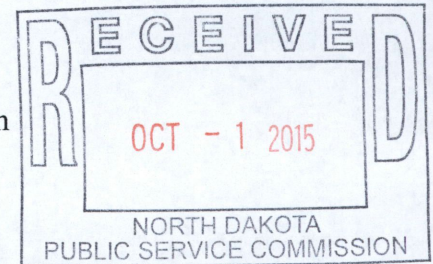


Before the North Dakota Public Service Commission  
State of North Dakota



In the Matter of Northern States Power  
Company's Advance Determination of  
Prudence for its 345 MW Power Purchase  
Agreement with Mankato Energy Center II,  
LLC

Case No. PU-15-96

**TESTIMONY OF TODD THORNTON**  
**Sr. Vice President – Origination and Development**  
**Calpine Corporation**

**1. Would you please state your name, business address, and occupation?**

My name is Todd Thornton. My business address is 717 Texas Avenue, Houston, Texas 77002. I am Senior Vice President for Origination and Development for Calpine Corporation ("Calpine").

**2. Please describe your background and experience at Calpine.**

I joined Calpine in October 2000 and have held positions of increasing responsibility within the organization, including being named Vice President of Finance in 2007 and Treasurer in 2009. I was named Vice President of Commercial Development in 2013 to lead Calpine's development of electric generation resources throughout the U.S. and Canada and was promoted to Senior Vice President for Origination and Development in 2014. I earned a Bachelor of Science degree in Finance from Northern Illinois University and hold the Chartered Financial Analyst designation.

**3. Please briefly describe Calpine Corporation.**

Calpine is a Fortune 500 company that is the second largest independent power company ("IPP") in the United States with a market capitalization of \$6 billion and annual revenues of approximately \$8 billion. Calpine employs 2,000 professionals and

its fleet includes 88 power plants either in operation or under construction located throughout 18 states and Canada, representing a combined total of nearly 28,000 megawatts of electric generating capacity. Calpine's headquarters is located in Houston, Texas.

Calpine owns and operates the largest and most modern fleet of clean, reliable and fuel-efficient gas-fired and geothermal power plants in North America and is the largest owner and operator of combined-heat-and-power (i.e. cogeneration) facilities in the U.S., making Calpine the single largest natural gas consumer in the U.S. power sector. Overall, Calpine is among the nation's largest electric generating companies as measured by annual megawatt-hour sales. Calpine is a member of Midcontinent Independent System Operator ("MISO"), operating power plants in Minnesota, Wisconsin and Arkansas.

**4. What is the purpose of your testimony?**

The purpose of my testimony is to provide additional context and support for Northern States Power's ("NSP") request for an Advance Determination of Prudence ("ADP") related to the Power Purchase Agreement ("PPA") between Calpine's subsidiary Mankato Energy Center II, LLC ("MEC II") and NSP for capacity and energy related to the expansion of the Mankato Energy Center ("Mankato"). I will also address several issues raised in the Direct Testimony of Richard A. Polich, P.E., which was submitted in this proceeding on behalf of the North Dakota Public Service Commission ("Commission") Advocacy Staff.

**5. Please summarize your testimony.**

First, I believe it is important to highlight why Mankato represents a uniquely cost-effective means of adding combined-cycle generating capability to NSP's energy mix. Calpine designed the Mankato Energy Center as a 720-megawatt combined-cycle generating facility that would be built in two phases. The recently executed PPA reflects construction of the second phase and the completion of the plant as originally designed. The pricing of this PPA reflects the economic efficiency of being able to use existing plant equipment and infrastructure and take advantage of significant inherent economies of scale compared with a stand-alone, new build facility. I will also discuss why I believe the project is a particularly good value for NSP and its ratepayers due to the fact that it was selected pursuant to a formal competitive procurement process, and why the timing of the project is important with respect to being able to secure those benefits.

Additionally, I will address several aspects of Mr. Polich's testimony with which I respectfully disagree. These include the manner in which Mr. Polich treats NSP's Black Dog 6 project in his analysis, his exclusive reliance on a single load forecast, and his assertion that the Mankato PPA would expose NSP to undesirable fuel and technology risks.

