

BEFORE THE SOUTH DAKOTA PUBLIC UTILITIES COMMISSION

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SOUTH DAKOTA PUBLIC
UTILITIES COMMISSION

IN THE MATTER OF THE APPLICATION BY OTTER TAIL POWER
COMPANY ON BEHALF OF THE BIG STONE II CO-OWNERS FOR AN
ENERGY CONVERSION FACILITY PERMIT FOR THE CONSTRUCTION OF
THE BIG STONE II PROJECT

Direct Testimony of

Olesya Denney, Ph.D.

QSI CONSULTING, INC.

On Behalf of

the Staff of the Public Utilities Commission of South Dakota

May 19, 2006

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1 **I. WITNESS INTRODUCTION**

2 **Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.**

3 A. My name is Olesya Denney. My business address is 6110 Cheshire Line North,
4 Plymouth, MN 55446.

5
6 **Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?**

7 A. I am employed as a Senior Consultant by QSI Consulting, Inc., a consulting firm
8 specializing in regulated utility industries.

9
10 **Q. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND AND**
11 **PROFESSIONAL EXPERIENCE.**

12 A. I hold a Ph.D. in Economics from Oregon State University (Corvallis, OR). In
13 addition, I hold a M.S. in Economics from the same institution and a B.S. in
14 Economics from Novosibirsk State University (Russia). My professional
15 experience that is directly relevant to this testimony stems from my academic
16 work, as well as graduate studies in the field of natural resource and
17 environmental economics. This work included academic research concerning the
18 environmental impact of energy industries at the Institute of Economics
19 (Novosibirsk, Russia) and teaching a course of Environmental and Natural
20 Resource Economics at Novosibirsk State University (Russia). My master's
21 studies at Oregon State University focused on the empirical methods for
22 economic valuation of non-market goods such as open space and other

1 environmental amenities. I have several academic publications.

2 Also relevant to this testimony is my experience in state regulatory
3 proceedings: While working at QSI Consulting, Inc. and earlier at AT&T, I
4 assisted expert witnesses with economic and quantitative analysis and testimony
5 in approximately twenty telecommunications cases. In addition, I filed my own
6 testimony in the telecommunications cost case U-13531 of the Michigan Public
7 Service Commission. Exhibit A to this testimony contains my resume.

8
9 **Q. ON WHOSE BEHALF WAS THIS TESTIMONY PREPARED?**

10 A. This testimony was prepared on behalf of the Staff of the Public Utilities
11 Commission of South Dakota.

12
13 **II. PURPOSE OF TESTIMONY**

14 **Q. PLEASE STATE THE PURPOSE OF YOUR TESTIMONY IN THIS**
15 **PROCEEDING.**

16 A. The main objective of Staff in this proceeding is to ensure that the Co-owners
17 have met the requirements of applicable portions of the South Dakota Codified
18 Law ("SDCL") Chapter 49-41B and the Administrative Rules of South Dakota
19 ("ARSD") Section 20:10:22, with respect to the Co-owners application for a
20 Permit (Application) for a 600 MW (net) coal-fired electric generating facility and
21 associated facilities known as Big Stone II (or, the Project).

1 More specifically, according to SDCL 49-41B-13, the Co-owners'
2 Application may be denied, returned, or amended at the discretion of the Public
3 Utilities Commission for:

- 4 1) Any deliberate misstatement of a material fact in the application or in
5 accompanying statements or studies required of the applicant;
- 6 2) Failure to file an application generally in the form and content
7 required; or
- 8 3) Failure to deposit the initial amount with the application as required by
9 § 49-41B-12.

10 Further, SDCL 49-41B-22 states that it is the Applicant's burden of proof to
11 establish that:

- 12 1) The proposed facility will comply with all applicable laws and rules;
- 13 2) The facility will not pose a threat of serious injury to the environment
14 nor to the social and economic condition of inhabitants or expected
15 inhabitants in the siting area;
- 16 3) The facility will not substantially impair the health, safety or welfare
17 of the inhabitants; and
- 18 4) The facility will not unduly interfere with the orderly development of
19 the region with due consideration having been given the views of
20 governing bodies of affected local units of government.

21
22 **Q. ARE THERE OTHER AREAS WHICH YOU WILL EVALUATE IN**
23 **YOUR TESTIMONY?**

1 A. Yes. In addition to ensuring that the Applicant has complied with all laws and
2 rules, I will provide the Commission with additional information relevant to the
3 Commission's stated purpose of promoting consumer utility interests through
4 public policy.¹

5
6 **Q. HOW WILL YOUR TESTIMONY BE ORGANIZED?**

7 A. The next section of my testimony will address the Applicant's legal requirements,
8 focusing on the specific language found in South Dakota statutes. I will highlight
9 the requirements that were not fully addressed, such as the calculation of
10 environmental impacts of the project. I will present Staff's own calculation of the
11 monetized negative environmental impacts, and compare them to the positive
12 economic impacts of the project. I will, in the final section of my testimony,
13 provide the Commission with high-level analysis regarding additional potential
14 risks to consumers associated with the development of this Project.

15 **III. EVALUATION OF THE APPLICATION**

16 **Q. PLEASE EXPLAIN YOUR GENERAL APPROACH TO THIS**
17 **TESTIMONY.**

18 A. This testimony is structured to address the main criteria for evaluating the
19 Application contained in SDCL 49-41B and ARSD 20:10:22. These criteria are
20 grouped into the following five categories:

¹ According to the South Dakota Public Utilities Commission website,
<http://www.state.sd.us/puc/whatispuc/index.htm>, one of the Commission's objectives is stated as
follows: "Assists the public in making wise utility choices, promote consumer utility interests
through public policy, and resolves disputes between customers and their utilities."

Table 1. Criteria for Evaluation of the Application	
A. Completeness of the Application	
SDCL 49-41B-13	An application may be denied, returned, or amended at the discretion of the Public Utilities Commission for: (2) Failure to file an application generally in the form and content required by this chapter and the rules promulgated thereunder;
B. Deliberate misstatements	
SDCL 49-41B-13	An application may be denied, returned, or amended at the discretion of the Public Utilities Commission for: (1) Any deliberate misstatement of a material fact in the application or in accompanying statements or studies required of the applicant.
C. Compliance with all applicable laws and rules	
SDCL 49-41B-22	Applicant's burden of proof. The applicant has the burden of proof to establish that: (1) The proposed facility will comply with all applicable laws and rules;
D. Environmental Impacts	
SDCL 49-41B-22	Applicant's burden of proof. The applicant has the burden of proof to establish that: (2) The facility will not pose a threat of serious injury to the environment nor to the social and economic condition of inhabitants or expected inhabitants in the siting area; (3) The facility will not substantially impair the health, safety or welfare of the inhabitants;
E. Community Impacts	
SDCL 49-41B-22	Applicant's burden of proof. The applicant has the burden of proof to establish that: (3) The facility will not substantially impair the health, safety or welfare of the inhabitants; (4) The facility will not unduly interfere with the orderly development of the region with due consideration having been given the views of governing bodies of affected local units of government.

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II. Evaluation of the Application

A. Completeness of the Application

Q. IS THE APPLICATION COMPLETE AS DEFINED BY THE REQUIREMENTS OF SDCL 49-41B AND SPECIFIED IN ARSD 20:10:22?

1 A. The application addresses most of the issues required by SDCL 49-41B and
2 ARSD 20:10:22. For example, the Application contains a reference table² that
3 lists the description of each section of ARSD 20:10:22 and provides references to
4 the corresponding sections of the Application where the requirements of the
5 specific section of ARSD 20:10:22 are addressed. However, a close reading of
6 the requirements of each section of ARSD 20:10:22 shows that certain issues are
7 addressed without the specific details required by the rule. Examples of the
8 missing details include the absence of required maps, estimates of monetary cost
9 of decommissioning, description of irreversible changes, etc. Table 2 provides a
10 list of missing details explicitly required by rule and explains whether the missing
11 information was adequately addressed in discovery:

² Application, pp. xiii-xiv.

Table 2. Matrix of Requirements to Application Content

ARSD Section	Description	Details Missing in the Application	
		Description	Addressed in Discovery or Testimony
20:10:22:01	Definitions	Not Applicable	
20:10:22:02	Content of notification of intent	Not Applicable	
20:10:22:03	Prefiling conference	Not Applicable	
20:10:22:04	General information of application for permit	Not Applicable	
20:10:22:05	Application contents	List of permits does not "state when each permit application will be filed."	Partially: Staff 1-5: Dates for filing some (but not all) permits were provided.
20:10:22:06	Names of participants	Not all names/phone numbers of "all persons participating in the proposed facility" were provided.	Yes: Staff 2-6.
20:10:22:07	Name of owner and manager	Description of the rights of ownership not provided.	Yes: Staff 1-1.
20:10:22:08	Purpose of facility		
20:10:22:09	Estimated cost of facility		
20:10:22:10	Demand for facility	Data, data sources, forecast methods or models not provided.	Yes: Intervenor RFP 1-3 (Specific data and models not provided). Staff 3rd Set ## 2, 8, 9, 17, 19, 24, 28.
20:10:22:11	General site description	Maps of cemeteries, historical properties and other public facilities not provided	Yes: Staff 2-8.
20:10:22:12	Alternative sites		
20:10:22:13	Environmental information	1. Irreversible changes not identified. 2. Environmental effects not calculated	1. Yes: Staff 2-9. 2. No.
20:10:22:14	Effects of physical environment	Geological constraints are not discussed.	Yes: Staff 2-10.
20:10:22:15	Hydrology	1. Map of water drainage not provided 2. Use of aquifers not discussed.	Yes: 1: Staff 2-11. 2: Staff 2-14.
20:10:22:16	Effects on terrestrial ecosystems	Breeding times and migration pathways not provided	Yes: Staff 2-15.
20:10:22:17	Effects on aquatic ecosystems		
20:10:22:18	Land use	1. The existence of certain land uses not clarified. 2. Number of displaced persons not provided. 3. Impact on farming not fully discussed.	Yes: 1: Staff 2-16. 2: 2-17. 3: 2-18.
20:10:22:19	Local land use controls		
20:10:22:20	Water quality		
20:10:22:21	Air quality		
20:10:22:22	Time schedule		
20:10:22:23	Community impact	Plans to coordinate with disaster services not discussed.	Yes: Staff 2-21
20:10:22:24	Employment estimates	Job classifications not provided	Partially: Staff 2-22 and 2-23. (Job classifications for contractors and subcontractors not yet determined).
20:10:22:25	Future additions and modifications		
20:10:22:26	Nature of proposed conversion facility	Consumption rate of materials not identified.	Yes: Staff 2-24 and 2-25.
20:10:22:27	Products to be produced		
20:10:22:28	Fuel type used		
20:10:22:29	Proposed primary and secondary fuel and transportation	No map of transportation of fuel sources. Rail issues not discussed adequately.	Map: Yes: Staff 2-27. Rail issues: Partially: Staff 3-34 - 3-40 (these responses focus on current rail situation with Big Stone I).
20:10:22:30	Alternative energy sources		
20:10:22:31	Solid or radioactive waste		
20:10:22:32	Estimate of expected efficiency	Expected efficiency not calculated.	Yes: Staff 2-28. Rolles Direct p. 23.
20:10:22:33	Decommissioning	Monetary cost of decommissioning not provided.	Yes: Staff 2-29.
20:10:22:34	Transmission facility layout and construction	Not Applicable	
20:10:22:35	Information concerning transmission facilities	Not Applicable	
20:10:22:36	Additional information in application		
20:10:22:37	Statement required describing gas or liquid transmission line standards of construction	Not Applicable	
20:10:22:38	Gas or liquid transmission line description	Not Applicable	
20:10:22:39	Testimony and exhibits	Application does not "show the witnesses supporting the information contained in the application."	Witness names are contained in the Applicants' Direct Testimonies
20:10:22:40	Application for party status	Not Applicable	

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2

1
2 As seen from this table, the Applicants provided most of the missing details in
3 discovery responses. However, certain important subjects have not been
4 adequately addressed. First, the Application does not contain a calculation of
5 environmental effects “to reveal and assess demonstrated or suspected hazards to
6 the health and welfare of human, plant and animal communities...” as required by
7 ARSD 20:10:22:13. Staff believes that such calculation should be in monetary
8 terms, which would provide an appropriate point of comparison to the positive
9 monetary impacts of the project on the community and state, for which the
10 Applicants provided aggregate monetary measures.³ Section III.D of this
11 testimony contains Staff’s own estimation of the environmental impact.

12 Second, neither the Application, nor the Applicants’ direct testimonies
13 provide a discussion of the current rail coal delivery problems – a discussion that
14 would be appropriate under section ARSD 20:10:22:29 (transportation).
15 Specifically, in its March 9, 2006, letter, Otter Tail Power Company notified the
16 Commission that it is experiencing coal delivery issues. The letter explained that
17 this problem is not unique to Otter Tail, that it started a year ago and has been
18 escalating, and that because of these delivery problems Big Stone I’s coal reserves
19 are down.

20 Responding to the Commission’s March 10, 2006, questions regarding the
21 coal delivery problem, Otter Tail stated that the cause of the problem is the

³ Application, Section 5.

1 delivery service of Burlington Northern Santa Fe Railways (“BNSF”)⁴ rather than
2 an issue with coal production or a deficit of railcars.⁵ In its data response to
3 Staff,⁶ the Applicants also referred to BNSF’s presentation at the April 21, 2006,
4 SD PUC’s Railroad Shipping Meeting where the railroad cited a 2005 supply
5 disruption and an unprecedented coal demand as two factors driving the coal
6 supply problems.⁷ Otter Tail also explained that it has no legal options to force
7 BNSF’s performance.⁸

8 Although Otter Tail used an emergency short-term contract with a
9 Montana mine to successfully replenish its stockpile by May 4, 2006,⁹ (which
10 shortened rail distance) this option is not viable in the long-term because the
11 higher-sulfur content of Montana coal requires additional sulfur dioxide
12 allowances, making this option prohibitively expensive.¹⁰ As an additional factor
13 in replenishing Big Stone I’s coal supply, BNSF provided to Big Stone a
14 temporary third train, and currently Big Stone co-owners are in discussions with
15 the railroad to make this third train permanent.¹¹

⁴ Note that BNSF provides the only rail line to Big Stone. The Applicants considered the absence of a competitive rail line as a disadvantage of Big Stone’s site in their analysis of alternative sites. (See Direct Testimony of Mark Rolfes, p. 9.)

⁵ Responses to March 10, 2006, PUC e-mail questions, Request No. 1.

⁶ Responses to Staff’s 3rd Set of Data Requests, Request No. 34.

⁷ See also <http://www.state.sd.us/puc/pucevents/Coal%20Train%20mtg%2006/RSMtg06.htm>.

⁸ Responses to March 10, 2006, PUC e-mail questions, Request No. 2.

