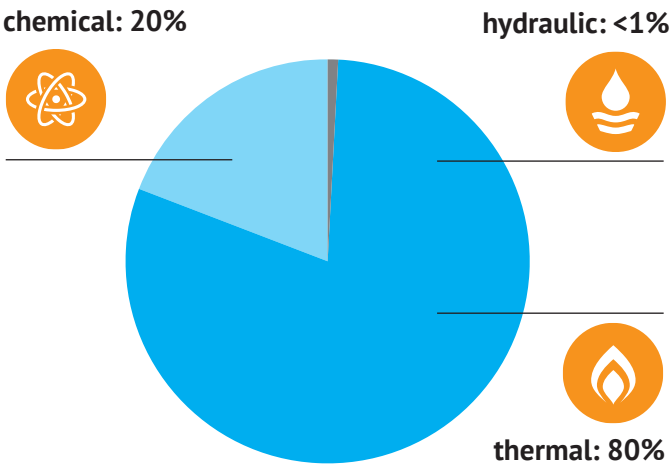
Energy from Wastewater

Wastewater is a renewable resource. Embedded within this resource is an abundance of energy — including thermal, chemical, and hydraulic.

To treat the nation's water, the wastewater sector consumes 22 terawatt hours of electrical energy each year. That is enough electricity to power the homes and businesses in the states of New Hampshire and Maine. At the same time, this sector has the potential to generate 851 trillion BTU of energy annually – enough to heat approximately 13 million homes, nearly the number of households in California.

The wastewater industry could harness that energy and eliminate its net-consumption, generating excess energy for other uses at a competitive price. We have the equipment and processes available and ready for market.

Energy Embedded in Wastewater



Wastewater contains nearly five times the amount of energy needed for the wastewater treatment process – the majority in the untapped area of thermal energy.

WERF Water Environment Research Foundation

Water Environment Federation the water quality people

NACWA A Clear Commitment to America's Waters

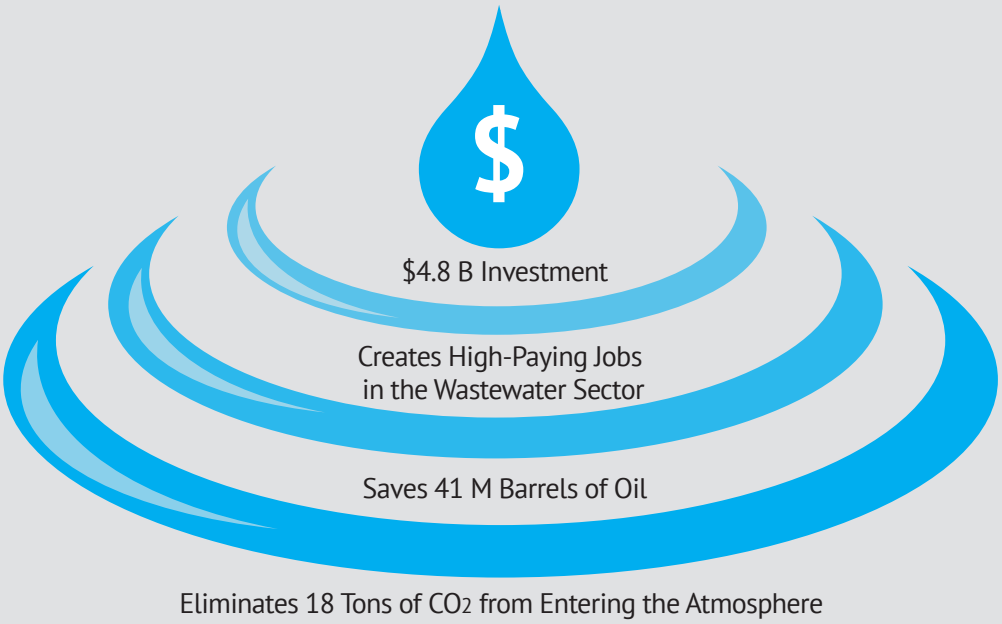
Utilities are using all of their financial resources to meet regulatory requirements and infrastructure needs – a new investment is necessary to achieve the tremendous benefits of energy.

Investing $4.8 billion (one quarter of the $20.5 billion the United States collectively spent on video games in 2013) in the 100 largest wastewater facilities would make them energy neutral. It is the same as saving 41 million barrels of oil (enough energy to power 2,210,000 homes annually).

