

Long Ridge Energy Generation

Hydrogen Fuel Blending Project

Update to the PJM Emerging Technologies Forum

September 1st, 2021



Background

Long Ridge Energy Terminal

- Grosvenor Capital Management, Labor Impact Fund, L.P. (GCM)
- Fortress Transportation and Infrastructure Investors LLC (FTAI)

Long Ridge Activities

- Redeveloping the site of the former Ormet aluminum smelter in Hannibal, Ohio
- Constructing the 485 MW Long Ridge Energy combined cycle power plant w/ GE 7HA.02 1x1x1 power island and Kiewit EPC
- Integrated natural gas fuel supply
- Developing power sales and complementary site uses
- Proactive in creating value today and preserving future value

Zero Carbon Transition

- What would a zero-carbon future mean to the project and the site?
- Alignment of interests with our partners: General Electric and New Fortress Energy, plus Black & Veatch and Kiewit
- Hydrogen Press Release →
- Commercial goals



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Long Ridge Energy Terminal Partners with New Fortress Energy and GE to Transition Power Plant to Zero-Carbon Hydrogen

October 13, 2020

HANNIBAL, Ohio, Oct. 13, 2020 (GLOBE NEWSWIRE) -- Long Ridge Energy Terminal ("Long Ridge"), located in Hannibal, Ohio, announced plans to transition its 485 MW combined-cycle power plant to run on carbon-free hydrogen. In collaboration with New Fortress Energy ("NFE") and GE, Long Ridge intends to begin providing carbon-free power to customers as early as next year by blending hydrogen in the gas stream and transition the plant to be capable of burning 100% green hydrogen over the next decade.

With commercial operations planned for November 2021, Long Ridge will be the first purpose-built hydrogen-burning power plant in the United States and the first worldwide to blend hydrogen in a GE H-class gas turbine. The plant utilizes a GE 7HA.02 combustion turbine, which can burn between 15-20% hydrogen by volume in the gas stream initially, with the capability to transition to 100% hydrogen over time. Long Ridge has engaged Black & Veatch to assist with developing plans for the plant integration for hydrogen blending and to ensure safe and reliable industrial practices.

"We are thrilled to work with the Long Ridge and New Fortress Energy teams on this first-of-its kind GE HA-powered project that will drive a cleaner energy future by utilizing hydrogen to ultimately produce carbon-free power," said Scott Strazik, CEO of GE Gas Power. "As one of the leaders in decarbonization in the gas turbine industry and the OEM with the most fleet experience in using alternative low heating value fuels including hydrogen, we look forward to applying more than 80 years of experience to help Long Ridge achieve its goal of providing reliable, affordable, and lower-carbon power to its customers."

To support a green hydrogen transition, Long Ridge is teaming with NFE's new division, Zero, which is focused on investing in and deploying emerging hydrogen production technologies to meet zero emissions targets. NFE's Zero division will support Long Ridge's carbon-free power transition as it scales up novel technologies that can produce low-cost hydrogen.

"Long Ridge has many advantages in the pursuit of green hydrogen and zero-carbon power and this partnership allows us to get firsthand knowledge and experience blending hydrogen and natural gas in GE turbines," said Wes Edens, CEO and Chairman of New Fortress Energy. "Our singular focus has been to identify and support clean technologies that can eventually produce hydrogen at commercially attractive prices. As we continue to make progress in our efforts and advance proof of concept projects, this experience will bring tremendous value."

"As the cost of carbon free fuels continues to drop, the Long Ridge Energy Terminal is ideally positioned to become a leader in deploying utility-scale green hydrogen solutions and clean energy storage," said Joe Adams, CEO of Fortress Transportation and Infrastructure Investors LLC (NYSE:FTAI). Long Ridge is a subsidiary of FTAI.