⁹ Responses to Staff’s 3rd Set of Data Requests, Request No. 35.

¹⁰ Responses to Staff’s 3rd Set of Data Requests, Request No. 36.

¹¹ *Id.*

1 Otter Tail stated that according to BNSF, “fluidity will only return with
2 more track construction, which is a year or two away.”¹² Although during the
3 April 21, 2006, SD PUC’s Railroad Shipping Meeting BNSF did highlight its
4 extensive plans for capacity expansion, the presentation also indicated that the
5 demand for coal transportation will continue to grow. Specifically, BNSF’s
6 presentation listed a total of 24 proposed coal-fired generation plants that will
7 require rail service in the Western United States and that are expected to start
8 operation between 2006 and 2012.¹³ In other words, growth in demand for coal
9 transportation is going to continue, and it is not clear whether the BNSF’s railroad
10 capacity expansion plans will solve the coal delivery problem by the time Big
11 Stone II becomes operational (which is 2011), or whether the coal delivery issue
12 will persist. It would also be desirable if the Applicants discussed whether the
13 presence of coal delivery problems would equally affect all alternative sites for
14 this project (ARSD 20:10:22:12), or whether the analysis of alternative sites
15 would result in a different site selection (different than Big Stone) if the coal
16 delivery problems were factored into the analysis.

17 Third, the future estimated consumer demand (ARSD 20:10:22:10) is not
18 adequately discussed. Specifically, the Application contains a verbal discussion
19 of the forecasting methods,¹⁴ but does not provide the required “data, data
20 sources, assumptions, forecast methods or models” required by rule. Although a

¹² Responses to March 10, 2006, PUC e-mail questions, Request No. 4.

¹³ BNSF Railway Presentation at SD PUC April 21, 2006 Meeting, slide 16. The last, twenty-fifth plant on this list does not have the year on-line listed, and as such, was not included in this count.

¹⁴ Section 3 of the Application.

1 significant amount of detail regarding forecasting models and data was provided
2 in responses to Interrogatories,¹⁵ these responses do not provide for the
3 Commission a user-friendly and exhaustive summary of the forecast models and
4 data supporting the Application's demand estimates. For example, SMMPA's
5 Integrated Resource Plan¹⁶ contains a detailed description of the econometric
6 models used to generate load forecasts. However, the specific forecast numbers
7 listed in this document are different when compared to the SMMPA's load
8 forecast presented in the Application,¹⁷ suggesting that some of the data, inputs or
9 methods used to generate SMMPA's forecast presented in the Application are
10 different from the forecast documented in SMMPA's Integrated Resource Plan.
11 The Applicants, including SMMPA, did provide detailed information on
12 modeling in their recent responses to Staff's 3rd Set of Data Request. However,
13 due to the timing of these responses and the amount of supporting material (which
14 was often lacking adequate explanations about the organization and hierarchy
15 between different files), Staff was not able to finish its analysis of the Applicants'
16 demand models before filing this testimony.

17 Further, demand forecasts of some of the Applicants are inaccurate
18 because they do not properly account for Demand Side Management ("DSM")
19 programs. Specifically, both SMMPA and Otter Tail Power Company stated in

¹⁵ Specifically, in Responses to Intervenor's 1st Request for Production, Request No. 3 and more recently – in responses to Staff's 3rd Set of Data Requests, Requests Nos. 2, 8, 9, 17, 19, 24 and 28.

¹⁶ Provided in Responses to Intervenor's 1st Request for Production, Request No. 3.

¹⁷ Table 3-7 on p. 57 of the Application. Compare these numbers to the load forecast of SMMPA's Integrated Resource Plan provided in Responses to Intervenor's 1st Request for Production, Request No. 3. (Table IV-1, pp. IV-17 - IV-18).

1 their responses to interrogatories that their DSM savings are not fully reflected in
2 their load demand forecasts presented in the Application.¹⁸ Although GRE stated
3 that its “existing DSM programs” are accounted for in its forecast,¹⁹ the relevance
4 of this statement is somewhat questionable because not only existing, but also
5 future DSM programs should be accounted for in a proper forecast. GRE’s own
6 statements suggest that it is expanding its DSM programs: “GRE has consistently
7 been increasing its efforts with respect to ... DSM programs...”²⁰ and “GRE has
8 more than doubled spending on conservation programs from 2002 ... to 2004[,] as
9 well as nearly doubling the annual energy savings over the same time period.”²¹
10 Note that GRE’s load forecast²² is made for a period starting in 2004. It is
11 reasonable to assume that this forecast was made based on data prior to 2004.²³ In
12 other words, the above referenced doubling of the DSM’s effort between 2002
13 and 2004 is likely not captured in GRE’s forecast.

14
15 **B. Deliberate misstatements**

16 **Q. DID YOU IDENTIFY ANY DELIBERATE MISSTATEMENTS BY THE**
17 **APPLICANTS?**

¹⁸ Responses to Intervenor’s 1st Set of Interrogatories, Requests Nos. 16 and 17. According to Otter Tail’s response to request 16, its controllable load programs – the largest component of its DSM programs – are not reflected in demand estimates, while other DSM programs are accounted for in the forecast.

¹⁹ Responses to Intervenor’s 1st Set of Interrogatories, Request No. 16.

²⁰ Responses to Intervenor’s 1st Set of Interrogatories, Request No. 15.

²¹ *Id.*

²² Table 3-4 on p. 50 of the Application.

²³ Direct testimony of Richard R. Lancaster explains that GRE’s forecast is based on historic usage patterns and load factors (p. 16).

1 A. No. Staff noticed a number of statements that are inconsistent with the supporting
2 material, but these inconsistencies may be stemming from the sheer amount of
3 application materials, the number of the Applicants' witnesses and/or the time
4 span over which the materials were filed. One example is the statement of the
5 Applicants' witness Mr. Skoglund regarding noise for the Big Stone II site. Mr.
6 Skoglund explained that although there are no quantitative standards in South
7 Dakota, the Applicants used Minnesota noise standards for reference purposes.
8 Mr. Skoglund explained that he prepared section 4.5.4 of the Application titled
9 "Noise." Further, Mr. Skoglund stated that Big Stone II will comply with
10 Minnesota noise standards.²⁴ A review of section 4.5.4 of the Application shows
11 that this statement is incorrect. The Application actually concludes "[i]ncreases
12 from Project are not predicted to cause *any new exceedances* of the reference
13 Minnesota noise standards."²⁵ The Application is referring to the fact that at two
14 out of the four noise monitoring sites in the Big Stone area, Minnesota noise
15 standards are currently violated (exceeded), and the additional noise from Big
16 Stone II, although increasing the total level of noise slightly, would not cause
17 noise violations at the other two sites – sites that currently comply with the
18 Minnesota noise standards. However, the Application does not conclude that Big
19 Stone II would comply with the Minnesota noise standards.

20 Another example is the Applicants' statements during the September 2005
21 public hearing about future mercury emissions. At the hearing, Mr. Grauman

²⁴ Direct Testimony of Andrew J. Skoglund, p. 3.

²⁵ Application, Section 4.5.4, p. 107. Emphasis added.

1 stated that “we will have sulfur dioxide, nitrogen oxide, and mercury emissions
2 from both units that are targeted to be less than or equal to Unit 1’s emissions in
3 2004.”²⁶ A similar statement was included in the Applicants’ exhibits to the
4 hearing.²⁷ Following Commission Chairman Hanson’s request at the hearing to
5 provide charts depicting emissions of several pollutants, the Applicants sent a
6 letter to the PUC containing such charts.²⁸ A chart for mercury showed total
7 emissions for Big Stone I and II at a level that is approximately two times higher
8 than 2004 emissions for Big Stone I. The chart did contain another data point
9 marked “BSP I and II Future Target,” but the note to this data point explained that
10 this target is based on “South Dakota mercury allowance allocation under the
11 Clean Air Mercury Rule.” Note that in his Direct testimony Mr. Grauman
12 testified that the Applicants “are uncertain if that goal can be reached given the
13 performance variability of mercury emission control measures.”²⁹

14 Further, Staff failed to find a discussion in the Application, Direct
15 testimony, the accompanying materials or discovery where the Applicants would
16 explain how they plan to achieve the mercury target that is lower than 2004 Big
17 Stone I’s mercury emissions. It should be noted that the Applicants’ testimony
18 does discuss briefly their participation in the ongoing research on mercury

²⁶ Transcript of Proceedings, September 13, 2005, pp. 32-33.

²⁷ The Applicants’ Exhibit 1a, slide 17.

²⁸ This October 10, 2005 letter was provided in response to Stueve 1st Request for Production of Documents/Interrogatories, Request No. 12.

²⁹ Direct Testimony of Terry Grauman, p. 12.

1 reduction emissions.³⁰ However, it is unclear from this discussion whether this
2 research is expected to bring any concrete improvements in mercury emission
3 controls in the near future – improvements compared to the mercury emissions
4 rate assumed for Big Stone II.³¹ As for the specific information, the Applicants’
5 *Prevention of Significant Deterioration Construction Permit Application* (“PSD
6 Permit Application”)³² mentions only one mercury emission rate – the rate set by
7 the Clean Air Mercury Rule. According to Staff’s calculation,³³ this rate would
8 result in the level of mercury emissions for Big Stone I and II units that would be
9 approximately two times higher than Big Stone I 2004 emissions. In other words,
10 the Applicants’ statement that mercury emissions are targeted to be less than
11 current mercury emissions is misleading because it is not supported by the record.
12

13 **C. Compliance with all applicable laws and rules**

14 **Q. WHAT EVIDENCE DID THE APPLICANTS PROVIDE TO SHOW THAT**
15 **THE FACILITY WILL COMPLY WITH ALL APPLICABLE LAWS AND**
16 **RULES?**

³⁰ *Id.*, p. 13.

³¹ Page 13 of Mr. Grauman’s testimony states that testing of mercury controls at W.A. Parish 8 Unit brought “encouraging results.” However, Mr. Grauman also explains that this unit is “equipped with emissions control equipment similar to what is proposed for Big Stone II Unit.” In other words, the exact meaning of the phrase “encouraging results” is unclear: Do the test results simply confirm the expected emissions rate for Big Stone II (which is the mercury emissions rate required by federal regulations), or show a smaller emissions rate than the rate assumed for Big Stone II?

³² Application provided in response to Staff 1st Set of Data Requests, Request No. 5.

³³ See Section III.C and Exhibit B to this testimony for details. These calculations produce the same results as Burns & McDonnell’s calculations summarized in Responses to Staff’s 3rd Set of Data Requests, Request No. 46.

1 A. The Applicants stated that Big Stone II will comply with all local, state or federal
2 regulations and standards related to various aspects of Big Stone II construction
3 and operation such as hydrology,³⁴ water quality,³⁵ aquatic ecosystems,³⁶ landfill
4 and solid waste disposal,³⁷ air quality,³⁸ radioactive waste,³⁹ local regulations such
5 as zoning and building,⁴⁰ plant decommissioning,⁴¹ and cultural resources.⁴²

6 The Application contained a list of the applicable potentially required
7 permits and approvals by project stage, agency and government level.⁴³ This list
8 was further updated in a data response to Staff,⁴⁴ where the Applicants indicated
9 the status of each permit. According to the updated list, a number of permit
10 applications had been filed with the appropriate agencies, including the PSD
11 Permit (Air Permit) and Solid Waste Disposal Permit Applications with South
12 Dakota DENR, Water Appropriation Permit Application with South Dakota
13 Water Rights Program, Transmission Route Permit Applications with the
14 Minnesota and South Dakota PUCs, and the certificate of need for the
15 transmission line with Minnesota PUC. It is Staff's understanding that on April
16 20, 2006, South Dakota DENR issued a public notice and a Statement of Basis for

³⁴ Direct Testimony of Daniel Jones, p. 5.

³⁵ *Id.* p. 9.

³⁶ *Id.*, p. 13.

³⁷ Direct Testimony of Terry Grauman, p. 19.

³⁸ Direct Testimony of David Gaige, p. 2.

³⁹ Direct Testimony of Terry Grauman, p. 20.

⁴⁰ *Id.*, p. 21

⁴¹ Direct Testimony of Mark Rolfes, p. 23.

⁴² Direct Testimony of K. Anne Ketz, p. 17.

⁴³ Application, p. 5.

⁴⁴ Response to Staff's First Data Request, Request No. 5.

1 draft PSD Permit for Big Stone II⁴⁵, and in May 2006 – draft Solid Waste Permit.

2 In addition, the Western Area Power Administration has issued a draft

3 Environmental Impact Statement for the project in May 2006.

4
5 **Q. WILL BIG STONE II COMPLY WITH THE MERCURY EMISSION**
6 **STANDARDS?**

7 A. The Applicants stated that Big Stone II will comply with the currently effective
8 standards of mercury emission per megawatt hour.⁴⁶ However, mercury emission
9 rules may change if and when the EPA finalizes its mercury cap-and-trade rules.
10 According to the EPA rules issued in March 2005, each state was given a certain
11 mercury emission budget – a budget expressed in physical units of annual
12 mercury emissions. Certain aspects of this rule, including the allocation of the
13 cap between states, have been challenged,⁴⁷ so that the budget allocated to South
14 Dakota under this rule cannot be considered final. Nevertheless, this budget
15 presents the best available estimate of the future cap, and the Applicants discuss
16 this budget in relation to Big Stone I and II's mercury emissions. Specifically,
17 they state that South Dakota's mercury budget, according to March 2005 EPA
18 rules, is 144 pounds per year starting in 2010, and it is reduced to 58 pounds per
19 year starting in 2018.⁴⁸ The Applicants also state that their goal is to reduce
20 mercury emissions to at least 144 pounds to avoid purchasing additional

⁴⁵ Available at <http://www.state.sd.us/denr/DES/AirQuality/aapubnot.htm>.

⁴⁶ Direct Testimony of David Gaige, p. 14.

⁴⁷ <http://www.epa.gov/air/mercuryrule/rule.htm#oct05a>.

⁴⁸ Direct Testimony of Terry Grauman, p. 12.

1 allowances, but they “are uncertain if that goal can be reached given the
2 performance variability of mercury emission control measures.”⁴⁹ Note that Big
3 Stone I and II are projected to emit approximately 400 pounds a year.⁵⁰ This
4 implies that in order to achieve the 2010 cap of 144 pounds, mercury emissions
5 should be reduced by more than two times, and in order to achieve the 2018 cap
6 of 58 pounds, the emissions should be reduced by more than six times. As
7 already discussed above, the Applicants are participating in research regarding
8 mercury emissions control.⁵¹ Although the Applicants do not quantify the
9 expected results and timeline of this research, this research may bring
10 improvements to mercury emissions controls.

