

PSEG's Energy & Environmental Resource Center: The Next Generation of Energy Education Centers – 11083

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ABSTRACT

On January 25, 2010, Public Service Enterprise Group (PSEG) opened the Energy & Environmental Resource Center (EERC), an exciting new learning center focused on building a greater understanding of energy, environmental challenges, and strategies for balancing energy demand with environmental stewardship. Located in Salem, NJ, the EERC is a community resource, introducing new audiences to PSEG and uniting educators, students, policy makers, and environmentalists in conversations about a smarter energy future. The EERC includes 6,000 square feet of hands-on, interactive exhibits, exploring the impact of technology, lifestyle, and public policy on energy consumption and the environment and challenging visitors to consider their own energy use and carbon footprint. Other exhibits offer the basics of electricity generation and focus on the need for a portfolio of solutions to the country's energy challenges, including conservation and efficiency efforts, renewables, and clean, central station power sources. To date, over 4,800 visitors have been to the EERC, including local, state and federal officials, students, regulators, industry representatives, environmentalists and community members.

INTRODUCTION

In January 2008, PSEG Power, LLC established a Nuclear Development team to explore building another reactor at the existing Salem and Hope Creek Nuclear Generating Station in Lower Alloways Creek, NJ. PSEG is a publicly traded diversified energy company headquartered in New Jersey, and one of the ten largest electric companies in the United States. PSEG has three principal subsidiaries: Public Service Electric and Gas Company (PSE&G), PSEG Power and PSEG Energy Holdings. PSEG Nuclear operates the Salem and Hope Creek Nuclear Generating Station in Lower Alloways Creek, NJ, and is a part owner of the Peach Bottom Nuclear Generating Station in Delta, PA. The Salem and Hope Creek site is the second largest in the country and provides power to approximately three million homes.

Renovation began on an existing company-owned building, formerly the PSEG Nuclear Training Center, located eleven miles from the nuclear site, to house office space for the NNI team. Eight associates from this team, as well as the president and chief operating officer of PSEG Power, LLC, William Levis, traveled to active new nuclear construction sites, including sites in France, Finland, Taiwan, and Japan. During this overseas trip, associates noted that the active construction sites had visitors' centers to educate stakeholders about the benefits of nuclear power. PSEG determined that a similar facility was needed to engage key stakeholders about the potential new reactor. The facility would also support current operations at Salem and Hope Creek, as well as the license renewal effort currently underway for all three units.

Approximately 16,000 square feet of the former training center became dedicated to an education center.

KEY OBJECTIVES

Shortly after the overseas tour of new nuclear plants demonstrated the importance of education centers, polling conducted by Bisconti Research, Inc. revealed that New Jersey residents lacked an understanding of basic energy concepts. Respondents thought that nuclear power generation emits carbon dioxide and believed that natural gas is not a fossil fuel. Most respondents showed no awareness of the difference between baseload power and peaking power and thought that solar and wind sources can be used interchangeably with existing generation sources. New Jersey residents expressed strong concern about the environment, and “Opinion Elite” respondents were the most concerned about the effects of nuclear power, particularly safety and waste issues.

As a result, a major goal in the development of the facility was to foster broad conversations around the energy and environmental challenges facing the United States and the world. More than being recognized as a nuclear information center, the EERC exhibits would emphasize that nuclear is *part* of the energy solution, not the *only* solution. In designing the content and intended usage of the facility, PSEG chose to target a broad range of audiences, not just children. Recognizing that building relationships with political, environmental and community-based audiences is key to sustainable support, the company determined that adult visitors would need to find value in their experience at the EERC. With this in mind, PSEG designed a flexible multi-purpose room, classroom and wet lab that would be made available for community use free of charge. Finally, in keeping with PSEG’s commitment to environmental stewardship, the company decided to pursue Leadership in Energy and Environmental Design (LEED) certification from the United States Green Building Council.

