



Wabash Valley Resources Hydrogen Project

DE-FE-0031994: Wabash Hydrogen Negative Emissions Technology Demonstration

Presentation for the NETL/GTI Clean Hydrogen Workshop – Sept 28, 2021



Wabash Valley Resources FEED Project Introduction

Wabash Valley Resources owns the Wabash Gasification Facility.

- Originally constructed in 1994. Commercially operated until 2016. Proven reliability and low-cost production of hydrogen-rich syngas.
- The plant is ideally situated, providing access to multiple energy markets including mobility markets for the important Midwest transportation corridor.
- The project is funded under DOE Cooperative Agreement FE0031994 for FEED Study completion, specifically focused on the integration of the existing Wabash assets with commercially proven technologies to achieve net-zero hydrogen production.



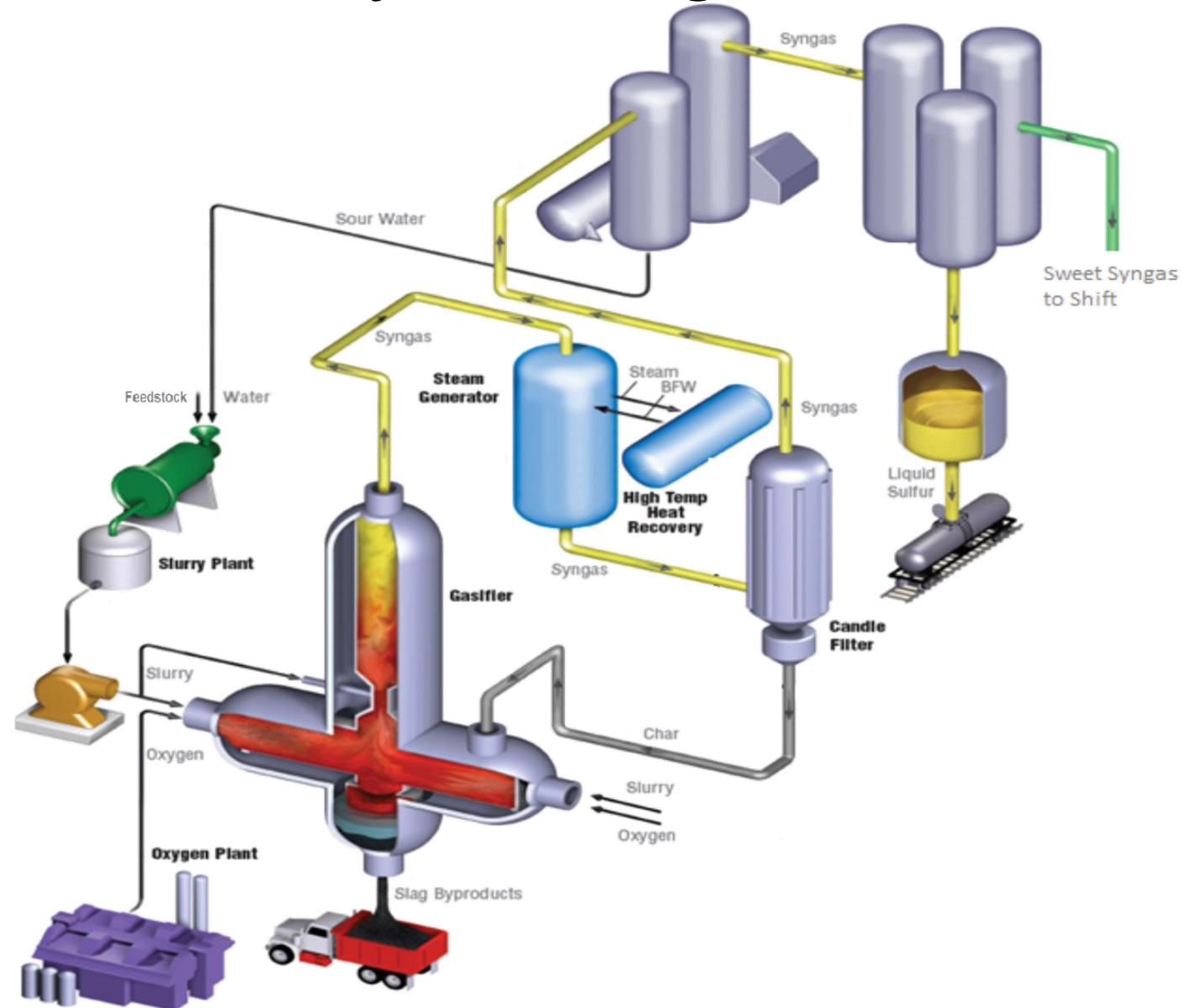
Wabash Valley Resources FEED Project Introduction

