




city of  
**Columbia**  
*Utilities*

## 2024 Renewable Energy Plan

 <p>city of  <b>Columbia</b>  <i>Utilities</i></p>		
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<p>_____          Director of Utilities</p>		<p>_____          Date</p>

## Introduction

### **Columbia Water & Light**

City of Columbia Water & Light's renewable energy portfolio is a diverse combination of wind, distributed and utility solar, and landfill gas resources. This resource mix aims to meet City Ordinances while maintaining reliable, cost-effective service and reducing reliance on non-renewable energy sources.

In November 2004, residents of Columbia approved a renewable energy ordinance for the City's power supply portfolio, directing Columbia Water & Light (CWL) to generate or purchase increasing levels of energy from renewable resources through 2029. The Columbia City Council revised the renewable energy ordinance in January 2014 to increase the renewable energy goals. The standard for 2023 was set at 25%.

In 2023, CWL purchased or generated 21.84% of its total electric usage through renewable energy sources.

The cost of renewable energy was approximately \$5 million less in 2023 than in 2022. This decrease in cost was predominantly due to a reduction in congestion and corresponding cost associated with the power purchase agreements at Crystal Lake 1 and 2 from 2022 to 2023. According to one report, Midcontinent Independent System Operator (MISO) market participants delayed power plant retirements and made additional existing capacity available to the region, helping bolster MISO's capacity supplies.

The rate impact for renewable energy compared to non-renewables was \$1,665,074, which was 41.1% of the rate impact limit of \$4,054,081.

CWL continued to make progress in 2023 toward expanding CWL's renewable portfolio, strengthening CWL's efforts to meet the Renewable Energy Standard, and making progress toward climate goals supported by the 2019 Climate Action and Adaptation Plan. 2023 was highlighted by progress in defining Columbia's energy future through taking necessary steps to better understand various options for expanding Water & Light's renewable energy portfolio.

City staff, the Water & Light Advisory Board and the City Council were provided an assessment of renewable energy by The Energy Authority (TEA). This assessment of CWL's renewable energy portfolio and potential expansion will allow the City to evaluate the potential of responsibly increasing renewable energy on our grid in 2024 and beyond.

## City of Columbia Ordinance Section 27-106: Renewable Energy Standard

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

- Two (2) percent of electric retail usage (kWhs) by December 31, 2007;
- Five (5) percent of electric retail usage (kWhs) by December 31, 2012;
- Fifteen (15) percent of electric retail usage (kWhs) by December 31, 2017;
- Twenty-five (25) percent of electric retail usage (kWhs) by December 31, 2022; and
- Thirty (30) percent of electric retail usage (kWhs) by December 31, 2028.

(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 non-renewable sources).

(c) Eligible renewable energy generation may be provided by wind power, solar energy, bio-energy sources or other renewable sources that meet the environmental criteria approved by the City Council after review by the energy and environment commission and the Water and Light Advisory Board. Electricity produced 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 preferential 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 energy and environment commission and the water and light advisory board and submitted to the city council for approval following a public hearing.

(Ord. No. 18196, § 1, 8-16-04; Ord. No. 21935, § 1, 1-6-14)

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

**Note:** Ord. No. 024044, passed by city council on October 7, 2019, dissolved the energy and environment commission and replaced it with the Climate and Environment Commission. It is recommended to consider revising all references to the energy and environment commission.

## 2023 Renewable Energy Supply

Columbia Adjusted System Load: 1,217,234 MWH

Renewable Energy Total: 265,866 MWH or 21.84%

In 2023, 21.84% of Columbia's electric portfolio came from renewable sources: wind (16.81%), landfill gas (2.62%), and solar (2.41%). The total amount did not meet the 25% standard for 2023 by 3.16%.

Adjusted System Load is determined by adding the amount of electricity produced inside Columbia's distribution system to the metered load provided by outside sources. Basing the renewable percentage on Adjusted System Load more accurately describes the actual electric load in the City's service territory.

### Summary of Significant Events for 2023

- The Energy Authority, a consultant for Water & Light, completed a requested assessment on acquiring 100% renewable energy by 2030. Based on the assessment from TEA, the City and the Water & Light Advisory Board are reviewing the current ordinance with a goal of moving renewable energy forward in a responsible way. TEA's assessment is that the cost of new renewables is not expected to come down until approximately 2030.
- Water & Light implemented a Power Cost Adjustment in October 2023. The PCA, an additional charge or credit on customers' bills, balances revenue collection to reflect cost changes in the energy markets. The PCA helps Water & Light manage fluctuations in power purchase costs by making adjustments that reflect the true cost of power each month, which will help CWL avoid reactionary rate increases.
- Water & Light received responses to multiple RFPs to construct a replacement for the abandoned Boone Stephens Solar Power Purchase Agreement (PPA). The proposed costs for a new solar field proved to be prohibitive, requiring an estimated 12% to 13% increase in rates to cover the costs.
- The Missouri Public Service Commission approved the final plans for the Grain Belt Express transmission line. Construction is expected to begin in 2025, and the anticipated delivery date for electricity in Missouri is 2028. CWL has a contract in place for the purchase of 35 MW and has requested 18 MW of additional wind energy through this existing arrangement with the Missouri Electric Commission (MEC). Negotiations for Columbia to have a total purchase of 53 MW are underway, and the MEC should have more information by the summer of 2024.
- Construction was approved for Unit No. 4 of the Columbia Landfill Gas Energy Plant expansion. The landfill gas facility saw lower numbers than expected. Unit No. 3 was out of service for approximately six months, and usage on Units 1 and 2 decreased. CWL expects to have all four units operational by summer 2024.

