GW Ranch and the Water Challenge of Ultra-Scale Power in West Texas

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Pacifico Energy's GW Ranch represents a new class of ultra-scale, privately operated power generation campuses emerging alongside the rapid expansion of hyperscale data centers. Planned for Pecos County, Texas, the project is being promoted by its developer as the largest power project in U.S. history, with up to 7.65 gigawatts (GW) of natural-gas-fired generation permitted under a single air authorization—the largest such permit ever issued in the country.

GW Ranch does not stand alone. Texas has become the epicenter of a national gas-generation buildout driven by data center demand. Recent announcements include Fermi America's 6-GW permit application and Chevron's planned 5-GW data-center-oriented facility in West Texas. In aggregate, gas-fired power projects currently under development in Texas total approximately 58 GW, exceeding the peak electricity demand of the state of California. Roughly half of this new capacity is intended to serve data centers, and nearly one-third of all new gas power plants under development nationwide are located in Texas.

Scale of Energy and Fuel Demand

At nameplate capacity, GW Ranch would be permitted to emit up to 33 million metric tons of carbon dioxide annually. If operated at high utilization, such a facility could consume between 1 and 2 billion cubic feet of natural gas per day, equivalent to approximately 4–7% of total daily natural gas production in the Permian Basin.

The project is designed as a private-grid energy campus, delivering power directly to large customers—primarily hyperscale data centers—without interconnection to the public grid. The site encompasses more than 8,000 acres of build-ready land, with major permits completed and gas turbines reportedly secured. From a project execution standpoint, the scale, speed, and level of integration place GW Ranch among the most ambitious energy infrastructure developments currently underway in North America.

Water Use at Gigawatt Scale

While fuel supply and emissions have received significant attention, cooling water requirements represent a critical but less visible constraint—particularly in arid regions such as West Texas. For a conventional wet-cooled natural-gas combined-cycle (NGCC) plant, cooling towers typically consume on the order of 200–300

gallons of water per megawatt-hour (MWh) generated. Assuming a 70% capacity factor, a 7.65-GW facility would generate approximately 46.9 million MWh annually. At that production level:

- Total water withdrawals could exceed 130 billion gallons per year
- Consumptive losses (primarily evaporation) would range from 9 to 14 billion gallons annually

At this magnitude, water availability becomes a first-order project risk rather than a secondary operational detail.

Cooling System Tradeoffs

Wet cooling systems offer clear thermodynamic advantages. By achieving lower condenser temperatures, they maximize steam-cycle efficiency and minimize heat-rate penalties. During cool or moderate ambient conditions, wet- and air-cooled systems deliver comparable performance. However, during hot afternoons and heat waves, when electrical demand is highest, air-cooled condensers can impose capacity derates of 5–10% or more.

Wet cooling also tends to carry lower capital cost per megawatt and requires smaller condenser surface areas. These advantages must be weighed against the requirement for long-term water rights, complex permitting, and exposure to drought risk. For multi-billion-dollar power investments with multi-decade lifespans, water security is increasingly a financing and bankability issue, not merely an environmental consideration.

Given these conditions, it is likely that GW Ranch would employ a hybrid cooling configuration, combining predominantly air-cooled systems with limited wet-cooling augmentation during peak temperature periods.

Water Availability in Pecos County

Freshwater availability in Pecos County is highly constrained. Municipal supplies lack the capacity to support industrial cooling demand at this scale, and freshwater aquifers are largely allocated to existing agricultural and municipal uses. As a result, freshwater sources are not realistic options for large-scale power cooling in this region.

In contrast, West Texas overlies extensive brackish groundwater resources, and the State of Texas actively encourages industrial and power-sector use of non-potable water sources to preserve freshwater supplies. Even with dry or hybrid cooling, GW Ranch would still require water for:

- Boiler feedwater for steam generation
- Cooling system makeup (for any wet components)
- Dust suppression and site services

This makes brackish groundwater treatment a central enabling technology for the project.

Brackish Water Treatment and Water Recovery

Brackish groundwater generally requires desalination prior to use, and once desalinated, high levels of water recovery and reuse are economically and operationally advantageous. One emerging approach involves the use of Vibratory Shear Enhanced Processing (VSEP) membrane systems. Unlike conventional spiral-wound reverse osmosis systems, VSEP employs mechanically induced membrane vibration, which suppresses scaling and fouling at the membrane surface. This allows operation at significantly higher recoveries, often without extensive pretreatment.

In power-generation applications, this capability has two important implications:

1. Efficient production of high-quality boiler feedwater from brackish sources
2. Treatment and reuse of cooling-tower blowdown, enabling a substantial portion of that stream to be returned to the cooling system rather than discharged

By closing this internal water loop, advanced membrane systems can materially reduce total raw-water intake, lowering both operating costs and long-term water-availability risk.

Balancing Efficiency, Cost, and Water Risk

At the scale of GW Ranch, technical decisions around cooling and water treatment directly influence project economics, reliability, and bankability. Wet-cooled systems offer higher efficiency and lower capital cost but introduce significant exposure to water scarcity. Dry-cooled systems eliminate most water risk but impose performance penalties during high-value operating periods. Hybrid systems, supported by high-recovery brackish water treatment, offer a middle path: preserving flexibility while minimizing long-term water exposure.

As Texas continues to host an increasing share of global data-center power demand, water management strategies will become as decisive as fuel supply or emissions control in determining which mega-projects ultimately succeed.

About New Logic Research

New Logic Research has been a trusted provider of advanced membrane filtration systems for more than 38 years. Its VSEP® technology is deployed worldwide across power generation, mining, and industrial water and wastewater applications, enabling high-recovery treatment of challenging feedwaters.

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