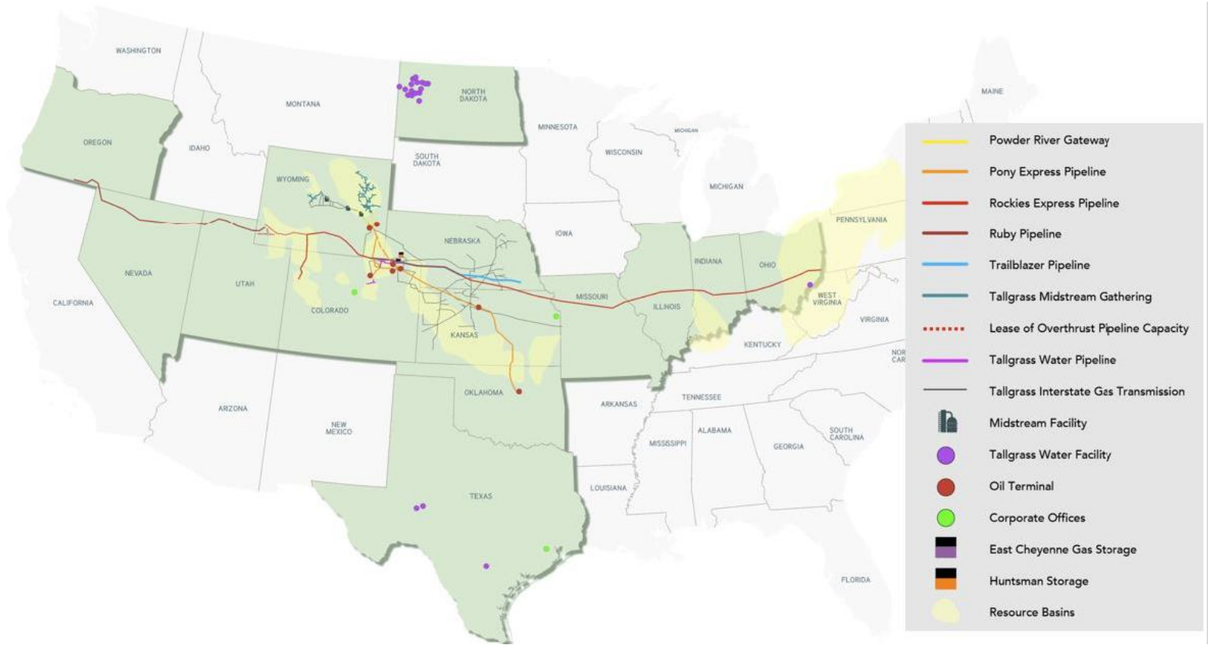
MIDSTREAM CASE STUDY

Tallgrass



The Opportunity

Pressure energy is wasted at over 4 million natural gas pressure letdown stations globally.

However, Sapphire Technologies' unique turboexpander generator technology can harness wasted pressure energy and convert it to clean electricity. Tallgrass, an industry leader with a vast natural gas pipeline network spanning nearly 7,000 miles in the US, has seized the opportunity to enhance their operations by working together with Sapphire Technologies. This collaboration will result in the largest deployment of turboexpander generators in the US, with up to 72 units set to offset a staggering 144,000 tons-CO_2e per year.