**6. Please describe the Mankato Energy Center.**

The existing Mankato Energy Center is a 375-MW natural gas fired, combined-cycle plant consisting of one Siemens 501FD combustion turbine generator ("CTG"), one Nooter/Erikson heat recovery steam generator ("HRSG"), a Toshiba TCDF 40L steam turbine generator ("STG") and other ancillary equipment needed for the plant's safe, reliable and efficient operation. The current facility, therefore, is a 1X1 combined-cycle power plant, meaning that it produces power using a single combustion turbine and a

single steam turbine. The existing Facility is located within the City of Mankato, Minnesota and is currently operating pursuant to a PPA with NSP.

**7. Was the existing Mankato Energy Center designed to accommodate incremental generating capacity?**

Yes. Calpine designed the Mankato Energy Center as a 2X1, 720-MW natural gas-fired, combined-cycle facility that would be built in two phases. The primary elements of the second phase, which is the subject of this PPA, include installation of a second combustion turbine and heat recovery steam generator (“power train”) and expansion of the plant’s mechanical draft cooling tower. I have attached three Exhibits to my testimony that visually depict the existing site and the proposed additional construction related to the PPA.

*Exhibit A* is the original site plan drawing from 2004 showing the components of the plant that were constructed as part of the first phase and denoting the equipment that would need to be added to complete the plant.

*Exhibit B* is an aerial photograph showing the existing plant and outlining where the additional construction would take place. As can be seen, all new equipment and construction activity would take place within the existing site footprint. This is truly a ‘brownfield’ project with significantly fewer environmental and other impacts compared with greenfield development.

*Exhibit C* is a ground-level photograph of the existing plant. The equipment in the foreground is the existing combustion turbine and heat recovery steam generator with the cooling tower in the background. The existing steam turbine is located in the elevated building that can be seen toward the top right of the photograph. Completing the plant

will involve installation of an additional combustion turbine and heat recovery steam generator that would be located immediately adjacent to the existing power train. As can be seen, the site work for the new power train was completed during initial construction.

**8. Are there other attributes of the project that take advantage of existing infrastructure?**

Yes. In addition to what can be seen in my Exhibits, various on-site piping, electrical connections and control systems are already in place. The project would utilize the plant's existing steam turbine, which eliminates the need for what otherwise would be a large additional capital cost. The additional power train can be easily integrated with the existing steam turbine generator and balance of plant. The additional capacity at the plant will be served by an existing natural gas pipeline interconnection and will utilize the existing switchyard and NSP substation. Calpine also has a FERC-approved MISO General Interconnection Agreement for the completion of the facility. MISO expects that only minimal transmission system upgrades will be required to ensure that the plant's additional output is deliverable to the NSP system. This is particularly important as new interconnection agreements in the MISO footprint often involve the need for expensive transmission upgrades.

**9. Has Calpine incorporated these cost savings in the PPA?**

Yes. The PPA fully reflects the cost savings of being able to use existing infrastructure and passes the benefits of the project's economies of scale to NSP and its ratepayers. As Mr. Clark notes in his testimony, Calpine's pricing for the Mankato PPA reflects an opportunity to acquire combined-cycle generating capacity at roughly the same price that it would cost to procure capacity from a typically much less expensive

simple-cycle combustion turbine peaking project. I am not aware of any other similar opportunity that exists in MISO today.

**10. Is the PPA competitively priced?**

Yes. I believe it is important to recognize that Mankato was selected as a result of a rigorous competitive bidding process. As an independent power producer we greatly appreciate the fact that Calpine was allowed to participate in a formal competitive bidding process that allowed non-utility generators to compete with proposed utility self-build projects on a level playing field. We strongly believe that competition provides the greatest level of assurance to ratepayers that they will benefit from the most cost-effective resource alternatives. Competitive procurement is a time-tested approach that ensures consumers pay the lowest possible cost for everything from pencils to capital-intensive power plants. Moreover, Calpine submitted a fixed price bid for Mankato, thereby insulating ratepayers from risks related to the construction and operation of the plant.

**11. Do you agree with Mr. Polich's conclusion that the Commission should rely exclusively on NSP's 2015 forecast?**

No, I do not. The Mankato PPA is the result of a formal competitive resource acquisition proceeding that was designed specifically to implement the findings of an approved integrated resource plan. I believe it is more appropriate that the Commission weight its consideration of the Mankato PPA based on the comprehensive record that has been established rather than basing its decision on a consultant's evaluation of a single forecast.

