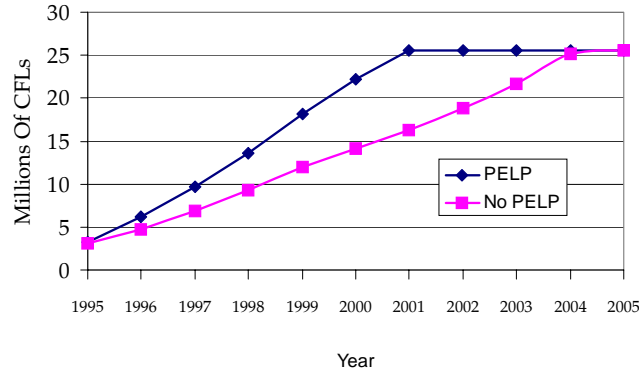
PELP was evaluated by an independent third-party contractor to determine the greenhouse gas reduction impacts. The objectives of the evaluation were to:

- Quantify the electricity savings and greenhouse gas emissions reduction resulting from the sale and installation of CFLs subsidized by PELP
- Quantify total impacts from the PELP initiative including both direct impacts and market transformation impacts according to GEF requirements and best established practice
- Assess the effects of the initiative on the residential CFL market in Poland
- Summarize lessons of experience to aid in the planning and evaluating of future initiatives similar in nature to PELP.

Summary of Results

PELP significantly increased the number of CFLs in Polish households as shown in Figure A. The line identified in the legend in Figure A as “No PELP” shows a forecast of the total installed CFLs in Poland had PELP never taken place. These data indicate that PELP may result in Poland’s reaching residential CFL market saturation approximately three years earlier than if the initiative had not been undertaken.

*Figure A. TOTAL PROGRAM IMPACT OF THE PELP CFL SUBSIDY PROGRAM ON CFL*



**INSTALLATIONS BY YEAR**

This result incorporates the conservative assumption that PELP did not increase the level of market saturation possible in Poland. The resulting electricity savings and greenhouse gas reductions from the acceleration of the Polish market are summarized in Table 1.

*Table 1. ELECTRICITY AND GREENHOUSE GAS SAVINGS FROM PELP*

	<b>GWh Savings</b>	<b>Thousand Tonnes CO<sub>2</sub> Reduced</b>	<b>Cost/tonne CO<sub>2</sub> Reduced</b>
CFL Subsidy Total Program Impact	2320.18	2794.5	\$1.39

A number of other market indicators of the significance of PELP upon the residential CFL market were tracked. These market indicators showed the following:

- CFL penetration increased from 11.5% of households prior to PELP to 33.2% one year after the initiative. The penetration of CFLs in Poland is now higher than in many other countries including countries with much higher incomes, e.g., the UK and US.
- CFL sales increased in Poland at more than double the rate in the rest of Central and Eastern Europe.
- Prices of CFLs in Poland declined by more than 34% during the program. These price decreases were sustained after PELP and have not reverted to pre-subsidy levels.
- CFLs are more widely stocked in Poland (both more stores carry CFLs and they carry more models) and preliminary data from one year after the program indicate

sustained retail availability.

- Polish consumers are more aware of the advantages of CFLs.
- The percentage of Polish consumers intending to purchase CFLs increased from 29.2% to 37.8%, and they intended to purchase significantly more CFLs (2.41 in the first program year to 3.45 post-program).
- Polish consumers are happy with their purchases and 97% of purchasers intend to replace their CFLs with another CFL when the current one burns out.
- Polish print media coverage increased and shifted from explaining CFLs to describing where and how to best use them, indicative that CFLs are becoming common, rather than something that needs to be introduced to consumers.

While direct causality can not be unambiguously established, the independent PELP evaluation determined that it is highly unlikely that the dramatic sales increases, price decreases and other effects would have occurred without the PELP. In summary, there is strong evidence of a widespread and sustainable change in the residential market for CFLs in Poland.

To obtain the PELP Evaluation Report, or additional information about PELP, please contact

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## The Scientific Consensus on Climate Change

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### ESSAY

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Without substantial disagreement, scientists find human activities are heating the Earth's surface. This year's essay series highlights the benefits that scientists, science, and technology have brought to society throughout history.

Policy-makers and the media, particularly in the United States, frequently assert that climate science is highly uncertain. Some have used this as an argument against adopting strong measures to reduce greenhouse gas emissions. For example, while discussing a major U.S. Environmental Protection Agency report on the risks of climate change, then-EPA administrator Christine Whitman argued, "As [the report] went through review, there was less consensus on the science and conclusions on climate change" (1). Some corporations whose revenues might be adversely affected by controls on carbon dioxide emissions have also alleged major uncertainties in the science (2). Such statements suggest that there might be substantive disagreement in the scientific community about the reality of anthropogenic climate change.

