

PITTSBURGH & DOE (NETL) PARTNERSHIP 2017 ACCOMPLISHMENTS



NETL
NATIONAL ENERGY TECHNOLOGY LABORATORY



OVERVIEW

In 2015, the City of Pittsburgh and NETL signed a Memorandum of Understanding that united them in an effort to design a 21st century infrastructure that would make Pittsburgh a “City of the Future”. The design will produce environmental, economic, and job creation benefits. Expected outcomes of the MOU include modernizing delivery of utility services through new business models and markets, growing technology research and development opportunities and product manufacturing, reducing environmental impacts, enhancing resilience and security through integrated district-based microgrid solutions, addressing affordability for consumers, and encouraging workforce development.

The City of Pittsburgh MOU provides an opportunity for NETL to demonstrate how fossil energy (FE) is a part of the clean energy future, and to show how technologies invented at NETL can support the safe and efficient use of energy. From high-efficiency fuel cells for electricity generation and district energy solutions, to the sensors and technologies to monitor energy infrastructure and detect natural gas leaks, NETL is developing the systems that are the future of energy. What follows are important milestones achieved in 2017 towards creating a clean energy future for Pittsburgh.



NETL ACCOMPLISHMENTS

Pittsburgh 2013 Energy Baseline Report

- On March 28, 2017, the Pittsburgh 2013 Energy Baseline: Consumption, Trends & Opportunities report was published.
- The study, encompassing 165 square miles of Pittsburgh, examined each energy district's electricity and natural gas use.
- The research revealed that the neighborhoods of Downtown, the Strip District, Oakland, Uptown, Herron Hill, and Schenley Heights consume the most energy in Pittsburgh, constituting 35% of the City's electricity consumption.
- Opportunities for energy usage and emissions reductions emerged, such as the need to reduce residential sector heating related natural gas usage, commercial sector electricity, and transportation sector energy usage/GHG emissions.

NRG Fuel Cell Power Plant

- This NETL-funded prototype fuel cell system, which runs solely on clean natural gas, will be installed for testing at the NRG Energy Center on the North Side by FuelCell Energy in early 2018.
- The Solid Oxide Fuel Cell (SOFC) power generation technology being utilized in the power plant generates industry-leading electrical efficiency of approximately 60 percent plus usable heat for combined heat and power applications, resulting in total estimated thermal efficiency between 80 and 85 percent.
- The SOFC process the power plant uses emits virtually no pollutants due to the absence of combustion.
- The power plant will provide heating and cooling for more than six million square feet of commercial and residential facilities in downtown Pittsburgh.
- According to NRG Energy Center Pittsburgh General Manager Cliff Blashford, "this project supports NRG's focus on identifying and integrating energy solutions that seek to improve efficiency, lower fuel consumption and costs, and reduce our environmental footprint."

DOE SunShot: Solar in Your Community Challenge

- The DOE Office of Energy Efficiency and Renewable Energy (EERE) provided prize money to low-to-moderate income communities for developing community-based solar projects that have a high potential for replication.
- NETL investigated opportunities and sought funding and technical assistance for these projects in collaboration with several nongovernmental organizations, the City of Pittsburgh, and other MOU partners.

Combined Heat and Power (CHP) Technical Assistance Partnership (TAP)

- NETL connected the City of Pittsburgh to the DOE Office of Energy Efficiency and Renewable Energy (EERE) Combined Heat and Power (CHP) Technical Assistance Partnership (TAP).
- TAP toured and assessed three of the City's existing combined heat and power/district heating resources: Duquesne University's Cogeneration Plant, NRG's North Shore Cogeneration Plant, and the Pittsburgh Allegheny County Thermal (PACT) plant which provides steam to downtown Pittsburgh.
- The CHP TAP team's initial analysis from the spring of 2016 was that the City of Pittsburgh had significant opportunity to utilize existing and planned CHP for increasing the resiliency of the City's power grid, but that economic factors (such as the current low cost of electricity) could be a challenge to expanding CHP in the City.

Power in Partnerships

- NETL continuously compiles, distributes, and considers potential partnerships related to funding and technical assistance opportunities from DOE Offices (Energy Efficiency & Renewable Energy, Electricity Delivery and Energy Reliability, Fossil Energy, Loan Program Office, etc.), other Federal agencies, and various sources (foundations, nongovernmental organizations, etc.).

Finding Pennsylvania's Solar Future

- NETL participates in an ongoing effort titled Finding Pennsylvania's Solar Future being led by the Pennsylvania Department of Environmental Protection (PADEP), in collaboration with key stakeholders, with the goal of developing a detailed plan that would increase the Commonwealth's electricity generation from solar energy to at least 10 percent by the year 2030. PADEP received a \$550,000 grant from the DOE/EERE SunShot program to support the effort.

Hazelwood Green Energy District

- NETL conducted a techno-economic study of geothermal energy extraction and use opportunities at Hazelwood Green.
- The project focuses on space heating and coincides with the DOE Geothermal Technology Office's (GTO) efforts to develop geothermal resource assessments and alternative geothermal use pathways, specifically seeking options for Deep Direct Use geothermal energy in the Eastern U.S.

Ongoing Studies

- A geothermal feasibility study is being conducted to determine if it is a viable energy option in the Pittsburgh region, and a report will be released in 2018. The geothermal feasibility study includes above ground energy analysis and underground resource analysis.
- An energy technologies pathway assessment is underway for the City of Pittsburgh. This study will evaluate the benefits of deploying different energy-related technologies in Pittsburgh.