Mr. Clark's testimony includes extensive discussion regarding the difficulties involved in long-term forecasting and resource planning. I agree with Mr. Clark's conclusion that relying on an overly simplistic approach may result in inaccurate – and therefore potentially more costly – conclusions. Additionally, I believe the Commission should consider the fact that duplicating the now completed planning and procurement proceedings would be an expensive and time consuming process – and may force NSP to implement a less optimal solution if the next forecast happens to show an urgent need for new capacity.

**12. Would Calpine be able to delay commercial operation of Mankato until 2025?**

No. There are several reasons why timing is an important limiting factor with respect to the successful completion of our project. First, the pricing in the PPA was based on a bid submitted in April 2013. It would not be possible for Calpine to extend its commitment to maintain its current pricing out to a 2025 commercial operation date. Secondly, the development of such a large-scale project represents a significant capital investment that requires a reasonable measure of predictability and involves a prescribed schedule for obtaining permits, reserving major equipment, lining up contractors and maintaining the status of the project's interconnection agreement with the grid operator.

Finally, I would add that the very same attribute that allowed us to offer such competitive pricing, i.e. the fact that we are simply completing the existing plant as designed, limits our ability to substantially delay the project. This is because the technology and specific equipment the plant was designed for may not be available at a

cost-effective price – or at all – at some point in the future. Any substantial redesign of the project would likely reduce its current economic advantages to NSP.

**13. Please provide your views on the treatment of NSP's Black Dog 6 project in the Commission's analysis of the Mankato PPA.**

Calpine does not in any way object to the Commission's prior approval of an ADP for Black Dog Unit 6. However, in my view the manner in which Mr. Polich considers Black Dog in his analysis implicitly gives Black Dog a competitive advantage over Mankato simply because of the timing of the Commission's approval of the Black Dog ADP. As a practical matter both Black Dog and Mankato are on equal footing in all other respects other than approval of an ADP. I believe the fact that Black Dog already has received an ADP from the Commission should not be used to prejudice the Commission's decision with respect to the Mankato PPA.

**14. Do you agree with Mr. Polich's assertions related to long-term fuel risks?**

No, I do not. Mr. Polich appears to base his determination that the Mankato PPA represents unnecessary fuel risk largely on the statement that “[t]he US has seen a lot of volatility of natural gas prices over the last 20 years” and that “over the next 10 years, natural gas could experience major price swings....” Apart from the observation that this is not a particularly sophisticated analysis, the prevailing market expertise indicates the opposite is true: every indication is that natural gas is likely to be a plentiful and cost-effective resource for the foreseeable future, especially as natural gas production technology continues to become even more efficient and productive. In any event, market data “over the last 20 years” is by no means a proxy for future prices given the dramatic market impacts related to the recent growth in domestic shale gas production

and commensurate pipeline expansions. As the largest consumer of natural gas in the nation's power sector, Calpine remains highly confident that natural gas will remain a cost-effective and reliable fuel for the foreseeable future.

**15. Do you agree with Mr. Polich's assertion that the Mankato PPA represents unnecessary technology risk?**

No, I do not. Combined-cycle technology is currently the state-of-the-art with respect to the development and operation of thermal power plants. Technology obviously improves over time, but in and of itself that is not a sufficient basis upon which to suggest that North Dakota should wait and see what comes next. Moreover, as Mr. Clark points out in his testimony, it is impossible to predict the cost of steel, labor and other important cost elements so far into the future.

I strongly believe that a 'bird in the hand' approach is much more prudent than the 'wait and see' approach espoused by Mr. Polich. Moreover, I believe that locking in the benefits of the Mankato project now is the most cost-effective and prudent way to hedge against the risks of an evolving energy future. I certainly agree with Mr. Clark's testimony, wherein he states that Mankato provides NSP with increased optionality and will serve as an important bridge to respond to tightening market conditions across the MISO footprint related to expected and potential retirements of existing baseload capacity. I would add that efficient natural gas-fired generation is becoming increasingly important to balance the region's rapidly increasing amount of intermittent renewable resources.

I strongly believe that Mankato will enhance, not diminish, the state's ability to manage around the lack of certainty that we face in today's evolving energy markets. Said differently, the Mankato PPA does not create risk, but mitigates risk.

**16. Does that conclude your testimony?**

Yes. In conclusion I believe the inherent benefits of the project, combined with the fact that it is a unique and time-sensitive opportunity to capture significant economic benefits, warrant approval of the Mankato ADP in this proceeding.

