CITY ENERGY CHALLENGE

1991-2001: A Decade of Success

▸▸ CITY ENERGY CHALLENGE WOULD LIKE TO ACKNOWLEDGE AND THANK THE FOLLOWING PEOPLE FOR THEIR CONTRIBUTIONS TO THE PROGRAM:

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and many more.
Thanks for all your hard work and dedication.

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CITY ENERGY CHALLENGE

Portland's Energy Savings Program:
Raising the Standard for
Energy Efficiency in Government

Ten-Year Report

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"Saving money and winning awards are just a small part of what our Energy Challenge is all about. Since energy and other natural resources are limited, it's efforts like the City Energy Challenge that will lead us to a more sustainable future. This program is a win-win-win in City Hall, on Main Street, and in our wild and scenic areas as well."

Commissioner Dan Saltzman

- In FY 2000 - 2001, energy bill savings were $1.2 million
- Annual savings for FY 2001-2002 will likely reach $2 million
- Total energy use was reduced by 20% in FY 2000-2001
- Cumulative 1991-2001 savings totaled $9.6 million
- 15,000 tons of carbon dioxide emissions were avoided during 1991 - 2001

Over the past decade, the City of Portland has cut energy bills by nearly $10 million!

In addition to stretching taxpayer dollars, these energy savings keep money circulating locally and create substantial environmental benefits, such as cleaner air and water and reduced global warming impacts.

Program Basics

These accomplishments have been achieved through the City Energy Challenge (CEC), a program created in 1991 to reduce energy use in City of Portland facilities and operations. CEC is managed by the Office of Sustainable Development, Energy Division. Partnering with other City bureaus, CEC works collaboratively to identify energy-saving opportunities, assist in securing project funding, and provide technical assistance, including facility energy audits, project bids, cost-benefit analyses, and product testing.

While working with other bureaus has identified and created large-scale energy efficiency opportunities, the City also recognizes the role individual employees have in reducing energy use. In 2000, CEC began distributing "Green Tips," a bi-monthly feature on both office and home strategies to cut energy use. These tips are e-mailed to all City employees. A recent, informal survey of City employees showed one in four respondents had taken specific actions to reduce energy use or improve the environment in response to Green Tips.

Policy Background

The City Energy Challenge program implements a primary objective of Portland's 1990 Energy Policy. The policy established a goal of improving energy efficiency in all sectors by 10% by 2000. For municipal operations, the policy added a specific objective to reduce annual energy bills for City facilities by $1 million by 2001. The City Energy Challenge has significantly surpassed both percentage and dollar savings goals!

City Government Energy Use

Even with this success, managing City government energy use remains a major fiscal and technical challenge. In FY 2000-2001, the City government's total energy bill was just over $11 million. Continued growth in services and facilities and a 40% increase in electricity and natural gas rates over the last two years have exacerbated the problem. However, the steep rate increases have made energy-efficiency improvements even more valuable and provide fuel for the ongoing commitment to reduce the costs and environmental impacts of City government energy use.

City Energy Savings

As Figure 1 shows, annual savings rapidly surpassed the initial goal in FY 1995-1996, and by FY 1997-1998 savings surpassed the enhanced goal of $1.5 million. Annual project savings dipped from FYs 1998 - 2001 as some projects with one-time savings ended and several larger projects were getting started. Now that these larger projects have been completed, annual savings for 2002 are expected to reach $2 million. Cumulative savings for FY 1991 - 2001 total almost $10 million (Figure 2).

"Through the City Energy Challenge staff we've been able to do more energy projects, do them quicker, get all available incentives and additional public recognition for our efforts. We know the technical side of street lighting and traffic signal operations, but it's nice to have assistance from the Energy Division of the Office of Sustainable Development. We wouldn't be as efficient without their help."

Brant Williams-
Department of
Transportation
Director

"Portland Parks & Recreation has participated in 24 projects under the City's Energy Challenge that account for $114,000 in ongoing energy cost savings. Parks also received $32,000 in rebates and has realized a cumulative savings of $421,000 since starting the program in July of 1991. The City Energy Challenge has helped raise awareness of energy cost and its ongoing consumption with relationship to the quality and type of capital investments. OSD's expanding role to work with environmental issues has also helped focus on the livability as well as energy costs of developing to minimize our impact on the environment by using green solutions that will last a lifetime employing natural conservation."

