

2008 Renewable Energy Report

Columbia Water & Light

In November 2004, Columbians approved a renewable energy ordinance for the city's power supply portfolio. The ordinance mandates Columbia Water & Light purchase increasing levels of energy from renewable resources starting in 2008. Each year prior to February 1, the utility is required to submit a report outlining compliance with the ordinance. Once the report is publicly released it will be reviewed by the Water and Light Advisory Board and the Environment and Energy Commission and then forwarded to the City Council. The council will vote for approving the plan following a public hearing at a regularly scheduled meeting.

Summary

Columbia Water & Light will be receiving energy from wind and two biogas projects in 2008. With these three projects, the utility will accomplish the 2013 target of 5% by the end of 2008. Various other solar energy projects in Columbia have also been initiated which will increase the amount of Columbia's renewable energy in the future.

Renewable Energy Ordinance

The city shall generate or purchase electricity generated from eligible renewable energy sources at the following levels:

1. 2% of electric retail sales by December 31, 2007
2. 5% of electric retail sales by December 31, 2012
3. 10% of electric retail sales by December 31, 2017
4. 15% of electric retail sales by December 31, 2022

The cost of the renewable energy mandated in the ordinance must not be more than 3% of the cost of electricity derived from non-renewable sources. The full text of the Renewable Energy Standard and the approved list of renewable resources are listed in the appendix of this report.

2008 Project Overview

Project	Location	Amount of Energy (Megawatt)	Percentage of Columbia Energy Portfolio
A.E.C. Wind Energy	King City, MO	6.3 MW	1.90%*
Ameresco Landfill Gas	Jefferson City, MO	3.2 MW	2.17%
Columbia Landfill Gas	Columbia, MO	2.1 MW	1.47%

*Due to wind speed being variable, the percent of annual energy output from wind is estimated.

2008 Projects

Wind Energy

Columbia started receiving wind power from turbines near King City, Missouri on September 5, 2007. Columbia is scheduled to purchase one ninth of the electric output from the Bluegrass Ridge Wind Farm from Associated Electric Cooperative. At the maximum output, Columbia Water & Light could receive up to 6.3 megawatts.

The amount of wind energy Columbia receives is variable, depending on the amount of wind. Over a whole year, the wind power contract is predicted to furnish roughly 22,000 Megawatt Hours to Columbia, or approximately 2% of Columbia's electric retail sales.

2007 Wind Energy Data

Month	Megawatt Hours Delivered	Percent of Total System Energy	Total Cost	Delivered Cost per Megawatt Hour	Total Load Factor
September '07	592	0.6%	\$43,404.06	\$73.32	15.06%
October '07	1,030	1.1%	\$67,494.06	\$65.53	21.97%
November '07	1,153	1.4%	\$74,259.06	\$64.41	25.42%
December '07	969	1.0%	\$64,139.06	\$66.19	20.67%

Columbia Biogas Energy Plant

The Columbia Biogas Energy Plant is expected to start delivering electricity to the Columbia system in the first quarter of 2008. This project will use the gas created from decomposing waste at the landfill to generate 2.1 Megawatts of renewable energy. This will supply approximately 1.5% of Columbia's energy use per year. The cost of the energy is estimated to be approximately \$0.05 per to \$0.055 per Kilowatt Hour.

The Columbia Biogas Energy Plant was constructed within the predicted time frame and was within the \$3 million budgeted amount. It was partially funded through a 2006 bond issue passed with overwhelming public support. The plant was designed for expansion. It is estimated that the new bioreactor at the landfill will increase landfill gas production within five years. The electric production is expected to grow to as much as 2.5% of Columbia's energy portfolio over the next five to ten years.

Ameresco Biogas Plant

Columbia Water & Light signed a power purchase agreement with Ameresco for 3.2 Megawatts of energy from a biogas plant at the Jefferson City landfill. Construction was expected to be completed in 2007 but has been delayed until 2008. Columbia Water & Light has an agreement to buy the electricity for a period of 20 years. The estimated annual electric production of 25,000 Megawatt Hours represents approximately 2% of Columbia Water & Light's annual energy

sales. The utility is to pay a flat rate of \$52.50 per Megawatt Hour for the electricity. The transmission fees are currently being negotiated with a third party and are not included in this price.

Solar Projects

Columbia Water & Light received approval from the Columbia City Council on a new program called Solar One. The goal of the new project will be to produce one percent of Columbia's electric portfolio from solar power in the year 2023. The utility will form power purchase agreements with entities that have a five kilowatt (or higher) photovoltaic system. Electric customers who sign up for Solar One would have an additional charge on their monthly utility bill to pay for the higher cost of the solar energy.