### 2023 Renewable Energy Production Amounts

Month	Columbia Adj. Load	Bluegrass Wind	Crystal Lake Contract 1	Crystal Lake Contract 2	Columbia Landfill	Jeff City Landfill	Truman Solar	Net-Metered Solar	Columbia Solar	Total Renewable	YTD % of System
<b>1-23</b>	104,703	1,048	3,035	13,631	1,303	1,361	879	245	15	21,517	20.55%
<b>2-23</b>	90,670	1,144	3,774	16,976	1,224	1,944	1,537	419	24	27,043	24.85%
<b>3-23</b>	96,751	1,193	3,563	15,595	1,397	2,143	1,551	441	24	25,906	25.49%
<b>4-23</b>	85,150	1,534	4,574	19,557	1,293	1,275	2,494	678	35	31,441	28.07%
<b>5-23</b>	98,468	543	3,481	14,537	1,351	1,932	2,659	703	35	25,241	27.57%
<b>6-23</b>	112,162	425	1,526	6,965	1,177	1,358	2,775	725	34	14,986	24.86%
<b>7-23</b>	125,294	302	1,308	6,105	733	1,849	2,457	678	31	13,462	22.38%
<b>8-23</b>	126,252	434	1,963	8,765	653	1,555	2,308	654	29	16,360	20.96%
<b>9-23</b>	103,040	613	2,463	10,750	574	1,924	2,195	478	28	19,026	20.69%
<b>10-23</b>	91,568	1,001	3,211	14,613	642	1,727	1,658	482	21	23,355	21.11%
<b>11-23</b>	88,277	1,007	3,652	16,092	646	1,615	1,380	467	25	24,883	21.67%
<b>12-23</b>	94,900	893	3,405	14,986	651	1,556	840	299	16	22,647	21.84%
<b>TOTAL</b>	<b>1,217,234</b>	<b>10,137</b>	<b>35,955</b>	<b>158,572</b>	<b>11,644</b>	<b>20,239</b>	<b>22,733</b>	<b>6,269</b>	<b>317</b>	<b>265,866</b>	<b>21.84%</b>
<b>% of System</b>		0.83%	2.95%	13.03%	0.96%	1.66%	1.87%	0.52%	0.03%	21.84%	

The amount of energy is measured in megawatt-hours (MWH)

## 2023 Renewable Energy Portfolio

### Bluegrass Ridge Wind Energy

Columbia started receiving wind power from turbines near King City, Missouri, in September 2007. The Columbia contract is for one-ninth of the electric output of the Bluegrass Ridge Wind Farm from Associated Electric Cooperative. At the maximum output, Columbia Water & Light could receive up to 6.3 MW. In 2023, Columbia received 10,137 MWH of power from this contract or 0.83% of the electric system total. The amount of wind energy Columbia receives is variable. There is a fixed transmission cost for this energy, so it is more expensive when less energy is received. The average cost for 2023 for wind power from the Bluegrass Ridge Wind Farm was \$73.60 per MWH.

### Crystal Lake III Wind

CWL has two PPAs with NextEra for wind energy produced at the Crystal Lake III wind farm in Northern Iowa. The first PPA, effective February 2012, is for 21 MW of wind. The second PPA, effective December 2016, involves the purchase of energy in two phases. The first is for the production of 27 MW of wind beginning in January 2017 with an additional 18 MW in January 2023.

Both contracts were amended in 2020 and include updated pricing as a result of a turbine repower of the entire site NextEra completed in 2021, with estimates of an additional 40,000 MWHs per year. Table 1.1, detailing updated pricing for the contracts from 2023 through 2040, can be found in the appendix.

Energy from the first contract provided 35,955 MWH in 2023 representing 2.95% of CWL's system total at a cost of \$27.10/MWH.

Energy from the second contract provided 158,572 MWH in 2023 representing 13.03% of CWL's system total at a cost of \$15.68/MWH.

In 2023, congestion on the electrical system near Columbia resulted in additional cost increases to \$14.24/MWH and \$13.88/MWH for Contract 1 and 2, respectively. In comparison, those costs in 2022 were \$42.29/MWH for Contract 1 and \$41.04/MWH for Contract 2.

Although costs related to congestion decreased in 2023, analysis from The Prime Group through the Electric Cost of Service Study noted in their Renewable Target Evaluation that:

*Future congestion costs from Crystal Lake will likely grow with the Expansion and Repower taking effect in 2022/2023. These costs could persist for the foreseeable future until MISO Long Range Transmission Plan projects are in service in the late 2020s/early 2030s.*

### Columbia Landfill Gas

The Columbia Landfill Gas Energy Plant was constructed in 2008 and uses the gas created from decomposing waste at the Landfill. The amount of energy received from the Columbia Landfill Gas Energy Plant is fairly consistent, aside from times when there is routine maintenance work. In 2023, the Landfill Gas Energy Plant produced 11,644 MWH of energy at a cost of \$43.99 per MWH, which was

0.96% of Columbia's energy system total. One generator was out of service for 6 months; two others had their usage lowered.

### Jefferson City Landfill Gas

Columbia Water & Light has a 20-year power purchase agreement with Ameresco for 3.2 MW of energy from the landfill gas plant at the Jefferson City Landfill. Columbia started receiving energy from the plant in April 2009. The total amount of energy received in 2023 was 20,239 MWH, which is 1.66% of the electric system total. The utility paid \$53.09 per MWH for the electricity.

### Truman Solar

Truman Solar is a 10 MW solar facility connected to Columbia Water & Light's 13.8 kV distribution system at the Rebel Hill substation. The solar installation went into operation May 7, 2021. In 2023, the Truman Solar facility produced 22,733 MWH of energy at a cost of \$44.81 per MWH, which was 1.87% of Columbia's energy system total.

### Net-Metered Customer Production

The Columbia City Council passed an ordinance in 2007 to allow customers to enter into a net-metering agreement with Columbia Water & Light. A net-metering arrangement is a billing agreement in which customers receive credits for electricity provided to the Columbia system.

During 2023, there were 100 new customer-owned photovoltaic installations or expansions, and the rated capacity grew from 4.75 MW to 5.67 MW. In 2023, the amount of energy sold to the electric utility was 2,740 MWH of 6,269 MWH estimated to have been generated. Net-metered production represented 0.52% of Columbia's electric portfolio in 2023.