Mary Huff-Portland Parks & Recreation Operations Manager

CEC's projects have far surpassed its initial goals for energy savings.

Figure 1. Annual CEC Project Savings, 1991-2001.

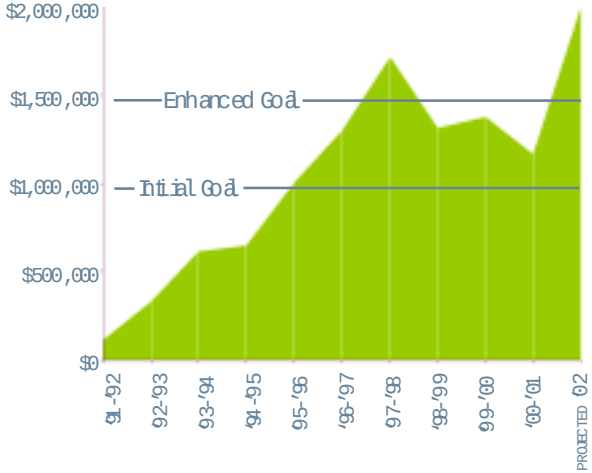
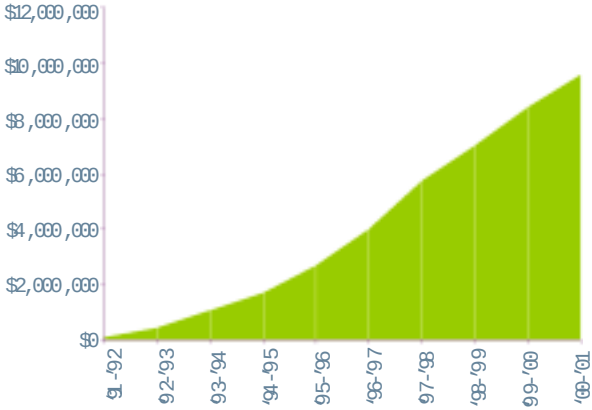


Figure 2. Cumulative CEC Savings, 1991-2001.



The largest energy-using City bureaus include General Services, Parks & Recreation, Maintenance, Fire, Environmental Services, Department of Transportation, and Water Works. Facilities managed by these bureaus were the first targeted by CEC for potential energy-saving opportunities. Figure 3 highlights by percentage each bureau's energy use.

Figure 3. City Energy Use by Bureau

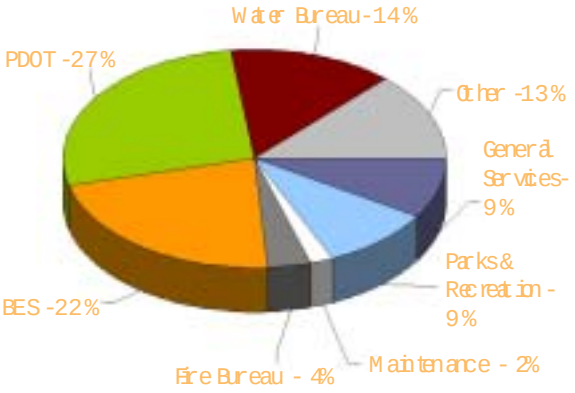
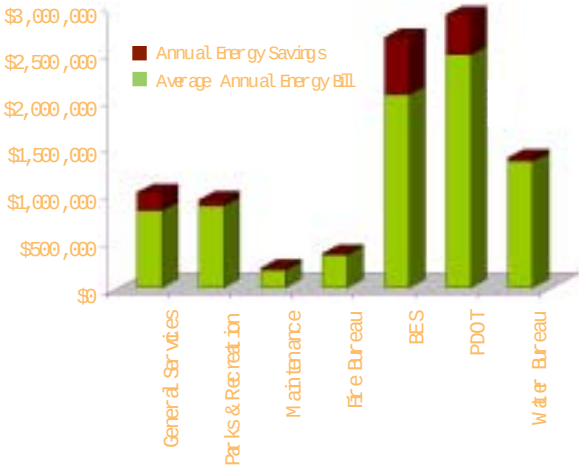


Figure 4. Energy Use and Savings by Bureau



Together, the seven largest bureaus account for 87% of the City's total energy bill. Figure 4 shows the average yearly bill for each bureau and the number of dollars saved annually through CEC energy-saving measures.