Recovering energy from wastewater treatment provides many environmental and health benefits by producing clean water. It also provides additional benefits such as:

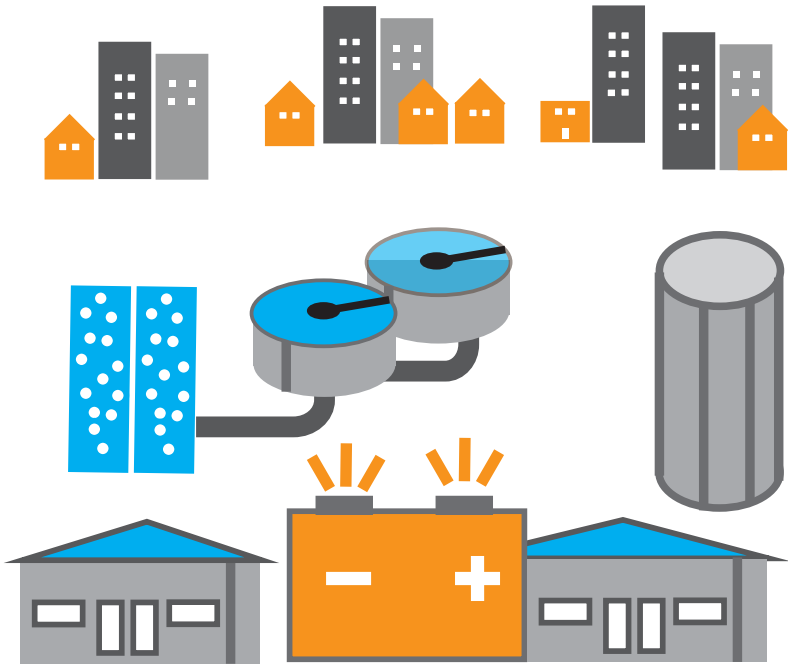
- Eliminating 18,000,000 tons of CO_2 from entering the atmosphere
- Sequestering the same amount of carbon as 4,000,000 acres of pine forest
- Creating local, high-paying jobs in the wastewater sector
- Eliminating transmission losses by providing little or no outside power to the 100 largest facilities
- Reducing the number of power plants needed
- Ensuring a more resilient critical infrastructure

With such an investment and using available technologies, the wastewater industry can become energy neutral today. With more resources devoted to research, the wastewater industry can hope to harness thermal resources and become a net energy exporter in the near future.



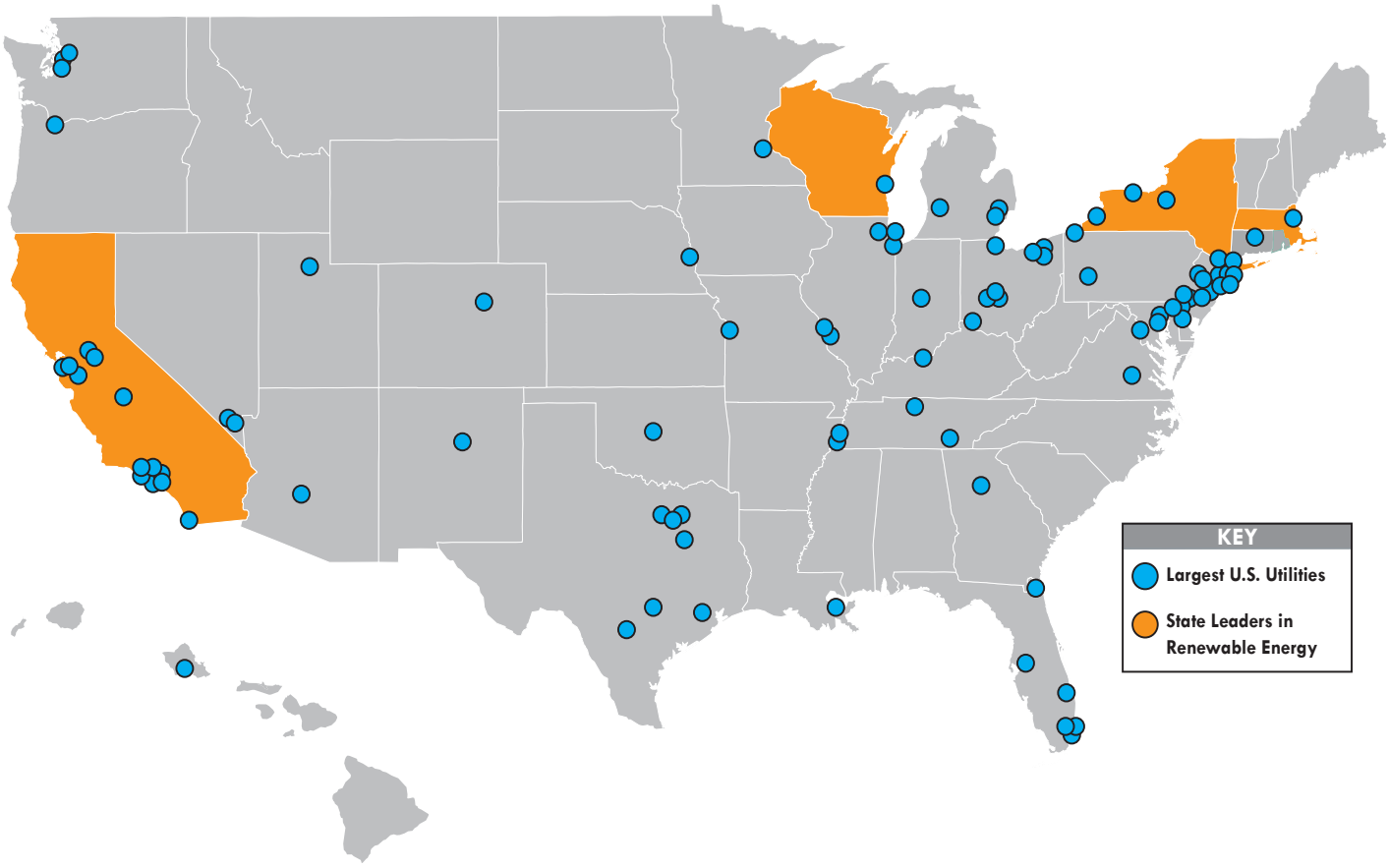
$4.8 B invested in 100 largest WWRFs = **New Jobs** in the wastewater sector - **41 M Barrels of Oil** prevented from being consumed - **18 M Tons of CO_2** eliminated from entering the atmosphere