- WVR's team and partners will retrofit the facility to separate CO₂ for sequestration and maximize production of clean hydrogen for power generation or offtake opportunities.
 - Initial capacity of 14,000 kg/hour hydrogen production (over 100k tons per year)
 - Potential for approximately 290 gross megawatts clean electricity generation
- Biomass will be introduced and blended with traditional feedstocks to offset upstream and uncaptured carbon intensity impacts
 - Targeting 10-15% biomass feed (by energy).
- Previous research funded through the DOE CarbonSAFE program has identified local geology that is conducive to CO₂ sequestration by the project. WVR's UIC Class VI permitting is in progress.

Wabash Valley Resources FEED Project Configuration

Existing Facilities

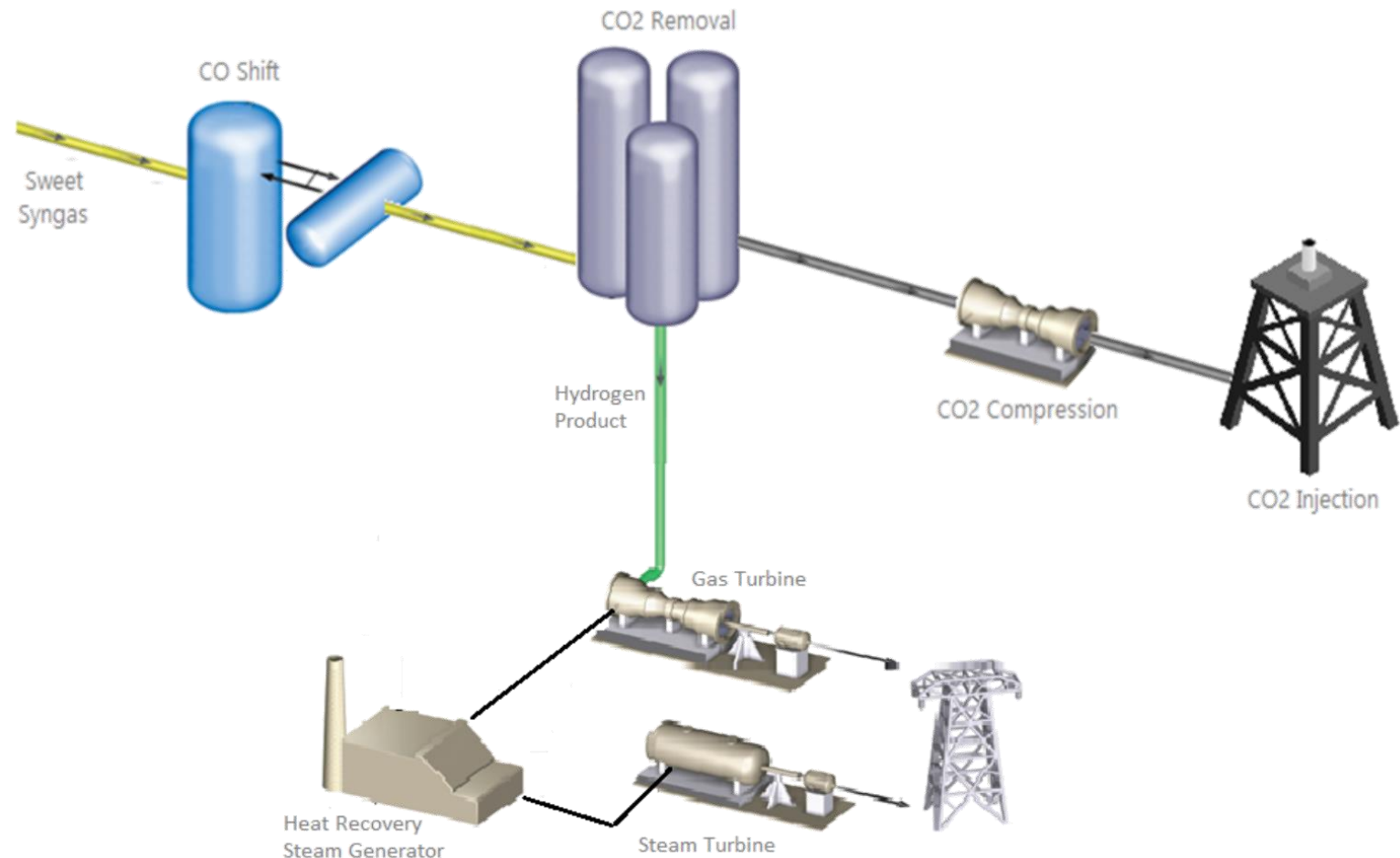
- 2,000 tpd Oxygen plant
- Proven E-Gas gasification process
- Efficient heat recovery and particulate removal
- Typical amine-based sulfur removal
- Typical 3-stage sulfur recovery plant with tail gas recycle.