DESIGN AND FABRICATION PROCESS

In August 2008, PSEG engaged a museum exhibit design firm, UJMN Architects and Designers (UJMN), of Philadelphia, PA, to provide conceptual design services. After identifying the target audience and key messages, the process moved into the detailed design phase, which involved a comprehensive research effort to develop content and identify imagery for each content area. These were designed and submitted by UJMN based on PSEG’s research and were subsequently reviewed and approved by PSEG. A media production firm, Talisman Interactive, of Philadelphia, PA, was also contracted to provide expertise on the computer-based exhibits, including touch screen interactives and video components. Upon completion of the detailed design phase, UJMN created construction documents, which included architectural drawings and graphics files that specified how the exhibits were to be constructed. The construction documents were used to solicit bids and select a fabricator to build the exhibits. Art Guild, Inc., located in West Deptford, NJ, was the successful bidder. Talisman Interactive remained under contract to provide programming and installation support for the media elements. The fabrication process lasted approximately four months and was concluded in December 2009.

EXHIBIT CONTENT

The exhibit space comprises 6,000 square feet of the overall 16,000 square feet dedicated to public use space. The exhibits can be divided into six content areas, or zones. Zone 1 is titled *Imagine a World Without Electricity* and prompts visitors to consider the role that energy plays in daily life. A static graphic panel and a looping PowerPoint presentation on a 46-inch LCD monitor demonstrate how critical energy is to things like healthcare, entertainment, and transportation.

Zone 2, *Energy 101*, provides an overview of basic energy principles and electricity generation (see Fig. 1). The section is supported by a hand crank generator with incandescent, compact fluorescent (CFL), and light-emitting diode (LED) light bulbs. The exhibit demonstrates the amount of effort, or energy, required to light each of the bulbs. The section also explains how electricity gets from the power plant to the end user and shows how the power grid system is structured in the United States. Particular attention is paid to the northeast section of the United States, which is serviced by PJM Interconnection. The section concludes with a custom interactive called *Power the Grid*. In this interactive, the visitor is the grid operator, moving the levers to keep electricity supply equal with customer demand. Visitors learn that grid operators dispatch specific power plants based on the power needs at the time. Concepts like grid reliability, cost and environmental impacts are explored.

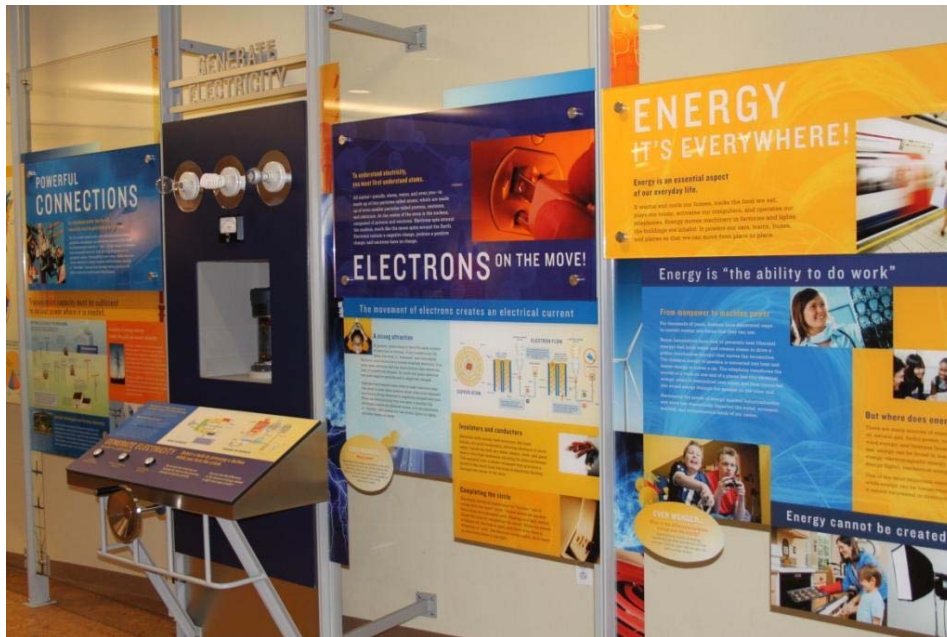


Fig. 1. Zone 2 provides an overview of energy concepts.