Wastewater facilities have the potential to produce the energy needed to not only treat our water, but to help heat and power the cities that depend on them.



Largest U.S. Treatment Facilities

Investing in the 100 largest wastewater facilities to become energy neutral could eliminate 17% of the wastewater industry's energy use.



Becoming Energy Neutral

Many U.S. communities are nearly there. Among them are:

California – Oakland

Since 2004, East Bay Municipal Utility District, Oakland, has captured energy from post-consumer food waste to boost biogas production at its wastewater facility. At this time, its biogas to energy recovery system produces 90% of the 5 MWh used by the plant.

California – Thousand Oaks

Thousand Oaks is a small community with a water resource recovery facility that treats only 9 million gallons per day, but they are also 81% of the way to electric power neutrality and are 76% energy neutral for all primary energy.

New York – Gloversville Johnstown

Gloversville Johnstown wastewater treatment facility attracted a dairy industry to relocate locally by agreeing to take waste whey into its anaerobic digesters to produce more biogas and generate 90% of the required electric power for plant operations.

New York – Ithaca

Ithaca, a small college town, is moving forward by digesting organic wastes from the dining halls at Cornell University with its wastewater solids to produce as much biogas, heat, and power as possible.

Oregon – Corvalis and Gresham

The Association of Clean Water Agencies began a program to show how Oregon treatment plants can become energy independent by eliminating the need to purchase electricity to run operations. Participating cities found that energy independence is possible through a combination of energy efficiency, solar power, and micro-hydro, or by the use of digester gas.

Pennsylvania – Philadelphia

Philadelphia Water Department's approach to reaching net-zero energy includes investing in energy-efficiency measures, solar power generation, and a $45-million, 5.6-megawatt biogas cogeneration facility. A geothermal project at PWD's Southeast Water Pollution Control Plant uses heat from wastewater to warm the facility's buildings at approximately half of the current cost.

California – Los Angeles

Los Angeles County Sanitary District's Joint Water Pollution Control Plant is 94% energy neutral for electric power, as well as primary energy (which is power from other sources such as natural gas and the power needed to produce chemicals used onsite).

Washington – King County

King County is protecting regional water quality while reducing energy consumption at its South Treatment Plant with newer, energy-efficient blowers. The wastewater treatment division is also converting treatment byproducts (digester gas, excess heat, biosolids, and reclaimed water) into resources. Digester gas is used for onsite energy, powering large pumps, or sold to Puget Sound Energy.

ANNUAL SAVINGS NATIONWIDE BY INVESTING IN RENEWABLE ENERGY FROM WASTEWATER

	Units	In 3 Years	In 5 Years	In 10 Years	In 20 Years
Electric Power	MWh/yr	2,920,000	5,840,000	7,681,245	10,161,199
Primary Energy	MMBtu/yr	35,600,000	71,200,000	92,964,920	121,741,952
GHG Emissions	Tons CO_2e/yr	1,808,239	3,616,478	4,756,688	6,292,424

Related WERF Research: www.werf.org/energy

ENER6C13 "Utilities of the Future Energy Findings" (WERF 2014)

For more information, contact:
Lauren Fillmore, WERF Senior Program Director
lfillmore@werf.org | 571-384-2107