11
12 **Q. IS IT CORRECT THAT BURNS AND MCDONNELL’S PHASE I**
13 **REPORT ON BIG STONE II ASSUMED MERCURY-MITIGATION**
14 **TECHNOLOGY WITH LOWER MERCURY EMISSIONS THAN THE**
15 **CURRENT DESIGN OF BIG STONE II?**

16 A. Yes. The Phase I Report assumed activated carbon injection technology with the
17 mercury emission rate of .00002 lb/MWh,⁵² which is approximately two times

⁴⁹ *Id.*

⁵⁰ This number is based on the chart “Big Stone I and II. Mercury” attached to the October 10, 2005, Applicants’ letter to PUC. This chart was provided in response to Stueve 1st Request for Production of Documents/Interrogatories, Request No. 12. This number is consistent with Staff’s own calculation of Big Stone II’s mercury emissions at around 194 pounds annually (see Exhibit B to this testimony) and the Applicant’s estimate of 2004 Big Stone I’s mercury emissions at 189.9 pounds provided in response to Stueve 1st Request for Production of Documents/Interrogatories, Request No. 13.

⁵¹ Direct Testimony of Terry Grauman, p. 13.

⁵² Exhibit 24-A to the Applicants’ Direct Testimony, p. 2-4.

1 less than the mercury emission EPA standard of 0.000042 lb/MWh adopted in the
2 current design of Big Stone II. However, even with this technology, total
3 emissions from Big Stone I and II would likely exceed the future state budget. In
4 other words, Big Stone Units I and II would have to purchase additional mercury
5 allowances. Given the above quoted Applicants' statement about the performance
6 variability of mercury controls, it appears that other coal-fired plants that are
7 subject to the mercury cap would be facing similar difficulties. In other words,
8 the price and availability of additional mercury allowances is a risk factor in Big
9 Stone II's ability to operate in compliance with mercury cap rules.

10
11 **D. Environmental Impacts**

12 **Q. WHAT EVIDENCE DID THE APPLICANTS PROVIDE IN ORDER TO**
13 **SHOW THAT BIG STONE II WILL NOT POSE A THREAT OF SERIOUS**
14 **INJURY TO THE ENVIRONMENT OR HEALTH OF THE**
15 **INHABITANTS IN THE SITING AREA?**

16 A. The Applicants observed that because Big Stone II is to be constructed on a
17 brownfield, the environmental impact would be small.⁵³ The Applicants stated
18 that Big Stone II will comply with all local, state and federal regulations and
19 standards related to various aspects of natural resources such as hydrology,⁵⁴
20 water quality,⁵⁵ landfill and solid waste disposal,⁵⁶ and air quality.⁵⁷

⁵³ Direct Testimony of Raymond J. Wahle, p. 12.

⁵⁴ Direct Testimony of Daniel Jones, p. 5.

⁵⁵ *Id.* p. 9.

1 Specifically, the Applicants explained that South Dakota is currently an
2 attainment area in terms of the National Air Quality Ambient Standards,⁵⁸ and
3 that due to the Applicants' plan to install a control technology common with Big
4 Stone Unit I, Big Stone II will not increase plant-wide emissions of sulfur dioxide
5 and nitrogen oxides, thus not affecting air quality levels. They also explained that
6 according to air dispersion models, Big Stone II's emissions for particulate matter
7 and carbon monoxide would not result in a violation of federal air quality
8 standards for these pollutants.⁵⁹ During construction the Applicants plan to use
9 best management practices for soil erosion.⁶⁰ Further, the Applicants explained
10 that because of the zero liquid discharge design of Big Stone II, there will be no
11 notable changes in surface water quality, and the only notable alteration – the
12 makeup storage pond – will only alter the route of the drainage, but not the source
13 and discharge of surface waters.⁶¹ The Applicants are working with USACE on
14 the mitigation plan to compensate for some of the wetlands that will be filled.⁶²
15 The Applicants explained that the impact on fish population will be minimal

⁵⁶ Direct Testimony of Terry Grauman, p. 19.

⁵⁷ Direct Testimony of David Gaige, p. 2.

⁵⁸ These are standards set for six criteria pollutants – sulfur dioxide, nitrogen oxides, ozone, carbon dioxide, particulate matter and lead. See <http://www.epa.gov/ttn/naaqs/>.

⁵⁹ Direct Testimony of David Gaige, p. 13. Note that it is unclear whether and how the conclusion about non-violation of the national ambient quality standards for the two other criteria pollutants – ozone and lead – was made. The DENR's Statement of Basis for draft PSD Permit for Big Stone II explains that there is not EPA-approved model to model air dispersion and concentrations of ozone (p. 29). The same document explains that because lead is emitted as particulate matter, the Best Available Control Technology ("BACT") analysis (an analysis that does not establish compliance with the national air quality standards) for particulate matter also satisfies the BACT analysis for lead (p. 16).

⁶⁰ Direct Testimony of Daniel Jones, p. 7.

⁶¹ *Id.*, pp. 3-4.

⁶² *Id.*, pp. 11-12.

1 because there will be no discharge in the Whetstone River, and because the design
2 of the water intake will minimize entrainment of fish from Big Stone Lake.⁶³

3
4 **Q. DID THE APPLICANTS CONSIDER OTHER PATHWAYS THAT**
5 **AFFECT FISH POPULATION SUCH AS MERCURY AIR EMISSIONS?**

6 A. Staff did not find such discussion in the documents presented in this case by the
7 Applicants. Staff believes that these effects should have been discussed.
8 Specifically, mercury air emissions eventually deposit into soils and water, and
9 build up in fish and animals that eat fish. Because mercury is known to harm
10 humans, especially unborn babies and small children,⁶⁴ many government
11 agencies and states issue guidelines regarding fish consumption. For example, the
12 state of South Dakota samples at least 10 lakes each year. Currently, fish
13 advisories are issued for five South Dakota lakes, including a lake in Day County,
14 which neighbors Grant County.⁶⁵ Minnesota issues statewide fish advisories, and
15 its current mercury advisory contains lakes in both counties that neighbor the Big
16 Stone plant – six lakes in Big Stone County, including Big Stone Lake, and Lac
17 Qui Parle Lake in Lac Qui Parle County.⁶⁶ Given that mercury emissions from
18 the combined operations of Big Stone I and II are projected to double compared to

⁶³ *Id.*, p. 12.

⁶⁴ See EPA information available at <http://www.epa.gov/mercury/about.htm>.

⁶⁵ See <http://www.state.sd.us/doh/Fish/index.htm>.

⁶⁶ <http://www.health.state.mn.us/divs/eh/fish/eating/lakegenpop.pdf>.

1 current Big Stone I emissions,⁶⁷ further contamination of local fish with mercury
2 is a concern.

3
4 **Q. DID THE APPLICANTS CALCULATE THE ENVIRONMENTAL**
5 **EFFECTS TO ASSESS DEMONSTRATED OR SUSPECTED HAZARDS**
6 **TO HUMAN, PLANT AND ANIMAL COMMUNITIES AS REQUIRED BY**
7 **ARSD 20:10:22:13?**

8 A. No, they did not. Staff did not find this information in the application, the
9 Applicants' direct testimonies, their supporting exhibits, or discovery responses.
10 A party in this case, Ms. Stueve asked the Applicants to identify irreversible
11 changes and noted the requirement that the environmental effects shall be
12 calculated.⁶⁸ In response, the Applicants stated that no irreversible changes are
13 expected, and that "[t]he environmental effects are described in Section 4 of the
14 Application." Because a *description* of environmental effects does not meet the
15 requirement of *calculating* environmental effects, Staff asked the Applicants a
16 follow-up interrogatory to provide the required calculation.⁶⁹ The responses to
17 this interrogatory are not expected before the filing date of this testimony;
18 therefore, Staff performed its own calculation of the environmental effects.

19

⁶⁷ See for example, chart "Big Stone I and II. Mercury" attached to October 10, 2005 Applicants' letter to PUC. This chart was provided in response to Stueve 1st Request for Production of Documents/Interrogatories, Request No. 12.

⁶⁸ Stueve 1st Request for Production of Documents/Interrogatories, Request No. 26.

⁶⁹ Staff 4th Data Request, Request No. 1.

1 **Q. PLEASE DESCRIBE YOUR GENERAL APPROACH TO THE**
2 **CALCULATION OF THE ENVIRONMENTAL EFFECTS OF BIG STONE**
3 **II.**

4 A. Environmental effects of coal-fired electric plants have been studied extensively.
5 Staff's starting point was the observation that the majority of environmental
6 effects for coal-fired plants come from air emissions.⁷⁰ Staff conducted a survey
7 of the existing environmental externality estimates per unit of air emission, and
8 applied them against Big Stone II's projected air emissions.

9
10 **Q. IS THE TERM "ENVIRONMENTAL EXTERNALITY" SYNONYMOUS**
11 **TO THE TERM "ENVIRONMENTAL IMPACT?"**

12 A. Strictly speaking, they are different, but close. An environmental externality is an
13 environmental impact that is not captured in the costs of the party that causes the
14 impact. This nuance is illustrated by the comparison of sulfur dioxide and
15 particulate emissions – two pollutants generated by coal-fired plants. Particulate
16 emissions are associated with numerous health effects, reduced visibility, negative
17 effects on vegetation and property damage from soiling.⁷¹ These costs are not
18 borne by the owners of the plants, and thus, constitute an externality. Sulfur
19 dioxide emissions are also associated with negative environmental impacts such

⁷⁰ For example, one study estimated that 90% of the environmental impact of coal fired plants was associated with air emissions, while land and water impacts accounted for the remaining 10% (Ottinger et al. *Environmental Cost of Electricity*. New York: Oceana Publications, 1990).

⁷¹ See for example, a review by EPA available at <http://www.epa.gov/oar/airtrends/pm.html>.

1 as respiratory health problems and acid rain.⁷² But because coal-fired plants are
2 required to buy tradable allowances for sulfur dioxide emissions, these costs are
3 considered to be internalized by the plant owners (to the extent allowance prices
4 capture all adverse environmental impacts). In other words, sulfur dioxide
5 emissions create the environmental impacts, but not environmental externalities.
6 Many academic sources estimate environmental externality values for sulfur
7 dioxide, thus ignoring the existing “internalization” system of sulfur dioxide
8 tradable allowances. Such externality estimates provide a suitable source of
9 calculating environmental impacts. Further, as shown below, because of the
10 projected zero net emissions of sulfur dioxide, Big Stone II’s environmental
11 impact from sulfur dioxide is zero. As a result, the difference between total
12 environmental effects and environmental externalities of Big Stone II is only
13 theoretical. Therefore, for the rest of this testimony Staff ignores the difference
14 between externality and environmental impact, and uses these terms
15 interchangeably.

16
17 **Q. PLEASE SUMMARIZE THE EXTERNALITY VALUES AND AIR**
18 **EMISSIONS USED IN YOUR ANALYSIS.**

19 A. Table 3 provides the list of pollutants, the range of externality values and Big
20 Stone II’s projected annual emission levels used in the calculation of the
21 environmental impact.

22

⁷² See for example, a review by EPA available at <http://www.epa.gov/oar/airtrends/sulfur.html>.

**Table 3. Big Stone II Annual Emissions and Externality Values
Used to Calculate Big Stone II's Environmental Impact**

Pollutant	Externality Estimates (per ton of emission)			Big Stone II Annual Emissions (tons per year)
	Low	High	Year \$	
SO2	\$ 1,800	\$ 10,600	1999	-
NOx	\$ 2,200	\$ 16,900	1999	-
CO	\$ 700	\$ 2,900	1999	3,193
PM10	\$ 2,000	\$ 26,500	1999	745
VOC	\$ 900	\$ 10,100	1999	85
Lead	\$ 472	\$ 526	2004	0.38
Mercury	\$ 5,000,000	\$ 73,300,000	1999	0.09
CO2 -- Literature Survey	\$ 1.5	\$ 51.0	1999	4,363,868
CO2 -- CA PUC Adder		8.0	2005	4,363,868

The specific sources for the externality values and calculations used to generate volumes in Table 3 are contained in Exhibit B to this testimony.

Q. WHAT WAS THE SOURCE OF THE ANNUAL EMISSIONS VOLUMES?

A. In general, the annual emissions were based on the Big Stone II's PSD Permit Application adjusted as described in detail below.⁷³ The only two exceptions are mercury and carbon dioxide for which emissions were calculated by using per unit emission factors and plant operational parameters quoted in the Application or the exhibits to Applicants' direct testimonies.

Staff made three adjustments to volumes listed in Big Stone II's PSD Permit Application. The first adjustment was to account for the fact that the volumes contained in the PSD Permit Application represent potential maximum

⁷³ Application provided in response to Staff 1st Set of Data Requests, Request No. 5.

1 emissions – emissions associated with continuous operation of the plant
2 throughout the year. In order to convert potential maximum emissions to
3 “expected” emissions, Staff adjusted the potential maximum emissions downward.
4 by the plant capacity factor.

5 The second adjustment was to account for the difference between the
6 proposed emission volumes (volumes contained in the Applicants’ PSD Permit
7 Application) and the permitted volumes (volumes expected to be permitted under
8 the PSD Permit). Note that in April 2006 the South Dakota Department of
9 Environment and Natural Resources issued a Draft PSD Permit for Big Stone II
10 and a Statement of Basis associated with this Draft Permit. Although these
11 documents did not contain total annual permitted emissions amounts for each
12 pollutant (the draft permit is formulated in terms of emissions rates), Staff noticed
13 that in certain cases the Draft PSD Permit allowed for smaller total emissions than
14 the emission volumes listed in the PSD Permit Application. Specifically, the
15 Draft Permit contained smaller plant-wide permitted emissions of nitrogen oxides
16 and sulfur dioxide, as well as a smaller emission rate for carbon monoxide, than
17 the PSD Permit Application. In accordance with the Draft PSD Permit, Staff re-

1 calculated total annual emissions for these three pollutants.⁷⁴ The impact of this
2 adjustment is a reduction in annual emissions of these three pollutants.⁷⁵

3 The third adjustment was to use a more accurate conversion factor
4 between pounds and tons. While performing its second adjustment to emission
5 volumes Staff noticed that the PSD Permit Application calculated total emission
6 volumes in terms of pounds, and then converted pounds to tons using a somewhat
7 rounded conversion factor.⁷⁶ Staff replaced this rounded conversion factor with a
8 more precise measure that Staff used elsewhere in its calculations.⁷⁷ The impact
9 of this adjustment is a small reduction in the annual tons of emissions.

10
11 **Q. THE PSD PERMIT APPLICATION CONTAINS EMISSION VOLUMES**
12 **FOR TWO OTHER POLLUTANTS – SULFURIC ACID MIST AND**
13 **FLUORIDES. WHY DID YOU EXCLUDE THESE POLLUTANTS FROM**
14 **YOUR ANALYSIS?**

15 A. Staff did not find externality estimates for these pollutants.
16

⁷⁴ This calculation is contained in Exhibit B. Staff conducted these calculations because first-hand information on total annual emissions was not available. However, it is unclear whether Staff's adjustments account for all the revisions to PSD Permit Applications, for example, revisions mentioned in the Statement of Basis on page 1. If more accurate information on total annual emissions becomes available, Staff would revise its environmental impact calculations accordingly.