Analysis from The Prime Group through the Electric Cost of Service Study noted in their Renewable Target Evaluation that:

*If Net Metering continues to grow at similar rates as 2020 and 2021, it will become a substantial renewable cost to the City if credits remain at the current retail rates.*

Since growth in the distribution of solar energy sold to the utility and behind-the-meter generation are expected to remain steady, the financial risks from net-metering are not likely to affect the overall renewable energy cost, though they could be significant in the future when considering cost of service.

In 2023, the estimated potential reduction of revenue to the utility due to power not being sold to customers because of net metering was \$511,048.

### Columbia Water & Light Solar Installations

Columbia Water & Light staff expanded the Bernadette site in 2015 to a total of 263 kW. This solar resource produced 317 MWH or 0.03% of the electric portfolio at a cost of \$73.63 per MWH.



## Costs of Renewable Energy

To minimize rate impacts on customers that could result from investments in renewable generation, Section 27-106(b) of the Renewable Energy Standard requires that rates will not increase by more than 3% due to the potentially higher cost of renewable energy compared to non-renewable energy.

Costs for renewable energy dropped in 2023. The total rate impact of renewable energy in excess of non-renewable energy was \$1,665,074, which is 41.1% of the rate impact limit of \$4,054,081.

The cost of renewable energy was less in 2023 than in 2022 due primarily to a decrease in the cost of power from Crystal Lake from reductions in transmission congestion. In 2023, congestion associated cost reductions resulted in cost decreases of 66.3% for Crystal Lake Contract 1 and 66.2% for Crystal Lake Contract 2 from 2022.

With consideration for fluctuating costs, Water & Light implemented a Power Cost Adjustment in October 2023. The PCA, an additional charge or credit on customers' bills, balances revenue collection to reflect cost changes in the energy markets. For example, transmission costs from non-renewable resources increased in 2023. The PCA helps Water & Light manage fluctuations in power purchase costs by making adjustments that reflect the true cost of power each month, which will help CWL avoid reactionary rate increases.

From calendar year 2022 to calendar year 2023, the total amount of renewable energy increased by 36,495 MWH, or 15.9%. The average cost per megawatt-hour of renewables in 2023 was \$32.33/MWH, which is comparable to the cost of non-renewables at an average cost of \$33.90/MWH. While cost is not the only consideration in evaluating power supply options, this metric is important when considering Columbia's Renewable Energy Standard.

### Impact of 2023 Renewable Energy Portfolio

Renewable Resource	Total 2023 MWH	Additional Cost/(Savings) Per MWH	Total Impact on Rates
Bluegrass Ridge Wind (Associated Electric)	10,137	\$36.60	\$371,014
Crystal Lake Wind Contract 1 (NextEra)	35,955	\$7.44	\$267,505
Crystal Lake Wind Contract 2 (NextEra)	158,572	\$5.09	\$807,131
Columbia Landfill	11,644	\$5.91	\$68,816
Jefferson City Landfill (Ameresco)	20,239	\$13.12	\$265,536
Truman Solar (Truman Solar LLC)	22,733	\$(3.72)	\$(84,567)
Net-Metered Photovoltaic Production	6,269	\$(6.12)	\$(38,366)
Columbia Water & Light Solar Production	317	\$25.25	\$8,005
<b>Total Renewable Resource Impact on Rates</b>			<b>\$1,665,074</b>



## Renewable Portfolio Cost Calculations

The City of Columbia has a fiscal year that does not match the calendar year outlined in the Renewable Energy Standard. Renewable energy costs for this report include information from January through September of the prior fiscal year and October through December of the current fiscal year.

Revenue Source	January – September (FY23)	October – December (FY24)
Residential	\$45,330,121	\$13,333,099
Commercial/Industrial	\$57,874,585	\$18,598,237
Total Revenue During Calendar Year 2023		\$135,136,042
3% Impact Limit on Rates		\$4,054,081

## Calculating Renewable Energy Rate Impact

In 2014, Columbia Water & Light enlisted the services of Utility Financial Solutions LLC to provide guidance on the valuation of renewable generation. As outlined by UFS’s Rate Impacts on Renewables report, CWL uses a combination of market prices of electricity and avoided cost to determine the cost for renewables and the impact on ratepayers.

Below is the approach and details used by the proposed renewable energy impact methodology:

- Start with total cost of renewable resource
- Subtract the capacity value
- Determine the difference between the renewable resource cost and Water & Light’s cost of avoided production from the non-renewable resource
- Add the cost of any congestion and losses for each renewable resources relative to Water & Light’s load
- Multiply by the production from the renewable resource

For 2023, the following factors have been established:

- Columbia’s Non-Renewable Avoided Cost — \$33.90/MWH
- The production weighted price of Columbia’s Midcontinent Independent System Operator (MISO) Load Node for Crystal Lake Contract One — \$23.18/MWH
- The production weighted price of Columbia’s Midcontinent Independent System Operator (MISO) Load Node for Crystal Lake Contract Two — \$23.31/MWH