Titled *Finding a Balance*, Zone 3 explores the impact of human activity on the health of the planet. Specifically, it asserts that everything on the planet is interconnected and demonstrates how human activity like population growth, technology development, and globalization have had unintended environmental consequences over the last century. Graphic panels illustrate the Greenhouse Effect, and pie charts show the sectors of society that are most responsible for

emitting carbon dioxide. Despite environmental effects like sea level rise and impacts to ecosystems and biodiversity, the section asserts that there is still a growing energy demand that will need to be provided in the future.

Two key media elements support Zone 3. The first is the *Globe* interactive, which demonstrates that energy and environmental challenges are not unique to one particular region. Rather, they are manifested in many ways all around the world. The *Globe* is a touch screen interactive where the visitor selects a pulse point on the world map to read a profile on that region and watch a short video clip. Topics include climate change, both environmental effects and adaptation techniques; impacts of population growth, technology development, economic growth and globalization; and energy use, both the growing demand for and the availability of resources. Specific stories include, but are not limited to, the deforestation of the Amazon rainforest, urban farming techniques in the United States, the reforestation effort in Ethiopia, China's economic and housing boom, and carbon dioxide emission reduction efforts in London, England.

The second media element in Zone 3 is the *I-Wall*, a touch screen computer that is programmed so that as the visitor slides the monitor along the rails, different information appears on screen at each stop along the timeline. The theme of the *I-Wall* is *The Evolution of Energy*. It begins at the 1700s with the introduction of electricity and continues through 2010 and beyond. Stories in the timeline touch on a number of topics, including key technology developments, examples of an increasingly energy-dependent lifestyle, and key energy and environmental policy (see Fig. 2).



Fig. 2. The I-Wall explores energy use through history.

As the visitor rounds the corner into Zone 4, he has learned that the quest for prosperity has had unintended environmental consequences over the last century. Despite this, energy demand will continue to rise in coming years. Zone 4 examines balancing future energy needs with environmental stewardship. Framed under PSEG's three-pronged approach, the section explores energy conservation and efficiency measures, renewable energy sources, and clean central station power (see Fig. 3). Key exhibits include the EnergyStar House, a touch screen interactive adapted from an EnergyStar.gov online program that highlights easy ways to cut back on energy use and save on energy bills throughout rooms in a typical home. The Renewables touch screen

interactive provides an opportunity to learn more about biofuels, biomass, geothermal, hydro, hydrogen, solar, wave and tidal, and wind energy technologies, including how they work, resource potential, and benefits and challenges to their implementation. The Building Dashboard is a touch screen interactive that monitors the output of the on-site solar panels and wind turbine, including current and past generation totals, cost, and carbon dioxide emission savings, as well as a real-time weather monitor. Finally, panels examine the important role of centrally located power stations in the U.S. energy mix, which account for nearly 90 percent of this country's electricity supply. Panels include information on coal and clean coal technologies, natural gas, and nuclear.



Fig. 3. Zone 4 explores a broad approach to climate change.

