

Neil Simpson Unit II Duel Fuel Project



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Summary

The Neil Simpson Unit II dual fuel (natural gas and coal) project is a modification to the existing 90-megawatt coal-fired Neil Simpson Unit II unit, located in Gillette, Wyoming. Neil Simpson Unit II is adjacent and connected to its twin, Wygen Unit I. This dual fuel project consisted of modifications to the steam generator (boiler) burners located in the Neil Simpson Unit II steam generator building.

New natural gas piping, natural gas heater, and natural gas pressure reducing station were installed at the existing gas yard located on the site. At the Neil Simpson Unit steam generator building, natural gas piping was routed internally to each of the boiler's burners.



Aerial view of Gillette Energy Complex.

Project Detail Scope of work

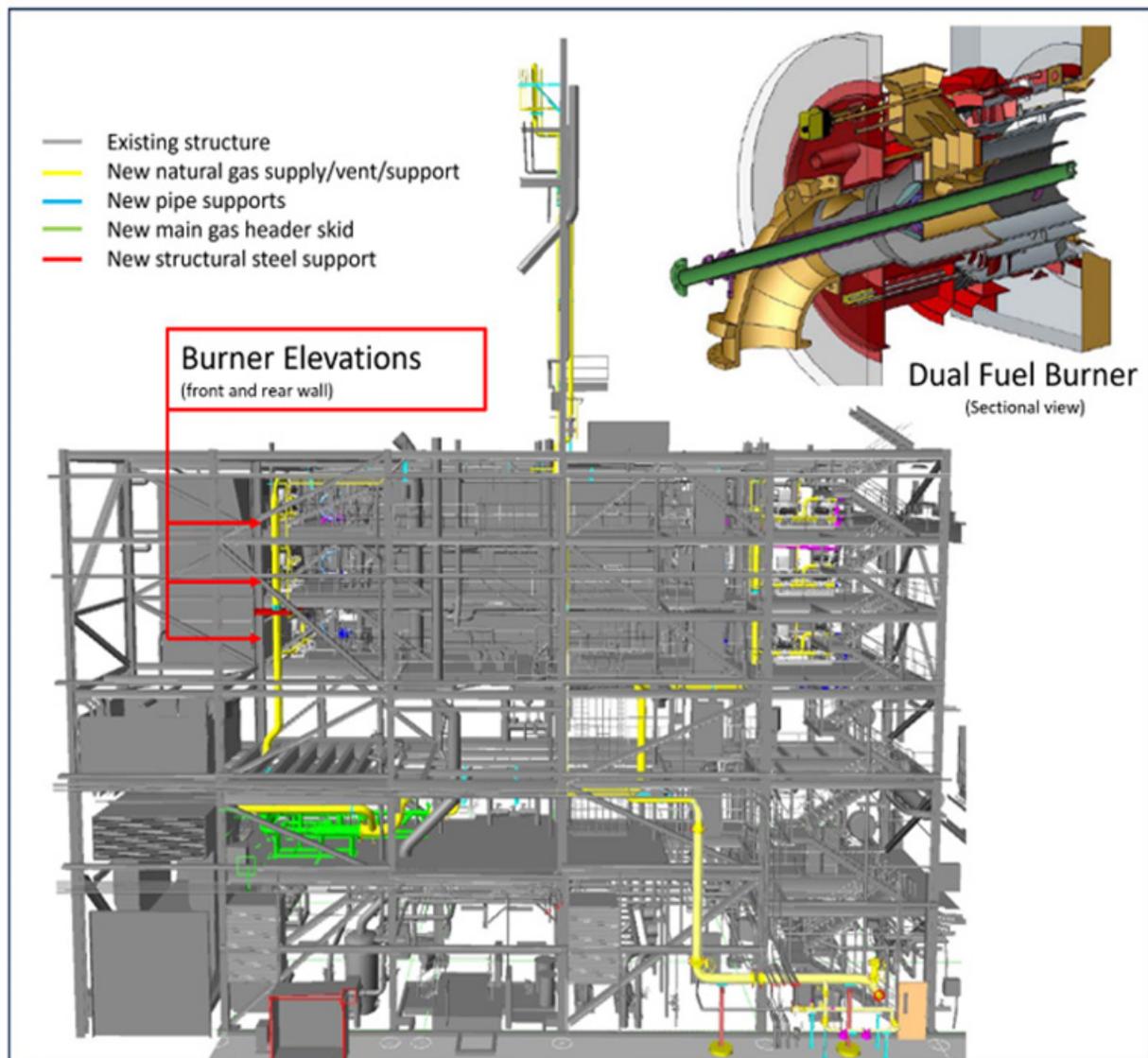
The scope of work to complete the dual fuel modifications required removing and installing 12 new dual fuel burners to the Neil Simpson Unit II boiler. These new burners also required modifications to the natural gas piping system.