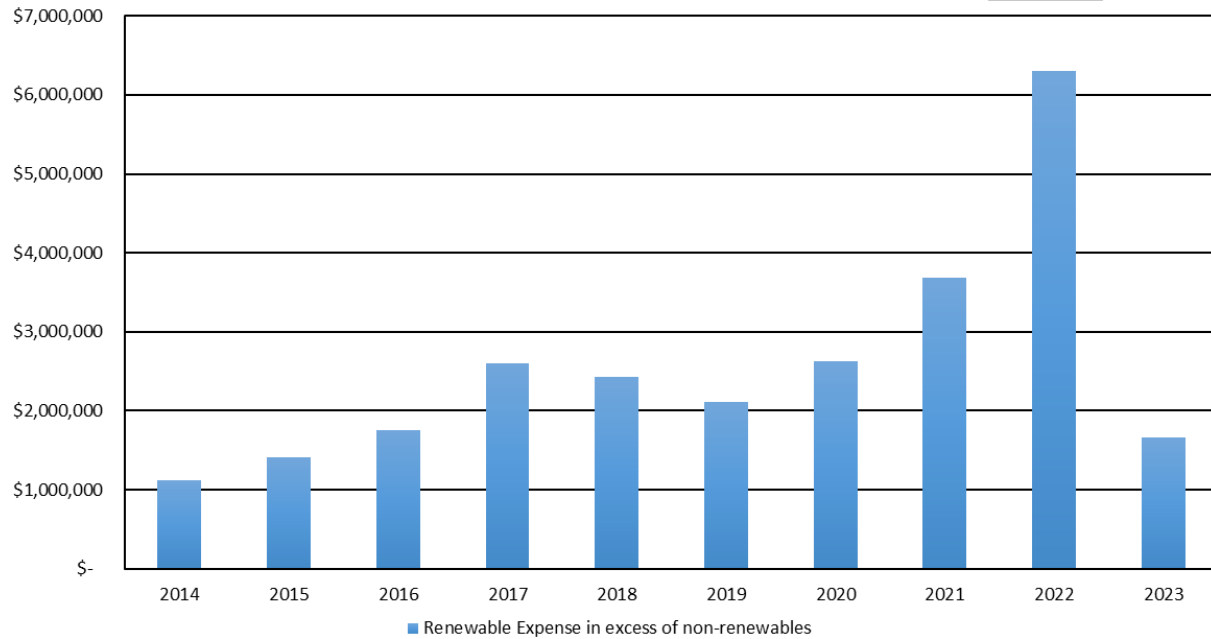
	A	B	C	D	E	F	G	H	
Resource	Resource Cost (\$/MWH)	Capacity Component (\$/MWH)	Energy Component (\$/MWH)	Energy Impact (\$/MWH)	Resource MISO LMP (\$/MWH)	Cong. & Loss Cost (\$/MWH)	Energy Impact w/ C&L (\$/MWH)	Production (MWH)	Renewable Rate Impact (\$)
Bluegrass Ridge Wind	\$ 73.60	\$ 3.10	\$ 70.50	\$ 36.60	-	-	\$ 36.60	10,137	\$ 371,014
Crystal Lake C1 Wind	\$ 27.10	\$ -	\$ 27.10	\$ (6.80)	\$ 8.94	\$ 14.24	\$ 7.44	35,955	\$ 267,505
Crystal Lake C2 Wind	\$ 25.11	\$ -	\$ 25.11	\$ (8.79)	\$ 9.43	\$ 13.88	\$ 5.09	158,572	\$ 807,131
Columbia Landfill Gas	\$ 43.99	\$ 4.18	\$ 39.81	\$ 5.91	-	-	\$ 5.91	11,644	\$ 68,816
Jefferson City Landfill Gas	\$ 53.09	\$ 6.07	\$ 47.02	\$ 13.12	-	-	\$ 13.12	20,239	\$ 265,536
Truman Solar	\$ 44.81	\$ 14.63	\$ 30.18	\$ (3.72)	-	-	\$ (3.72)	22,733	\$ (84,567)
Customer Generated PV (Net Meter)	\$ 42.26	\$ 14.48	\$ 27.78	\$ (6.12)	-	-	\$ (6.12)	6,269	\$ (38,366)
CWL Generated PV	\$ 73.63	\$ 14.48	\$ 59.15	\$ 25.25	-	-	\$ 25.25	317	\$ 8,005
								265,866	\$ 1,665,074

- Column A - Total cost of the Renewable resource
- Column B - Amount of total cost that is determined to be providing capacity value, as outlined in the Utility Financial Solutions report
- Column C - Amount of total cost that is determined to be providing energy value (Column A minus Column B)
- Column D - Cost impact of the renewable resource energy above the incremental cost of Water & Light's non-renewable resource cost (Column C minus \$33.90)
- Column E - Production weighted MISO LMP at the point of resource connection to the MISO system for the Crystal Lakes wind contracts
- Column F - Resource congestion and losses as compared to Water & Light's load Wind Resources (\$23.18 minus Column E for contract 1, \$23.31 minus Column E for contract 2)
- Column G - Energy Impact plus congestions and losses for the resource (Column D plus Column F)
- Column H - Resource Annual Production
- Renewable Rate Impact – Column G times Column H

## Renewables Cost Impact by Year

The City Ordinance states that the renewable energy integrated into CWL's electric portfolio shall not increase electric rates more than 3% higher than the rates for electricity generated from 100% non-renewable resources. For calendar year 2023, the additional expense of renewable energy in excess of non-renewable energy was \$1,665,074.