While the rest of the exhibit space explores a broad conversation around energy use and environmental impacts, Zone 5 was designed specifically to help visitors understand nuclear power and address stakeholders' questions and concerns. Visitors enter the nuclear section by walking through a cutaway of a mock containment wall with models of steel rebar. The containment cutaway measures three feet in width and provides visitors with a sense of the physical integrity of plant structures. Inside the containment walls is a model of a reactor core, providing visitors with a birds-eye view into the core. A model fuel assembly is positioned above the core and is used to explain the fission process (see Fig. 4). The Salem and Hope Creek Nuclear Generating Station is unique in that it has two reactor technologies on a single site, and informational panels include diagrams and explanations of both the Boiling Water Reactor (BWR) technology and Pressurized Water Reactor (PWR) technology. Graphic panels explain radiation and its sources and put into perspective the exposure from working or living near a nuclear power plant, compared with natural sources, x-rays, or airplane trips. Safety and security are covered in great detail, including the oversight role of the Nuclear Regulatory Commission (NRC) and the Institute of Nuclear Power Operations (INPO), emergency planning, environmental testing, employee training, cyber security, and on-site security force presence. In addition, a five-minute video updated from an existing Nuclear Energy Institute (NEI) video reviews security at nuclear sites in the U.S., including the latest training, equipment, emergency preparedness, and site access requirements. Much of the training exercise footage was shot at the Salem and Hope Creek Nuclear Generating Station.



Fig. 4. Visitors enter the nuclear section through a cutaway of a mock containment wall.

Used fuel management has proven to be one of the greatest points of concern for stakeholders. One panel explores interim storage, including information on spent fuel pools, dry cask storage containers, and independent spent fuel storage installations (ISFSIs). The panel also discusses transportation of used fuel via railways, as well as a need for a long-term federal repository for spent fuel. A second panel explores used fuel reprocessing, highlighting countries where such processes are currently used and explaining how concerns of cost and proliferation have prevented the United States from following suit. The panel also graphically illustrates closing the fuel cycle and shows the percentage of used fuel in a single assembly that is available for reprocessing.

The *Conversation* touch screen interactive summarizes the entire section by addressing the most common questions or concerns that visitors have about nuclear power. When the visitor selects a person on the screen, he or she will step forward and pose a question related to nuclear. A PSEG employee will appear on screen to answer the question. Topics include how a nuclear reactor and cooling tower operate, the accidents at Three Mile Island and Chernobyl, need for and cost of new nuclear plants, job opportunities within the industry, impacts on the surrounding community, and safe storage of nuclear fuel.

Zone 6 concludes the visitor's experience in the exhibit space with a call to action. The section includes opportunities for business and industry to reduce emissions and improve energy efficiency and promotes the need for a national energy policy. The section focuses on the role of the individual, specifically opportunities for individuals to reduce energy and resource consumption at home, on the road, and in the office. Two carbon footprint stations allow the visitor to create an avatar, or virtual "me," and based on his response to questions about food and goods consumption, housing, and transportation, calculates how many planets would be required if everyone in the world lived like the visitor. The application also allows the visitor to go back through the exercise and see how different choices reduce his personal carbon footprint.

LEED CERTIFICATION

Issued by the U.S. Green Building Council, Leadership in Energy and Environmental Design (LEED) certification signifies that a facility is designed and built with a consideration toward energy savings, water efficiency, carbon dioxide emissions reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts.

The back half of the building (including the Nuclear Development office area) was awarded Silver-level certification. The front half of the facility, including the public use space, was awarded Gold-level certification, which is notable considering the amount of electronic equipment in the exhibit space. In designing and constructing the building, the following results were achieved: reduced water usage by 40 percent; reduced energy usage by 28 percent; replaced ten percent of the building's energy supply with on-site solar and wind generation; selected furnishings with high recycled content; installed cork flooring, a rapidly renewable resource; and recycled nearly 100 percent of the construction waste.

A 75 kilowatt (kW) photovoltaic solar panel array is installed on the roof of the building. The cost of the solar panels was approximately \$9,000 per kW (before 30 percent tax credit). Total production as of January 3, 2011, was 133,995 kilowatt-hours (kWh). A 2.3 kW wind turbine is also installed on the property. The cost of the wind turbine was approximately \$16,000 per kW. Total production as of January 3, 2011, was 995 kWh.

