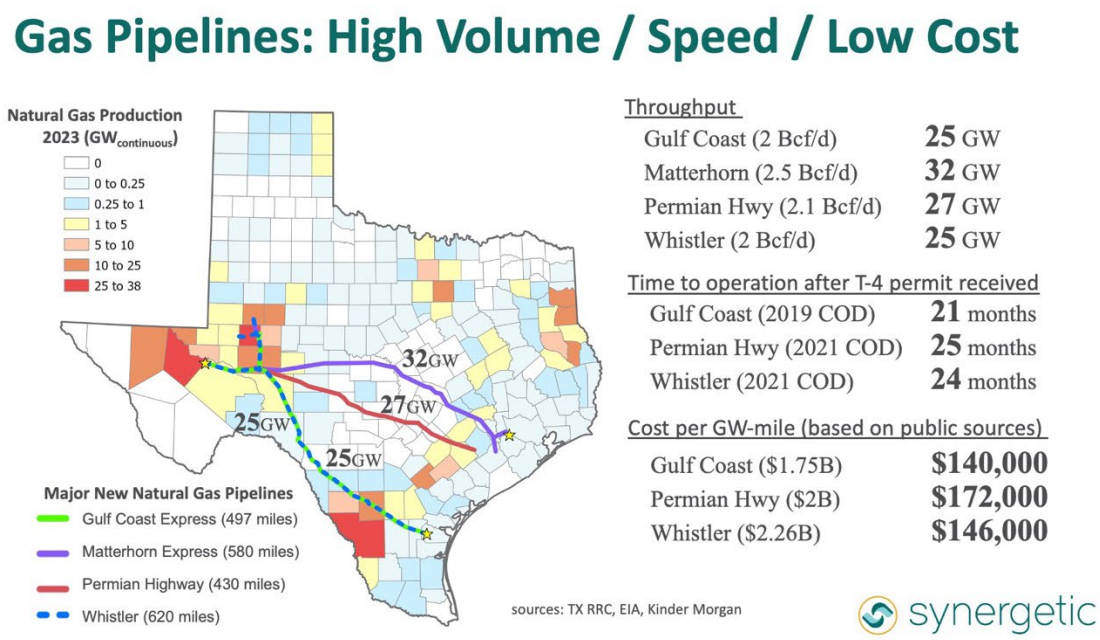
Synergetic's Hydrogen Summer School

Informational series on how America can maximize the benefits of IRA investments through 2036



#3 - New Pipelines -vs- New Wires? One is Bigger, Faster, Cheaper.

Texas, and America as a whole, both need new electric power lines as fast as they can be built. The problem is: *that's not very fast*.

SunZia, the nation's largest-ever non-hydro renewable energy project, includes a $3 billion HVDC line that can move 3 GW of electricity 550 miles, but by the time it enters service, it will have taken about 18 years from project inception. The CREZ proactive transmission buildout – a $7 billion investment that improved transfer of electric power across Texas by about 10 GW – entered service in 2014, a full 12 years after the PUCT held its first public meeting on the topic.

And these are electric transmission *success stories*.

Moving clean energy in the 21st century demands a broader set of solutions. Hydrogen pipelines can be an important new piece of that solution set, and they can be ready to contribute much faster than most people realize.

Texas is a triple lottery winner: best combined oil and gas production, best combined wind and solar, and best geology to store hydrogen in underground salt caverns. On top of those advantages, Texas may well have the best capabilities to build pipelines on planet Earth.

Since the U.S. lifted the oil export ban in December 2015, Texas has been building pipelines brick-on-the-accelerator fast. This timely infrastructure has enabled a massive scale up in oil and gas production

in West Texas and South Texas. **About 600 GW of new oil and gas pipelines have been added since 2015**,[i, ii] the vast majority connecting the Permian Basin in West Texas to refineries, ports and LNG-terminals on the Texas coast. This new hydrocarbon energy transfer capability is about 12 times the average electric demand of ERCOT (51 GW in 2023).

The map above features 4 of the new pipelines built to deliver natural gas across Texas. **Each pipeline moves at least 25 GW**, which is about 10 times more energy than the best-case capability of the largest 345 kV electric power lines used in ERCOT. Per unit of energy moved, pipeline price tags are about 1/10th of the cost of a new 345 line. Texas gas pipelines are reliably built within about 2 years of receiving their T-4 permit from the state's pipeline regulator, the Texas Railroad Commission. And if there was an Olympics for regulatory speed, the Texas RRC would be a favorite for the podium. The $2 billion Whistler pipeline permit was approved merely 17 days after submitting its request.

Hydrogen is much less dense than methane (natural gas), but by moving through the pipe faster, it can still achieve 88% of the energy throughput as a natural gas pipeline for a capital cost adder of about 10%. New dedicated hydrogen pipelines can reasonably be sized to move clean hydrogen affordably in increments of 10 to 20 GW.

Bigger, Faster, and Cheaper are things we could use more of in infrastructure to move clean energy.

And since wind and solar vary daily and seasonally with nature, an essential additional infrastructure need is high-volume, high-deliverability storage. For long-duration storage, salt caverns are vastly better than electric batteries, as the following comparison demonstrates with overkill.

The world's largest electric battery energy storage system is in California and stores a little over 3 GWh.[iii] While not trying to prove that everything is bigger in Texas, The Strategic Petroleum Reserve (SPR) facility at Bryan Mound, Texas stores more than 100,000 times as much energy – 411,000 GWh of crude oil.[iv, v, vi] If drained of oil and packed with hydrogen gas, the existing caverns at **Bryan Mound could store over 2,000 times more energy as hydrogen than the world's largest battery installation**.[vii, viii]

This week, the U.S. Treasury Dept. is hearing oral testimony on Section 48E energy storage incentives that apply to hydrogen storage in salt caverns. Synergetic joined others in recommending that investment tax credit incentives extend broadly to stimulate deployment of pipeline and storage infrastructure – a prerequisite to encourage formation of clean hydrogen demand in hard-to-electrify sectors like steel and cement.

On the home front in Texas, Synergetic recently filed comments with the PUCT encouraging that the planning of new Extremely High Voltage (EHV) electric power lines contemplate and coordinate with the symbiotic capabilities of faster-to-deploy hydrogen pipelines and storage.

Federal and State planners would serve their constituents well to heed the lessons of the Permian Basin. Massive new energy production requires massive new delivery infrastructure. Hydrogen pipelines and storage caverns will unlock vast economic development AND progress on climate goals. Applying oil and gas technology – pipelines and storage caverns – to the delivery of wind and solar is a breakthrough the world needs asap.

[i] https://www.eia.gov/naturalgas/pipelines/EIA-NaturalGasPipelineProjects.xlsx
[ii] https://www.eia.gov/petroleum/xls/EIA_LiqPipProject.xlsx
[iii] https://www.energy-storage.news/edwards-sanborn-california-solar-storage-project-world-largest-bess-battery-system-fully-online/
[iv] https://www.energy.gov/ceser/spr-quick-facts
[v] https://www.energy.gov/ceser/spr-storage-sites
[vi] https://www.eia.gov/energyexplained/units-and-calculators/energy-conversion-calculators.php
[vii] https://downloads.regulations.gov/IRS-2023-0054-0090/attachment_1.pdf
[viii] https://h2tools.org/hyarc/calculator-tools/hydrogen-heating-values-mass-basis