## Additional Cost for Renewables

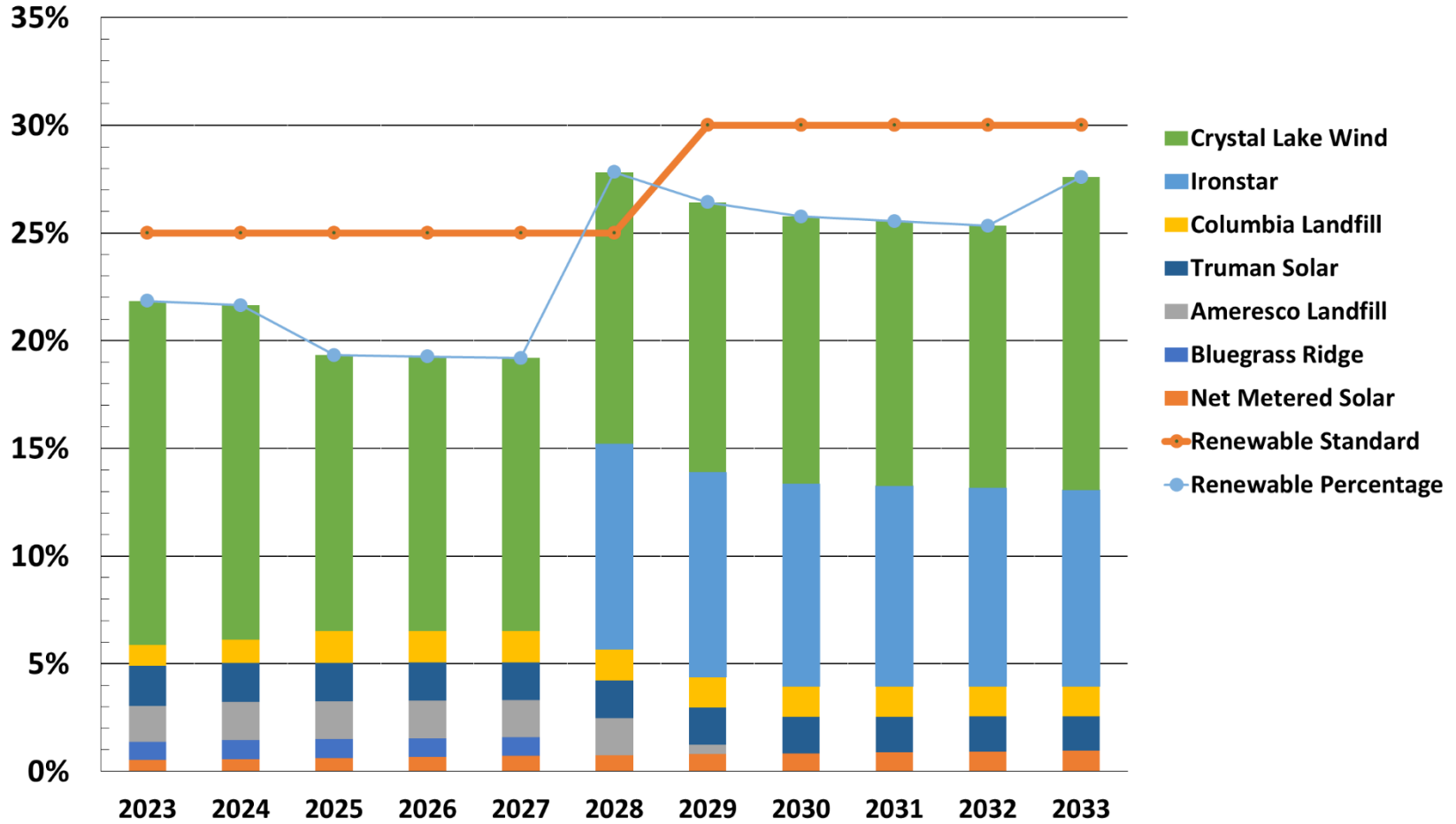


## Planning for the Future of Renewables

CWL's Renewable Energy Plan is based on the revised 2014 Renewable Energy Standard. The 2021 Integrated Electric Resource and Master Planning process laid the foundation for the future of energy planning in Columbia. In 2023, utility staff enlisted TEA to evaluate the different options toward meeting a goal of 100% renewable energy by 2030. This assessment will further inform the planning and implementation process for a greater expansion of renewable energy supply in Columbia. TEA's assessment is that the cost of new renewables is not expected to come down until approximately 2030.

The chart on the following page depicts the 10-year outlook for renewable energy supply in Columbia. CWL has renewable energy provided by wind, solar, and landfill gas resources. With the loss of the Boone Stephens solar project, staff initiated a request for proposal to replace the lost energy. The proposed costs proved prohibitive, requiring a 12% to 13% increase in rates to cover the costs. A shortfall in renewable energy is anticipated as a result of project delays, cancellations and the increased cost of new renewable generation sources. As requested by the City Council, the City and the Water & Light Advisory Board are reviewing the current ordinance with a goal of moving renewable energy forward in a responsible way based on information provided in the TEA assessment.

## Renewable Energy Generation Production by Percentage of Load (2023-2033)



## Planned Additions to the Renewable Energy Portfolio

Transitioning the power supply to renewable energy from traditional sources requires long-term planning to ensure all utility and customer needs are met. To address Columbia's future renewable energy needs, Columbia Water & Light is working on the following projects:

### Customer Net-Metered Solar (ongoing)

Customer-owned distributed generation has continued steady growth since approximately 2008. Market analysis predicts ongoing growth in this area. For the purposes of the Renewable Energy Plan, CWL has projected conservative growth in this area as many factors can impact the customer-owned solar market, including regulation changes, economic growth or recession, component pricing and rates.

### Columbia Landfill Gas Expansion (2024)

With authority to use the design-build process approved by Council in December 2021, staff is currently in the contract award process. Work is expected to begin on the fourth generator in 2024. When complete, this project will increase the Landfill Gas Plant's capacity from 3.1 MW to 4.2 MW.

### Future Power Purchase Agreement (ongoing)

In 2023, Utility sought additional renewable energy projects to replace the abandoned Boone Stephens solar project. However, the proposed costs for a new solar field proved to be prohibitive, requiring an estimated 12% to 13% increase in rates to cover the costs.

The City and the Water & Light Advisory Board are reviewing the current renewable energy ordinance with a goal of moving renewable energy forward in a responsible way based on information provided in the TEA assessment.

### Ironstar Wind (2028)

In June 2017, the City Council approved a contract with the Missouri Joint Municipal Electric Utility Commission for the purchase of 35 MW of wind energy from western Kansas. Delivery of this energy depends upon the construction of the Grain Belt Express transmission line and a converter station in northeast Missouri. As of January 2023, Invenergy Transmission was continuing work on the right of way acquisition through property easements in Missouri and Kansas, with the majority of those easements being in place as of 2023.

As a result of a need to amend their Certificate of Convenience and Necessity due to the converter station changing locations, this project was returned to the Missouri PSC in 2023. This change will push back the anticipated delivery date to 2028.

