Rebuttal Testimony
Gregory L. Ford

Before the Minnesota Public Utilities Commission
State of North Dakota

In the Matter of the Petition of Northern States Power Company d/b/a Xcel Energy for Approval of Competitive Resource Acquisition Proposal and Certificate of Need

Docket No. E002/CN-12-1240
Exhibit___(GLF-2)

CT Generation Response and Selective Catalytic Reduction Testimony

October 18, 2013

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I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND TITLE.

A. My name is Gregory L. Ford. I am Director of Engineering, Design, and Document Services in the Energy Supply Engineering and Construction Department.

Q. HAVE YOU PREVIOUSLY PROVIDED TESTIMONY IN THIS PROCEEDING?

A. Yes, I filed direct testimony discussing the design, operation and maintenance, and construction costs and schedules for the Company's proposed addition of three 215 MW natural gas-fired, simple-cycle, combustion turbine generators to its system at its Black Dog location in Burnsville, Minnesota, and a new generating plant to be located near the Red River Valley by Hankinson, North Dakota.

Q. WHAT IS THE PURPOSE OF YOUR REBUTTAL TESTIMONY?

A. I address the testimony of Calpine witness Paul Hibbard regarding the responsiveness of combustion turbine (CT) generation versus combined cycle (CC) generation with respect to load-following. In addition, I address Mr. Hibbard's testimony about the purported need for Selective Catalytic Reduction (SCR) for the Company's three proposed CT generators.

II. CT GENERATION RESPONSE

Q. WHAT WAS MR. HIBBARD'S TESTIMONY WITH RESPECT TO CT GENERATION AND LOAD FOLLOWING?

A. In his direct testimony, at pages 27-28, Mr. Hibbard provided testimony on

the ability of both CT and CC generation to address expected variation in load that occurs over several hours or more, and sudden system events for which recovery is needed in tens of minutes or hours. For purposes of load following, however, Mr. Hibbard testified that CC generation could address net load variation in a matter of minutes and tens of minutes, while the CT generation proposed in this proceeding by Invenergy and the Company may require more advance notice time.

Q. WHAT DOES LOAD FOLLOWING REFER TO?

A. Load following refers to the adjustment of the generation levels of the system's coal and gas fired units to match the variations in the system's load that occur on a minute-by-minute basis. Many of these units are equipped with automatic generation controls (AGC) to facilitate the quickest response by generation units to meet system load shifts.

Q. DO YOU AGREE WITH MR. HIBBARD REGARDING THE ABILITY OF CC GENERATION TO MORE QUICKLY RESPOND THAN CT GENERATION FOR PURPOSES OF LOAD FOLLOWING?

A. If the CC unit is already on line and at operating load, it would generally have a wider operating range and a potentially faster ramp rate available than a large frame CT. However, the current F Class CT technology being considered for Black Dog Unit 6 and Red River Valley Units 1 and 2 – the GE 7FA Series 5 and the Siemens 5000F.05 – has a 50 to 100 percent load operating range with a high ramp rate, and an 8 to 10 minute cold start to minimum load capability. Older F Class models, on the other hand, have a 30-minute start time from cold, have a smaller operating range while meeting emissions limits, and have slower ramp rates within the operating range. All of these traits make older

models less capable of supporting system changes in load.

A CC facility such as proposed by Calpine will have a significantly slower start time than the current F Class CTs proposed for Black Dog 6 and Red River Valley 1 and 2. The combustion turbine start time for Calpine will be on the order of 30 minutes, based on CT cold start criteria, but will be slowed in achieving operational levels by the requirements to bring the Heat Recovery Steam Generator (HRSG) up to temperature and pressure, and to match the steam temperatures and pressures with the other unit, assuming the other unit is already on line.

III. SELECTIVE CATALYTIC REDUCTION

Q. WHAT IS YOUR RESPONSE TO MR. HIBBARD'S ADJUSTMENT OF THE COSTS OF THE CT GENERATION PROPOSALS IN THIS PROCEEDING TO INCLUDE SELECTIVE CATALYTIC REDUCTION?

A. The addition of SCR to our proposed CTs is wholly unnecessary because these units will meet all applicable environmental standards. As proposed, Black Dog 6 and Red River Valley 1 and 2 meet the current NOx Best Available Control Technology (BACT) emission requirements for peaking or CT units of 9 ppm under normal operating conditions, not including startup, shutdown, or upset conditions. We have also completed a permitting analysis that demonstrates Black Dog 6 and Red River Valley 1 and 2 will comply with the more recent rules of the National Ambient Air Quality Standards (NAAQS) that place restrictions on emissions from a plant site on an hourly basis. These rules apply to all modes of operation, including the start up/shut down period when CT and CC emissions are significantly higher than during

normal operation. Adding Unit 6 to the Black Dog plant upon the retirement of Units 3 and 4 will result in an overall reduction of plant site emissions from historical levels.

Q. WHAT IS YOUR RESPONSE TO MR. HIBBARD'S CONTENTION AT PAGES 29-30 OF HIS DIRECT TESTIMONY THAT THE $15 MILLION OF SCR TECHNOLOGY COSTS NEED TO BE ADDED TO EACH CT PROPOSAL SO THAT CALPINE IS NOT PUNISHED FOR BEING A MORE EXPENSIVE GENERATION PROPOSAL THAT RESULTS IN LOWER EMISSIONS?

A. As Mr. Wishart explains in his rebuttal testimony addressing this proposed adjustment, the relative value of a unit that costs more to build and maintain but results in less emissions is fully captured by Strategist's analysis of the avoided costs associated with the unit's lower emissions. What concerns me about Mr. Hibbard's contention is the implication that the operation of Calpine's CC facility will necessarily result in significantly lower emissions over time than the operation of a CT. This is not the case.

As I noted, current permitting criteria for a CT in Minnesota and North Dakota under BACT is 9 ppm for NOx, while it is 4.5 ppm or even lower for a CC unit. But with CCs commonly operating at a capacity factor that is four times higher than the capacity factor for CTs (20 percent versus 5 percent), a CC unit will emit double the NOx emissions on an annual basis than a CT.

In addition, all CTs – whether operating alone or in a CC configuration – have significantly higher NOx and CO emissions during the startup period, and to a smaller extent during shut down. The quick start CTs that we are proposing have a shorter time period from first fire to minimum environmental

compliance than the older models of F Class CTs, and thus will have less total emissions for each start. The CT emissions for a CC plant during startup are also high because SCR cannot be put into service until the gas temperature in the Heat Recovery Steam Generator gets high enough for the ammonia and catalyst to work effectively. Startup emissions are a significant portion of the annual totals for a CT even in CC mode.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes, it does.