These savings are the result of more than 100 projects over the past 10 years, including energy retrofits, energy-efficient design in new construction projects, and utility rate reductions accomplished through rate negotiations.

"Over the past decade Portland has developed a well deserved reputation as a national leader among cities on energy management and sustainable development. The City has demonstrated how strong local leadership can attract talented staff who can leverage state and federal resources to put together projects that achieve substantial lasting results. We look forward to continuing our great working relationship with the City and the Office of Sustainable Development."

Kathy Pierce - US Department of Energy Regional Manager

CEC Project Highlights

The following pages highlight just a few of the projects that have contributed to the success of the City Energy Challenge.

Bureau of General Services

Projected 2002 Savings: $82,127
Total CO_2 Savings: 981 Tons/year

The Portland Building - 1992, 1994, 2001

The Portland Building lighting project started in 1992 when the Bureau of General Services and CEC assessed energy-savings opportunities in the building. An energy analysis identified $67,000 worth of annual savings through energy-efficient improvements such as lobby lighting changes, fluorescent lighting upgrades and lighting controls. Installation of energy-saving measures occurred in three phases. Phase I, the lobby lighting project, replaced existing lobby lighting with technologically advanced lighting fixtures and lightened the color of interior walls, increasing the lighting levels threefold while simultaneously lowering the wattage expended per square foot from 2.5 to 1.5. The lobby lighting project achieved $8,000 in annual lighting savings. Phase II, the office lighting project, upgraded lighting fixtures on the remaining 14 floors. Lighting upgrades on the office floors save the City over $30,000 a year. Phase III, the lighting control project, was completed in late 2001. The lighting control system switches office lights off at a preset time. Occupants can override the system as needed; the system then resets

for a later time to ensure lights are shut off after occupants leave. This system has reduced lighting energy use by 29%, for an annual saving of $28,000.

Sullivan/Arkeny Pump Stations - 1992, 1993

Bureau of Environmental Services
Projected 2002 Savings: $40,443
Total CO_2 Savings: 529 Tons/year

Renovation of the Sullivan and Arkeny Sewage Pump Stations significantly improved the energy efficiency of the pump systems. At the Sullivan Pump Station, four outdated 400-HP pumps and source converters were retrofitted with four pulse with modulated variable speed drives. These upgrades increased the energy efficiency of each unit from an 80% efficiency rate to over 95%, saving almost 560,000 kilowatt-hours per year. In addition, the City received a $16,000 rebate from PGE. A similar retrofit at the Arkeny Pump Station saves more than 324,000 kilowatt-hours per year and received a PGE rebate of $10,000.

Columbia Boulevard Wastewater Treatment Plant (CBWTP) Fine Bubble Diffusers - 1994

Bureau of Environmental Services
Projected 2002 Savings: $493,618
Total CO_2 Savings: 4,980 Tons/year

Bacteria-driven wastewater treatment requires an ample supply of air for optimal waste breakdown. Large, electrically-powered blowers supply air to the micro-organisms in the basin through the fine-bubble diffusers. These bubble diffusers are often a treatment facility's greatest energy expense. In 1993, CEC and the Bureau of Environmental Services saw a great opportunity for savings at the CBWTP: replacing the coarse bubble aerators with fine bubble aerators. Finer bubbles cut in

half the air needed for wastewater treatment, also reducing the amount of energy needed to inject air into the system. The savings are huge. Replacing diffusers in the plant's eight wastetreatment basins saves over 8 million kilowatt-hours each year—enough energy to power the entire Portland Building. A rebate of $114,000 from PGE, along with annual energy savings, led to a payback on the new equipment of just three years.