The Neil Simpson Unit II dual fuel modification consists of the following:

- 12 ultra-low NOx AireJet burners modified with the addition of Natural Gas Super Spuds. These Super Spuds will be designed and installed to support the maximum burner performance while minimizing emissions produced from combustion. While the burner is firing coal, the Super Spud is retracted, and no gas firing occurs in that burner. So, these burners are therefore equipped with actuators and controlled by the distributed control system burner management system.
- 12 flame scanners upgraded to tri-color scanner heads to enable the detection of both natural gas and coal firing flames.
- A new high pressure regulating/reducing skid installed at the gas yard at the Gillette Energy Complex will be added to properly supply the correct pressure of the natural gas flow to the burners.
- A new natural gas heater will be added to compensate for the Joule-Thomson effect of cooling that happens when a gas expands; installed at the gas yard.
- Gas piping will be added to the burner elevations and burner low-pressure control skids.
- The Burner Management System will be updated to incorporate control logic for the combustion of coal, natural gas or combinations thereof.
- The dual fuel project design will follow applicable governing codes including National Fire Protection Association (NFPA) Standard 85 and Factory Mutual Codes for safe operation.

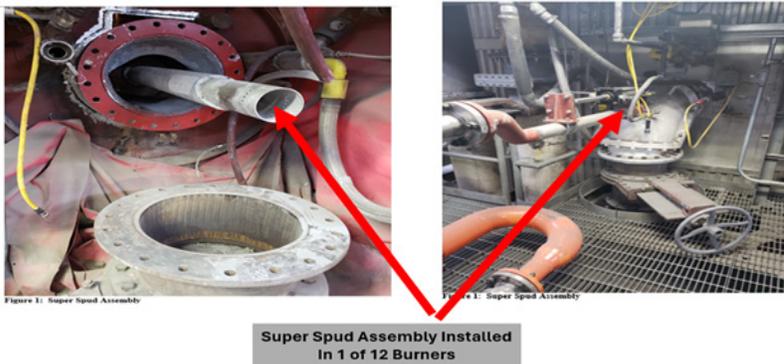
Project Detail Scope of work (continued)

Neil Simpson Unit II is a 90 MW Carolina type radiant boiler with pendant primary and secondary superheater banks with an economizer downpass. Designed to fire pulverized Powder River Basin (PRB) coal, the boiler is a balanced draft unit. Equipped with 12 low nitric oxide (NOx) AireJet burners, on three elevations of the steam generator building, front and rear walls (i.e. opposed fired). The boiler was designed for a main steam flow of 778,000 lb/hr at 1005°F and 1620 psig. This prior design performance will be maintained with the dual fuel modification. The addition of natural gas burners has been designed to maintain the performance of the unit. The image below is the Neil Simpson Unit II boiler from the ground floor to the 210' elevation, looking North. The gray colored material is existing equipment and structural steel. The other colors are the gas firing system modifications. Also in the upper right corner is a sectional view of a dual fuel burner with the required modifications for natural gas combustion. The green- and purple-colored materials are the required modifications for the additional piping routed to each burner.



Project Detail Scope of work (continued)

The natural gas system modifications include carbon steel gas supply piping connected at the ground floor elevation to supply gas to the burner gas supply skid located on the second elevation of the Neil Simpson Unit II steam generator building. From the burner gas supply skid, steel piping is routed to each of the 12 dual fuel burners. The super spud installed in a burner is shown as follows:



Natural gas is supplied to the power plant from gas supply yard as shown in yellow in the picture below:



Project Performance Benefits

With the dual fuel modifications, the Neil Simpson Unit II will provide 90 MW to serve its current customer load and ensure sufficient generating resources for reliability but with enhanced performance benefits. Post 2025, when the dual fuel conversion was placed in service, customers will realize additional savings from the Western Energy Imbalance Service (“WEIS”) market Black Hills Power joined in April 2023 and the soon to be joined Western Imbalance Energy Market (“WEIM”) in May 2026. These savings are realized as a result of the additional turn down dispatchability from 55 MW minimum firing on coal to 25 MW minimum firing with natural gas. The performance benefits improve Neil Simpson Unit II’s dispatchability with lower turn down while improving the reliability of the unit by adding multi-fuel resiliency. Benefits of adding a natural gas option on a coal unit allows for the ability to utilize either coal or natural gas and doubles the resiliency of the power generation unit providing reliability for customers. The proposed project further benefits compliance with other potential future environmental emissions requirements.