

Drought puts drain on water supplies for power plants



Nick De La Torre, Staff

Hundreds of feet of pipe is used to run water through out Cedar Bayou Power Plant to cool its electricity making machines, Wednesday, Aug. 29, 2012, in Baytown. (Nick de la Torre / Houston Chronicle)

By Emily Pickrell

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As drought continues, Texans' thirst for electricity is drawing down supplies of the water needed to quench it.

And that has grid officials cracking down on power companies to make sure they're using supplies wisely during what could be prolonged dry conditions.

"We have just started requiring new generators to provide proof of water rights before we will include them in our planning models going forward," said Kent Saathoff, vice president of system planning and operations for the Electric Reliability Council of Texas, which operates most of the state's grid.

Under the month-old rule, proposals for new power plants must include proof that the generators have access and rights to the water they need, in order to be included in plans for future transmission lines.

The Electric Reliability Council doesn't issue plant permits - the Texas Commission on Environment Quality has that authority - but as a practical matter power plants can't connect to the state's transmission network if they're not included in the council's grid planning.

The council also requires existing plants to submit estimates on the amount of electricity they can generate each season - and available water in a continuing drought can be a critical part of this calculation.

Water serves two purposes in most power production: Providing steam to turn generator turbines, whether boilers are fueled by natural gas, coal or nuclear reaction, and cooling down the steam afterward. (Wind and solar generation typically are less dependent on water.)

8 percent evaporates

Texas power plants used about 450,000 acre-feet of water to cool their plants in 2010, according to the Texas Water Development Board. About 90 percent came from Texas lakes and streams, with the rest drawn from groundwater. The average family uses about one-half to one acre-foot of water a year, according to the Texas Comptroller's Office.

Eight percent of the water used in power plants evaporates during the process, but most is cycled through and returned to its source.

That doesn't mean supplies are inexhaustible.

"We look at water at each plant on a daily basis," said John Ragan, executive vice president of the Gulf Coast for NRG Energy, second only to Luminant in the amount of power it generates in Texas.

"We follow it up with a monthly review to assess any long-term water issues, make sure that all our assumptions are still accurate and that we will have sufficient water to keep our plants generating power for Texas."



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Cedar Bayou Power Plant has a permit to draw water from Cedar Bayou. The brackish water is used to cool the plants machines and is pumped underground to the plant, Wednesday, Aug. 29, 2012, in Baytown. (Nick de la Torre / Houston Chronicle)

Dry-cooling technology

The Limestone plant was built in the 1970s, and uses cooling towers and a closed looped system, an older technology that loses more water to evaporation.

"Limestone was built in an era when we weren't as concerned about water usage as we are today," said plant manager Gary Mechler. "It is a limited resource and we have to use it well," he said.

Water considerations are driving technology decisions for new plants as well.

When NRG added an additional unit to its gas-fired Cedar Bayou plant in 2009, it took advantage of a newer technology called combined cycle that improves the unit's overall efficiency and also uses 66 percent less water.

Combined cycle plants capture hot exhaust from power generation, and use that heat to create steam that turns an additional turbine.

In 2011, developers of the White Stallion Energy Center coal plant in Matagorda County changed its design to incorporate dry-cooling technology, after learning it would be difficult to procure water needed to run the plant from the Lower Colorado River Authority.

While other problems have delayed construction of the White Stallion plant, another proposed clean coal gasification plant near Odessa also plans to use dry-cooling for its system. If successful, it will be the first dry-cooling power plant in the state.

Dry-cooling technology cuts down on the amount of water used, but the reduction comes at a cost. White Stallion, for example, estimated that it would pay an additional \$70 million in capital costs to add dry-cooling technology.

And it doesn't work as well.

"Dry cooling has the downside of being less efficient in transferring heat," said Judith Herschell, president of Herschell Environmental, an industrial water engineering company. "If you burned your hand, you would put it under water. The same kind of heat transfer works much better through cold liquid than through air."

This is especially true in hotter climates - areas where the drought is the most persistent.

"You have to design it for your worst-case day," Herschell said. "The design will be oversized for the winter months, but in the summer months you are not getting much efficiency."

State officials declared at the end of December that Texas will extend emergency drought measures, signaling a view that the dry spell may be a long haul.

Extended drought conditions could force the retirement of some existing power generation and limit where new plants are built, according to a recent study by the grid operator.

In midsummer 2011, NRG Energy considered shutting down one of the units at its coal-fired Limestone Plant in Jewett, about 70 miles east of Waco, because of dangerously low water levels at its reservoir, Lake Limestone.

Rain came just in time, but the company has developed contingency plans for worsening drought, including drilling additional groundwater wells, buying water rights, or shutting down one of the plant's two generation units.



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Water used to cool Cedar Bayou Power Plant machinery in Baytown is kept in holding basins. A unit has been added there that uses 66 percent less water.