Fire Bureau
Projected 2002 Savings: $11,334
Total CO_2 Savings: 44.4 Tons/year

Fire Station No. 1 - 1994, 1995

One of several stations retrofitted by CEC and the Fire Bureau, Fire Station No. 1 underwent major lighting and HVAC upgrades starting in 1994. Over 300 T-12 magnetic fluorescent lighting systems were converted to more efficient T-8 electronic systems, and occupancy sensors were added to many of the lighting circuits. The HVAC system was upgraded to a new, fan-powered variable air volume system with a gas boiler. Upgrades at Station No. 1 save more than $11,000 a year today.

PROJECT HIGHLIGHTS

Negotiated Rate Savings and Green Power Purchase - 1995

Office of Sustainable Development
Projected 2002 Savings: N/A
Total CO_2 Savings: 360 Tons

In 1995, the City signed an innovative contract with Portland General Electric (PGE) to purchase green power generated by wind or other renewable resources. The contract allowed the City to take advantage of wholesale rates for a 10 MW a minimum power purchase, and to require PGE to purchase 5% of that power from renewable resources. As a result, the City cut costs substantially for 95% of the purchase and paid a small premium for the 5% of renewable power it received. At the time, the net effect was a savings of $300,000 per year and substantial environmental benefits. In 2000, after that contract expired, the City made another commitment to renewable energy resources and announced its intent to buy electricity from power resources such as wind and solar through PGE and Pacific Power's green power programs. Today the City purchases over 600,000 kilowatt-hours per year of green power. The City's Energy Division works with other City bureaus, local businesses, and other institutions to buy green power and accelerate the development of renewable wind, solar, and geothermal resources.

Ira Keller Fountain - 1996

Bureau of Water Works
Projected 2002 Savings: $41,164
Total CO_2 Savings: 383 Tons

In 1996, the Ira Keller Fountain closed for a week for major repairs. Temperature changes, ground settlement, and age had worn down the 25-year-old fountain. In addition, public health and safety, mechanical, building, and

electrical features were in need of upgrading to current code standards. Leaks in the fountain had corroded electrical conduits, pumps, light fixtures, and controls and the outdated filter system was inefficient. New, highly efficient energy and water measures included an improved filtration system, a rebuilt pump, updated light fixtures, restored rock surfaces, an automated chlorination system, and restored nighttime lighting.

Bureau of Environmental Services
Projected 2002 Savings: $32,077
Total CO_2 Savings: 323 Tons/year

Water Pollution Control Lab - 1997

Built on a reclaimed industrial brownfield underneath the St. John's Bridge, the City of Portland's Water Pollution Control Lab houses a laboratory, educational viewing area, offices and multipurpose conference rooms. The facility incorporates a number of innovative energy-efficiency features. The highly efficient HVAC system features centralized air handling and exhaust, gas-fired space heating with variable flow hydronic distribution, and roof top unitary air conditioning with single-duct variable air volume air distribution. High-efficiency fluorescent lighting was installed throughout the building. In the large open office areas on the first and second floors, light fixtures nearest to the windows respond to

available levels of daylight through automatic dimming sensors located in the suspended ceiling clouds. Occupancy sensors were installed in private offices, conference rooms, restrooms and locker areas. Exterior sunscreens, operable windows, and computerized interior shades were installed, as appropriate. Glass-walled private offices and meeting rooms are placed within the core, providing natural light into interior spaces and river views for all. Prism-shaped light monitors over the lab area allow indirect natural illumination without interfering with the digital readouts in the laboratory equipment. Energy savings on these highly efficient features added up to $23,000 a year at the time (even more at today's higher electric rates) while offering employees and the community a state of the art facility.

PV Powered Maintenance Trucks - 1998, 2000

Bureau of Maintenance
Projected 2002 Savings: $9,360
Total CO_2 Savings: 26.4 Tons/year

In the past, maintenance vehicles were left running to power repair tools inside the vehicles. This wasted gas and forced employees to breathe harmful fumes while working. The mobile solar generators were designed to deliver clean, renewable power and eliminate the need to run the V-8 truck engine and twin cylinder generator while operating equipment onsite. The new solar panels located atop two of the City's Maintenance Bureau/ Environmental Services Emergency

Investigation TV trucks and Trenchless Sewer Repair trailers can power all vehicle maintenance tools for a full eight-hour shift. With a total of 1,899 watts of PV panels installed, the reduced consumption of fossil fuels and lower maintenance requirements make these PV projects cost effective and emission free. The PV panels and related equipment cost nearly $7,000 per van when a gasoline powered generator would be about $2,000. However, between the fuel savings and the avoided generator maintenance, this solar PV application has a payback of less than two years.