⁷⁵ Because the plant-wide Big Stone Units I and II permitted emissions for sulfur dioxide and nitrogen oxides are set equal to historical emissions of Big Stone I, the effective emissions of these two pollutants associated with Big Stone II are zero.

⁷⁶ Calculations on pages 3-3 and 3-4 of PSD Permit Application imply a conversion factor of 0.0005 lb/ton.

⁷⁷ This conversion factor is approximately 0.0004536 lb/ton.

1 **Q. PLEASE EXPLAIN WHY YOUR EXTERNALITY ESTIMATES ARE**
2 **REPRESENTED AS A WIDE RANGE OF VALUES.**

3 A. The wide range simply captures the uncertainties associated with estimating
4 externalities. One source of such uncertainties is the need to assign monetary
5 values to non-market goods, such as the value of human life or health. Another
6 factor is the uncertainty about the dose-response functions – the physical
7 relationship between specific levels of exposure to pollution and the resulting
8 physical effects such as an asthma attack or cancer. An EPA’s survey of
9 externality studies⁷⁸ found that these two factors contribute significantly more to
10 the variability of externality estimates than the third factor – regional-specific
11 parameters such as population density, ambient air quality or the presence of
12 fragile ecosystems. Because of these uncertainties it is customary in the
13 externality literature to conduct an aggregation analysis – derive a range of
14 externality values from a number of surveyed sources. The above mentioned
15 EPA survey contains such aggregation analysis. Staff used this EPA survey as its
16 main source of the externality values.

17
18 **Q. WHAT WERE THE OTHER SOURCES OF YOUR EXTERNALITY**
19 **VALUES?**

20 A. The EPA survey did not contain externality values for lead and mercury. For
21 each of these two pollutants Staff identified only one source of externality

⁷⁸ Available at www.epa.gov/oppt/epp/pubs/guidance/top20faqexterchart.htm.

1 estimates. For mercury this source was a recent paper by *Resources for the*
2 *Future*,⁷⁹ and for lead – Minnesota PUC’s prescribed externality values.

3 In addition, because the EPA’s externality estimates for carbon dioxide
4 exhibited the widest range compared to other pollutants,⁸⁰ Staff utilized two
5 alternative estimates for externalities associated with carbon dioxide – one was
6 the estimate from the EPA survey, and the other – the externality adder used by
7 the California PUC.⁸¹ Staff believes that the use of two alternative externality
8 estimates for carbon dioxide was appropriate for two reasons. First, as will be
9 shown below, due to the large volumes of carbon dioxide emissions, the
10 environmental impacts of carbon dioxide constitute a significant portion of total
11 impact. Second, although scientists agree that carbon dioxide creates adverse
12 effects on the environment by attributing to global warming, the specific adverse
13 effects of carbon dioxide on the environment are less understood than the effects
14 of criteria pollutants such as sulfur dioxide or particulate matter.⁸² For example,
15 the EPA’s Global Warming site explains

⁷⁹ Palmer K., Butraw D. and Shih S.-J. *Reducing Emissions from the Electricity Sector*, Discussion paper, June 2005.

⁸⁰ The ratio of upper and lower values was 34, or 3,400%.

⁸¹ The choice of California PUC’s value was not based on any formal analysis, but rather as an example of a mid-range value. For example, California’s externality value of \$8 per ton of carbon dioxide emission is higher than Minnesota PUC’s values of \$3.64 within Minnesota, and zero within 200 miles of Minnesota. Another example is Oregon, where the PUC requires utilities to conduct scenario analysis with carbon dioxide externality values of zero, \$10, \$25 and \$40. In their latest integrated resource plans one Oregon utility adopted a base-case scenario externality value of approximately \$8, another utility adopted a base-case value of \$12 per ton of carbon dioxide, and a third utility adopted two alternative base-case scenarios of zero and \$10. (Information provided by Oregon PUC Staff.)

⁸² Criteria pollutants include SO₂, NO_x, CO, PM, Lead and Ozone. Ozone is formed by a reaction between NO_x and Volatile Organic Compounds (VOC). In other words, Staff’s analysis includes the effects of criteria pollutants plus mercury and carbon dioxide.

1 Figuring out to what extent the human-induced accumulation of
2 greenhouse gases since pre-industrial times is responsible for the global
3 warming trend is not easy. This is because other factors, both natural
4 and human, affect our planet's temperature. Scientific understanding of
5 these other factors – most notably natural climatic variations, changes in
6 the sun's energy, and the cooling effects of pollutant aerosols – remains
7 incomplete.⁸³

8 Because of the controversy surrounding the quantification of environmental
9 impacts of carbon dioxide Staff not only utilized two alternative externality
10 estimates for carbon dioxide, but also presented the results of its calculation by
11 explicitly separating the impact of carbon dioxide.

12
13 **Q. DO THE EXTERNALITY VALUES USED IN YOUR ANALYSIS**
14 **REPRESENT THE IMPACT SPECIFIC TO SOUTH DAKOTA?**

15 A. No, they do not. By nature, air emissions are not confined to state boundaries,
16 especially in the case of Big Stone II, which is located on the Minnesota border.
17 In fact, most of the air emissions in question have a regional, rather than local
18 nature in the sense that they are often transported hundreds of miles away from
19 the source. For example, acid rain (which results from the emissions of nitrogen
20 oxides and sulfur dioxide) may be carried by winds across state or national
21 borders before it falls on the ground. It is estimated that at least 75% of the
22 emitted mercury will likely be transported more than 50 km⁸⁴ from the emission
23 source, and a significant portion would be vertically diffused into free atmosphere

⁸³ <http://yosemite.epa.gov/oar/globalwarming.nsf/content/climateuncertainties.html>.

⁸⁴ Thirty one miles. EPA *Mercury Study. Report to Congress. Volume III: Fate and Transport of Mercury in the Environment*. December 1997.

1 to become part of the global cycle.⁸⁵ Particulate matter has both local and
2 regional nature, where large particles are deposited locally, and fine particles can
3 be transported thousands of miles away from the source.⁸⁶ And finally, the
4 greenhouse effect of carbon dioxide is global by nature, so that the adverse effects
5 of global warming may show in areas unrelated to the emission sources of carbon
6 dioxide.

7
8 **Q. THE APPLICANTS' PSD PERMIT APPLICATION ESTIMATES THAT**
9 **BIG STONE II WILL NOT CAUSE A VIOLATION OF THE NATIONAL**
10 **AMBIENT AIR QUALITY STANDARDS IN GRANT COUNTY. DOES**
11 **THE NON-VIOLATION OF THE STANDARDS IMPLY THAT THE**
12 **ENVIRONMENTAL IMPACTS ARE ZERO?**

13 A. No, it does not. As explained above, air emissions are often transported hundreds
14 of miles away, thus contributing to air pollution in other areas. The negative
15 impact of mercury emissions (to which the national ambient air quality standards
16 do not apply⁸⁷) is associated with its accumulation in fish, and as discussed above,
17 fish in certain lakes in South Dakota and the two Minnesota counties neighboring
18 Big Stone is already considered to be unsafe by state health departments.

⁸⁵ *Id.*

⁸⁶ http://www.epa.gov/airtrends/pmreport03/pmunderstand_2405.pdf#page=1. Note that particulate matter from Big Stone II (PM10) defined as particles with diameter less or equal to 10 micrometers includes both fine particles (particles with diameter less or equal to 2.5 micrometers) and coarse particles (particles with diameter greater 2.5 micrometers).

⁸⁷ The national ambient air quality standards are set for six criteria pollutants discussed above. See for example, <http://www.epa.gov/ttn/naaqs/>.

1 Of course, it is reasonable to expect that emissions that deposit locally or
2 regionally cause larger environmental impacts in areas where the air quality is low
3 compared to areas where the air quality is high. It is also important to keep in
4 mind that externality studies are often conducted for more densely populated
5 areas than the Big Stone area and the surrounding states. Therefore, Staff's
6 calculation of the environmental impacts should be considered as a "pessimistic
7 scenario" rather than an "average scenario." Based on the same reasoning, the
8 lower boundary of externality values listed in Table 3 may be more relevant to the
9 proper estimation of environmental impact of Big Stone II than the upper
10 boundary. However, Staff utilized both lower and upper values of externalities in
11 its calculation because, as explained above, the variance in externality estimates is
12 caused not only by regional factors, but also by uncertainty related to the value of
13 non-monetary goods such as human life and the exact physical dose-response
14 relationships.

15
16 **Q. PLEASE SUMMARIZE YOUR CALCULATION OF THE**
17 **ENVIRONMENTAL IMPACTS OF BIG STONE II.**

18 A. Table 4 contains Staff's estimate of the annual environmental impact associated
19 with air emissions by Big Stone II.⁸⁸

⁸⁸ For calculations, see Staff's Exhibit B.

Table 4. Big Stone II Annual Environmental Impact Estimates (2005 Dollars)

Pollutant	Big Stone II Environmental Impact Estimates		
	Low	High	Average
SO2	\$ -	\$ -	\$ -
NOx	\$ -	\$ -	\$ -
CO	\$ 2,561,019	\$ 10,609,935	\$ 6,585,477
PM10	\$ 1,706,836	\$ 22,615,578	\$ 12,161,207
VOC	\$ 87,401	\$ 980,833	\$ 534,117
Lead	\$ 183	\$ 204	\$ 194
Mercury	\$ 504,855	\$ 7,401,175	\$ 3,953,015
Total Excluding CO2	\$ 4,860,294	\$ 41,607,726	\$ 23,234,010
CO2 -- Literature Survey	\$ 7,500,704	\$ 255,023,933	\$ 131,262,318
CO2 -- CA PUC Adders	\$ 34,910,940	\$ 34,910,940	\$ 34,910,940
Total: CO2 Based on Literature	\$ 12,360,998	\$ 296,631,659	\$ 154,496,328
Total: CO2 Based on CA PUC	\$ 39,771,235	\$ 76,518,666	\$ 58,144,950

1
2
3 The total annual impact is calculated as a product of Big Stone II's annual
4 emissions, and the low and high externality values. As the table shows, carbon
5 dioxide's contribution to the total impact is by far the largest: Under the
6 externality values from the EPA literature survey, carbon dioxide constitutes on
7 average 85% of the total environmental impact.⁸⁹ Under the carbon dioxide's
8 externality adder used by the California PUC, carbon dioxide's share in total
9 impact is 60%.⁹⁰ The total impact ranges between approximately \$12 and \$300
10 million if we use the carbon dioxide externality values from literature, and
11 between \$40 and \$77 million if we use the California PUC's externality adder for

⁸⁹ Calculated as \$131,262,318 / \$154,496,328.

⁹⁰ Calculated as \$34,910,940 / \$58,144,950.

1 carbon dioxide. The two other pollutants that contribute significantly to the total
2 impact are carbon monoxide and particulate matter.

3
4 **Q. THE ESTIMATED ENVIRONMENTAL IMPACTS APPEAR TO BE**
5 **LARGE. WHAT IS THE PROPER CONTEXT FOR THE ESTIMATED**
6 **ENVIRONMENTAL IMPACTS THAT WOULD HELP THE**
7 **COMMISSION IN ITS DECISION-MAKING?**

8 A. The proper context for the environmental effects – which are negative
9 “external”⁹¹ effects of Big Stone II to society and the environment – is to compare
10 them to the positive socio-economic effects of Big Stone II. The Applicants
11 quantified two sources of the positive socio-economic effects of Big Stone II:
12 First, the Applicants estimated the direct, indirect and induced economic impacts
13 of Big Stone II construction and operation to the state of South Dakota (the
14 multiplier analysis).⁹² Second, the Applicants estimate additional state and local
15 property, sales, use and excise tax effects.⁹³ Although the socio-economic impact
16 is calculated for a more limited geographic region (state of South Dakota), it
17 nevertheless provides a useful reference point. At the same time it is important to
18 keep in mind that because of this geographic “mismatch,” the positive impacts, as
19 well as the net impacts (the difference between positive and negative impacts) are
20 likely to be underestimated. In addition, the Applicants’ estimate for socio-

⁹¹ These effects are “external” in the sense that they are borne by entities other than the Applicants.

⁹² Direct Testimony of Randall M. Stuefen and Exhibit C of the Application.

⁹³ Direct Testimony of Janelle Johnson and Application Section 5.1.5.

1 economic benefits does not include “primary” consumer benefits of the project
2 associated with the production of electricity.⁹⁴ Again, this is another factor that
3 makes Staff’s analysis a “pessimistic” scenario.
4

5 **Q. HOW DID YOU COMPARE ENVIRONMENTAL AND SOCIO-**
6 **ECONOMIC EFFECTS GIVEN THAT THE LATTER VARY BY YEAR?**

7 A. The socio-economic impact does vary significantly between the phases of
8 construction and operation. For example, the Applicants estimate⁹⁵ that the
9 economic impact of the four-year construction is between \$745.1 and \$810.4
10 million,⁹⁶ while the annual economic impact of operation is \$3.6 million.⁹⁷
11 Similarly, sales taxes during construction are estimated as \$11 million,⁹⁸ and as
12 “materially insignificant”⁹⁹ during operation.

⁹⁴ These benefits – referred to as consumer surplus in economic textbooks – are associated with the positive difference between the consumers’ willingness to pay of electricity and the market price of electricity.

⁹⁵ The estimates of the economic impact quoted in this testimony are based on the Applicants’ direct testimony. The Applicants’ response to Staff’s discovery (Staff’s 3rd Set of Data Requests, Request No. 48) indicates that the economic impacts should be revised downwards to exclude social security contributions. In this data response the Applicants provided a revised estimate for one of the measures of the impact, which was lowered by 6.2% (social security contributions) compared to the estimate filed in the testimony. Unfortunately, the data response did not contain the revisions for all estimated impacts. The data response also did not explain whether any other measures of the economic impact should be revised; therefore, Staff’s summary of the economic impact does not capture this revision.

⁹⁶ Direct Testimony of Randall M. Stuefen p. 8 (2008 dollars) and Exhibit 26-B, Summary Table 4. The Applicants calculated the lower boundary as the economic impact without escalation money (money budgeted to account for inflation and cost over-runs), and the upper boundary – as the economic impact with escalation money.

⁹⁷ Direct Testimony of Randall M. Stuefen p. 8.

⁹⁸ Direct Testimony of Janelle Johnson, p. 5.

⁹⁹ *Id.*, p. 6.