This is not the case. The scientific consensus is clearly expressed in the reports of the Intergovernmental Panel on Climate Change (IPCC). Created in 1988 by the World Meteorological Organization and the United Nations Environmental Programme, IPCC's purpose is to evaluate the state of climate science as a basis for informed policy action, primarily on the basis of peer-reviewed and published scientific literature (3). In its most recent assessment, IPCC states unequivocally that the consensus of scientific opinion is that Earth's climate is being affected by human activities: "Human activities ... are modifying the concentration of atmospheric constituents ... that absorb or scatter radiant energy. ... [M]ost of the observed warming over the last 50 years is likely to have been due to the increase in greenhouse gas concentrations" [p. 21 in (4)].

IPCC is not alone in its conclusions. In recent years, all major scientific bodies in the United States whose members' expertise bears directly on the matter have issued similar statements. For example, the National Academy of Sciences report, *Climate Change Science: An Analysis of Some Key Questions*, begins: "Greenhouse gases are accumulating in Earth's atmosphere as a result of human activities, causing surface air temperatures and subsurface ocean temperatures to rise" [p. 1 in (5)]. The report explicitly asks whether the IPCC assessment is a fair summary of professional scientific thinking, and answers yes: "The IPCC's conclusion that most of the observed warming of the last 50 years is likely to have been due to the increase in greenhouse gas concentrations accurately reflects the current thinking of the scientific community on this issue" [p. 3 in (5)]. Others agree. The American Meteorological Society (6), the American Geophysical Union (7), and the American Association for the Advancement of Science (AAAS) all have issued statements in recent years concluding that the evidence for human modification of climate is compelling (8). The drafting of such reports and statements involves many opportunities for comment, criticism, and revision, and it is not likely that they would diverge greatly from the opinions of the societies' members. Nevertheless, they might downplay legitimate dissenting opinions.

That hypothesis was tested by analyzing 928 abstracts, published in refereed scientific journals between 1993 and 2003, and listed in the ISI database with the keywords "climate change" (9). The 928 papers were divided into six categories: explicit endorsement of the consensus position, evaluation of impacts, mitigation proposals, methods, paleoclimate analysis, and rejection of the consensus position. Of all the papers, 75% fell into the first three categories, either explicitly or implicitly accepting the consensus view; 25% dealt with methods or paleoclimate, taking no position on current anthropogenic

climate change. Remarkably, none of the papers disagreed with the consensus position. Admittedly, authors evaluating impacts, developing methods, or studying paleoclimatic change might believe that current climate change is natural. However, none of these papers argued that point. This analysis shows that scientists publishing in the peer-reviewed literature agree with IPCC, the National Academy of Sciences, and the public statements of their professional societies. Politicians, economists, journalists, and others may have the impression of confusion, disagreement, or discord among climate scientists, but that impression is incorrect.

The scientific consensus might, of course, be wrong. If the history of science teaches anything, it is humility, and no one can be faulted for failing to act on what is not known. But our grandchildren will surely blame us if they find that we understood the reality of anthropogenic climate change and failed to do anything about it. Many details about climate interactions are not well understood, and there are ample grounds for continued research to provide a better basis for understanding climate dynamics. The question of what to do about climate change is also still open. But there is a scientific consensus on the reality of anthropogenic climate change. Climate scientists have repeatedly tried to make this clear. It is time for the rest of us to listen.

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## **ERRATUM**

*CORRECTED 21 JANUARY 2005;*

Post date 21 January 2005

Essays: "The scientific consensus on climate change" by N. Oreskes (3 Dec. 2004, p. 1686). The final sentence of the fifth paragraph should read "That hypothesis was tested by analyzing 928 abstracts, published in refereed scientific journals between 1993 and 2003, and listed in the ISI database with the keywords 'global climate change' ( 9)." The keywords used were "global climate change," not "climate change."

## **References and Notes**

1. A. C. Revkin, K. Q. Seelye, New York Times, 19 June 2003, A1.
2. S. van den Hove, M. Le Menestrel, H.-C. de Bettignies, Climate Policy 2 (1), 3 (2003).
3. See [www.ipcc.ch/about/about.htm](http://www.ipcc.ch/about/about.htm).
4. J. J. McCarthy et al., Eds., Climate Change 2001: Impacts, Adaptation, and Vulnerability (Cambridge Univ. Press, Cambridge, 2001).
5. National Academy of Sciences Committee on the Science of Climate Change, Climate Change Science: An Analysis of Some Key Questions (National Academy Press, Washington, DC, 2001).
6. American Meteorological Society, Bull. Am. Meteorol. Soc. 84, 508 (2003).
7. American Geophysical Union, Eos 84 (51), 574 (2003).
8. See [www.ourplanet.com/aaas/pages/atmos02.html](http://www.ourplanet.com/aaas/pages/atmos02.html).
9. The first year for which the database consistently published abstracts was 1993. Some abstracts were deleted from our analysis because, although the authors had put "climate change" in their key words, the paper was not about climate change.
10. This essay is excerpted from the 2004 George Sarton Memorial Lecture, "Consensus in science: How do we know we're not wrong," presented at the AAAS meeting on 13 February 2004. I am grateful to AAAS and the History of Science Society for their support of this lectureship; to my research assistants S. Luis and G. Law; and to D. C. Agnew, K. Belitz, J. R. Fleming, M. T. Greene, H. Leifert, and R. C. J. Somerville for helpful discussions.