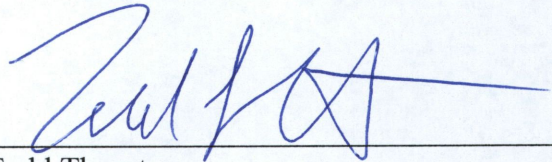
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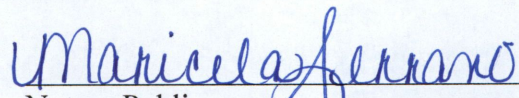
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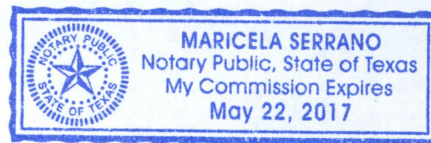
Todd Thornton, being first duly sworn on oath, deposes and states that he is the Senior Vice President of Origination and Development for Intervenor, Calpine Corporation, in the above captioned matter, that he has read the testimony and exhibits submitted in the above captioned matter under his name, that they were prepared under his direction, that he knows the contents thereof, and that the same is true and correct to the best of his knowledge and belief.



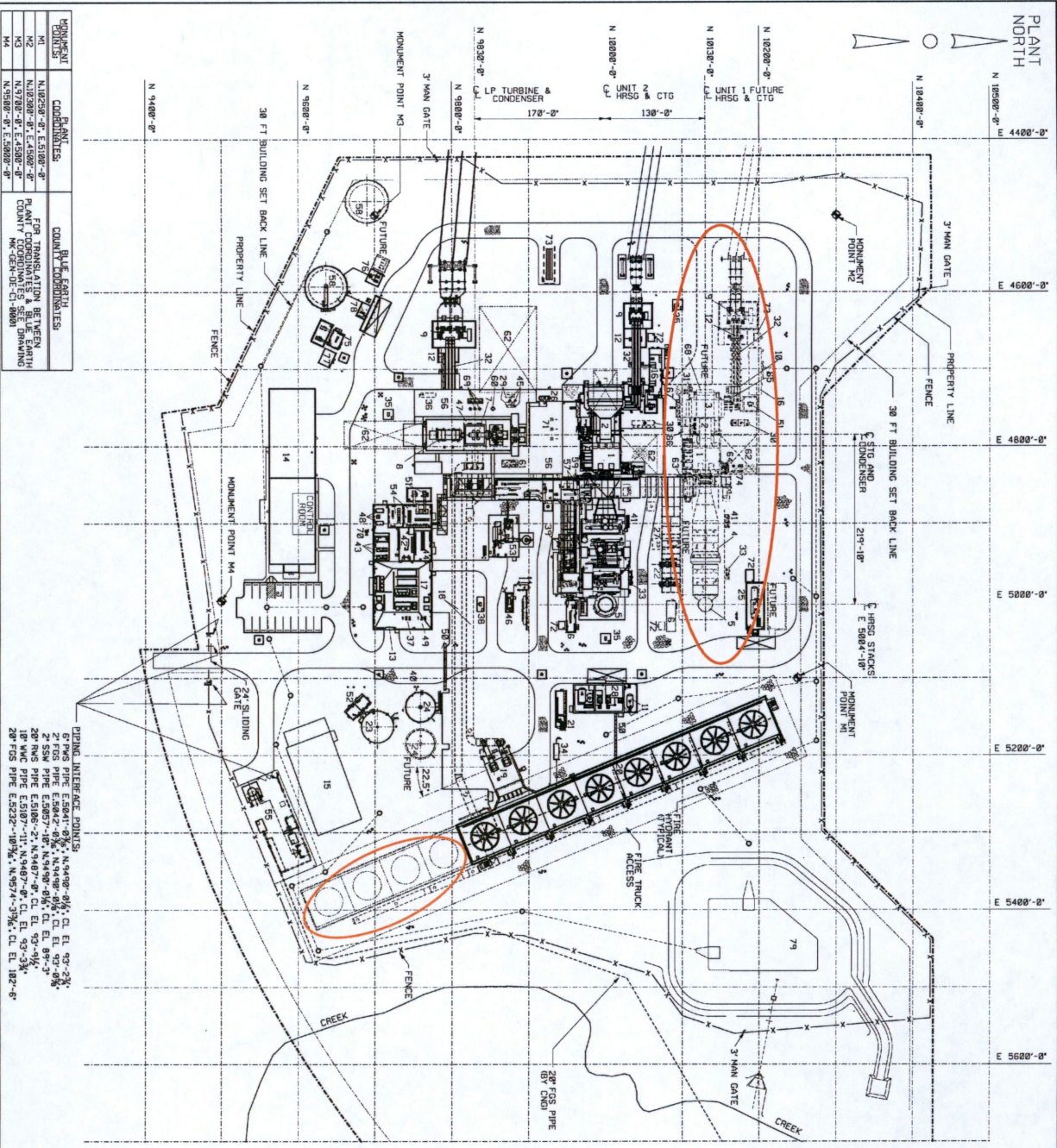
Todd Thornton

Subscribed and sworn to before me this 29 day of September, 2015

  
Notary Public  
My Commission Expires: May 22, 2017



PLANT NORTH

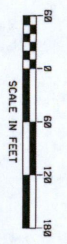


MONUMENT POINTS	PLANT COORDINATES	COUNTY CORNER COORDINATES
M1	N.12350'-0", E.5180'-0"	FOR TRANSECTION BETWEEN PLANT COORDINATES & BLUE EARTH COUNTY CORNER COORDINATES
M2	N.12350'-0", E.4580'-0"	
M3	N.9780'-0", E.4580'-0"	
M4	N.9580'-0", E.5080'-0"	

DEPND INTERFACE POINTS

N.9400'-0", E.4580'-0", CL. EL. 97'-2.3"
2" FGS PIPE E.5842'-0", N.9400'-0", CL. EL. 97'-0.6"
2" SSW PIPE E.5837'-10", N.9400'-0", CL. EL. 97'-3"
28" RNS PIPE E.5180'-2", N.9400'-0", CL. EL. 97'-10.5"
28" FGS PIPE E.5232'-10.5", N.9574'-3.5", CL. EL. 182'-6"

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LEGEND

1. COMBUSTION TURBINE
2. CT EXHAUSTION BELOW AIR INLET
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5. HRSO STACK
6. STEAM POWER DISTRIBUTION CENTER