Under CWL's current agreement, Ironstar Wind is expected to have an annual energy production estimated around 122,640 MWH per year, which would be 9.4% of the projected electric system total in 2028.

Utility staff has notified the Missouri Joint Municipal Electric Utility Commission of our interest in expanding our takeoff from Ironstar Wind based on additional energy being available. CWL has requested up to an additional 18 MW for delivery, bringing the total purchase potential to 53 MW of wind energy.

### 2024 Estimated Renewable Energy Percentage

In order to meet the City’s Renewable Energy Standard, Columbia Water & Light utilizes an array of renewable energy sources including wind, solar, and landfill gas. Based on a metered system energy requirement of 1,214,601 MWHs and similar renewable energy production levels, it is estimated that 20.6% of Columbia’s electric portfolio will come from existing renewable resources in 2024.

	Location	Amount of Energy	% of System Load	Cost
Bluegrass Ridge	King City, MO	11,058 MWH	1.0%	\$69.15/MWH
Crystal Lake Contract #1	Hancock County, IA	38,608 MWH	3.2%	\$27.04/MWH
Crystal Lake Contract #2	Hancock County, IA	133,938 MWH	11.0%	\$25.37/MWH
Jefferson City Landfill gas	Jefferson City, MO	22,216 MWH	1.8%	\$53.04/MWH
Columbia Landfill gas	Columbia, MO	13,582 MWH	1.1%	\$43.99/MWH
Net-Metered Customer Production	Columbia, MO	7,450 MWH	0.6%	\$42.26/MWH
West Ash Solar Field	Columbia, MO	343 MWH	0.0%	\$67.27/MWH
Truman Solar	Columbia, MO	23,013 MWH	1.9%	\$44.81/MWH
<b>TOTAL</b>	—	<b>250,208 MWH</b>	<b>20.6%</b>	—

## Summary

Columbia Water & Light strives to provide reliable, cost-effective service while achieving City of Columbia environmental and renewable energy goals. In 2023, CWL fell short the goal of providing 25% renewable energy and is evaluating the future expansion of renewables on our grid. Market forces will impact CWL's renewable energy portfolio, presenting new and unforeseen challenges, as happened with the utility's RFPs for additional renewables being cost prohibitive. It will be important that the utility remains adaptable to these market forces as CWL transitions to a cleaner energy future.

Although a shortfall in renewable energy is anticipated, City staff and the Water & Light Advisory Board are reviewing the current renewable energy ordinance with a goal of moving renewable energy forward in a responsible way based on the information provided in the TEA assessment. This assessment will inform the City on future expansions of renewable energy supply.

Renewable energy prices decreased in 2023 from 2022, which resulted in the cost of renewable energy being less than the 3 percent impact limit on rates. This decrease in price was primarily due to an approximate 66 percent reduction in pricing from the Crystal Lakes wind contracts from reduced congestion on transmission.

To continue the trend of increasing renewables in an ever-changing environment, it will require significant commitment and planning. As the City of Columbia looks to the future of energy supply, long-term goals laid out in the Renewable Portfolio Standard, Climate Action and Adaptation Plan and TEA assessment of the 100% renewable energy goal will guide the utility in future planning and resource selection.

In a rapidly changing market and environment, CWL will continue to provide customer-focused, reliable and cost-effective service that meets today's needs while planning for the future of the community.



## Appendix

### Glossary of Abbreviations

**IERMP** stands for Integrated Electric Resource & Master Plan.

**kV** means kilovolt, and is a standard unit for electromotive force. It is used to describe the infrastructure of the transmission and distribution systems.

**kWh** means kilowatt-hour(s), and is common unit for electric energy. Note that 1,000 kWh equals 1 MWh.

**LMP** stands for Locational Marginal Price. This is the hourly price that Columbia Water & Light buys or sells energy into the MISO marketplace.

**MISO** stands for Midcontinent Independent System Operator and is the regional transmission organization that Columbia Water & Light is a member.

**MWh** means megawatt-hour(s), and is a common unit for utility-scale electrical energy.

**MW** means megawatt(s), and is a common unit for utility scale electrical power.

**REC** stands for Renewable Energy Credit.

**Table 1.1: Crystal Lake III Amended Price Chart**

<b>Period</b>	<b>Fixed Rate (\$/MWH)</b>
Repower Completion Date through Dec. 31, 2022	26.21
January 1, 2023 through December 31, 2023	25.11
January 1, 2024 through December 31, 2024	25.37
January 1, 2025 through December 31, 2025	25.63
January 1, 2026 through December 31, 2026	25.89
January 1, 2027 through December 31, 2027	26.16
January 1, 2028 through December 31, 2028	26.43
January 1, 2029 through December 31, 2029	26.71
January 1, 2030 through December 31, 2030	27.01
January 1, 2031 through December 31, 2031	27.30
January 1, 2032 through December 31, 2032	22.61
January 1, 2033 through December 31, 2033	22.00
January 1, 2034 through December 31, 2034	22.44
January 1, 2035 through December 31, 2035	22.89
January 1, 2036 through December 31, 2036	23.35
January 1, 2037 through December 31, 2037	23.81
January 1, 2038 through December 31, 2038	24.29
January 1, 2039 through December 31, 2039	24.78
January 1, 2040 through December 31, 2040	25.27

## Historical Renewable Energy Data

For reference, Renewable Energy Data from the previous five years are included here. For all the data charts dating to 2005, visit <https://www.como.gov/wp-content/uploads/2021/12/2022-Renewable-Report-Yearly-Production-Charts-1.pdf>.