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Note that the estimated environmental impact is associated with the operation stage of the plant, therefore, in order to compare socio-economic and environmental effects of Big Stone II, it is necessary to express them in comparable measures – present values of the future streams of annual effects. In addition, all of the dollar figures need to be converted into “real” dollars – dollars of the same base year. Staff performed this calculation for the whole operation life of the plant, which was assumed to be 40 years.¹⁰⁰ In addition, Staff had to make an assumption about the annual discount rate, which was set to 10% in Staff’s base case scenario. Later in this testimony I discuss the basis for this assumption and the sensitivity of the results to alternative discount rates.

Table 5 below lists the economic impacts presented in the Applicants’ testimony. The annual economic impacts are converted into present value real dollars in the last row of this table.

¹⁰⁰ This assumption is based on the Applicants’ statements that the plant is designed for a 30-year minimum operation life, and that it is common for solid fossil fuel plants to operate beyond their projected minimum lives (See Section 2.1.3 of the Application).

Table 5. Big Stone II's Annual and Total Economic and Tax Impacts
Present Value Calculated over Life of the Plant (2005 dollars).

Time Period	SD Economic Impact*		Property Tax Impact**	Sales, Use, Excise Tax Impact**	Total Impact	
	Without Escalation \$	With Escalation \$			Min	Max
Total Construction (4/07-4/11)	\$ 745,145,207	\$ 810,376,070		\$11,000,000		
Construction year 1			\$ 560,000			
Construction year 2			\$ 1,100,000			
Construction year 3			\$ 1,600,000			
Construction year 4			\$ 1,600,000			
Annual Operation	\$ 3,600,000	\$ 3,600,000	\$ 4,700,000	<i>insignificant</i>		
Present Value over Life of the Plant***	\$579,285,084	\$628,012,199	\$35,105,456	\$8,717,130	\$623,107,670	\$671,834,785

* – Source: Stuefen's Direct Testimony, Exhibit 26-B Table 4 (2008 dollars)
 ** – Source: Johnson's Direct Testimony (year for dollar figures was not specified; Staff assumed year 2005)
 *** – Based on 40-year plant life and 10% discount rate

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As seen from Table 5, the present value of economic and tax impacts over the life of the plant is estimated to be between \$623,107,670 and \$671,834,785. This range represents the comparison point to Staff's estimates of the negative environmental impacts.

Q. PLEASE PROVIDE THE COMPARISON OF SOCIO-ECONOMIC BENEFITS AND NEGATIVE ENVIRONMENTAL IMPACTS OF BIG STONE II.

The results of Staff's calculations are presented in Table 6A. ¹⁰¹

¹⁰¹ For calculations, see Staff's Exhibit B.

Table 6A. Comparison of Negative Environmental and Positive Local Impacts of Big Stone II.			
CO2 Externalities Based on Literature Values. 10% Discount Rate.			
Present Value over 40-year Life of the Plant (2005 dollars).			
Measure	Lower Boundary	Upper Boundary	Average
I. Negative Impact: Externalities from Pollution (No geographic boundaries defined)			
Total Externalities Including CO2	\$ 82,561,866	\$ 1,981,269,062	\$ 1,031,915,464
Total Externalities Excluding CO2	\$ 32,462,990	\$ 277,907,289	\$ 155,185,139
II. Positive Impact: Local Economic and Tax Effects (State of South Dakota)			
Total Impact	\$623,107,670	\$671,834,785	\$ 647,471,227
III. Net Impact			
Net Impact Including CO2	\$ (1,358,161,392)	\$ 589,272,919	\$ (384,444,236)
Net Impact Excluding CO2	\$ 345,200,381	\$ 639,371,795	\$ 492,286,088
* - Lower Boundary of Net Impact = Lower Boundary of Positive Impact - Upper Boundary of Negative Impact. Similarly, Upper Boundary of Net Impact = Upper Boundary of Positive Impact - Lower Boundary of Negative Impact			

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2
3 **Q. WHAT ARE THE MAIN CONCLUSIONS FROM THIS TABLE?**

4 A. Staff made three main conclusions. First, if we account for the negative impacts
 5 of all pollutants including carbon dioxide, for which the EPA literature survey
 6 gives a wide range of externality values, the net impact of Big Stone II lies in a
 7 wide range between negative \$1.4 billion and positive \$0.6 billion, and averaging
 8 negative \$0.4 billion.¹⁰² This result is shown in Table 6A. As seen from the row
 9 titled "Net Impact Excluding CO₂," the negative net impact is driven by the
 10 presence of externality effects associated with carbon dioxide: If we exclude
 11 carbon dioxide externalities, the total net impact of Big Stone II is positive.

12 Second, if we adopt a moderate level of the carbon dioxide's externality
 13 value, such as the adder used by the California PUC, the net impact of Big Stone
 14 II is positive. This result is shown in Table 6B, which represents a variation of

¹⁰² Values from the second to last row of Table 6A.

1 Table 6A, with the only difference being the externality value for carbon dioxide
2 utilized in the calculations:

Table 6B. Comparison of Negative Environmental and Positive Local Impacts of Big Stone II. CO2 Externalities Based on Literature Values. 10% Discount Rate. Present Value over 40-year Life of the Plant (2005 dollars).

Measure	Lower Boundary	Upper Boundary	Average
I. Negative Impact: Externalities from Pollution (No geographic boundaries defined)			
Total Externalities Including CO2	\$ 265,640,954	\$ 511,085,253	\$ 388,363,103
Total Externalities Excluding CO2	\$ 32,462,990	\$ 277,907,289	\$ 155,185,139
II. Positive Impact: Local Economic and Tax Effects (State of South Dakota)			
Total Impact	\$623,107,670	\$671,834,785	\$ 647,471,227
III. Net Impact*			
Net Impact Including CO2	\$ 112,022,417	\$ 406,193,831	\$ 259,108,124
Net Impact Excluding CO2	\$ 345,200,381	\$ 639,371,795	\$ 492,286,088

* – Lower Boundary of Net Impact = Lower Boundary of Positive Impact - Upper Boundary of Negative Impact.

Similarly, Upper Boundary of Net Impact = Upper Boundary of Positive Impact - Lower Boundary of Negative Impact

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5 As seen from Table 6B, the net impact of Big Stone II is positive if we “price” the
6 impact of carbon dioxide at the level used by the California PUC. In other words,
7 under the moderate level of the carbon dioxide’s externality value the geographic
8 mismatch between the estimated “global” environmental impacts and “state-wide”
9 socio-economic effects does not affect the overall conclusion that Big Stone II’s
10 socio-economic benefits exceed its environmental costs.

11 Third, if we narrow down the environmental impacts to the state of South
12 Dakota, the net impact of Big Stone II is likely to be positive: It is reasonable to
13 assume that South Dakota’s share of the adverse effect of carbon dioxide (which

1 is global warming) is very small. As already noted, if we exclude the effect of
2 carbon dioxide, the net impact of Big Stone II becomes positive.¹⁰³

3
4 **Q. PLEASE EXPLAIN YOUR BASIS FOR THE ASSUMED DISCOUNT**
5 **RATE AND COMMENT ON THE SENSITIVITY OF THE RESULTS TO**
6 **CHANGES IN THIS ASSUMPTION.**

7 A. Recall that a discount rate is a measure of the trade-off between present and future
8 cash flows. As noted above, Staff's base case scenario assumes a 10% discount
9 rate. This value is designed to be a round number that approximates a discount
10 rate of the private industry, which is typically measured as expected returns on
11 investment.¹⁰⁴ However, the issue of choosing the appropriate discount rate is
12 controversial when the study involves environmental impacts. Some researchers
13 believe that in utility planning private discount rates should be used for the sake
14 of consistency.¹⁰⁵ Others believe that the discount rate should be low (or even
15 zero) because environmental impacts involve health effects and future
16 generations, and it is inappropriate to discount health and well-being of future
17 generations.¹⁰⁶ The EPA uses alternative discount rates in its cost-benefit

¹⁰³ This result holds even if we assume that South Dakota's share of the adverse effects of carbon dioxide (as calculated in Table 6A, i.e. under carbon dioxide's externality values from the EPA literature) is 20%.

¹⁰⁴ In regulated industries the expected returns on private investment are reflected in the calculated weighted cost of capital. According to the Analysis of the Baseload Generation Alternatives (the Applicants' Exhibit 23-A, pages 5-5 – 5-6), the weighted cost of capital (and the discount rate) of an investor owned utility was assumed to be 9.75%.

¹⁰⁵ Chernick, P. and E. Caverhill, *The Valuation of Externalities from Energy Production, Delivery and Use*, Boston, Massachusetts, 1989.

¹⁰⁶ Pearce, D. and R. Turner, *Economics of Natural Resources and the Environment*, Harvester-Wheatsheaf, 1990.

1 analysis, which are currently set at 3% for the “social discount rate” and 7% for
 2 the “opportunity cost of capital.”¹⁰⁷

3 Staff adopted the EPA’s discount rate of 3% to test the sensitivity of its
 4 analysis that compares environmental costs and economic benefits of the Big
 5 Stone II project. Table 7A below represents a version of Table 6A (Staff’s base
 6 case) with only one difference – the discount rate was changed from 10% to 3%.

Table 7A. Comparison of Negative Environmental and Positive Local Impacts of Big Stone II. CO2 Externalities Based on Literature Values. 3% Discount Rate. Present Value over 40-year Life of the Plant (2005 dollars).

Measure	Lower Boundary	Upper Boundary	Average
I. Negative Impact: Externalities from Pollution (No geographic boundaries defined)			
Total Externalities Including CO2	\$ 253,859,988	\$ 6,091,976,435	\$ 3,172,918,211
Total Externalities Excluding CO2	\$ 99,816,715	\$ 854,505,169	\$ 477,160,942
II. Positive Impact: Local Economic and Tax Effects (State of South Dakota)			
Total Impact	\$833,616,799	\$890,755,970	\$ 862,186,384
III. Net Impact			
Net Impact Including CO2	\$ (5,258,359,636)	\$ 636,895,982	\$ (2,310,731,827)
Net Impact Excluding CO2	\$ (20,888,370)	\$ 790,939,254	\$ 385,025,442

* – Lower Boundary of Net Impact = Lower Boundary of Positive Impact - Upper Boundary of Negative Impact.
 Similarly, Upper Boundary of Net Impact = Upper Boundary of Positive Impact - Lower Boundary of Negative Impact

7
 8
 9 As seen from Table 7A, the decrease in the discount rate significantly decreased
 10 the net impact: For example, the average total net impact (including the impact of
 11 carbon dioxide) decreased from negative \$0.4 billion in Table 6A to negative \$2.3
 12 billion in Table 7A. Similarly, the average net impact excluding carbon dioxide
 13 also decreased – from positive \$0.5 billion to positive \$0.4 billion. At the same

¹⁰⁷ See for example, EPA “Regulatory Impact Analysis for the Final Clean Air Visibility Rule or the Guidelines for Best Available Retrofit Technology (BART) Determinations Under the Regional Haze Regulations,” June 2005, page 4-5, footnote 17.

1 time the upper boundary of the net impact increased. For example, the upper
2 boundary for the net impact excluding carbon dioxide increased from positive
3 \$0.6 billion to positive \$0.8 billion.

4 Although the average net impacts appear to be unfavorable to the
5 Applicants, the fact that the upper boundary of the estimated net impact remains
6 to be positive is significant: As explained above, because of the “generic” nature
7 of the externality values used in Staff’s calculation and the fact that South Dakota
8 is likely to be a “cleaner” and less densely populated state than a typical area
9 where externality studies were performed, the upper boundary of the net impact¹⁰⁸
10 is likely to be a more accurate estimate of Big Stone II’s net impacts than the
11 lower boundary. It is also important to re-iterate that the positive economic
12 impact estimated by the Applicants and utilized in Staff’s calculations does not
13 account for “primary” consumer benefits of the project – consumer surplus from
14 the production of electricity.

15
16 **Q. ARE THERE ANY OTHER LIMITATIONS OF YOUR ANALYSIS**
17 **BESIDES THE ALREADY DISCUSSED LIMITATIONS?**

18 A. Yes. Staff’s estimates of the environmental impacts are based on the key air
19 emissions, and do not account for other natural resource uses such as land and
20 water. As mentioned above, land and water impacts are expected to be
21 significantly less than air impacts; nevertheless, they are likely to be present. For

¹⁰⁸ Because the environmental impact represents cost rather than benefits, the upper boundary of the net impact is calculated using the lower boundary of the environmental impact.

1 example, the project is expected to permanently take out of production 465 acres
2 of prime farmland, which is 0.17% of the prime farmland in Grant County as
3 discussed later in the testimony.¹⁰⁹ The negative impact to farming, which is
4 expected to be small, is not captured in the analysis above. Another effect that is
5 not accounted for is the impact of Big Stone II's project on the tourism industry,
6 where a small displacement of traditional users is likely to happen. The effect on
7 the tourist industry is analyzed in the testimony of Staff's witness Dr. Madden.
8

9 **E. Community Impact**

10 **Q. WHAT IS THE MAIN SOURCE OF THE POTENTIAL NEGATIVE** 11 **COMMUNITY IMPACTS OF THE PROJECT?**

12 A. The potential negative impact on the community is associated mainly with the
13 substantial influx of people in the area during construction. Specifically, the
14 Applicants estimated that at its peak, Big Stone II's construction will employ
15 1,400 workers, which, counting the family members, may bring approximately
16 3,556 people into the area.¹¹⁰ This number constitutes 11% of the total population
17 of the four-county local area.¹¹¹ Although the Applicants cite the construction of

¹⁰⁹ Responses to Staff's 2nd Discovery, Request No. 18.

¹¹⁰ Application, Table 5-3, pp. 128-129. Note this estimate may be over-stating the total influx of people because it does not account for the possibility that some of the new workers would be local residents. It also assumes that construction workers will typically bring their families, while the evidence collected by the Local Review Committee from the currently built Weston 4 power plant in Wisconsin shows that few employees brought their children with them. (*Big Stone II Final Report on the Social and Economic Assessment*, December 14, 2005 ("Report of the Local Review Committee"), p. 13).

¹¹¹ Based on the population counts by county contained in Application, Table 5-3, pp. 128-129.

1 Big Stone I as an example where the local community successfully
2 accommodated the influx of people, it is worth noting that during Big Stone I
3 construction, the number of construction workers was smaller at 900 people.¹¹²

4 As discussed in Exhibit 4 of the Application, an influx of people
5 stimulates demand for lodging, medical care, schools and other sectors of the
6 local economy, which can strain a small rural economy.¹¹³ Because of the rural
7 character of the Big Stone area, this site received the lowest “socio-economic”
8 score in the Applicant’s analysis of alternative sites.¹¹⁴

9
10 **Q. WHAT SPECIFIC NEGATIVE IMPACTS OF THE INFLUX OF PEOPLE**
11 **DURING CONSTRUCTION HAVE YOU IDENTIFIED?**

12 A. Staff identified two areas where the negative impact is expected to be most
13 noticeable: housing and law enforcement. The Applicants contracted the First
14 District Association of Local Governments¹¹⁵ (“First District”) to conduct a
15 community survey, including a study of the availability of temporary lodging,
16 including motels and rental properties such as houses, apartments, mobile homes
17 and mobile home pads. According to their survey, there are 2,242 motel beds in
18 the 60-miles radius area around Big Stone,¹¹⁶ and motels will be able to

¹¹² Application, p. 116.

