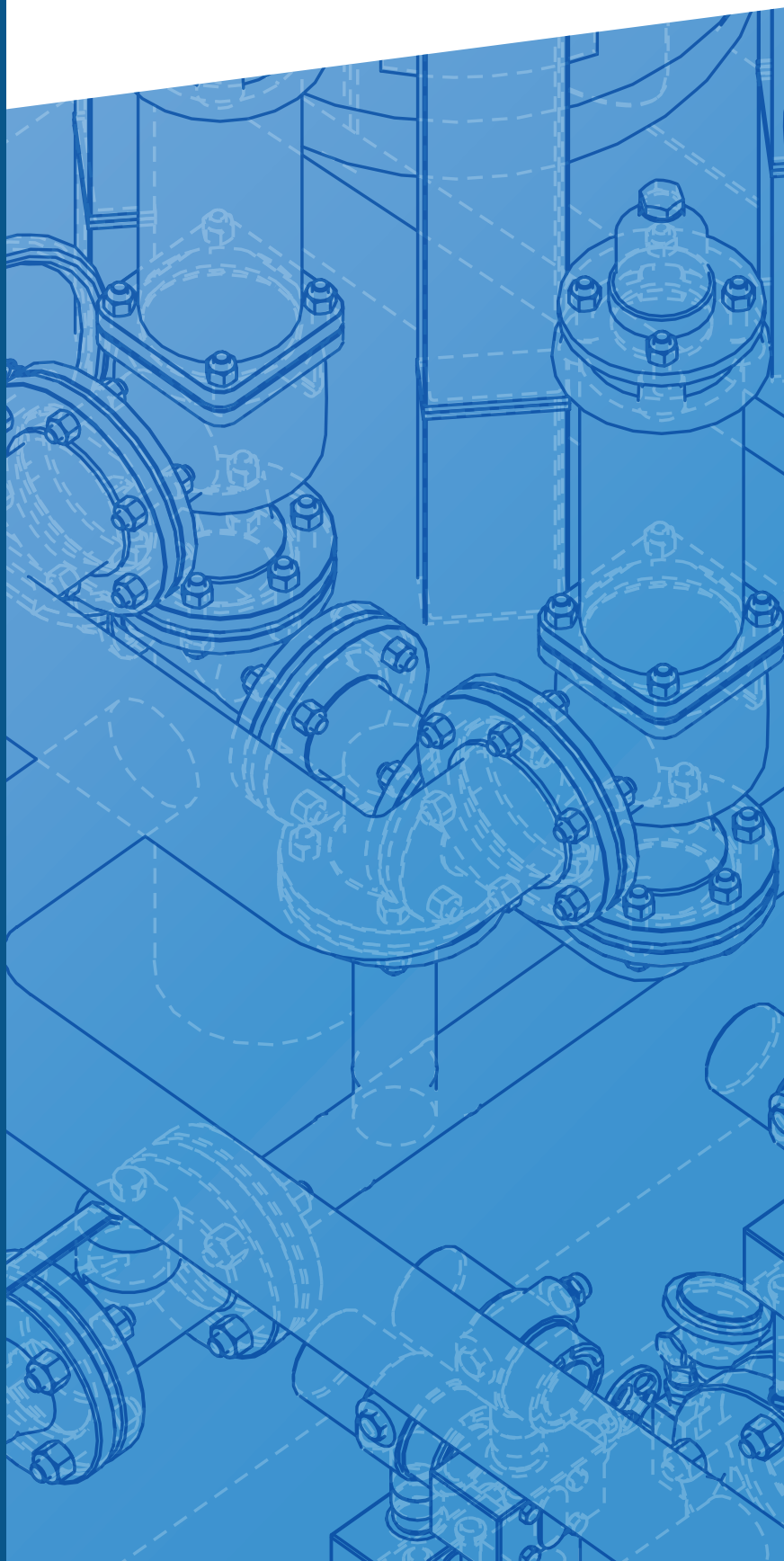
Pacific Northwest
NATIONAL LABORATORY

Case Study: The Massachusetts' Gap Energy Grant Program:

An innovative funding model for realizing energy benefits in the water sector.