7. STEAM TURBINE
8. GEORGIS POWER GENERATOR COOLED
9. GEORGIS POWER GENERATOR
10. CT EXHAUSTION COOLING INJECTION
11. ACID STORAGE TANK AND FEED SISO
12. MAIN AIRFLOW TRANSFORMER
13. WATER TREATMENT & 80% ELECTRICAL CONTROL BUILD
14. ADVANCEMENT/CONTROL/CONTROL ROOM BUILD
15. EXISTING WAREHOUSE BUILDING
16. CT POWER DISTRIBUTION CENTER
17. WATER DISTRIBUTION EQUIPMENT AREA
18. EXHAUSTION WATER TANKS
19. EXHAUSTION WATER PUMPS
20. COOLING TOWER
21. COOLING TOWER POND
22. BOLLER FEED PUMPS ENCLOSED
23. SERVICE / FINE WATER STORAGE TANK
24. BROWN WATER STORAGE TANK
25. AMMONIA STORAGE TANK
26. CLOSED COOLING WATER HEAD TANK
27. ALUMINUM TANK & SUMP
28. EXISTING TOWER COOLING FEED ENCLOSURE
29. EXHAUSTION WATER STORAGE TANK
30. FINE WATER STORAGE TANK
31. WATER STORAGE TANK
32. 100 POUND SWS SALT
33. AMMONIA INJECTION SISO
34. OIL/WATER SEPARATOR
35. OIL / WATER SUMP & PUMPS
36. FINE VALVE STATION FOR STEAM TURBINE AREA & DEPT
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**PARSONS E&C**

Mansfield Energy Center  
Mansfield, Massachusetts

GENERAL ARRANGEMENT  
SITE PLAN

NO. MK-GEN-DE-01-0001

**CALPINE**

NO. 01

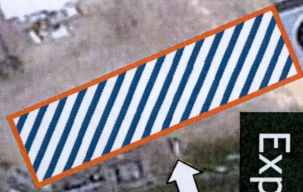
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99	ISSUED FOR REVIEW & COMMENT	06-14-04	MS	MS
100	ISSUED FOR REVIEW & COMMENT	06-14-04	MS	MS

2004 Site Plan Showing Design of Full Plant Including Expansion EXHIBIT A

New Combustion Turbine and HRSG



Cooling Tower Expansion



Mankato Energy Center Expansion

EXHIBIT B

Image © 2011 GeoEye © 2011 Google

44°11'56.82" N 94°00'08.21" W elev 814 ft

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Eye alt 2056 ft



EXHIBIT C