Bureau of General Services
Projected 2002 Savings: $21,214
Total CO_2 Savings: 169 Tons/year

Portland City Hall Renovation - 1998

Prior to the 1998 renovation of Portland's City Hall, the building was dark and stuffy. Windows had been covered during previous renovations; the heating system was outdated and air conditioning nonexistent. In 1995, the building was declared seismically unsafe, triggering the need for a major renovation. With electrical, HVAC, and lighting severely outdated, the renovation offered an excellent opportunity for energy-efficient upgrading. New light fixtures, designed to match the historic character while accommodating compact fluorescent bulbs, cut lighting costs by 75%.

Newly insulated walls, double-glazed glass windows, and an energy-efficient HVAC system make the building more energy-efficient and employees more comfortable. Two interior atriums with skylights, once

walled off to create more office space, were reopened to allow central daylighting on all four floors. In council chambers, daylight flows through newly uncovered windows and the lighting and audio/visual equipment is controlled by motion sensors to save energy. In 1998, the Portland Chapter of the American Institute of Architects awarded the renovation its Cornerstone Award for energy-efficient design.

Southwest Community Center - 1999

Bureau of Parks & Recreation
Projected 2002 Savings: $37,227
Total CO_2 Savings: 342 Tons/year

The Southwest Community Center, a Portland Parks & Recreation facility located in Gabriel Park, opened its doors to the community in June 1999. The facility is a recreation and community center with two pools, a fitness center, meeting rooms, and full-court gymnasium. A PGE Earth Smart certified building, the design incorporates a variety of energy-saving features. With premium efficiency mechanical system motors, occupancy light sensors in offices and meeting rooms, a heat recovery system in the pool area, and an energy-efficient HVAC system, the building exceeds Oregon energy code by 20%.

Biogas Fuel Cell Power Plant - 1999

Bureau of Environmental Services
Projected 2002 Savings: $92,000
Total CO_2 Savings: 840 Tons/year

In July 1999, the City's Bureau of Environmental Services unveiled a methane-powered fuel cell at the Columbia Boulevard Wastewater Treatment Plant. The 200-kW fuel cell is one of only a handful of fuel cells in the

US that operates on a renewable fuel. It produces about 1.4 million kilowatt-hours a year — enough energy to power 120 homes while cutting the City's energy bills by $58,000 a year. The full value of the fuel cell is even greater since it is a renewable power source. The "green power" it produces would cost about $92,000 a year on the open market. While most fuel cells use natural gas, this fuel cell converts methane gas, a natural by-product of the sewage treatment process, into clean, renewable electricity that will help provide uninterrupted power to one of the treatment plant's buildings. The unit operates like a battery but never needs recharging. Funding for this project was obtained through federal and state grants, including a $200,000 grant from the U.S. Department of Defense. PGE provided an additional $247,000, and a $224,000 state tax credit reduced the City's costs further.

Bureau of Parks and Recreation
Projected 2002 Savings: $31,150
Total CO_2 Savings: 164 Tons/year

VendingMiser - 2001

VendingMisers cut refrigerated vending machine energy consumption almost in half by powering machines only when in use by a customer or when product temperatures rise. In May of 1999, CEC tested VendingMisers on beverage vending machines in City Hall and found energy savings of 44% and 48%, respectively. When Portland General Electric offered a free installation program in 2001,

CEC and Parks & Recreation were prepared to act. In December 2001, 30 vending machines were outfitted with VendingMi$ers at various Parks & Recreation facilities at no cost to the City.

LED Traffic Signals - 2001

Bureau of Traffic Management
Projected 2002 Savings: $335,000
Total CO_2 Savings: 2,940 Tons

In 2001, the City of Portland replaced nearly all its red and green incandescent traffic signal lights with new signal lights featuring highly efficient light-emitting diodes (LEDs). When the City of Portland first explored converting traffic signals to LEDs in 1995, green LEDs were not yet available and red LEDs were not cost-effective. By 2001, reduced LED prices, increasing electric rates, and new utility rebates made the replacement cost-effective. Leasing the LED signals allowed the City to eliminate any up-front costs. By the end of the year, 6,990 red and 6,400 green incandescent signal lamps had been replaced with LED lamps. Annual energy and maintenance savings total $400,000 and net payback is less than three years.