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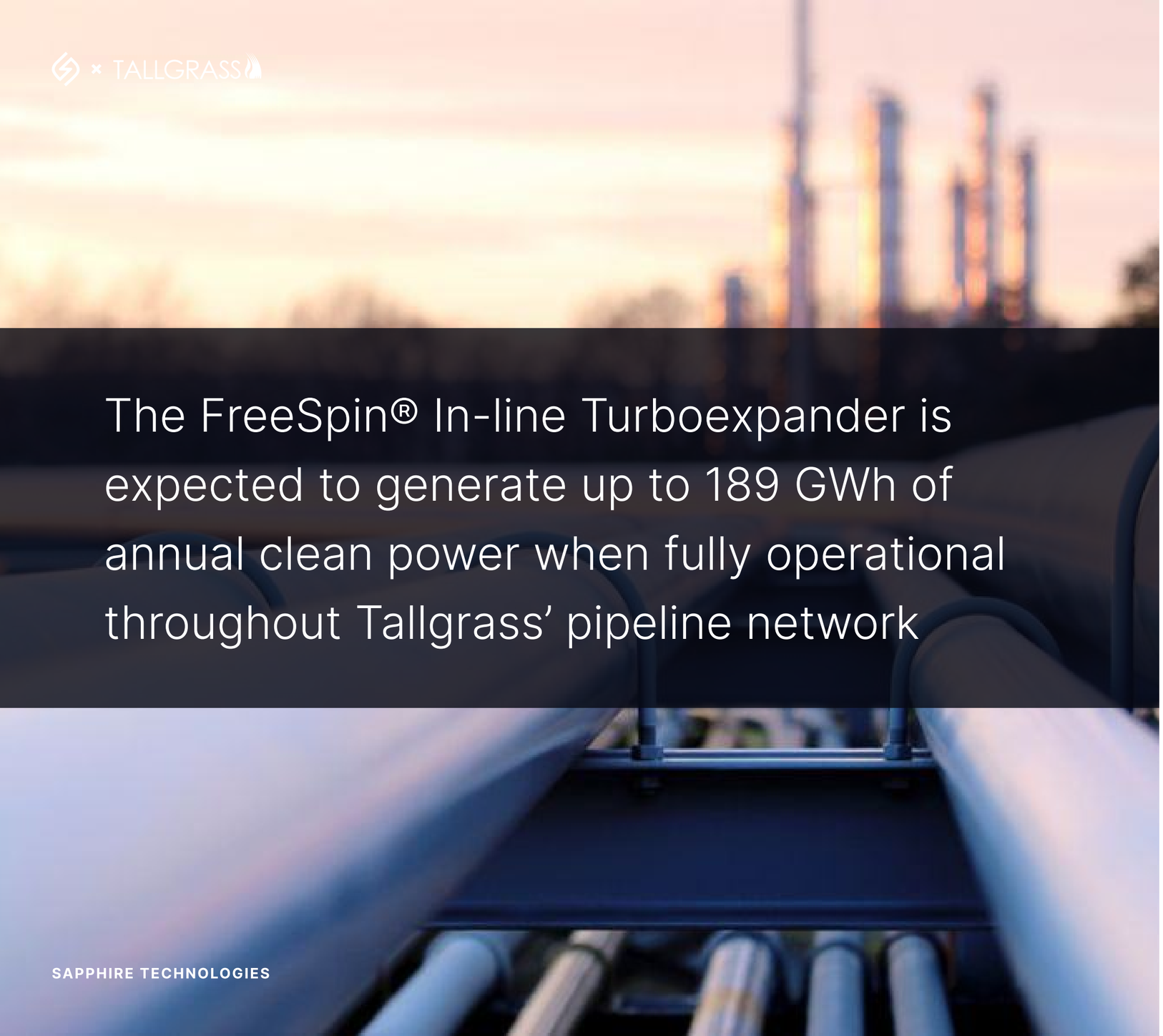

The FreeSpin® In-line Turboexpander is expected to generate up to 189 GWh of annual clean power when fully operational throughout Tallgrass' pipeline network

Goals

In their quest to harness wasted pressure energy and advance their goal of delivering decarbonized power to consumers, Tallgrass sought a technology that was both accessible and scalable within their pipeline infrastructure.

The collaboration with Sapphire Technologies was a strategic choice, as they opted to implement the FreeSpin® In-line Turboexpander (FIT) - a clean energy solution that offers a low capital expenditure and operating costs.

The Technology

The Technology

The FIT uses advanced magnetic technologies to efficiently capture the energy lost in pressure reduction. These turboexpander-generators extract kinetic and thermal energy from natural gas as it moves through the natural gas transmission network, enabling the generation of clean electricity with no added pollution.

The FIT system stands out for its standardized and compact design, enabling simple installation with minimal disruptions. This oil-less system and in-line architecture, which uses the process gas for stator cooling eliminates oil systems, generator cooling systems and dynamic seals, ensuring maintenance-free operation. These advancements enhance equipment reliability and reduce the overall cost of ownership, making the system suitable for large-scale deployment.

The Deployment

The current scope of this project is **up to 72 turboexpander units installed at 26 sites** across Tallgrass' natural gas pipeline network in the United States. The clean electricity generated will be monetized either by exporting to the utility grid or consumed locally at the site. One local use case is to power data centers.

Through a unique partnership with Evolve Energy, a leading critical infrastructure and data center service company, clean energy generated by Sapphire Technologies' FIT units will be consumed by Evolve Energy data centers. The data centers will be installed as close as possible to pressure letdown stations to minimize the need to run electric cables, further minimizing the infrastructure needed to utilize this clean energy source.

Projected Impact

The deployment of Sapphire Technologies' FreeSpin® In-line Turboexpander (FIT) throughout Tallgrass' pipeline network is expected to generate up to 189 GWh of annual clean power when fully operational, offsetting an equivalent of ~ 144,000 tons-CO2e per year.

