

Steam-Electric Water Demand Projections Methodology for the 2026 Regional and 2027 State Water Plans

Methodology Summary

The draft steam-electric power water demand projections for each region-county were developed based upon:

- 1) The highest single-year county water use from within the most recent five years of data for steam-electric power water users from the annual water use survey (WUS),
- 2) Near-term additions and retirements of generating facilities, and
- 3) Holding the projected water demand volume constant through 2080.

Draft projections (decades 2030 through 2080) for each region-county are provided to the Regional Water Planning Groups (RWPGs), and the RWPGs may request alterations to the draft projections, subject to adequate documentation, justification, and EA approval per guidance in *Exhibit C: General Guidelines for Development of the 2026 Regional Water Plans*.

Key changes from the previous planning cycle's projection methodology: None

Historical Steam-Electric Power Water Use

The TWDB conducts an annual WUS of power-generating facilities throughout the state to estimate the volume of water *consumed* for generating steam-electric power. The water use volumes in the water planning process include volumes consumed by operable power generation facilities that sell power on the open market and also exclude facilities which the RWPGs have requested to be included with manufacturing estimates. The water use estimates are composed of the reported intake volume of self-supplied groundwater, water purchased from a provider, and/or water withdrawn from a surface water source and not returned to the source. The volume of water withdrawn from a surface water source and not returned is referred to as consumptive use. Additionally, reuse volumes, such as treated effluent, were included in the historical water use intake estimates and water demand projections. Any water sales from the surveyed facility to other entities are subtracted from the intake volume.

If any known power generation facility was not surveyed in the TWDB's annual WUS, then that facility's water use was obtained from the operator or estimated using average water use per kilowatt-hour output for the associated fuel-type and added to the historical highest water use for that county.

Facility Review

The U.S. Energy Information Administration (EIA) releases an annual database called EIA-860, which includes data about power generating facilities and infrastructure across the nation. Each year, TWDB staff review data from the EIA-860 tables for new operational facilities meeting the specifications for a WUS.

In preparation for the water demand projections for the 2027 State Water Plan (SWP), staff thoroughly reviewed attribute data for steam-electric facilities, including location and NAICS classification, developed a list of active facilities to be included in the projections, and identified any facilities scheduled to come online within the planning horizon. Staff also acquired a list of facilities included in the 2022 SWP steam-electric power water demand projections, along with revision comments from the RWPGs. All facilities from the 2019 EIA-860 database, 2022 SWP projections, and any additional power generating facilities reporting use to the WUS between 2015-2019, were compiled and reviewed for inclusion in the draft water use baseline.

Some facilities were removed from the baseline estimates based on the following criteria:

- Facilities with confirmed retirement: any facility which was listed as retired in the 2019 EIA-860 database **and** reporting 0 use to the WUS by 2019.
- Manufacturing power facilities: facilities which were confirmed to have water use in a manufacturing survey or which the RWPG requested to be removed from 2022 SWP projections.

Near-term (2030) Draft Projection Methodology

Region-county baseline estimates were established using water use data from the final facility list created. Historical water use for 2015-2019 from the WUS for each facility was then aggregated by county and region. The highest year for each region-county was considered as the baseline water use. If a facility within the county retired between 2015-2019, then the baseline was re-estimated as the highest year for non-retired facilities.

For the near-term projected decade (2030), proposed or existing, *non-surveyed* facilities identified in the EIA-860 reports or from other sources, staff estimated the anticipated annual water use based upon their fuel type, generation capacity, average water use per fuel type, and average operational time. For proposed facilities, the estimated water use was added to the corresponding online decade. The average water use per kilowatt hour assumed for those soon to be online facilities was based on water demand factors presented in the TWDB contracted study “Evaluation of Water Projection Methodologies & Options for Agency Consideration” (Table 1).¹ The average percentage of operation time for near-term future facilities is based upon the historical equivalent forced outage rates (Table 2), noted in a year 2016 study funded by the TWDB.² Data within that study was based upon historical reports from the Electric Reliability Council of Texas (ERCOT).