There are two solar projects that Columbia Water & Light has been working on to launch the Solar One program. Quaker Oats has approached the city with an agreement for a five Kilowatt system. Dow Chemical is also interested in purchasing a photovoltaic unit to be stationed on city property. This five Kilowatt unit will produce electricity for the Columbia system and also be used for research.

Columbia Water & Light is estimating that a Power Purchase Agreement for five kilowatts of electricity could be signed for no more than \$3,500 a year. This energy would be sold to 70 customers in 100 Kilowatt Hour blocks for \$42 annually or \$3.50 a month. Each year, the utility would look for new suppliers and evaluate the customer charge for this energy.

Wood Fuel at the Columbia Municipal Power Plant

Columbia has started the permitting process with the Missouri Department of Natural Resources for Columbia to burn wood products at the Municipal Power Plant. The two year permit would enable staff to evaluate the effectiveness of burning wood pellets. These pellets are made from extra wood products at manufacturing plants in southeast Missouri. This pilot project will move forward in 2008.

Renewable Energy Education

Columbia Area Career Center

Energy from the sun will help power the Columbia Career Center and provide a learning opportunity for its students. In 2007, Columbia Water & Light purchased photovoltaic panels for the Columbia Area Career Center. Students can now use the solar data in their studies of science and technology.

With this project, Columbia Water & Light hopes to measure the effectiveness of solar energy in Columbia and raise awareness of this renewable technology with the students. A two Kilowatt photovoltaic system will generate electricity that will be used by the Career Center. Six, 10 Watt solar panels and one 50 Watt solar module were also purchased. They will provide information about the amount of

solar radiation, temperature, wind speed and humidity. This will allow the students to have quantitative data for solar research projects.

The solar system equipment was paid for by the utility and will be maintained by the Columbia Public School system. The school district agreed to include solar curriculum in the Career Center's classrooms and provide the computer systems for collecting and analyzing the data. The cost of the project was \$30,000.

The data collected from the solar units is available on the Web, which will allow anyone in the community to analyze the data. This will be valuable to an individual who wants to invest in solar or those researching solar energy. A link to the solar information can be found on the City of Columbia's Web site at www.GoColumbiaMo.com.

Anemometers

In June 2007, the Columbia City Council accepted a proposal from the University of Missouri's Atmospheric Sciences Department for establishing an anemometer site in Boone County. The anemometer will be used to study the wind speeds in the Columbia area.

The anemometer project will cost Columbia Water & Light \$11,626. This will include purchasing and installing the necessary equipment to measure wind parameters at three heights, up to the 150 meter level. By partnering with the Atmospheric Sciences Department, Columbia Water & Light can save the cost of constructing a tower. At the time of this report, the arrangements were being finalized to locate the anemometer on the KOMU tower on the south side of Columbia.

Advancing Renewables in the Midwest

On March 28, 2007, a conference was held in Columbia to keep community members informed about the latest developments in renewable energy. It was attended by 160 people from across the Midwest. The conference was sponsored by Columbia Water & Light, the Missouri Department of Natural Resources, the Iowa Department of Natural Resources and the University of Missouri Atmospheric Sciences Department.

Customer Based Renewable Energy Projects

Columbia Water & Light established several new programs to encourage electric customers to invest in solar energy.

Net Metering

The Columbia City Council passed an ordinance in 2007 to allow customers to enter into a net metering agreement with Columbia Water & Light. Net metering measures electricity flowing to the utility from a customer's solar system on sunny days, when production exceeds consumption and the amount of electricity used by the customer on cloudy days or at night. At the end of the month, the

customer is billed for the difference or the 'net' amount of electricity used over the month's time. Columbia Water & Light will buy the excess electricity from their customers at the residential electric rate after their net metering agreement is approved.

Solar Rebates

Columbia Water & Light is now offering a one-time \$500 per Kilowatt rebate for qualifying Photovoltaic systems. Customers installing a solar water heating system can qualify for a \$400 rebate. If the customer needs to install a back-up electric water heater, they can receive an additional \$400. To date, one customer has installed a Photovoltaic system and one customer has installed a solar water heater. The utility is expecting more customers to take advantage of these programs as solar technology improves and the cost of the systems goes down.

Appendix

Approved Sources of Renewable Energy

The following sources of renewable energy were approved by the Columbia City Council in March 2006 as sources of compliance with the Renewable Energy Standard ordinance.

Wind Energy: All electricity generated through wind power would qualify as a renewable resource, including wind energy that is stored in any form for later use as electrical power.

