

FINAL REPORT

MAY 2015

for

SPIRITWOOD ENERGY POWER PLANT PROJECT

NDIC Contract No. FY07-LVIII-149

Submitted by:



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Introduction

Great River Energy (GRE), Cargill, Inc. (Cargill), and the Newman Group (Newman) originally partnered to develop the Spiritwood Energy Power Plant (SWS), as part of the Spiritwood Industrial Park. In addition to electric power production, low pressure steam produced by SWS as a by-product of power generation was to be purchased by Newman and Cargill to provide process heat for Spirit Ethanol and a 30 percent expansion of the Cargill facility. It is the low cost of this energy source that was to allow Newman and Cargill to make development and expansion of their facilities economically feasible. The original ethanol plant portion of the project was cancelled by Newman and GRE spent several years actively pursuing replacement steam hosts for that portion of the project. In 2014 GRE was successful in finding an additional steam host in addition to the Cargill facility which is Dakota Spirit Ag-Energy (DSA). DSA is an ethanol plant located directly west of SWS.

Construction of the SWS and more recently DSA has provided a direct economic impact in eastern North Dakota by providing hundreds of construction jobs. SWS currently has 24 full time employees providing operations and maintenance functions for the power plant.

SWS achieved commercial operation on November 1, 2014 and has been providing low pressure steam to the Cargill facility. SWS has generated over 100,000 MWh of energy into the MISO market and delivered over 450,000 pounds of steam to Cargill since the plant achieved commercial operation.

DSA is expected to be in commercial operation in the second quarter of 2015 at which time SWS will be supplying low pressure steam, treated water and electric services for ethanol production.

The SWS project construction was completed in the fall of 2013 but was not placed into commercial operation due to low MISO energy prices at that time. Subsequently with the addition of DSA as an additional steam host the economics of operating SWS improved and starting in early 2014 the plant was re-commissioned and placed into commercial operation on November 1, 2014. This is different than what was originally presented to the NDIC in the summer of 2006. Multiple changes to the plant configuration, costs and business structure have occurred since that original funding request; however the intent and purpose of the project is unchanged. SWS began construction in the third quarter of 2007, and is currently in commercial operation. SWS is utilizing Dryfine™ fuel enhancement process of North Dakota lignite from Coal Creek Station to provide steam to Cargill Malt, DSA and supply electricity into the MISO market and provide 24 new jobs for the Stutsman County area, all to the benefit of North Dakota.

SWS is also the first power generating facility to be fired with Dryfine™ fuel enhancement process of North Dakota lignite as the design fuel. The GRE and related steam host relationships allows for the expanded use of lignite coal in North Dakota, the innovative use of Dryfine™ fuel enhancement process of lignite coal, and the introduction of lignite-driven power production in the eastern half of North Dakota.

The North Dakota Industrial Commission (NDIC) in recognition of the above attributes of SWS funded a portion of the development of the project in an amount of \$2,000,000 at their July 2006 meeting.

Accomplishments to Date

Business Structure and Financing

The current business model for the Spiritwood Station is for GRE to have 100% ownership of the facility. Cargill did supply a portion of the project costs. Cargill and DSA receive steam from GRE at rates that were jointly negotiated between both parties. GRE receives condensate returned from Cargill and DSA and the remainder of heat is rejected in conventional cooling towers. Other commodity exchanges such

as water, wastewater, and fire suppression water have similar exchange or sales agreements. GRE owns and operates SWS as a part of its generation fleet.

Cost Estimate

The final cost of the various projects comprising the construction and commissioning of SWS until commercial operation was achieved on November 1, 2014 was greater than \$400 million dollars.

Design Basis

The plant design basis has remained essentially unchanged since GRE submitted the first report to the NDIC in April of 2007. Spiritwood Station will provide 62MW of base load electricity and 37MW of peaking capability along with supply of steam to Cargill and DSA.

The Spiritwood Station is comprised of a Dryfine™ fuel enhancement process of North Dakota lignite-utilizing a new circulating fluidized bed (CFB) boiler supplied by Babcock and Wilcox, a single automatic extraction condensing steam turbine generator (STG) supplied by Siemens, with the capability of being used in peaking conditions for approximately 1,500 hours annually. This peaking capability is obtained through the use of a packaged boiler system, installed to provide steam to Cargill and DSA during times when the Spiritwood Station CFB boiler is unavailable or utilized to provide steam to Cargill and DSA during peak system demand and passing all of the steam generated in the Spiritwood Station CFB boiler through the steam turbine. The plant will furnish process steam to Cargill and DSA, while producing reliable, low-cost power delivered to the market.

Summary

SWS achieved commercial operation on November 1, 2014 and has been providing low pressure steam to the Cargill facility and to DSA beginning in the second quarter of 2015. SWS has generated over

100,000 MWh of energy into the MISO market and delivered over 450,000 pounds of steam to Cargill since the plant achieved commercial operation.

If you would like to visit and tour SWS in operation please let us know. GRE appreciates the support of the NDIC in making SWS possible.