FACILITY USAGE

Since opening on January 25, 2010, the EERC has hosted more than 4,800 visitors. The facility is open by appointment only, primarily due to staffing limitations. EERC staff provides educational programming to students in grades four through twelve on electricity generation, energy sources, climate change, and nuclear energy. Subject matter experts from the nuclear site are called in to provide more technical programs for upper-grade high school students, vocational schools, and college students. PSEG associates who are members of the North American Young Generation in Nuclear (NA-YGN) organization will also make presentations to high school and college level groups, providing a perspective on career opportunities in the nuclear field. Staff also offers the Nuclear Science Merit Badge for Boy Scouts and general energy and environmental programming for Girl Scouts. With 40 percent of the current workforce eligible to retire in the next decade, these interactions serve as a workforce development tool and introduce a new generation to career opportunities in the nuclear industry.

In addition to student audiences, PSEG hosts briefings and tours for various stakeholder groups in the 10,000 square feet of meeting, classroom, and lab space within the EERC. Audiences include local, state and federal officials, law enforcement, regulators, environmental stakeholders, civic and community-based groups, non-profit organizations, and company functions. Many organizations have taken advantage of the meeting space in the facility. The EERC has hosted Red Cross fundraising events, Chamber of Commerce functions, teachers' workshops, law enforcement trainings, and environmental roundtables, introducing PSEG to new audiences and positioning the company as a valued member of the community.

NEI TASKFORCE

The nuclear industry has recognized the importance of facilities like the EERC, which foster community involvement and promote conversations about energy, the environment and the role that nuclear plays in meeting the challenges of climate change. The industry has formed a taskforce organized by the Nuclear Energy Institute (NEI) to standardize the exhibit design developed by PSEG. Funding has been secured from more than twenty companies to adapt the original design for generic use so that contributing companies can update existing facilities or create new education centers in their territory. By collaborating across the industry, new educational exhibits will be deployed at significant savings. Savings of up to 60 percent of PSEG's expenses are anticipated.

FUTURE PLANS

As the EERC moves into its second year of operation, reaching new audiences continues to be a priority. Budget constraints limit some schools' ability to take field trips, so helping schools secure funding is a challenge.

In response to the increased concern about used fuel management, PSEG has partnered with Holtec International to install a dry cask storage model in the exhibit space. Additional content around nuclear expansion and the global water crisis is being developed for the *Globe* interactive. All of the touch screen interactives are Flash-based applications and are easily and inexpensively updated to keep the information relevant and fresh for returning visitors.

Pulling from a depth of knowledge among company associates, the educational programs focused on energy and electricity were easily developed in-house and have received positive feedback. In an effort to expand environmental programming, PSEG has partnered with the New Jersey Academy for Aquatic Sciences to develop and deliver a salt marsh ecology program, a hands-on soil and water testing lab experience, and a dynamic, audience-engaging conservation program. Intended audiences include middle and high school students and Scouts.

PSEG has also partnered with the Rutgers Cooperative Extension of Salem County and the Rutgers Water Resources Program to build a rain garden on building property. Long-term goals include adding a pavilion for an outdoor classroom experience, building additional gardens that introduce native vegetation and reduce lawn service, and using rain barrels for rain water collection. The company has also introduced a composting program to reduce the amount of landfill waste generated at the EERC. There is an element of education in all environmental initiatives at the EERC to encourage building occupants and visitors to implement similar practices in their homes, schools, and businesses.

CONCLUSION

The EERC has been well received by the community as a valuable education tool and comfortable and flexible destination for meetings and functions. By introducing a broader conversation around energy and environmental challenges, PSEG has strengthened its reputation for providing sound, relevant information on these issues. The fact that the facility is LEED

certified has garnered additional interest from the environmental community, in particular. The response has prompted PSEG to pursue LEED certification for other company assets. The company continues to strengthen existing relationships with key stakeholders and educate a new generation to opportunities in the nuclear industry. PSEG received no contentions to its license renewal application for the Salem and Hope Creek units, attributed in part to the outreach and relationship building effort conducted at the EERC. And, should the new nuclear effort continue in this country, education centers like the EERC will play a critical role in developing the broad public support needed to build the next generation of nuclear plants in the United States.