## 2022 Renewable Energy Production Amounts

Month	Columbia Adj. Load	Bluegrass Wind	Crystal Lake Contract 1	Crystal Lake Contract 2	Columbia Landfill	Jeff City Landfill	Truman Solar	Net-Metered Solar	Columbia Solar	Total Renewable	YTD% of System
1-22	114,255	1,180	2,967	7,856	1,137	2,124	1,261	301	24	16,850	14.75%
2-22	99,995	1,283	3,653	10,037	1,160	1,875	1,505	299	23	19,836	17.12%
3-22	94,465	1,452	4,328	11,958	1,376	1,970	1,907	398	29	23,418	19.47%
4-22	86,861	1,472	4,827	12,612	1,421	2,023	2,046	482	33	24,916	21.49%
5-22	100,378	1,039	3,834	9,701	1,311	1,543	2,273	500	33	20,234	21.22%
6-22	117,760	751	2,603	6,963	1,250	1,497	2,817	597	38	16,516	19.84%
7-22	130,699	489	2,060	5,416	1,350	1,767	2,506	539	34	14,161	18.26%
8-22	128,406	309	1,877	4,993	1,328	1,819	2,608	557	35	13,526	17.12%
9-22	102,853	730	2,750	7,238	1,296	2,027	2,303	511	33	16,888	17.05%
10-22	87,400	1,071	3,393	9,049	1,317	1,637	1,964	459	29	18,919	17.43%
11-22	92,478	1,560	4,703	12,322	1,241	2,148	1,362	362	23	23,721	18.09%
12-22	108,065	1,355	4,268	11,158	1,332	1,299	741	221	13	20,387	18.15%
<b>TOTAL</b>	<b>1,263,615</b>	<b>12,691</b>	<b>41,261</b>	<b>109,305</b>	<b>15,519</b>	<b>21,729</b>	<b>23,293</b>	<b>5,226</b>	<b>347</b>	<b>229,371</b>	<b>18.15%</b>
<b>% of System</b>		1.00%	3.27%	8.65%	1.23%	1.72%	1.84%	0.41%	0.03%	18.15%	

The amount of energy is measured in megawatt-hours (MWH)

### 2021 Renewable Energy Production Amounts

The Truman Solar 10 MW facility began operation in May. The Water & Light Advisory Board and the City Council recommended against the purchase of Renewable Energy Credits.

Month	Columbia Adj. Load	Bluegrass Wind	Crystal Lake Contract 1	Crystal Lake Contract 2	Columbia Landfill	Jeff City Landfill	Truman Solar	Net-Metered Solar	Columbia Solar	Total Renewable	YTD % of System
1-21	105,250	970	2,291	5,401	1,522	2,208	—	143.7	13.3	12,548	11.92%
2-21	108,774	602	1,808	5,134	1,724	1,675	—	164.8	14	11,121	11.06%
3-21	88,380	1,363	2,610	4,213	2,091	2,198	—	379.9	31.2	12,886	12.09%
4-21	83,807	1,154	3,095	6,805	1,933	2,163	—	469.8	37	15,657	13.52%
5-21	88,215	925	3,154	8,133	1,666	1,733	1,226	414.7	31.6	17,283	14.65%
6-21	113,121	504	2,270	5,989	1,929	2,015	2,560	496.0	37.0	15,799	14.52%
7-21	122,265	351	1,425	3,927	1,855	2,013	2,548	495.1	36.6	12,651	13.80%
8-21	129,083	670	1,855	4,837	1,331	1,385	2,466	508.3	38.4	13,090	13.24%
9-21	107,649	1,016	2,463	6,585	1,119	1,374	2,148	480.7	36.7	15,222	13.34%
10-21	90,711	996	2,967	7,809	1,060	1,287	1,322	295.5	22.7	15,759	13.69%
11-21	87,076	1,206	4,426	11,557	921	2,203	1,265	323.0	25.5	21,927	14.58%
12-21	93,983	1,232	2,301	6,026	1,215	2,168	1,048	267.6	21.6	14,279	14.63%
<b>TOTAL</b>	<b>1,218,313</b>	<b>10,989</b>	<b>30,664</b>	<b>76,414</b>	<b>18,365</b>	<b>22,422</b>	<b>14,583</b>	<b>4,439</b>	<b>346</b>	<b>178,223</b>	
<b>% of System</b>		<b>0.90%</b>	<b>2.52%</b>	<b>6.27%</b>	<b>1.51%</b>	<b>1.84%</b>	<b>1.20%</b>	<b>0.36%</b>	<b>0.03%</b>	<b>14.63%</b>	

The amount of energy is measured in megawatt-hours (MWH)

## 2020 Renewable Energy Production Amounts

Free Power Company LLC defaulted on its lease agreement with the City.

Month	Columbia Adj. Load	Bluegrass Wind	Crystal Lake Contract 1	Crystal Lake Contract 2	Columbia Landfill	Jeff City Landfill	Free Power Solar	Net Metered Solar	Columbia Solar	Total Wind RECs	Total Renewable	YTD % of System
1-20	103,904	929	3,110	7,848	1,151	2,277	8.11	138.71	7.73	—	15,469	14.89%
2-20	96,923	856	3,213	8,696	1,589	2,131	13.88	149.71	17.14	—	16,666	16.00%
3-20	86,776	881	3,301	8,471	2,135	2,235	20.84	245.34	29.71	—	17,319	17.20%
4-20	76,639	704	3,080	7,810	1,247	2,158	26.40	314.18	36.82	—	15,376	17.80%
5-20	82,741	625	2,672	6,507	1,011	1,859	26.10	319.75	36.32	10,676	23,732	19.81%
6-20	109,963	581	3,025	7,080	1,396	2,094	32.10	397.08	43.66	9,324	23,973	20.21%
7-20	126,435	228	1,222	3,186	748	2,062	28.97	356.77	38.55	—	7,870	17.62%
8-20	115,374	388	2,198	5,594	578	1,993	28.83	369.81	39.09	—	11,189	16.47%
9-20	94,957	634	2,522	5,452	469	1,702	24.20	348.62	34.54	—	11,186	15.98%
10-20	88,430	1,010	1,908	4,196	1,337	1,845	11.73	280.43	27.79	—	10,616	15.62%
11-20	84,537	1,313	3,211	6,340	1,791	1,816	0.00	253.24	24.95	—	14,749	15.76%
12-20	99,725	890	2,006	4,397	1,975	2,118	0.00	226.65	21.93	—	11,635	15.41%
<b>TOTAL</b>	<b>1,166,405</b>	<b>9,039</b>	<b>31,467</b>	<b>75,578</b>	<b>15,427</b>	<b>24,290</b>	<b>221.2</b>	<b>3,400</b>	<b>358.2</b>	<b>20,000</b>	<b>179,780</b>	<b>15.41%</b>
<b>% of System</b>	—	<b>0.77%</b>	<b>2.70%</b>	<b>6.48%</b>	<b>1.32%</b>	<b>2.08%</b>	<b>0.02%</b>	<b>0.29%</b>	<b>0.03%</b>	<b>1.71%</b>		—