This clean electricity produced from this network alone could support 26,058 homes' electricity use for one year or power 43,844 electric vehicles for one year based on average EV consumption.[1]

[1] https://evbox.com/en/ev-home-charger-electricity-usage

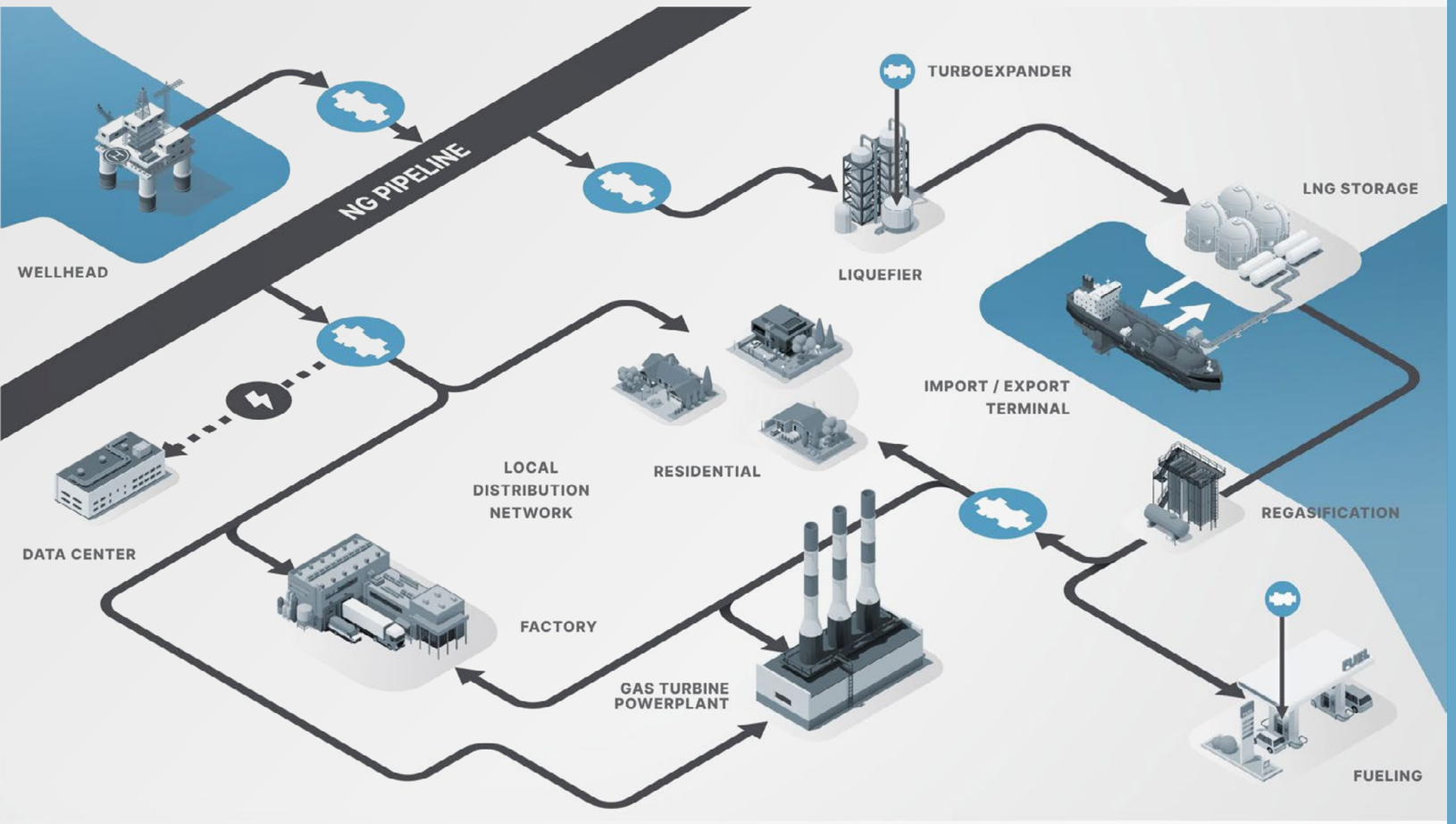

Image does not represent Tallgrass assets

Looking Ahead

If this technology were to be adopted on a global scale in midstream natural gas operations, it could generate enough clean energy to power *double the number of homes in the United States.*

Beyond midstream natural gas, FIT systems have applications spanning decarbonizing upstream wellheads, LNG regasification, refineries, and in future hydrogen and carbon pipelines.