Wabash Valley Resources FEED Project Configuration

New Facilities

- Water-Gas shift reactors with heat recovery
- Efficient syngas dehydration and fractionation of CO₂
- CO₂ sequestration infrastructure
- PSA purification
- Hydrogen gas turbine combined cycle
- Hydrogen offtake processes as opportunity is identified



Unique Characteristics of the WVR Hydrogen Project

- Large and commercially proven gasification plant, with reduced CAPEX due to retrofit of existing facility.
- Local geology (Illinois Basin) that can support industrial scale sequestration of CO₂.
- Self-supply of clean electricity
 - Avoids need to procure clean electricity
 - Ensures goal of net-zero hydrogen production
- Flexibility to shift or divert hydrogen during peak/non-peak electricity demand – clean electricity dispatchability

Challenges of Net-Zero Hydrogen via Gasification

- Lack of available market for clean hydrogen produced at industrial scale in most areas – WVR is managing this concern by combusting hydrogen to power with a full-size power block.
Long-term offtakes for hydrogen are expected to occur from the site, but the project’s initial investment requires full-scale power block that ultimately may not be fully utilized.
- Uncertain market for potential low-cost corn stover biomass supply (or other “energy crops”).
WVR is working to determine the suitability of corn stover utilizing typical pretreatment techniques of torrefaction and pyrolysis. Logistics are also anticipated to be challenging.
- Carbon sequestration project development time and expenses. It is time consuming and expensive to establish the necessary data to support an EPA UIC Class VI permit application.
WVR’s project was supported with grant from the DOE CarbonSAFE program between 2018-2021. EPA’s application approval process is anticipated to be 12 months.
- State and local support for sequestration development activities – including economic development support and lawmaking.

Critical Research Areas to Enable Net-Zero Hydrogen via Gasification

- Biomass pretreatment and blending research
Upgrading the fuel value and eliminating variability of biomass feedstock is necessary to achieve an efficient and reliable gasification facility
- Higher efficiency and higher availability gasification technologies
Continue to develop gasification technologies – specifically entrained flow gasifiers – which are efficient, cost-effective, and reliable.
- Longer term incentives to produce clean hydrogen.
Present incentives, including many proposed incentives for clean hydrogen production, are a short term. WVR's project works from an investment case prospective mainly because it is a lower cost retrofit to an existing proven production facility. However, a greenfield project likely needs a longer horizon of support to be economically justified.



THANK YOU