Solar Energy: All active solar energy systems would qualify as a renewable resource, including solar photovoltaics, solar water heating, solar space heating, and any other method of using the sun that requires 'active' collection techniques. In this regard 'passive' solar heating, or systems which do not employ the use of mechanical equipment to move or distribute the heat, would not be considered as eligible items.

Biomass Energy: Biomass energy is typically considered as energy that is derived from plants which have accumulated solar energy through photosynthesis. This definition, however, is somewhat open-ended as virtually all our current fossil fuels are derived from plants, even though their life span may have occurred in the geologic past. To create a definition of biomass that would correspond with its commonly understood meaning, biomass energy is considered as energy derived from plant origin, considering only those plants that have been harvested within the recent past, certainly within the last 100 years.

Columbia Water & Light suggests that eligible biomass energy specifically include (but not be limited to) the following materials:

- Landfill Gas
- Paper based products, such as cardboard and newsprint
- Wood and wood wastes
- Cellulose based products that originate from trees or shrubbery
- Other materials that come directly from trees or plants.

In the event that an energy source would be derived from a mixture of biomass and other non-renewable materials Columbia Water & Light would make a rigorous assessment to determine what energy content of the fuel is biomass derived, and only claim that portion for compliance with the renewable energy ordinance.

Hydropower: By all definitions, hydropower fits the definition of renewable power in that it is renewed by the earth's water cycle.

Geothermal Power: Columbia Water & Light considers that geothermal power, or any energy that may be extracted from the earth, is eligible as a renewable resource. This would only be in reference to active mechanical systems that

extract the heat energy from the earth. Passive systems would not be eligible under this definition. It would be the utility's responsibility to provide details on what constitutes energy provided through geothermal power on a case-by-case basis.

Green Tags: The Green Tag system that has originated throughout the country allows utilities to make purchases of Green Tags and thus participate in the development of green, or renewable, energy without actually receiving that energy in the utilities' system. In such situations the developer of the renewable resource is paid an agreed to amount for the Green Tag for each Megawatt-hour sold, however, the electricity is not delivered to the utility. Thus Green Tags simply represent the value of the renewable portion of the project or the premium that is above the cost of conventional electricity project. Green Tags are commonly sold and traded across the US.

Although this works for other utilities, Columbia Water & Light has every intention of complying with the renewable energy ordinance by finding sources located close enough to Columbia that the power can be physically transmitted into our system. In the future, however, the higher compliance requirements may force the utility to look at Green Tags as an option. Columbia Water & Light would pursue this avenue only as a last resort and would seek approval before purchasing renewable energy in this manner.

Future Projects: The above list is not intended to be final because there may be new sources of power that could be a renewable resource in the future. Columbia Water & Light could come back to the city's governing bodies in the future should a new renewable resource come available.

Sec. 27-106. Renewable energy standard

(a) The city shall generate or purchase electricity generated from eligible renewable energy sources at the following levels:

- (1) Two (2) percent of electric retail sales (kWhs) by December 31, 2007;
- (2) Five (5) percent of electric retail sales (kWhs) by December 31, 2012;
- (3) Ten (10) percent of electric retail sales (kWhs) by December 31, 2017; and
- (4) Fifteen (15) percent of electric retail sales (kWhs) by December 31, 2022.

(b) This renewable energy shall be added up to these kilowatt hour levels only to the extent that it is possible without increasing electric rates more than three (3) percent higher than the electric rates that would otherwise be attributable to the cost of continuing to generate or purchase electricity generated from one hundred (100) percent non-renewable sources (including coal, natural gas, nuclear energy and other nonrenewable sources).

(c) Eligible renewable energy generation may be provided by wind power, solar energy, bio-energy sources or other renewable sources which meet the environmental criteria approved by the city council after review by the environment and energy commission and the water and light advisory board. Electricity purchased from on-site renewable energy systems owned by Columbia Water & Light customers ("net metering") may be included within the calculation of the levels required in subsection (a).

(d) Renewable energy generation sources located within Missouri may receive referential consideration in the selection process.

(e) Each year prior to February 1, the water and light department shall publicly release a renewable energy plan detailing a proposal for how the city would comply with this section during the following year. The plan will explain the city's due diligence in pursuing renewable energy opportunities and detail all cost assumptions and related utility rate calculations, except with regard to confidential information that may be withheld pursuant to state law. The plan will then be reviewed by the environment and energy commission and water and light advisory board and submitted to the city council for approval following a public hearing.

(Ord. No. 18196, § 1, 8-16-04)

Editors Note: Ord. No. 18196, passed by city council on Aug. 16, 2004, called for election; said ordinance was passed by the voters on Nov. 2, 2004.

Secs. 27-107--27-110. Reserved.