¹¹³ Application, Exhibit 4, pages 4-5 – 4-6.

¹¹⁴ *Id.*

¹¹⁵ The results of this survey are described in the direct testimony of Mr. Dick Edenstrom, who is the executive director of this association.

¹¹⁶ Application, p. 120.

1 accommodate 1,121 workers and still conduct business as usual.¹¹⁷ Although the
2 general conclusion of the First District study was that the affected communities
3 are capable and willing to absorb the housing needs of the project,¹¹⁸ certain
4 negative effects may be expected. For example, the Application mentions that
5 seasonal availability of the motels may be an issue.¹¹⁹ Given that the Application
6 also mentions long-term arrangements for large blocks of rooms, it is reasonable
7 to conclude that the seasonal shortage of motel beds may be an issue for other
8 visitors to the area, rather than the Big Stone II's construction workers (who
9 would likely have long-term arrangements). In other words, some seasonal
10 business such as from the tourist industry may be lost during the years of
11 construction.

12 The Local Review Committee pointed to another area where the housing
13 market may be adversely affected by the temporary influx of construction workers
14 – the upwards pressure on housing prices and that housing may cease being
15 affordable to some local residents. Specifically, the Local Review Committee
16 noted that the existing housing base within Grant and Big Stone counties is only
17 6,500 units;¹²⁰ that local developers have already started purchasing rental
18 property;¹²¹ and that lot rents have already increased.¹²² The Local Review
19 Committee suggested not only a housing contingency plan be developed by the

¹¹⁷ Direct Testimony of Dick Edenstrom, p. 9.

¹¹⁸ *Id.*, p. 3.

¹¹⁹ Application, p. 120.

¹²⁰ Report of the Local Review Committee, p. 11.

¹²¹ *Id.*, p. 9.

¹²² *Id.*, p. 10.

1 Big Stone owners (in case the local housing market cannot accommodate
2 additional workforce),¹²³ but also that rent assistance be provided by the South
3 Dakota Housing Development Authority in cases of sudden rate hikes.¹²⁴ Note
4 that the Applicants stated that they plan to follow the recommendations of the
5 Local Review Committee and develop a housing contingency plan.¹²⁵

6 Despite these negative impacts it is important to recognize that the total
7 impact on the housing and tourist industry is expected to be positive because of
8 the expected increase in these industries' total revenues associated with the influx
9 of people. These positive impacts are discussed in detail in the testimony of
10 Staff's witness Dr. Madden.

11
12 **Q. WHAT WILL BE THE NEGATIVE IMPACTS RELATED TO LAW**
13 **ENFORCEMENT?**

14 A. These effects may be associated with the general increase in population and
15 economic activity. For example, the Application discusses the need for additional
16 traffic patrol activities because of the increased amount of traffic due to
17 construction.¹²⁶ Similarly, the Local Review Committee explains that "just the
18 increase in the number of workers will likely impact the crime and civil case load.
19 Taken together, the Sheriff's workload will increase."¹²⁷ The Local Review

¹²³ *Id.*, pp. 11-12

¹²⁴ *Id.*, p. 12.

¹²⁵ Responses to Staff's 2nd Set of Interrogatories, Request No. 30.

¹²⁶ Application, p. 126.

¹²⁷ Report of the Local Review Committee, p. 16.

1 Committee recommends that an additional officer be added to the Grant County's
2 Sheriff's office. The Applicants stated that they agreed to provide funding for this
3 additional position.¹²⁸

4 Based on the experience of Big Stone I's construction, drinking and
5 driving by the construction workers is perceived as a potential issue.¹²⁹ To
6 mitigate this problem, the Local Review Committee recommends that the
7 Applicants conduct drug screening of its employees,¹³⁰ as is currently being done
8 in construction of the Weston 4 power plant in Wisconsin. Note that the
9 Applicants stated that they plan to follow the recommendations of the Local
10 Review Committee and conduct drug and alcohol screening of employees,
11 including "pre-employment, random, post-accident and for-cause testing."¹³¹
12 Staff supports this recommendation. Staff would further recommend that the
13 Applicants submit a plan setting forth its actions to implement these
14 recommendations.

15
16 **Q. WERE ANY OTHER NOTICEABLE NEGATIVE IMPACTS ON THE**
17 **LOCAL COMMUNITY IDENTIFIED?**

18 A. No. The Applicants surveyed local governments and local infrastructure services
19 including schools, health facilities, fire departments, local water and sewer
20 systems, and cultural resources. The results of this survey suggest that local

¹²⁸ Responses to Staff's 2nd Set of Interrogatories, Request No. 34.

¹²⁹ Report of the Local Review Committee, p. 4.

¹³⁰ Report of the Local Review Committee, pp. 16-17.

¹³¹ Responses to Staff's 2nd Set of Interrogatories, Request No. 31.

1 governments support the project, and that the local infrastructure should be able to
2 accommodate the increased load. The Applicants agreed, following the
3 recommendation of the Local Review Committee, to provide fire protection
4 equipment and training to the local fire department.¹³² In addition, the Applicants
5 intend to comply with another recommendation of the Local Review Committee –
6 to appoint a public relations representative who would facilitate the exchange of
7 information between the project owners and local communities.¹³³ The
8 Applicants are making arrangements for solid waste management of construction
9 waste, as well as the construction workers' personal solid waste.¹³⁴

10 Several minor adverse effects of the project on communities should be
11 mentioned. As discussed above, traffic is expected to increase during
12 construction, however, the Application discussed possible mitigation measures
13 including radar signs, traffic counters and arranged private transportation to and
14 from the site if traffic and parking become an issue.¹³⁵ The Draft Environmental
15 Impact Statement¹³⁶ suggested several measures to mitigate adverse transportation
16 impacts, including coordination with County authorities to mitigate severe road
17 damage (TR-1); organization of bus transportation or car pooling to reduce
18 congestion (TR-2); and delivery of heavy equipment in such a manner as to

¹³² Responses to Staff's 2nd Set of Interrogatories, Request No. 33.

¹³³ Responses to Staff's 2nd Set of Interrogatories, Request No. 32.

¹³⁴ Application, p. 123.

¹³⁵ *Id.*, pp. 123-124.

¹³⁶ WEPA: "Draft Environmental Impact Statement: Big Stone II Power Plant and Transmission Project," May 2006, Section 4.

1 reduce traffic congestion and unsafe driving conditions. Staff supports these
2 recommendations.

3 The Application also mentions that railroad traffic will increase from three
4 to four deliveries per week to six to eight deliveries per week. Because of the
5 existence of an underpass and overpass in Milbank, the additional train traffic
6 should not have an effect on road traffic. Although the increased rail traffic will
7 increase the level of noise, the intensity of traffic is comparable to what it was in
8 the past – specifically, one train a day between 1975 and 1995.¹³⁷ Additional
9 noise may be created by night time construction activity, which the Applicants
10 plan to perform in cases where technology requires a continuous 24-hour activity.
11 However, the Applicants anticipate that there will be only 20 instances that will
12 require such night-time operations.¹³⁸

13 The project may cause displacement of two to three households: the
14 Application identified two properties that may need to be vacated in order to
15 accommodate construction. These properties have either been purchased or are
16 under option to be purchased.¹³⁹ Another household is located in close proximity
17 to the future site, and the Applicants made an offer to purchase this property in
18 order to maintain a buffer zone.¹⁴⁰ In addition, the project will permanently take

¹³⁷ Responses to Staff's 2nd Set of Interrogatories, Request No. 37.

¹³⁸ Responses to Staff's 2nd Set of Interrogatories, Request No. 36.

¹³⁹ Application, p. 103.

¹⁴⁰ Responses to Staff's 2nd Set of Interrogatories, Request No. 17.

1 out of production a certain amount of farm land, but this amount constitutes only
2 0.17% of prime farmland in Grant County.¹⁴¹

3
4 **Q. WHAT ARE THE MAIN POSITIVE IMPACTS OF THE PROJECT ON**
5 **THE LOCAL COMMUNITY?**

6 A. The project's positive impacts come from two sources – additional tax revenues
7 for local taxing authorities,¹⁴² and the stimulation of the local economy through
8 project-related spending.¹⁴³ These impacts, which are associated not only with
9 the construction, but also the operation stage of the project, have already been
10 briefly discussed in section III.D of this testimony where these positive impacts
11 were compared to the negative environmental impacts of the project.

12 **IV. OTHER CONSIDERATIONS**

13 **Q. ARE THERE OTHER AREAS THE COMMISSION SHOULD CONSIDER**
14 **AS IT MAKES ITS DECISION?**

15 A. Yes. Given the huge investment associated with this project, it is appropriate for
16 the Commission to consider the risks to both the consumers and utilities
17 themselves in making this financial commitment. While the Applicants in this
18 proceeding who serve customers in South Dakota have not at this point filed for
19 recovery of this investment, that day will likely come. Likewise, for the Co-
20 Owners that are regulated by the Commissions in other states, at some point in the

¹⁴¹ Responses to Staff's 2nd Set of Interrogatories, Request No. 18.

¹⁴² Application, Section 5.1.5 and Direct Testimony of Janelle Johnson.

¹⁴³ Application, Section 5.1.1 and Direct Testimony of Randall M. Stuefen.

1 future, such utilities will go before their appropriate commission(s) seeking
2 recovery for the plant. Therefore, any risks that may impact the ability of the
3 utilities to recover the costs of Big Stone II, or that may impact the ability of
4 consumers to benefit from the existence of Big Stone II, should be addressed at
5 this point in time.

6
7 **Q. PLEASE DISCUSS HOW RATEPAYERS COULD BE IMPACTED IF**
8 **RISKS ARE NOT APPROPRIATELY CONSIDERED.**

9 A. The Applicants to this case will undoubtedly seek to recover the costs associated
10 with this plant through the selling of its output. Because it is the Applicants'
11 ratepayers who will be the buyers in this transaction, it becomes clear that the
12 costs associated with building Big Stone II and the correlating price of the output
13 it produces may be borne by the ratepayers. These ratepayers do not play a direct
14 role in making the determination to build Big Stone II, yet, in the end, they may
15 be held responsible for those decisions.

16
17 **Q. WHY WOULD THE APPLICANTS EXPOSE SOUTH DAKOTA**
18 **RATEPAYERS AND OTHER RATEPAYERS TO EXCESSIVE RISK?**

19 A. Because the Applicants have the ability to divert this financial responsibility (on a
20 "cost plus" basis) onto their ratepayers, the Applicants have less of an aversion to
21 taking financial risk and making financially risky management decisions than if
22 the responsibility was to be borne solely by the shareholders of the respective

1 utilities. Because there is a strong likelihood that ratepayers will bear at least part
2 of the burden, they are exposed to risky management decisions.

3
4 **Q. COULD POWER FROM BIG STONE II BE SOLD TO BUYERS OTHER**
5 **THAN RATEPAYERS ON THE WHOLESALE MARKET?**

6 A. Yes. Wholesale buyers may buy power from the Applicants from Big Stone II.
7 However, if the decision to construct Big Stone II is not economically sound, and
8 because wholesale purchasers have greater choice than the Applicants' captive
9 ratepayers, it is unlikely that such a transaction could occur profitably. In other
10 words, if risks taken today result in the ultimate cost of Big Stone II being higher
11 than the existing market, it is unlikely that wholesale customers would be willing
12 to "bail out" the captive ratepayers.

13
14 **Q. PLEASE DISCUSS HOW THE UTILITIES COULD BE IMPACTED IF**
15 **RISKS ARE NOT APPROPRIATELY CONSIDERED.**

16 A. As I mentioned above, the utilities participating in the Big Stone II project can
17 only recover the costs associated with the plant through appropriate filings with
18 their respective state commissions. Should any of these Commissions determine
19 that the plant (or a portion of the plant) is not "used and useful," there is a risk
20 that the utilities would not have the ability to pass those costs through to their
21 ratepayers. Such a decision by one or more state commissions would leave the
22 Co-Owners of Big Stone II with an asset for which there is no way to recover the
23 costs.

1 It should be clear that because the issue of cost recovery for this project
2 will come before regulatory bodies other than the South Dakota Public Utilities
3 Commission, the potential decisions by these other bodies should be considered
4 part of the risks that the SD PUC should take into account.

5
6 **Q. HOW COULD IT IMPACT SOUTH DAKOTA RATEPAYERS AND**
7 **UTILITIES IF OTHER STATE COMMISSIONS DISALLOWED BIG**
8 **STONE II?**

9 A. If another commission didn't allow one or more of the utilities it regulates to
10 recover all or a portion of the costs associated with Big Stone II, it could
11 jeopardize that utility's ability to uphold its obligations relative to the project.
12 Such an outcome could result in the remaining Co-Owners having an increased
13 burden with respect to recovering the costs of Big Stone II.

14
15 **Q. WHAT IS THE MAIN POINT WITH RESPECT TO THIS PORTION OF**
16 **YOUR TESTIMONY?**

17 A. The main point is that regardless of whether it is shareholders or ratepayers
18 bearing the financial burdens associated with risky management decisions, poor
19 decision making at this point in time may haunt this Commission in the future. I
20 only mention this to emphasize the fact that in making this decision, the
21 Commission is setting the stage upon which future decisions – which will have
22 direct financial impacts on both ratepayers and the utilities it regulates – will be
23 made.

1
2 **Q. ARE THERE PARTICULAR ISSUES THAT YOU HAVE IDENTIFIED**
3 **WHICH MAY EXPOSE THE CO-OWNERS AND THEIR RATEPAYERS**
4 **TO RISKS?**

5 A. Yes, there are a number of issues which should be thoroughly considered by the
6 Commission as part of its decision making process in this proceeding. Among
7 those are:

- 8 • The potential that Big Stone II will not have a reliable fuel source.
- 9 • The potential that Big Stone II will be subject to taxes and
10 emission restrictions that will dramatically increase the cost of
11 production.

12 Of course, the other side of the risk considerations is the possibility of
13 electricity shortages or higher electricity prices in the event Big Stone II is not
14 constructed.