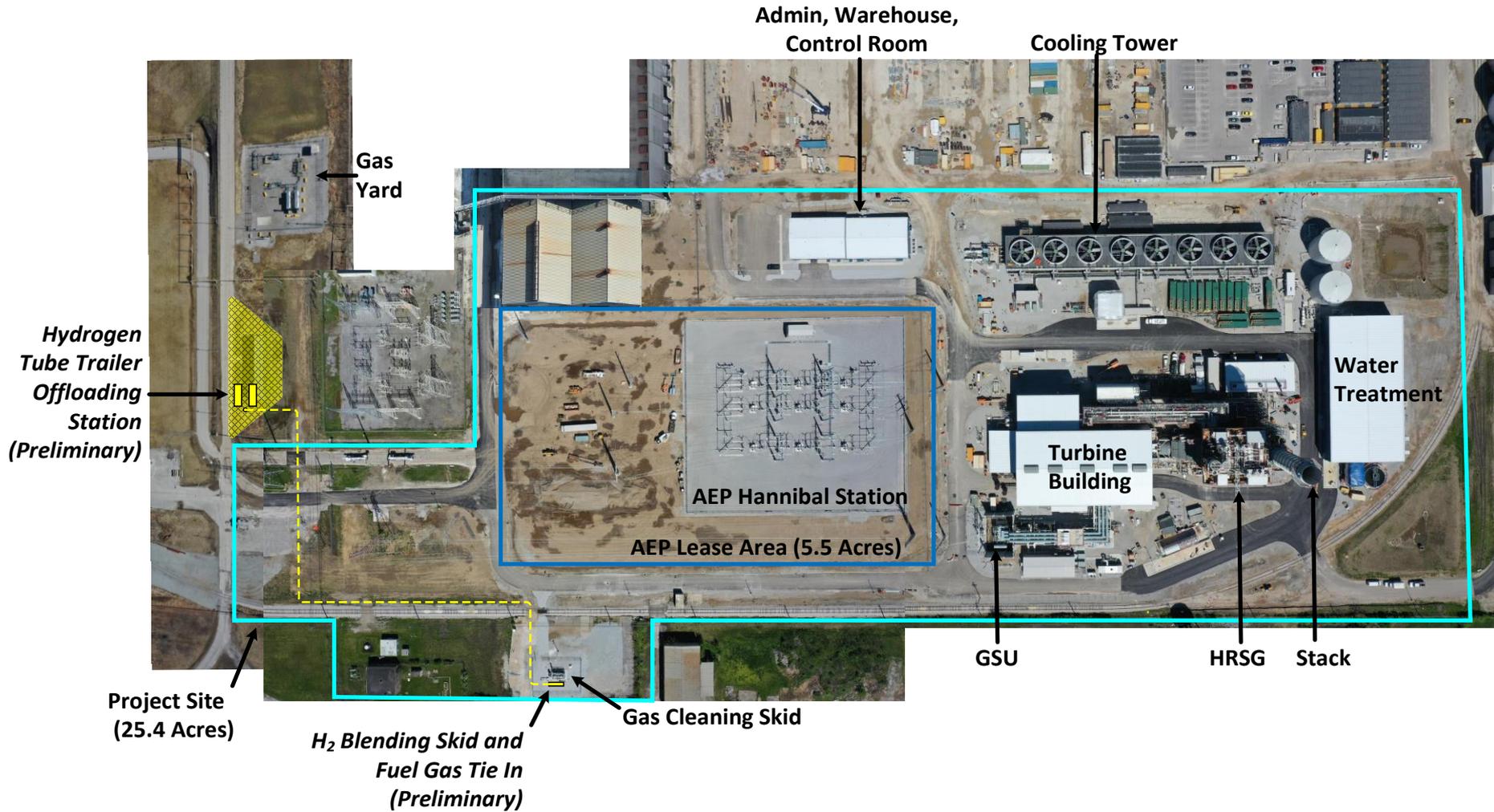
For initial testing of hydrogen blending, Long Ridge has access to nearby industrial byproduct hydrogen. For the production of green hydrogen with electrolysis, Long Ridge has access to water from the Ohio River. Over time, below ground salt formations can be used for large-scale hydrogen storage.



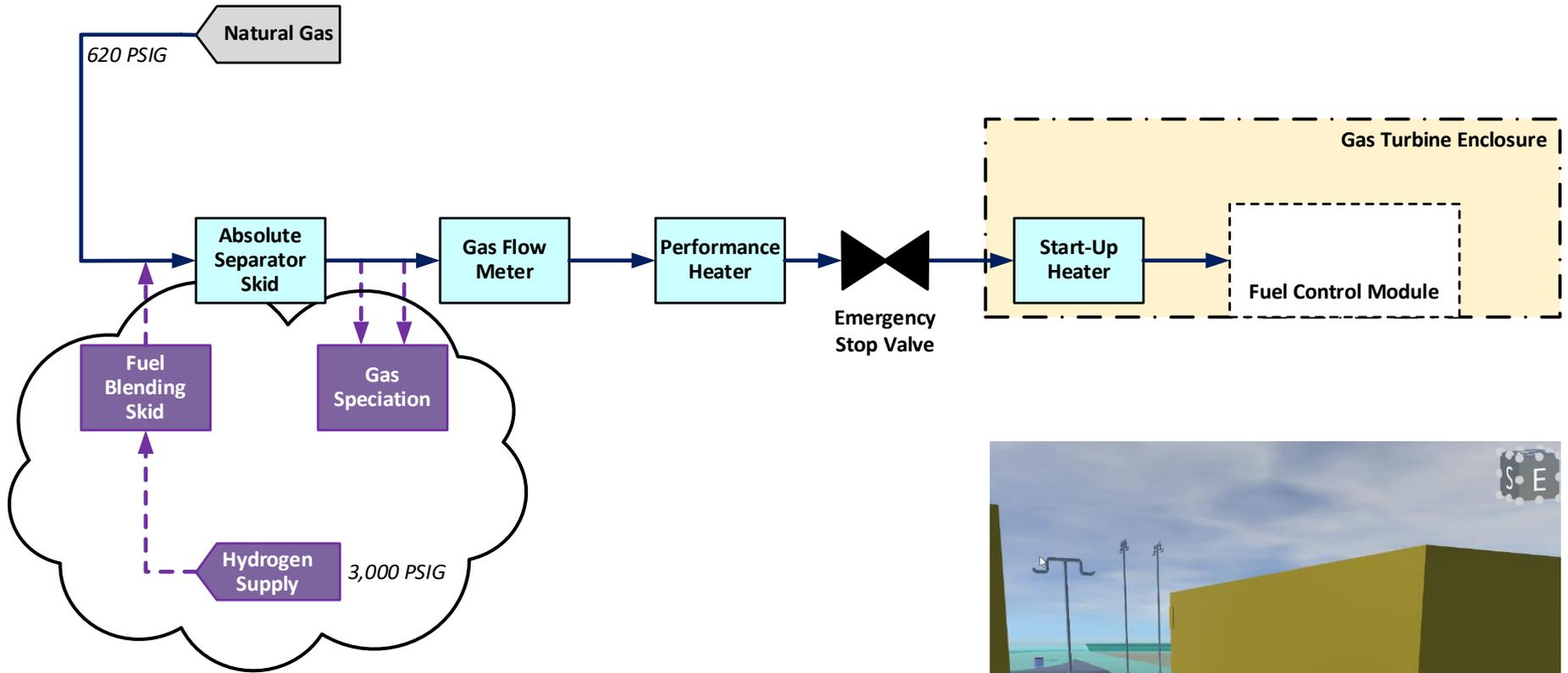
Long Ridge power plant under construction in Hannibal, Ohio. Photo courtesy of Kiewit.

