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Water, Water Everywhere: Maximizing Oil Field Produced Water Use in West Texas

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Texas has an opportunity to continue as the leader in oil and gas production for decades to come. To do so, industry and the state must manage and productively use the significant volume of water that gets produced along with the oil and gas.

Permian oil and gas production is vital to U. S. transportation and power generation. Each day the Permian Basin produces about **6 million barrels of oil** (~ 45% of U.S. supply) daily, which industry refines to produce gasoline, diesel, jet fuel and myriad other products.

The basin also produces about **26 billion cubic feet of natural gas** (~ 22% of U.S. supply), which industry processes for industrial, residential, commercial and transportation use. In addition, natural gas has become the backbone of Texas power generation and is increasingly being called on for “behind the meter” electricity generation for **data centers**.

Associated with oil and gas, each day the Permian basin produces over **20 million barrels of salty water!** North Dakota, Oklahoma, Appalachia and other regions also produce significant water along with oil or natural gas. In Texas, industry reuses what it can, then transports and disposes the remainder into deep or shallow rock formations, which changes subsurface pressure conditions and can induce earthquakes.

A decade ago, as the State Geologist of Texas, I worked with the Texas Legislature, industry, and academics to create TexNet at the Bureau of Economic Geology (BEG). BEG maintains over **200 seismometers** tracking earthquakes across Texas and makes the data **publicly available**.

The Railroad Commission of Texas, which regulates oil and gas activity, uses TexNet to help mitigate earthquakes, while still allowing for production of oil and gas.

A similar program should be created for produced water. Rather than continue to reinject the water, industry would use **water desalination** (desal) technologies to clean up about half of the volume, creating hundreds of millions of gallons of fresh water daily. The remaining volume of salt water would help reduce earthquakes.

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Rather than dumping the cleaned-up water in the Pecos River, why not put it to beneficial use? What could benefit from that much fresh water in Texas? Data centers. But their demand would be easily satisfied.

Nonfood crops. Farmers grow hundreds of thousands of acres of cotton in nine counties less than 50 miles north of Permian oil and gas production. Cotton farmers currently use about 50% rainwater and 50% irrigation from the Ogallala, **the largest U.S. aquifer**. In Texas, **Ogallala recharge** rates—the natural process where surface water percolates down to replenish aquifers—are much lower than rates of withdrawal. Thus, the Ogallala in Texas is in decline and nearing depletion, which would mean the end of cotton in the Panhandle. Nothing would make China and Brazil, who are **competing with the U.S. in cotton**, happier.

Does the water math work? **Daily cotton irrigation volumes during the growing season** are greater than daily produced oilfield water in West Texas. In the off season, desalinated produced water could be stored in lined surface reservoirs. A second cotton growing season could even be possible. Produced water reuse would significantly reduce pressure on the Ogallala Aquifer and extend its productive life.

Does the dollar math work? Today, desal costs two to three times that of water disposal, owing to the energy and infrastructure required. But, as earthquakes continue to grow in frequency and magnitude—risking industry license to operate—produced water is being moved farther for disposal, resulting in increased costs.

By contrast, with economies of scale and technology improvements, the cost of desal will come down. Factoring in avoided seismic risk, regulatory certainty, long-term water supply stability, and public license for industry to operate, the economics make sense.

What is needed from each sector? Leadership.

State government could support farmers by helping with the cost of water. State regulators, like the Texas Commission on Environmental Quality (TCEQ), must accelerate water desal permitting approvals.

The Federal government could support testing of various desal technologies to accelerate water cleanup at scale; loans to build water pipelines from oil wells to cotton fields; and an independent testing lab to ensure water quality.

Industry, including oil and gas and tech, must desal produced water at scale, build water pipelines, and support water tracking to verify systemwide water volumes. This will gain public trust and provide regulatory integrity.

It is time for Texas leaders to come together to desalinate produced water; reduce disposed water volumes and earthquakes; sustain a cotton industry while providing relief to the Ogallala aquifer; sustain a public license for the oil and gas industry to operate; provide water data center development; and provide ongoing tax revenue to Texas from oil, cotton, and data centers.

Texas can lead the way with a practical energy-environment-economy win-win-win.

Dr. Scott W. Tinker was State Geologist of Texas for 24 years and is Professor Emeritus and Director Emeritus at UT Austin.

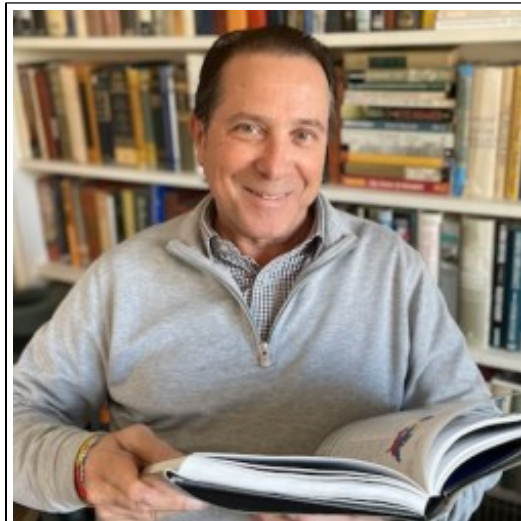
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