The amount of energy is measured in megawatt-hours (MWH)

## 2019 Renewable Energy Production Amounts

Month	Columbia Load	Bluegrass Wind	Crystal Lake Contract 1	Crystal Lake Contract 2	Columbia Landfill	Jeff City Landfill	Free Power Solar	Net Metered Solar	Columbia Solar	Total Wind RECs	Total Renewable	YTD % of System
1-19	109,535	1,169	3,300	8,648	515	1,745	9.39	96.78	17.35	-	15,499	14.15%
2-19	98,438	957	2,644	6,489	1,131	1,765	10.02	105.09	17.64	-	13,119	13.76%
3-19	94,656	1,332	3,540	9,049	940	2,069	21.69	222.00	33.45	-	17,207	15.14%
4-19	81,014	1,366	2,568	6,514	1,428	1,914	25.90	270.81	39.64	-	14,126	15.63%
5-19	91,789	821	2,971	7,670	1,245	1,609	30.71	284.77	39.47	-	14,671	15.70%
6-19	101,949	745	2,091	5,634	517	1,368	34.84	311.47	42.79	-	10,744	14.79%
7-19	123,326	657	1,808	4,776	1,217	2,112	37.59	337.89	45.92	-	10,992	13.75%
8-19	116,521	487	1,366	3,782	1,463	1,819	30.96	285.17	38.48	-	9,272	12.93%
9-19	112,748	1,015	2,583	6,853	965	1,253	27.45	281.99	34.52	20,000	33,012	14.91%
10-19	87,641	1,129	3,507	9,288	1,451	2,251	18.29	200.31	14.44	-	17,859	15.38%
11-19	90,026	1,238	3,340	8,898	1,481	2,211	14.55	175.52	12.26	-	17,370	15.70%
12-19	96,218	1,517	3,125	8,177	1,878	2,286	10.93	136.29	9.86	-	17,141	15.87%
<b>TOTAL</b>	<b>1,203,862</b>	<b>12,433</b>	<b>32,842</b>	<b>85,780</b>	<b>14,229</b>	<b>22,402</b>	<b>272.32</b>	<b>2,708.09</b>	<b>345.82</b>	<b>20,000</b>	<b>191,012</b>	<b>15.87%</b>
<b>% of System</b>	-	<b>1.03%</b>	<b>2.73%</b>	<b>7.13%</b>	<b>1.18%</b>	<b>1.86%</b>	<b>0.02%</b>	<b>0.22%</b>	<b>0.03%</b>	<b>1.66%</b>	<b>15.87%</b>	-

The amount of energy is measured in megawatt-hours (MWH)

## 2018 Renewable Energy Production Amounts

Month	Columbia Load	Bluegrass Wind	Crystal Lake Contract 1	Crystal Lake Contract 2	Columbia Landfill	Jeff City Landfill	Free Power Solar	Net Metered Solar	Columbia Solar	N. Dakota Wind RECs	Total Renewable	Annual % of System
<b>1-18</b>	113,783	1,442	3,931	9,684	1,463	1,852	16.67	111.55	25.57	25,000	43,526	38.25%
<b>2-18</b>	94,959	1,050	2,743	6,899	1,470	1,782	14.82	102.85	21.74	-	14,083	27.60%
<b>3-18</b>	93,030	1,525	3,419	9,083	1,868	2,052	18.81	134.59	27.75	-	18,127	25.10%
<b>4-18</b>	87,303	1,252	3,209	8,422	1,779	1,858	27.69	200.88	40.27	-	16,789	23.78%
<b>5-18</b>	106,787	646	2,184	5,778	1,534	1,907	34.49	224.35	43.73	-	12,352	21.15%
<b>6-18</b>	120,263	933	2,853	7,268	1,190	1,821	34.66	229.46	44.39	-	14,373	19.35%
<b>7-18</b>	126,035	335	1,852	4,806	940	1,824	36.78	245.09	46.42	-	10,086	17.43%
<b>8-18</b>	123,712	796	1,390	3,598	966	1,886	31.30	237.63	40.08	-	8,945	15.97%
<b>9-18</b>	105,292	724	2,546	6,536	845	2,200	28.30	235.03	38.50	-	13,153	15.59%
<b>10-18</b>	89,827	966	2,140	5,621	1,309	2,059	22.08	194.60	32.13	-	12,343	15.44%
<b>11-18</b>	93,526	1,072	3,321	8,386	1,537	2,092	12.28	99.10	15.69	-	16,534	15.62%
<b>12-18</b>	98,758	1,186	3,280	8,687	643	2,127	12.22	98.96	15.01	-	16,049	15.67%
<b>TOTAL</b>	1,253,275	11,927	32,867	84,767	15,544	23,460	290.00	2,114.00	391.00	25,000	196,361	15.67%
<b>% of Total</b>	-	0.95%	2.62%	6.76%	1.24%	1.87%	0.02%	0.17%	0.03%	1.99%	-	-

The amount of energy is measured in megawatt-hours (MWH)