15
16 **Q. HOW REAL IS YOUR CONCERN THAT BIG STONE II MAY NOT**
17 **HAVE AN ADEQUATE AND RELIABLE FUEL SOURCE?**

18 A. I believe that is a very real concern. The Co-Owners of Big Stone I recently
19 curtailed production due to the fact that they were running short of coal.
20 According to a recently published report, the Plant Manager of Big Stone I, Jeff
21 Endrizzi was quoted – regarding Big Stone I’s inability to adequately stockpile
22 coal – as saying “Nothing like this where it’s an extended period and we see no

1 end in sight as it sits today.”¹⁴⁴ Keith Kelley, the Big Stone Fuel supervisor also
2 expressed concern regarding the ability to hold its customers costs down, given
3 this situation.

4
5 **Q. DO YOU AGREE WITH MR. ENDRIZZI THAT THERE IS “NO END IN**
6 **SIGHT” WITH RESPECT TO THIS ISSUE?**

7 A. From what I understand, the crux of this issue is not that there is not enough coal,
8 or even that not enough coal is being mined. The key factor in the inability of Big
9 Stone I and other coal-fired generation facilities to maintain an adequate supply of
10 fuel is that the railroads delivering the coal are capacity restricted. In other words,
11 as demand for coal (particularly from the Powder River Basin) increases, the
12 existing rail infrastructure is becoming inadequate. As I already mentioned,
13 BNSF railroad named an unprecedented demand for coal as one of the main
14 factors that created the current coal shortage at Big Stone I. I also mentioned that
15 over twenty coal fired plants requiring rail service in the Western United States
16 have been proposed to start operation between 2006 and 2012, thus increasing the
17 demand for railroad coal transportation. As such, the ability of the railroads to
18 deliver this necessary fuel at prices consistent with the past, is becoming difficult,
19 if at all possible to maintain. Therefore, I believe that this issue may present risks
20 to the Co-Owners that are not addressed in their application. Further, this issue
21 represents a risk to ratepayers, who will likely be expected to pay for Big Stone II.
22 As the Chairwoman of the Arkansas Public Service Commission, Sandra

¹⁴⁴ <http://keloland.com/News/NewsDetail15440.cfm?Id=0,46855>.

1 Hochstetter was recently quoted “We’re going to have a really huge problem if
2 railroads aren’t held accountable for reliable deliveries and reasonable prices.”¹⁴⁵

3 This problem is so serious that the U.S. Senate Committee on Energy and Natural
4 Resources scheduled a special hearing on this issue on May 25, 2006.¹⁴⁶

5
6 **Q. HOW DO EMISSION AND TAX ISSUES INCREASE RISK TO**
7 **RATEPAYERS AND THE UTILITIES?**

8 A A great deal of uncertainty surrounds emission standards and potential taxes on
9 the emissions associated with coal-fired generation. The SD PUC will likely not
10 make decisions on either of these issues, but, will be forced to deal with the
11 problems associated with them, should taxes be higher than anticipated, or
12 restrictions tightened. Either of these two events would negatively impact South
13 Dakota ratepayers, the Co-Owners of Big Stone II or both.

14
15 **V. CONCLUSIONS**

16 **Q. WHAT ARE YOUR RECOMMENDATIONS REGARDING THE**
17 **APPLICATION?**

18 A. Although the upcoming rounds of testimonies by other parties, including the
19 Applicants, may cause Staff to alter its recommendations, Staff’s preliminary
20 recommendation is that the application should be approved subject to the

¹⁴⁵ Post-gazette.com. “Railroads struggle to deliver coal to utilities,” Wednesday, March 15, 2006.

¹⁴⁶ http://energy.senate.gov/public/index.cfm?Fuseaction=Hearings.Hearing&Hearing_ID=1560.

1 condition that all applicable permits are issued. Staff bases this recommendation
2 on its analysis showing that the project generally satisfies the criteria contained in
3 SDCL 49-41B and ARSD 20:10:22. The main negative impact of the project
4 concerns the environment, but the plant is expected to operate within the
5 applicable environmental regulations. Staff's quantitative analysis showed that
6 when the environmental impacts are estimated in monetary terms, the net benefits
7 of the project (the economic impact minus the environmental impact) are likely to
8 be positive.

9 Staff's specific recommendations regarding the community impact is that
10 the Applicants submit a plan setting forth its actions to implement
11 recommendations of the Local Review Committee, which Staff supports. These
12 recommendations include a housing contingency plan to be developed by the
13 Applicants; financing of an additional officer to the Grant County's Sheriff's
14 office; drug and alcohol screening of the Big Stone II employees; provision of fire
15 protection equipment and training for the local fire department; and an
16 appointment of a public relations representative that would facilitate the exchange
17 of information between the project owners and local communities.

18 In addition, Staff supports recommendations contained in the Draft
19 Environmental Impact Statement¹⁴⁷ that concern plant construction and operation,
20 including the following:

¹⁴⁷ WEPA "Draft Environmental Impact Statement: Big Stone II Power Plant and Transmission Project," May 2006, Section 4.

- 1 • Vegetation: implementation of an integrated weed control plan prior to
2 construction (V-1).
- 3 • Transportation: coordination with County authorities to mitigate severe
4 road damage (TR-1); organization of bus transportation or car pooling to
5 reduce congestion (TR-2); and delivery of heavy equipment in such a
6 manner as to reduce traffic congestion and unsafe driving conditions.
- 7 • Public safety: establishment of a work safety program (PH-1); secure
8 after-hours access to construction areas (PH-2); and notification of public
9 about high-risk operations (PH-3).
- 10 • Noise: work with local residents to develop noise mitigation measures in
11 case of noise complaints (N-1).

12 Further, Staff recommends that the Applicants supplement the record with all the
13 missing information identified in Table 2 of this testimony.

14 Absent the complete implementation of these conditions, Staff would
15 recommend that the Application be denied.

16

17 **Q. DOES THIS CONCLUDE YOUR TESTIMONY?**

18 **A** Yes.

BEFORE THE SOUTH DAKOTA PUBLIC UTILITIES COMMISSION

DOCKET NO. EL05-022

**IN THE MATTER OF THE APPLICATION BY OTTER TAIL POWER
COMPANY ON BEHALF OF THE BIG STONE II CO-OWNERS FOR AN
ENERGY CONVERSION FACILITY PERMIT FOR THE CONSTRUCTION OF
THE BIG STONE II PROJECT**

EXHIBIT A

to

Direct Testimony of

OLESYA DENNEY, PH.D.

May 19, 2006

Olesya Denney, Ph.D.

Senior Consultant
 QSI Consulting, Inc.

CONTACT INFORMATION

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EDUCATION

Ph.D., Economics, Oregon State University, Corvallis, OR, 1999

Dissertation: *Cost Structure of the Local Telecommunications Industry.*

M.S., Economics, Oregon State University, Corvallis, OR, 1996

Thesis: *Open Space Contingent Valuation Survey: Adjusting for Nonresponses.*

B.S., Economics, Novosibirsk State University, Novosibirsk, Russia, 1988

Thesis: *The Environmental Factor in the Development of Industrial Systems: Natural Gas Industry.*

EMPLOYMENT HISTORY

<p>QSI Consulting, Inc. 2003 – present Senior Consultant</p>	<p>Independent Consultant in Telecommunications 2002 – 2003</p>
<p>AT&T Corporation, Denver, Colorado 1997, 1998, 1999 – 2000 Supervisor; Associate Manager</p>	<p>Novosibirsk State University, Russia 1991, 2000 - 2001 Instructor: <i>Environmental and Natural Resource Economics; Media Economics</i></p>
<p>Institute of Economics and Industrial Organization, Russia 1988 - 1992, 2000 – 2002 Researcher</p>	<p>Oregon State University, Corvallis, Oregon 1996-1998 Instructor (Graduate Teaching Assistant): <i>Introduction to Econometrics; Linear Algebra</i></p>

TESTIMONY PROFILE AND EXPERIENCE

Before the Michigan Public Service Commission

Case No. U-13531

In the Matter, on the Commission's Own Motion, to Review the Costs of Telecommunications Services Provided by SBC Michigan

Initial: January 20, 2004; Final Reply: May 10, 2004

INDUSTRY REPORTS

QSI Final Report to the Hawaii Public Utilities Commission "Analysis and Recommendations Related to Docket No. 04-0140 *Merger Application Of Paradise Mergersub, Inc. (n/k/a Hawaiian Telecom Mergersub, Inc.), Verizon Hawaii, Inc. and Related Companies,*" February 7, 2005.

QSI Technical Report "IP-Enabled Voice Services: Impact of Applying Switched Access Charges to IP-PSTN Voice Services" *Ex Parte filing in FCC dockets WC Dockets No. 04-36 (In the Matter of IP-Enabled Services), 03-266 (In the Matter of Level 3 Communications LLC Petition for Forbearance Under 47 U.S.C. § 160(c) from Enforcement of 47 U.S.C. § 251(g), Rule 51.701(b)(1), and Rule 69.5(b); IP Enabled Services)* Washington DC, January 27, 2005.

QSI Report to the Wyoming Legislature "The Wyoming Universal Service Fund. An Evaluation of the Basis and Qualifications for Funding." December 3, 2004.

QSI Technical Report "Taxation Impact on Payphone Services in the State of Kentucky: An Economic Suppression Analysis." May 27, 2004.

ACADEMIC PUBLICATIONS (All under maiden name Gainutdinova)

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Mkrtchian G.M., Gainutdinova O.G. *Environmental and Natural Resource Economics: Textbook* (Title in the language of publication: *Ekonomika Prirodopol'zovanija: Uchebno-metodicheskoje Posobie*). Novosibirsk State University, Novosibirsk, 2002 (in Russian).

Alekseev M.A., Gainutdinova O.G., Mezentseva L.A., Mkrtchian G.M. *Problems for the Course in Environmental Economics* (Title in the language of publication: *Sbornik Zadach po Ekonomike Orkuzhajuschej Sredy*). Novosibirsk State University, Novosibirsk, 1997 (in Russian).

Gainutdinova O.G., Mezentseva L.A. "Regulation of Water Use and Pollution," in: *Economic Regulation of Natural Resource Exploitation* (Title in the language of publication: *Ekonomicheskaje Regulirovanije Prirodopol'zovanija*), ed. Mkrtchian G.M., Novosibirsk, 1992 (in Russian).

Gainutdinova O.G., Mezentseva L.A. "Environmental Damage," in: *Management of Natural Resources Use and the Environment* (Title in the language of publication: *Prirodopol'zovanije v Sisteme Upravljenija*) ed. Kuleshov V.V., Novosibirsk, Nauka, 1991 (in Russian).

Gainutdinova O.G. "Modeling of Environmental and Economic Interactions: Natural Gas Industry," in: *Planning and Modeling of Multi-product Industries* (Title in the language of publication: *Sovershenstvovanije Planirovanija i Modelirovanija Mnogootraslevykh Kompleksov i Otrastej*), ed. Kuleshov V.V., Bazhanov V.A., Novosibirsk, 1989 (in Russian).

BEFORE THE SOUTH DAKOTA PUBLIC UTILITIES COMMISSION

DOCKET NO. EL05-022

**IN THE MATTER OF THE APPLICATION BY OTTER TAIL POWER
COMPANY ON BEHALF OF THE BIG STONE II CO-OWNERS FOR AN
ENERGY CONVERSION FACILITY PERMIT FOR THE CONSTRUCTION OF
THE BIG STONE II PROJECT**

EXHIBIT B

to

Direct Testimony of

OLESYA DENNEY, PH.D.

May 19, 2006

THIS TAB CONTAINS ASSUMPTIONS USED IN PRESENT VALUE CALCULATIONS

Life of the Plant	40
Discount Rate	10%

THIS TAB COMPARES THE ENVIRONMENTAL IMPACT ESTIMATES FOR THE TESTIMONY WITH THE ECONOMIC IMPACTS
To generate this table, change Discount rate to 3% in Tab Assumptions

Table 7A. Comparison of Negative Environmental and Positive Local Impacts of Big Stone II.
CO2 Externalities Based on Literature Values. 3% Discount Rate.
Present Value over 40-year Life of the Plant (2005 dollars).

Measure	Lower Boundary	Upper Boundary	Average
I. Negative Impact: Externalities from Pollution (No geographic boundaries defined)			
Total Externalities Including CO2	\$ 82,561,866	\$ 1,981,269,062	\$ 1,031,915,464
Total Externalities Excluding CO2	\$ 32,462,990	\$ 277,907,289	\$ 155,185,139
II. Positive Impact: Local Economic and Tax Effects (State of South Dakota)			
Total Impact	\$623,107,670	\$671,834,785	\$ 647,471,227
III. Net Impact			
Net Impact Including CO2	\$ (1,358,161,392)	\$ 589,272,919	\$ (384,444,236)
Net Impact Excluding CO2	\$ 345,200,381	\$ 639,371,795	\$ 492,286,088

* - Lower Boundary of Net Impact = Lower Boundary of Positive Impact - Upper Boundary of Negative Impact.

Similarly, Upper Boundary of Net Impact = Upper Boundary of Positive Impact - Lower Boundary of Negative Impact

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THIS TAB COMPAREs THE ENVIRONMENTAL IMPACT ESTIMATES FOR THE TESTIMONY WITH THE ECONOMIC IMPACTS

**Table 6B. Comparison of Negative Environmental and Positive Local Impacts of Big Stone II.
CO2 Externalities Based on Literature Values. 10% Discount Rate.
Present Value over 40-year Life of the Plant (2005 dollars).**

Measure	Lower Boundary	Upper Boundary	Average
I. Negative Impact: Externalities from Pollution (No geographic boundaries defined)			
Total Externalities Including CO2	\$ 265,640,954	\$ 511,085,253	\$ 388,363,103
Total Externalities Excluding CO2	\$ 32,462,990	\$ 277,907,289	\$ 155,185,139
II. Positive Impact: Local Economic and Tax Effects (State of South Dakota)			
Total Impact	\$623,107,670	\$671,834,785	\$ 647,471,227
III. Net Impact*			
Net Impact Including CO2	\$ 112,022,417	\$ 406,193,831	\$ 259,108,124
Net Impact Excluding CO2	\$ 345,200,381	\$ 639,371,795	\$ 492,286,088

* – Lower Boundary of Net Impact = Lower Boundary of Positive Impact - Upper Boundary of Negative Impact.

Similarly, Upper Boundary of Net Impact = Upper Boundary of Positive Impact - Lower Boundary of Negative Impact

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THIS TAB COMPAREs THE ENVIRONMENTAL IMPACT ESTIMATES FOR THE TESTIMONY WITH THE ECONOMIC IMPACTS

**Table 6A. Comparison of Negative Environmental and Positive Local Impacts of Big Stone II.
CO2 Externalities Based on Literature Values. 10% Discount Rate.
Present Value over 40-year Life of the Plant (2005 dollars).**

Measure	Lower Boundary	Upper Boundary	Average
I. Negative Impact: Externalities from Pollution (No geographic boundaries defined)			
Total Externalities Including CO2	\$ 82,561,866	\$ 1,981,269,062	\$ 1,031,915,464
Total Externalities Excluding CO2	\$ 32,462,990	\$ 277,907,289	\$ 155,185,139
II. Positive Impact: Local Economic and Tax Effects (State of South Dakota)			
Total Impact	\$623,107,670	\$671,834,785	\$ 647,471,227
III. Net Impact			
Net Impact Including CO2	\$ (1,358,161,392)	\$ 589,272,919	\$ (384,444,236)
Net Impact Excluding CO2	\$ 345,200,381	\$ 639,371,795	\$ 492,286,088

* – Lower Boundary of Net Impact = Lower Boundary of Positive Impact - Upper Boundary of Negative Impact.