WATER + POWER
RESILIENCE

The U.S. Department of Energy's Water Power Technologies Office funded PNNL's research to study the MA Gap Funding Program to identify and share successful models for realizing the adoption of energy efficiency and renewable energy projects by water utilities.



The **Massachusetts' Gap Energy Grant Program spurs investment in energy efficiency and renewable energy technologies at water and wastewater sites**. The Gap Energy Grant Program is a statewide partnership between the Massachusetts Department of Environmental Protection (MassDEP), Massachusetts Department of Energy Resources, and the Massachusetts Clean Energy Center (MassCEC). The program provided two rounds of funding, Gap I and II, totaling $5.7 million, to incentivize 147 energy upgrades worth $31.6 million at 24 water and 32 wastewater utilities. The grant funding was supplemented by $2.8 million in electric utility incentives and other state funds to create a total of $8.5 million in available funding. The funded projects are expected to yield **over $66.7 million in energy savings over the life of projects and provide decreased carbon emissions worth over $8 million for a total benefit of over $75 million**—nearly nine times the original incentive amount. Project details for Gap I and II can be found in MassDEP's story map.

A Gap Energy Grant is a grant that provides up to $200,000 per community for implementing energy efficiency and generation projections at water and wastewater facilities. The Gap Grant fills the last "gap" in project financing to encourage and empower drinking water and wastewater facilities to take advantage of energy utility incentives and other funding sources to carry out renewable energy and energy efficiency projects.

The financial savings listed above were calculated on the assumption electricity rates will increase at an average of 1.5 percent per year. If electricity rates were assumed to increase 5 percent per year over the life of the energy upgrades, water and wastewater utilities in Massachusetts would save closer to $91 million over the life of the Gap I and II upgrades in per kilowatt-hour (kWh) energy savings.

Gap Funding Yields Significant Benefits

$8.5M INCENTIVE FUNDING

$5.7M Gap Grants

$2.8M Other funding

~ 9x

$75.2M TOTAL PROJECT BENEFITS

$66.7M Avoided Electricity Cost

Electric Bill Savings to W and WW Utilities

$8.5M Avoided Carbon Emission

Societal Value of Avoided CO2 Emissions

Other funding includes electricity utility incentives dollars and other state funds.

Savings represent the present value savings over the life of the projects. Savings are shown in 2018 dollars.

Programs such as the Massachusetts's Gap Energy Grant Program provide a crucial framework and financial bridge to realize energy and environmental improvements for both the energy and water sectors.

Projected Benefits Over the Life of Projects (Gap I and II Only)

$66.7M
TOTAL ELECTRICITY COST SAVINGS

189,000 MWh
TOTAL ENERGY SAVED

252,000 MWh
TOTAL ENERGY GENERATED

441,000 MWh
TOTAL ENERGY SAVED/GENERATED

125,634 Metric Tons
TOTAL CO2 EMISSION REDUCTION

Secrets to Success

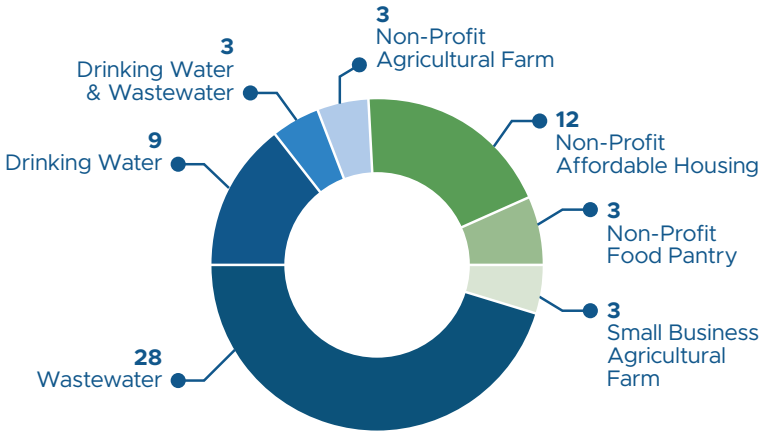
Funding is only one aspect of the success of Massachusetts' Gap Energy Grant Program. Other aspects that led to success of the Massachusetts' Gap Energy Grant Program, include:

- **"No cost" energy audits and renewable energy assessments,** which were provided to water utilities through agreements with electric utilities. Gap projects were able to implement the savings identified in these or previous audits.
- **A relatively simple application process,** which allowed utilities to complete Gap Energy Grant applications without hiring a consultant.
- **Developed relationships and trust between water utilities** and the MassDEP through a Clean Energy Partnership that included a series of roundtables held on-site at water and wastewater facilities.

Building on success

Due to the success of Gap Energy Grant I and II, Massachusetts' Gap Energy Grant Program entered its third round and is reaching a new, broader community. Gap Energy Grant III provided $8.1 million in funding (as compared to $1.7 million in Gap I and $4 million in Gap II) for energy upgrades at water and wastewater facilities, along with nonprofit multifamily **affordable housing, nonprofit agricultural food-producing organizations (e.g., food pantries) and small businesses engaged in food distribution and processing facilities.**

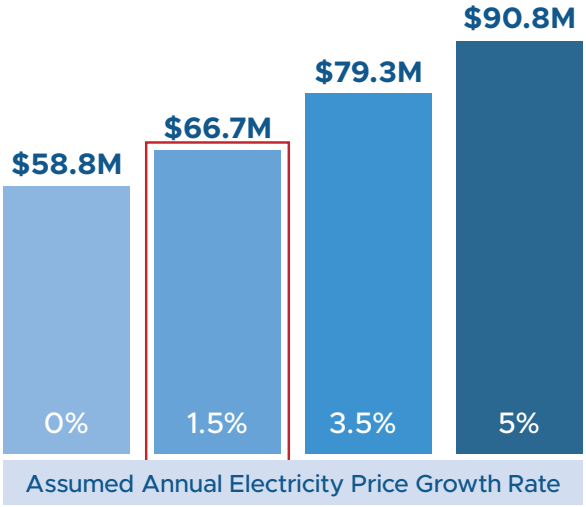
The two case studies on the next page show how two different utilities are benefiting from Gap Energy Grants.



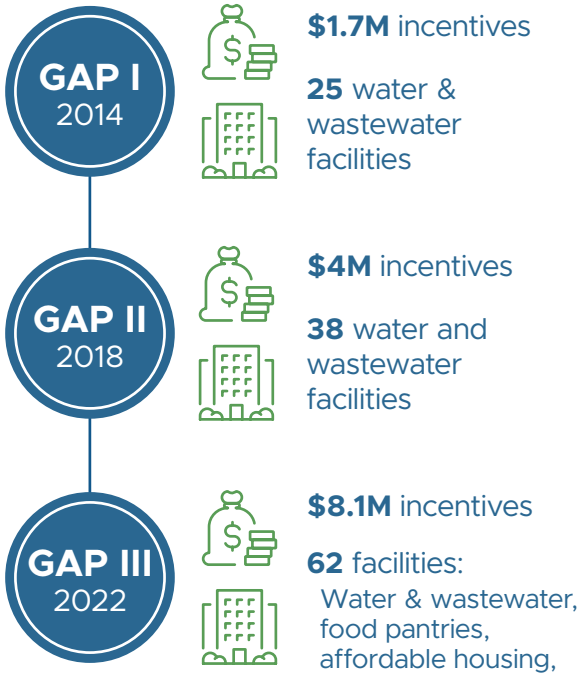
Gap III Project Awardees by Type

Present Value of Electric Bill Savings for Water Utilities Based on Gap I and II Energy Upgrades

Calculations assume 2018 retail electricity price of 15 cents/kWh and a discount rate of 1.34%.



