



COAL GENERATION TO HYDROGEN GENERATION: A NEW TREND?

In 2015, the Nebraska Public Power District (NPPD) announced plans to replace an existing coal-fired boiler (Unit 2) at its Sheldon Station plant in Hallam, Nebraska, with a boiler that uses clean-burning hydrogen fuel.

Hydrogen has been burned to create electricity on a small scale in the past, such as in refineries, but not anything approaching the magnitude of the NPPD project.

The Sheldon Station power plant has been running on coal since the 1960s, and, for the time being, NPPD plans to continue to have Unit 1 run on coal.

The Unit 2 project is anticipated to be “the first large-scale utility operation to generate electricity through the use of hydrogen,” said Pat Pope, President and CEO of NPPD. “NPPD takes pride in having the opportunity to lead the way.”

By using hydrogen as a fuel, the Sheldon Station boiler will continue to be capable of generating 125 megawatts of electricity for customers.

Environmental Issues

Because the hydrogen fuel will produce no greenhouse gas emissions, the project is expected to reduce carbon dioxide emissions at the plant by 1.1 million tons per year.

The boiler conversion “is also expected to result in a dramatic reduction in other types of air emissions, as well as aid in NPPD’s maintaining service as a low-cost energy producer for Nebraskans,” the utility said in a statement.

The project is expected to increase NPPD’s total carbon-free generation to 46 percent (much of which is nuclear generation), making NPPD one of the lowest carbon-free footprints in the region.

NPPD has already met with the Nebraska Department of Environmental Quality and the Environmental Protection Agency, both of which have reacted favorably to the project.

Hydrogen Source

The hydrogen will be produced by a company called Monolith Materials, which plans to build a carbon black manufacturing facility on NPPD’s property adjacent to the Sheldon Station plant.

Monolith Materials is a Redwood City, California, manufacturing company that produces hydrogen as a byproduct of its production of cleanly-made carbon black.

Monolith will power its new manufacturing facility with electricity from the Norris Public Power District, which is headquartered in Beatrice, Nebraska.

Carbon black, which is basically pure carbon powder, is a material that is used to add black color to tires, printing inks, rubber, plastics, batteries, and other products.

Monolith Materials will use a patented and environmentally-friendly process to manufacture the carbon black. The company will use electricity to extract the carbon from a feedstock of natural gas, instead of from the traditional sources of oil or coal tar.

Byproducts of the natural gas process are hydrogen and water. Monolith will sell the hydrogen that is produced in its process to NPPD as fuel, and the hydrogen will be piped to Unit 2 and used to produce baseload power.

“Monolith plans to bring a cleaner process to a carbon black plant for the first time in the United States, which will help our country grow this important industry and expand America’s manufacturing economy,” said Robert Hanson, co-founder and chief commercial officer of Monolith.

Monolith is breaking ground for the manufacturing facility this year. Once the plant is operational, it will flare the waste hydrogen off until the new unit at the Sheldon powerhouse has been installed and is ready to operate. NPPD and Monolith both expect the project to be completed in 2019.

The initiative is not dependent on federal government grants or loan guarantees. Instead, innovative technology, affordable electricity, and the nation’s vast supply of low-cost natural gas allow for the production of the products at market-competitive prices.

“This is an example of the next-generation of American innovation and energy production that will also have a positive economic impact in Nebraska, and deliver clean and affordable energy to the state,” said Pete Ricketts, governor of Nebraska.



John Ham, P.E.,
Manager Substation Engineering
913-601-3977
j.ham@fecinc.com

John Ham has more than 18 years of electrical engineering experience. His key focus at Finley is to provide advanced services and work with smart grid technologies. Specialties include electrical engineering, substation automation, distribution automation, and SCADA systems.

Additional experience includes design management and functional design testing of substations, engineering service and proposal project management, program and construction management, NERC transmission and distribution, substation compliance and overall project management and supervision of professional staff.