"City Energy Challenge is the kind of program I like. It doesn't cost us money, it saves money! We would have had to pay out an additional $10 million for energy over the past ten years without this program in place. I see the benefits on our bottom line, but other benefits are evident in our wastewater treatment plants, parks facilities, traffic signals, and even City Hall. Lower energy costs are just one of the benefits from using more efficient equipment."

Tim Grewe - Chief Financial Officer

Next Steps

Will the City Energy Challenge be able to cut Portland's energy costs by another $2 million per year in the next 10 years? It may be possible. CEC staff has documented a total of $3.8 million per year in potential energy savings. Given expected technology advances, that potential could soon be higher.

As this summary is being assembled, a number of CEC projects are underway. Fine bubble diffusers are being installed at the Tryon Creek Wastewater Treatment Plant, the City is preparing to purchase new energy tracking software, biogas powered microturbines are being constructed at the Columbia Boulevard Wastewater Treatment Plant, an eco-roof is being installed on Fire Station #12, an energy-efficient expansion is underway at the 911 center, and a 10kW wind turbine will soon tower above Sunderland Yard.

Future renewable power opportunities include full utilization of digester gas at the wastewater treatment plant and the possibility of acquiring large-scale renewables as Oregon's newly restructured electricity market matures.

From energy efficiency to renewable power resources, from employee education to testing new technologies, City Energy Challenge has a key role in making our operations as efficient as possible while helping the City cut its costs.

In another ten years, through bureau partnerships and new technologies, we know we can accomplish a lot more. Stay tuned!

CITY ENERGY CHALLENGE PROGRAM, STAFF & PROJECT AWARDS:

- 2001 – **Green Power Partner Founding Partner**, awarded to the City of Portland by the EPA
- 2001 - **Innovation Award**, awarded to the City of Portland by the Interstate Renewable Energy Council for the biogas-powered fuel cell
- 2001 - **Spirit of Portland Award**, awarded to Tom Ullman (BGS) by the City of Portland Mayor's Office
- 2000 - **EPA Green Lights Honorable Mention**, awarded to the City of Portland by the EPA
- 2000 – **Energy Manager of the Year**, awarded to Curt Nichols (CEC) by the Association of Professional Energy Managers
- 1999 - **PGE Earth Smart Award**, awarded for the SW Community Center by Portland General Electric
- 1999 - **Partnership of the Year Award**, awarded to the City of Portland and local partners by ReBuild America
- 1998 - **Pollution Prevention Award**, awarded to Tom Ullman (BGS) by the Bureau of Environmental Services - City of Portland
- 1998 – **Pollution Prevention Award**, awarded to Dave Tooze (CEC) by the Bureau of Environmental Services - City of Portland
- 1998 - **PGE Earth Advantage Designation**, awarded for City Hall by Portland General Electric
- 1998 - **Architecture + Energy Design Award - *The Cornerstone Award***, awarded for City Hall by the Portland Chapter of the AIA
- 1997 - **PGE Energy Smart Design Recognition**, awarded for the Water Pollution Control Lab by Portland General Electric
- 1997 - **Renew America Certificate of Environmental Achievement**, awarded to the CEC program by ReBuild America
- 1996 - **Renewable Energy Recognition Award**, awarded to OSD by Interstate Renewable Energy Council
- 1996 - **US Department of Energy Certificate of Recognition for Outstanding Contributions**, awarded to CEC by the US Department of Energy
- 1995 - **Energy Manager of the Year**, awarded to Dave Tooze (CEC) by the Association of Professional Energy Managers
- 1995 - **Pollution Prevention Award**, awarded to Dave Tooze (CEC) by the Bureau of Environmental Services - City of Portland
- 1993 - **Governor's Energy Award for Outstanding Achievements**, awarded to CEC by the State of Oregon

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