Smart City Challenge

- NETL was an active partner in supporting Pittsburgh's pursuit of a \$50 million Smart City Challenge grant from the U.S. Department of Transportation (DOT) to improve regional transportation.
- Plans call for development of a full range of diverse transportation elements that improve air quality, develop new manufacturing related to smart traffic signals and tracking devices, and help to facilitate electric vehicle use.
- Powering of the city's electric vehicles would be accomplished through locally sourced distributed energy that would be developed under the MOU.
- The State of Pennsylvania provided the city with \$11 million to support its application, which would be used to leverage other state or federal money to support the proposal to improve transportation and revitalize the economy.
- The DOT announced that Columbus, Ohio won the Smart City Challenge in July 2016, however, on October 11, 2016, Pittsburgh received notice that it would receive a \$10.9 million grant under the Fixing America's Surface Transportation Act (FAST Act). This grant is to be used to create "smart spines" that collect data through a network of sensors to help balance and move traffic through the city.

OTHER NOTABLE PITTSBURGH 2017 ACCOMPLISHMENTS

The City Energy Efficiency Scorecard

- ACEEE releases an annual report called *The City Energy Efficiency Scorecard* that ranks 51 large US cities on their efforts to save energy in five key areas. In 2017, Pittsburgh ranked 17th, moving up three positions since 2015.
- Pittsburgh earned 53 out of 100 points, which is 12 points more than 2015.

Pittsburgh 2030 District

- The Pittsburgh 2030 District has reduced its total energy and water consumption by 12.5 percent and 10.3 percent respectively, surpassing the 2015 goal of 10 percent.
- There was also a 24.2 percent reduction in transportation emissions, exceeding its 2020 goal of a 20 percent reduction - five years early.
- The Pittsburgh district is the first 2030 district to report that incremental goals have been achieved and surpassed.

Denmark/Pittsburgh Energy Exchange

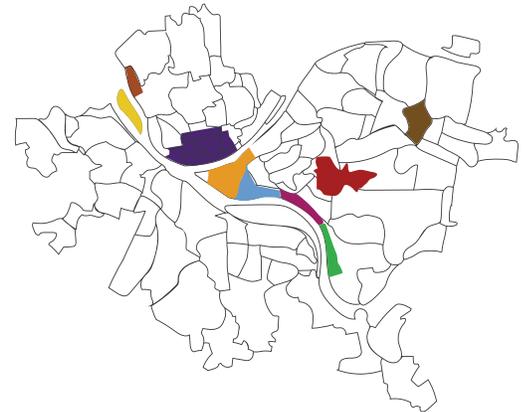
- In March 2018, the University of Pittsburgh and the Danish energy ministry signed an agreement to develop plans for implementing district energy infrastructure and smart city technologies in Pittsburgh. The partnership will leverage the Danish expertise in providing affordable, sustainable energy using integrated district energy systems with a focus on providing sustainable resources to underprivileged communities.

Pittsburgh's focus on energy districts is based on the increasing global recognition of the value that district-scale energy systems can bring. Designing systems around the energy needs of a neighborhood or city allows developers to take advantage of local resources, infrastructure, and other regional features. While these systems may require more up-front engineering, they are highly efficient and often more cost-effective than traditional technologies.

Pittsburgh has several existing district energy systems in which a central facility generates steam, hot water, and/or chilled water that is then piped to residential or commercial consumers, just as a utility would provide water or natural gas. These "energy districts" are currently independent, run by different entities, and have diverse characteristics. NETL's vision is to have a system of interconnected energy districts that work together to provide the City with clean energy in a cost-effective way.

-  Northside Energy District
-  Uptown Energy District
-  Oakland Energy District
-  Downtown Energy District
-  Hazelwood Green Energy District

-  Larimer Energy District
-  Brunot Island Microgrid
-  Woods Run Microgrid
-  2nd Avenue Microgrid



Northside Energy District

Established in 1999, NRG Energy Center Pittsburgh provides both district heating and cooling services to a total of 6.3 million square feet of building space which serves more than 30 buildings on the north side of Pittsburgh. This includes PNC Park, Carnegie Science Center, and Allegheny General Hospital.

Uptown Energy District

NRG Energy has begun designing a new heat and power plant in the Lower Hill/Uptown District to deliver heat to surrounding buildings including PPG Paints Arena and UPMC Mercy. This energy district could also integrate Duquesne University's Cogeneration Plant.

Oakland Energy District

Built in 1907, Bellefield Boiler Plant serves most of Oakland's major institutions including Carnegie Mellon University and Carnegie Museums of Pittsburgh. Carrillo Steam Plant in Oakland was established in 2009 and serves UPMC. The two sites have interconnecting steam distribution lines.

Downtown Energy District

Established in 1983, Pittsburgh Allegheny County Thermal (PACT) serves 59 buildings downtown including many local government buildings.

Hazelwood Green Energy District

This property is a mixed-use development in Hazelwood on a 178-acre former steel mill riverfront that would be operated almost exclusively on renewable-based distributed energy.

Larimer Energy District

A community-based microgrid that would be part of the redevelopment of a 285-acre neighborhood in the east end of Pittsburgh.

Brunot Island Microgrid

Existing electric substation and is a possible site for a biogas and waste-to-energy plant.

Woods Run Microgrid

Duquesne Light Company is installing a nominal 10 MW microgrid at their Woods Run operations center on the north side of Pittsburgh. The facility will be used to investigate challenges and solutions to integrating distributed energy technologies such as photovoltaics, wind, and energy storage.

2nd Avenue Microgrid

A project that will link grid and transportation modernization through garage/rooftop solar and electric vehicle charging stations.

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