Similarly, Upper Boundary of Net Impact = Upper Boundary of Positive Impact - Lower Boundary of Negative Impact

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THIS TAB SUMMARIZES ECONOMIC IMPACTS

**Table 5. Big Stone II's Annual and Total Economic and Tax Impacts
Present Value Calculated over Life of the Plant (2005 dollars).**

Time Period	SD Economic Impact*		Property Tax Impact**	Sales, Use, Excise Tax Impact**	Total Impact	
	Without Escalation \$	With Escalation \$			Min	Max
Total Construction (4/07-4/11)	\$ 745,145,207	\$ 810,376,070		\$ 11,000,000		
Construction year 1			\$ 560,000			
Construction year 2			\$ 1,100,000			
Construction year 3			\$ 1,600,000			
Construction year 4			\$ 1,600,000			
Annual Operation	\$ 3,600,000	\$ 3,600,000	\$ 4,700,000	<i>insignificant</i>		
Present Value over Life of the Plant***	\$579,285,084	\$628,012,199	\$35,105,456	\$8,717,130	\$623,107,670	\$671,834,785

* – Source: Stuefen's Direct Testimony, Exhibit 26-B Table 4 (2008 dollars)

** – Source: Johnson's Direct Testimony (year for dollar figures was not specified; Staff assumed year 2005)

*** – Based on 40-year plant life and 10% discount rate

THIS TAB SUMMARIZES THE ENVIRONMENTAL IMPACT ESTIMATES FOR THE TESTIMONY

Table 4. Big Stone II Annual Environmental Impact Estimates (2005 Dollars)

Pollutant	Big Stone II Environmental Impact Estimates		
	Low	High	Average
SO2	\$ -	\$ -	\$ -
NOx	\$ -	\$ -	\$ -
CO	\$ 2,561,019	\$ 10,609,935	\$ 6,585,477
PM10	\$ 1,706,836	\$ 22,615,578	\$ 12,161,207
VOC	\$ 87,401	\$ 980,833	\$ 534,117
Lead	\$ 183	\$ 204	\$ 194
Mercury	\$ 504,855	\$ 7,401,175	\$ 3,953,015
Total Excluding CO2	\$ 4,860,294	\$ 41,607,726	\$ 23,234,010
CO2 -- Literature Survey	\$ 7,500,704	\$ 255,023,933	\$ 131,262,318
CO2 -- CA PUC Adders	\$ 34,910,940	\$ 34,910,940	\$ 34,910,940
Total: CO2 Based on Literature	\$ 12,360,998	\$ 296,631,659	\$ 154,496,328
Total: CO2 Based on CA PUC	\$ 39,771,235	\$ 76,518,666	\$ 58,144,950

THIS TAB CALCULATES ANNUAL ENVIRONMENTAL IMPACT IN REAL DOLLARS. IT ALSO CALCULATES THE PRESENT VALUE OF THIS IMPACT.

Pollutant	Nominal Dollars			Average	Year for Dollars	Deflator to 2005 \$	2005 Dollars		
	Lower Boundary	Upper Boundary	Average				Lower Boundary	Upper Boundary	Average
SO2	\$ -	\$ -	\$ -	-	1999	1.15	\$ -	\$ -	\$ -
NOx	\$ -	\$ -	\$ -	-	1999	1.15	\$ -	\$ -	\$ -
CO	\$ 2,234,980	\$ 9,259,201	\$ 6,747,091		1999	1.15	\$ 2,561,019	\$ 10,609,935	\$ 6,585,477
PM10	\$ 1,489,542	\$ 19,736,425	\$ 10,612,983		1999	1.15	\$ 1,706,836	\$ 22,615,578	\$ 12,161,207
VOC	\$ 76,274	\$ 855,965	\$ 466,120		1999	1.15	\$ 87,401	\$ 980,833	\$ 534,117
Lead	\$ 178	\$ 199	\$ 188		2004	1.03	\$ 183	\$ 204	\$ 194
Mercury	\$ 440,583	\$ 6,458,944	\$ 3,449,763		1999	1.15	\$ 504,855	\$ 7,401,175	\$ 3,953,015
CO2 - EPA Literature Survey	\$ 6,545,801	\$ 222,557,245	\$ 114,551,523		1999	1.15	\$ 7,500,704	\$ 255,023,933	\$ 131,262,318
CO2 - CA PUC Adder	\$ 34,910,940	\$ 34,910,940	\$ 34,910,940		2005	1.00	\$ 34,910,940	\$ 34,910,940	\$ 34,910,940
TOTAL EXCLUDING CO2	\$ 4,241,556	\$ 36,310,734	\$ 20,276,145				\$ 4,860,294	\$ 41,607,726	\$ 23,234,010
TOTAL Including CO2 based on Literature	\$ 10,787,358	\$ 258,867,979	\$ 134,827,668				\$ 12,360,998	\$ 286,631,659	\$ 154,496,328
TOTAL Including CO2 based on CA PUC adder	\$ 39,152,497	\$ 71,221,674	\$ 55,187,085				\$ 39,771,235	\$ 76,518,666	\$ 58,144,950

PRESENT VALUE OF EXTERNALITIES -- BIG STONE II			
Assumed Discount Rate	10%		
Assumed Life of Plant (years)	40		
PV of TOTAL EXCLUDING CO2	\$ 32,462,990	\$ 277,907,289	\$ 155,185,139
PV of TOTAL Including CO2 based on literature	\$ 82,561,866	\$ 1,981,269,062	\$ 1,031,915,464
PV of TOTAL Including CO2 based on CA PUC	\$ 265,640,954	\$ 511,085,253	\$ 386,363,103

THIS TAB LISTS EXTERNALITY VALUES AND EMISSION VOLUMES USED IN THE CALCULATION OF THE IA

**Table 3. Big Stone II Annual Emissions and Externality Values
Used to Calculate Big Stone II's Environmental Impact**

Pollutant	Externality Estimates (per ton of emission)			Year	Big Stone II Annual Emissions (tons per year)
	Low	High	\$		
SO2	\$ 1,800	\$ 10,600	1999		-
NOx	\$ 2,200	\$ 16,900	1999		-
CO	\$ 700	\$ 2,900	1999		3,193
PM10	\$ 2,000	\$ 26,500	1999		745
VOC	\$ 900	\$ 10,100	1999		85
Lead	\$ 472	\$ 526	2004		0.38
Mercury	\$ 5,000,000	\$ 73,300,000	1999		0.09
CO2 -- Literature Survey	\$ 1.5	\$ 51.0	1999		4,363,868
CO2 -- CA PUC Adder		8.0	2005		4,363,868

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THIS TAB LISTS EXTERNALITYIMPACT

**Table 3. Big Stone II Ann
Used to Calculate**

Pollutant	<u>Source of Externality Values</u>
SO2	EPA Survey of Literature EPA http://www.epa.gov/oppt/epp/pubs/guidance/top20faqexterchart.htm
NOx	EPA Survey of Literature EPA http://www.epa.gov/oppt/epp/pubs/guidance/top20faqexterchart.htm
CO	EPA Survey of Literature EPA http://www.epa.gov/oppt/epp/pubs/guidance/top20faqexterchart.htm
PM10	EPA Survey of Literature EPA http://www.epa.gov/oppt/epp/pubs/guidance/top20faqexterchart.htm
VOC	EPA Survey of Literature EPA http://www.epa.gov/oppt/epp/pubs/guidance/top20faqexterchart.htm
Lead	MN PUC Externality Values http://www.puc.state.mn.us/docs/eeupdate05.pdf
Mercury	Resources for the Future 2005 Report Palmer et al. http://www.rff.org/documents/RFF-DP-05-23.pdf
CO2 -- Literature Survey	EPA Survey of Literature EPA http://www.epa.gov/oppt/epp/pubs/guidance/top20faqexterchart.htm
CO2 -- CA PUC Adder	CA PUC Externality Adder: http://www.cpuc.ca.gov/static/energy/oregon_carbon_allocation_task_force.pps#352,15 , GHG Regulation

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THIS TAB CALCULATES EMISSION VOLUMES USED TO CALCULATE THE ENVIRONMENTAL IMPACT

TOTAL KWh	Amount	Source
Nominal Capacity, MW		600 Application Table 2-6
Hours Per Year (Total)		8760 PSD Application p. 3-1
Hours per year (Adjusted for Capacity Factor)		7708.8 Testimony Exh. 24A (Phase I Report)
Capacity Factor		88% Application Table 2-6 (Range is 88-100%)
Annual kWh	4,625,280,000	

EMISSIONS from PSD Application and Draft April 2006 Permit							
	NOx		VOCs	CO	PM10	SO2	Lead
Maximum Emissions (from PSD Application Table ES-1)	39		106.16	4262.18	932.91	39	0.47
Emissions Adjustments Based on Draft Permit	0			3999.38		0	
Notes on Emissions Adjustments Based on Draft Permit	<i>p. 3-2 of Application and p. 9 of Draft Permit</i>		<i>Reduction in Boiler Emissions (see below)</i>		<i>p. 3-2 of Application and p. 9 of Draft Permit</i>		
Correction for a more precise lb/tons conversion factor	-		96.31	3,628.21	846.33	-	0.43
Emissions Adjusted for Capacity Factor	-		84.75	3,192.83	744.77	-	0.38

Hg (Based on new standard for mercury emissions)	
40 CFR Part 60 : CAMR (lb/MWh)	0.0000420
Conversion factor: lb/ton	0.000453597
Total Big Stone II Annual Emissions (lb)	194.26176
Total Big Stone II Annual Emissions (tons)	0.08812

CO2 (Based on Technology Assessment Applicants Direct Exh 23 Table 1-1)	
CO2 lb/MMBtu	208
Max Heat Output mmBtu/hour (PSD Application p. 1-2)	6,000
Annual mmBtu	46,252,800
CO2 lb Annual	9,620,582,400
CO2 ton Annual	4,363,868

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PSD Application (pp. 3-3 - 3-4; Boiler)	VOCs	CO	PM10	Lead
lb/hour	21.6	960	180	0.108
tons per year	94.61	4204.8	788.4	0.47
Implied conversion factor lb/tons	0.000500011	0.000500	0.000500	0.00049679
Proposed Emissions Rate lb/MMBtu (p. 3-3 Application)		0.16		
Draft Permit Emissions Rate lb/MMBtu (p. 5 of Draft Permit)		0.15		

THIS TAB CONVERTS THE ECONOMIC AND TAX IMPACT (CALCULATED BY THE APPLICANTS) INTO PRESENT VALUE TERMS

Applicants Data

	Stuefen Direct Exhibit 26B (\$ 2008) SD Econ Impact		Johnson Direct (year for \$ not specified)	
	W/o Escalation \$	With Escalation \$	Property Tax	Sales, Use, Excise Tax
Total Construction (4/07-4/11)	\$ 745,145,207	\$ 810,376,070		\$ 11,000,000
Construction year 1			\$ 560,000	
Construction year 2			\$ 1,100,000	
Construction year 3			\$ 1,600,000	
Construction year 4			\$ 1,600,000	
Annual Operation	\$ 3,600,000	\$ 3,600,000	\$ 4,700,000	"not materially significant"

Calculation of Present Values

Assumed Discount Rate	10%
Assumed Operation Life of Plant (years)	40
Assumed Deflator for Econ Impact 2005/2008	0.94
Assumed Deflator for Taxes 2005/2005	1

Data in 2005 \$:	SD Econ Impact		Property Tax	Sales, Use, Excise Tax	TOTAL	
	W/o Escalation \$	With Escalation \$			Min	Max
PV: Total Construction (4/07-4/11)	\$556,619,589	\$605,346,704	\$3,713,107	\$8,717,130		
PV: Operation Over Life of Plant	\$22,665,494	\$22,665,494	\$31,392,349	\$0		
PV OF TOTAL IMPACT OVER LIFE OF PLANT	\$579,285,084	\$628,012,199	\$35,105,456	\$8,717,130	\$623,107,670	\$671,834,785

PV Annual Multipliers

Years from 2006

1	0.909090909
2	0.826446281
3	0.751314801
4	0.683013455
5	0.620921323
6	0.56447393
7	0.513158118
8	0.46650738
9	0.424097618

2125

10	0.385543289
11	0.350493899
12	0.318630818
13	0.28966438
14	0.263331254
15	0.239392049
16	0.217629136
17	0.197844669
18	0.17985879
19	0.163507991
20	0.148643628
21	0.135130571
22	0.122845974
23	0.111678158
24	0.101525598
25	0.092295998
26	0.083905453
27	0.076277684
28	0.069343349
29	0.063039409
30	0.057308553
31	0.052098685
32	0.047362441
33	0.043056764
34	0.039142513
35	0.035584103
36	0.032349184
37	0.029408349
38	0.026734863
39	0.024304421
40	0.022094928
41	0.020086298
42	0.018260271
43	0.016600247
44	0.015091133

THIS TAB CONTAINS PRICE DEFLATORS USED TO CONVERT DOLLARS TO REAL VALUES

BEA DATA		ANALYSIS
http://www.bea.gov/bea/dn/nipaweb/TableView.asp#Mid		
National Income and Product Accounts Table		
Table 1.1.9. Implicit Price Deflators for Gross Domestic Product [index numbers, 2000=100] Today is: 4/25/2006. Last Revised on March 30, 2006. Next Release Date April 28, 2006		
Line	Gross domestic product	Annual Growth
1980	54,043	
1981	59,119	9.4%
1982	62,726	6.1%
1983	65,207	4.0%
1984	67,655	3.8%
1985	69,713	3.0%
1986	71,25	2.2%
1987	73,196	2.7%
1988	75,694	3.4%
1989	78,556	3.8%
1990	81,59	3.9%
1991	84,444	3.5%
1992	86,385	2.3%
1993	88,381	2.3%
1994	90,259	2.1%
1995	92,106	2.0%
1996	93,852	1.9%
1997	95,414	1.7%
1998	96,472	1.1%
1999	97,868	1.4%
2000	100	2.2%
2001	102,399	2.4%
2002	104,187	1.7%
2003	106,305	2.0%
2004	109,099	2.6%
2005	112,145	2.8%
10-year average		1.9893%
Projected Index		
2006	114.38	
2007	116.65	
2008	118.97	

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