Table 1 Water use factors by fuel type in Texas, 2010

Fuel Type^a	Facility Count	Net Generation (TWh^b)	Volume Consumed (kaf^c)	Gallons per KWh^d
Coal	38	150.7	248.4	0.53
Natural Gas	65	109.3	94.7	0.28
Nuclear	4	41.3	59	0.46

¹ “Evaluation of Water Projection Methodologies & Options for Agency Consideration”, CDM Smith, TWDB Contract 1600011921, Table 4-7, page 4-20

² Evaluation of Water Demand Projection Methodologies & Options for Agency Consideration, CDM Smith in conjunction with the University of Texas, Bureau of Economic Geology, 2016, page 4-20, Table 4-7.

^aIncludes steam turbine and combined cycle generator technology and once-through and tower cooling systems. Cogeneration is not included in this analysis.

^bTerawatt hour

^cThousand acre-feet of water

^dKilowatt hour

Table 2 Average percentage of operation time for near-term future facilities

Fuel and Generation Types	Average Percentage of Operation Time
Coal Steam Turbine	70%
Natural Gas Combined Cycle	59%
Natural Gas Steam Turbine	14%
Natural Gas Turbine	7%
Nuclear	85%

Long-term (2040 - 2080) Draft Projection Methodology

The baseline steam-electric power water demand projections include the highest region-county water use in the most recent five years of data plus the anticipated water use of new facilities as described above. Projections for the 2030-decade account for expected new facility construction for facilities proposed to come online between 2020 and 2030. For decades 2040 and beyond, the draft water demand projections are held constant at their year 2030 levels through 2080.

Major Assumptions

Such constant projections for planning purposes are considered reasonable for the following reasons:

- 1) Basing projections on the highest power generation water use of the most recent five years of data ensures that we are planning for water use that has already occurred in the recent past.
- 2) To model a projection of steam-electric power water use would require the inclusion of a multitude of potential water-use drivers – each with an individual probability of occurring and level of impact – including, but not limited to the following: the facility replacement schedule, anticipation of generation efficiency and cooling systems, carbon capture activities, cost of various fuels and federal environmental/regulatory policies. Such an effort is resource prohibitive and, due to many assumptions regarding uncertain future outcomes and events that would be required, would not guarantee results in water use estimates that are demonstrably more probable than those generated by the methodology used.
- 3) The projected general increase in wind and solar generation capacity off-sets the necessity to run water-consuming power facilities and may thereby not increase the overall amount of water required to meet future power demands.
- 4) While water-consuming coal, oil, and natural gas facilities will still be required in the future, any such facilities replacing an older facility are expected to be more water efficient, either using less

water or producing more power with a similar volume of water that had already been required at the same facility site.

- 5) Any assumed increase in water demand from fossil fuel facilities between 2040 and 2080 would require a distribution of additional water use to the county level. Based on discussions with power generating company contacts, distributing to the county-level is a difficult exercise, as the locations of new facilities not listed in governmental reports cannot be identified or otherwise predicted. To distribute anticipated additional water use to counties with existing facilities will result in over-projections in most counties and under-projection in others.
- 6) The steam-electric power water demand projections will be updated with each planning cycle with the most recent data.

In order to address changes in the power generation industry and any changes in water use patterns, the draft steam-electric power water demands are re-estimated as part of each 5-year planning cycle. As with any methodology applied statewide, there may be specific cases for which for which modifications to this general methodology are warranted. In such cases, TWDB staff may adjust the methodology as necessary while being consistent with the original intent.

Key Data Sources

Links to the key data sources in developing the projections:

1. Historical water use (county):

https://www3.twdb.texas.gov/apps/reports/WU_REP/SumFinal_CountyReportWithReuse

2. 2021 RWP Projections (county):

https://www3.twdb.texas.gov/apps/reports/Projections/2022%20Reports/demand_county

3. U.S. Energy Information Administration Form EIA-860:

<https://www.eia.gov/electricity/data/eia860/>