

# City of Worcester, Massachusetts



## SUSTAINABILITY PROFILE

### Harvesting Sun's Energy at Worcester's Water Filtration Plant

Location: 71 Stonehouse Hill Road, Holden MA

Solar Array's Capacity: 126 kW DC

Worcester's [Water Filtration Plant](#), located on the shore of Holden Reservoir No. 2, processes on average 24 million gallons of water per day (with a designed maximum capacity of 50 million gallons a day) sourced from ten reservoirs located in Leicester, Paxton, Rutland, Holden, and Princeton. The plant uses a six-step process to treat the reservoirs' water in order to provide clean and safe drinking water to Worcester, as well as the towns of Holden, Auburn, and Paxton.

Between 2011 and 2012, two solar arrays (PV1 and PV2) were installed as part of the large solar project funded by the American Recovery and Reinvestment Act (ARRA) funding for clean energy. This funding allowed for 4.1 megawatts of solar capacity on 12 water and waste treatment facilities across Massachusetts, costing a total of \$20.1 million. The project was financed through the State Revolving Fund under MassDEP and the Water Pollution Abatement Trust. This was the largest-ever state contract for solar energy installations and came as part of the state administration's initiative to expand solar power installations around the state. There was no cost to the City for this project.



The water treatment plant's ground-mounted solar array (PV 2), adjacent to Holden Reservoir No. 2

#### **PV System Specifications and Other Interesting Facts:**

- ✓ **Maximum rated capacity:** PV 1: 60 kW DC, PV 2: 66 kW DC
- ✓ **Owned by:** City of Worcester
- ✓ **Date in service:** PV 1: 6/29/2011, PV 2: 1/31/2012
- ✓ **Number of panels:** 565
- ✓ **PV panel rated efficiency:** 15%
- ✓ **Azimuth:** PV 1: 180°, PV 2: 225°
- ✓ **Inclination:** PV 1: 10°, PV 2: 20°
  
- ✓ **Project Cost** (materials, labor & engineering): \$1,172,107
- ✓ **Funding Source:** MA DEP EECBG (100%)
  
- ✓ **PV panel manufacturer:** Kyocera Solar, Inc.
- ✓ **Inverter manufacturer :** Solectria
- ✓ **Service Provider :** Installed by Florence Electric LLC and Nexamp



#### **Worcester Energy**

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The two solar arrays were installed on the plant's flat roof (PV1, 60 kW DC capacity) and mounted in the ground (PV1, 66 kW DC capacity), located between the reservoir and the wooded areas on site.

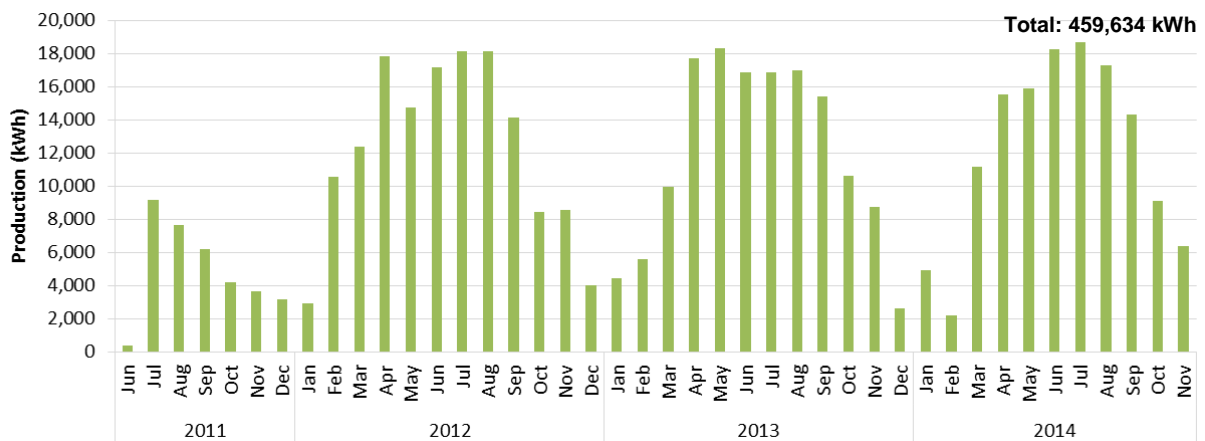
The total electricity produced since June 2011 and through November 2014 was 459,634 kWh, which is enough green power to offset carbon emissions produced by electrifying and heating 29 homes for a year!<sup>1</sup>

From the time both systems went online in February 2012 and through November 2014, they have produced 422,244 kWh, which is equivalent of 4.8% of the plant's electricity consumption.



*PV 1 on the plant's roof, secured in place by cinder blocks. The stones surrounding the array, as well as the weight of the array itself, hold down the roof's rubber membrane.*

### Water Filtration Plant Solar Systems PV1 and PV2: Electricity Production by Month, June 2011-November 2014



Source: Worcester DPW&P Water Operations<sup>2</sup>

As can be seen on the chart above, the total output of electricity is highly variable based on the seasonal cycle of solar energy available with the highest outputs during late spring and summer months.

<sup>1</sup> EPA, "Greenhouse Gas Equivalencies Calculator," <http://www.epa.gov/cleanenergy/energy-resources/calculator.html>, accessed May 21, 2015.

<sup>2</sup> Forrest Iwanik, "Solar Photovoltaic Energy Production at the Worcester Water Filtration Plant," January 29, 2015.

The photovoltaic arrays are a financial asset to Worcester for a number of reasons, including:

1. **They reduce electricity purchased from the grid:** Because PV systems produce electricity, the plant saves money equivalent to the cost of that electricity. Together, the two PV systems save the plant approximately \$1,300 per month in utility supply costs or estimated \$49,000 from project's commencement (June, 2011) through December, 2014.
2. **They reduce electrical peak demand charge:** Because the PV systems produce the most electricity during the period of the day when the plant's operations require the highest amount of electricity, the plant's electricity demand charge is reduced.
3. **They earn renewable energy credits (RECs):** For every megawatt-hour of electricity it produces, the plant sells one renewable energy [credit](#). Since project's commencement through May 2015, RECs have brought in \$23,188 in direct revenue to the Worcester Water Enterprise.

**Operation and Maintenance:** Department of Public Works and Parks, Water Division, is responsible for the general system maintenance of the solar arrays.