With one of the most efficient power plants in the United States, Long Ridge continues to innovate by being among the first to provide reliable, resilient, and green power to its customers. "said Matthew Rubin, Managing Director at GCM Company, which owns a 49.9% partnership in Long Ridge. [Contact Us](#) | [Policies](#) | [Terms of Use](#)

Project Layout



CT Fuel Gas System Block Diagram



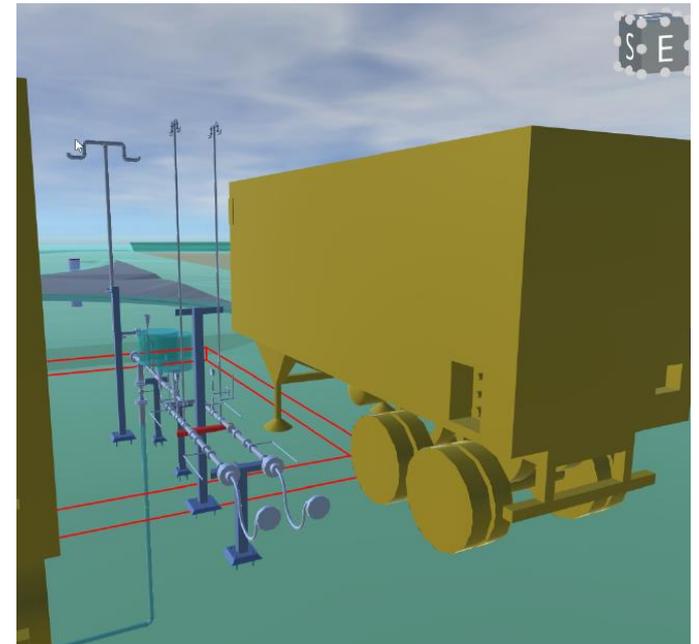
Hydrogen Blending Modifications

Hardware

- Offloading station
- pipeline
- Blending skid
- Real-time fuel analysis
- Tie-ins

Software

- DOR
- Systems integration
- Permitting
- DCS modifications
- Contract amendments



Project Implementation

Project Team

- Hydrogen working group: Long Ridge Energy Generation, Black & Veatch, GE, Kiewit EPC, Kiewit Services, NAES

Basis of Design

- No disruptions to the EPC for the 485 MW natural gas-fired Long Ridge Energy Generation Project
- Owners' commercial goals
- Divisions of responsibility
- Hydrogen supply and delivery
- Preliminary design framework
- Performance estimates for permitting
- Operational regime for hydrogen blending: 5% max H₂ (by volume), no blending below 60% minimum CT load
- Defining success

Implementation

- GE scope of supply, hardware design and procurement
- GE MarkVIe and DCS modifications, CEMS integration
- Joint Failure Modes and Effects Analysis
- Kiewit scope, design and physical integration
- Procurement of specialty and long lead time components
- EPC contracting and execution
- Startup and commissioning, performance tests
- Tracking required changes for next phase – 20% H₂ by volume

Operations/Asset Management/Owner

- Complete the ongoing natural gas-fired project and declare commercial operations
- Operating procedures
- Operating cost impacts, insurance
- Permit compliance and reporting, CAMD waivers
- Measure and analyze performance, feed learning into GE's technology development process and the planning for Phase II