BRIGHTLOOP HYDROGEN WITH CCS
(NEIL SIMPSON SITE)

Developer / Lead: Black Hills Energy + Babcock & Wilcox

Location: Campbell County, WY

Status Category: Permitted / Under Development

Prepared By: Carbon Solutions

OVERVIEW

BrightLoop Hydrogen with CCS is a project underway at Black Hills Energy's Neil Simpson Complex in Campbell County. It aims to produce blue hydrogen using chemical looping technology (BrightLoop™) applied to coal or mixed feedstocks. The process is designed to generate high-purity hydrogen while producing a nearly pure CO_2 stream for capture and sequestration (or beneficial use). Current work is focused on engineering, permitting, and development; construction or demonstration facility plans are under evaluation.

OBJECTIVES

- Develop and permit a hydrogen generation facility using BrightLoop technology with carbon capture and storage, targeting daily hydrogen production of ~15 tons.
- Produce clean hydrogen in a way that isolates CO_2 emissions from fossil / coal feedstocks via chemical looping, enabling lower carbon intensity operations.
- Secure regulatory approvals and engineering design sufficient to begin demonstration or pilot scale operation.
- Evaluate feedstock flexibility (coal, biomass, waste) for the chemical looping process and assess integration with existing plant infrastructure.
- Establish CO_2 capture, compression, and transport/sequestration pathways, possibly linked with regional storage hubs or pipelines, to handle the CO_2 produced.

GEOLOGY & DESIGN

Because this is a hydrogen / capture facility rather than a storage hub itself, geology pertains primarily to the location of the CO_2 sequestration path. The design anticipates capture of CO_2 at high concentration, enabling easier compression and transport. Potential sequestration options include regional Class VI approved hubs or pipelines, or on-site or nearby underground storage if suitable formations are identified. The facility will integrate with Neil Simpson's existing infrastructure to the extent possible to reduce cost and leverage coal supply and plant utilities.

TIMELINE / MILESTONES

May 2023: Black Hills Energy received grant from WEA to explore clean hydrogen generation using coal with BrightLoop technology.
Jan 2024: Awarded $16 million by WEA for permitting, engineering, and project development.
2023-2024: Completion of feasibility study / techno-economic evaluation including alternative feedstocks and design parameters.
2024-2025: Engineering and permitting underway; detailed design activities being scoped.
By late 2025 / early 2026 (projected): Expected milestone for decision-go-no-go and possible pilot or demonstration facility initiation.

KEY FACTS

- Wyoming Energy Authority awarded a $16 million grant in January 2024 to Black Hills Energy + Babcock & Wilcox for permitting, engineering, and development of the project.
- The facility is proposed for the Neil Simpson Complex in Gillette, adjacent to Black Hills' existing coal infrastructure.
- BrightLoop is a chemical looping process that uses regenerable particles to produce hydrogen and generate a nearly pure CO_2 stream.
- The targeted hydrogen output is ~15 tons per day under initial planned scale.
- Feedstock sources under evaluation include PRB coal, possibly biomass or mixed solid fuels.
- The project is in a feasibility/pre-development stage; no public announcement yet of construction start as of Sept 2025.

TRANSPORT & SOURCE CONCEPT

Feedstock supply is expected to be PRB coal, possibly complemented by biomass or other solid fuels. Hydrogen production via BrightLoop will generate a CO_2-rich stream, which is expected to be compressed on-site. Transport of CO_2 may use pipelines or tie into regional sequestration hubs, pending geological suitability and regulatory approvals. Integration with the existing Neil Simpson Complex infrastructure (coal mine mouth location, power plant utilities) is intended to reduce development and operational costs.