Timeline of Gap Energy Grant Offerings



Gap Grant Project Case Studies

Case Study 1: Innovative Hydroelectric Pump as Turbine Project in Fitchburg

Gap Grant funding allowed Fitchburg, Massachusetts to invest in a 10 kW hydroelectric pump as turbine, an efficient water turbine design that can operate in both a pump and generation mode for producing electricity. The project was installed in 2020 and became operational in 2021. The total project cost was $362,481, and $200,000 was covered by a Gap Energy Grant, $78,000 by MassCEC, and $84,124 by the water utility. The average annual output of the system is 65,000 kWh. Benefits provided by the pump as turbine represent a valuable source of energy and financial savings by reducing the energy Fitchburg has to purchase.

- Annual electricity cost savings: $10,203
- Projected annual electricity generation: 65,000 kWh
- Payback period based on city investment: 8.2 years

10 kW pump as turbine installed at the Narrows Road Water Treatment Plant in Fitchburg, Massachusetts

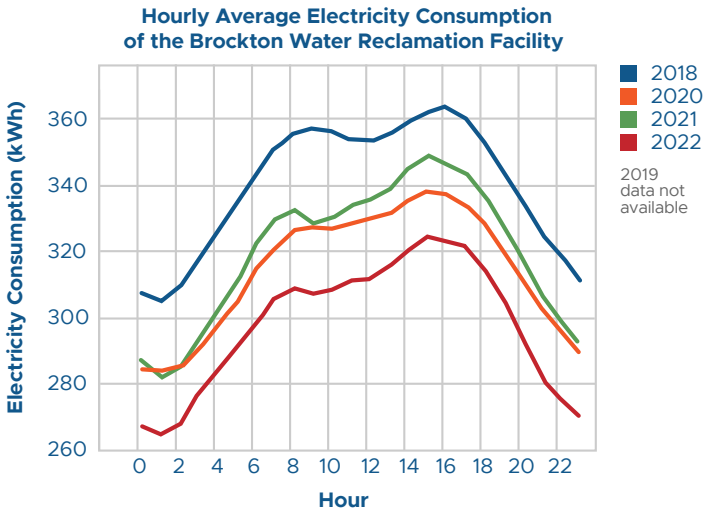
Case Study 2: Brockton Project Demonstrates Average Annual and Peak Electricity Savings

Built in 1963, the Brockton Advanced Water Reclamation Facility is designed to treat 20 million gallons of wastewater per day from a population of over 137,000. Brockton benefited from a series of equipment upgrades, aimed at replacing four worn out and inefficient blowers. Blowers provide oxygen for the aeration process in wastewater treatment.

In 2017, one blower was replaced by the city. In 2018, Brockton benefited from a $200,000 Gap Grant (second round funding) to acquire a second blower. With an estimated useful life of 80,000 hours, the new turbo blower is as efficient as two of the older blowers. The city installed the third and fourth blowers in 2020. These more efficient blowers help reduce the amount of energy consumed to power this facility.

The Gap Grant-funded blower replacement cost $350,000, $200,000 of which was covered by the Gap Energy Grant, $35,000 by an electric utility incentive, and $69,000 by Brockton. The electricity savings from this project is 293,000 kWh/year, or an estimated savings of $41,000 per year. The utility recovered its investment in the blower in 1.7 years.

Brockton's total annual energy use decreased from 11.9 million kWh in 2018 to 9.6 million kWh in 2022, due in part to a Gap Energy Grant-funded project and other blower replacements. The peak average hour energy use was also reduced from 364 kWh in 2018 to 323 kWh in 2022 as the figure below shows.



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