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

Direct Testimony of

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QSI CONSULTING, INC.

On Behalf of

the Staff of the Public Utilities Commission of South Dakota

May 19, 2006

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I. WITNESS INTRODUCTION

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

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

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

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

Q. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND AND PROFESSIONAL EXPERIENCE.

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

environmental amenities. I have several academic publications.

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

Q. ON WHOSE BEHALF WAS THIS TESTIMONY PREPARED?

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

II. PURPOSE OF TESTIMONY

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

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

More specifically, according to SDCL 49-41B-13, the Co-owners' 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;
2) Failure to file an application generally in the form and content required; or
3) Failure to deposit the initial amount with the application as required by § 49-41B-12.

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

1) The proposed facility will comply with all applicable laws and rules;
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; and
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.

Q. ARE THERE OTHER AREAS WHICH YOU WILL EVALUATE IN YOUR TESTIMONY?

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

Q. HOW WILL YOUR TESTIMONY BE ORGANIZED?

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

III. EVALUATION OF THE APPLICATION

Q. PLEASE EXPLAIN YOUR GENERAL APPROACH TO THIS TESTIMONY.

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

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?

A. The application addresses most of the issues required by SDCL 49-41B and ARSD 20:10:22. For example, the Application contains a reference table[2] that lists the description of each section of ARSD 20:10:22 and provides references to the corresponding sections of the Application where the requirements of the specific section of ARSD 20:10:22 are addressed. However, a close reading of the requirements of each section of ARSD 20:10:22 shows that certain issues are addressed without the specific details required by the rule. Examples of the missing details include the absence of required maps, estimates of monetary cost of decommissioning, description of irreversible changes, etc. Table 2 provides a list of missing details explicitly required by rule and explains whether the missing 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: Intervenors 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. Irreversable changes not identified. 2. Environmental effects not calculated	1. Yes: Staff 2-9. 2. No.
20:10.22.14	Effects of physical environment	Geological contraints 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 2-26. Rolfes 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	

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

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

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

[3] Application, Section 5.

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

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

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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.*

Otter Tail stated that according to BNSF, "fluidity will only return with more track construction, which is a year or two away."[12] Although during the April 21, 2006, SD PUC's Railroad Shipping Meeting BNSF did highlight its extensive plans for capacity expansion, the presentation also indicated that the demand for coal transportation will continue to grow. Specifically, BNSF's presentation listed a total of 24 proposed coal-fired generation plants that will require rail service in the Western United States and that are expected to start operation between 2006 and 2012.[13] In other words, growth in demand for coal transportation is going to continue, and it is not clear whether the BNSF's railroad capacity expansion plans will solve the coal delivery problem by the time Big Stone II becomes operational (which is 2011), or whether the coal delivery issue will persist. It would also be desirable if the Applicants discussed whether the presence of coal delivery problems would equally affect all alternative sites for this project (ARSD 20:10:22:12), or whether the analysis of alternative sites would result in a different site selection (different than Big Stone) if the coal delivery problems were factored into the analysis.

Third, the future estimated consumer demand (ARSD 20:10:22:10) is not adequately discussed. Specifically, the Application contains a verbal discussion of the forecasting methods,[14] but does not provide the required "data, data 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.

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

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

[15] Specifically, in Responses to Intervenors' 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 Intervenors' 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 Intervenors' 1st Request for Production, Request No. 3. (Table IV-1, pp. IV-17 - IV-18).

their responses to interrogatories that their DSM savings are not fully reflected in their load demand forecasts presented in the Application.[18] Although GRE stated that its "existing DSM programs" are accounted for in its forecast,[19] the relevance of this statement is somewhat questionable because not only existing, but also future DSM programs should be accounted for in a proper forecast. GRE's own statements suggest that it is expanding its DSM programs: "GRE has consistently been increasing its efforts with respect to … DSM programs…"[20] and "GRE has more than doubled spending on conservation programs from 2002 … to 2004[,] as well as nearly doubling the annual energy savings over the same time period."[21] Note that GRE's load forecast[22] is made for a period starting in 2004. It is reasonable to assume that this forecast was made based on data prior to 2004.[23] In other words, the above referenced doubling of the DSM's effort between 2002 and 2004 is likely not captured in GRE's forecast.

B. Deliberate misstatements

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

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18 Responses to Intervenors' 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 Intervenors' 1st Set of Interrogatories, Request No. 16.

20 Responses to Intervenors' 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).

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

Another example is the Applicants' statements during the September 2005 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.

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

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

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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.

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

C. Compliance with all applicable laws and rules

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

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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.

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

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

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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.

draft PSD Permit for Big Stone II[45], and in May 2006 – draft Solid Waste Permit. In addition, the Western Area Power Administration has issued a draft Environmental Impact Statement for the project in May 2006.

Q. WILL BIG STONE II COMPLY WITH THE MERCURY EMISSION STANDARDS?

A. The Applicants stated that Big Stone II will comply with the currently effective standards of mercury emission per megawatt hour.[46] However, mercury emission rules may change if and when the EPA finalizes its mercury cap-and-trade rules. According to the EPA rules issued in March 2005, each state was given a certain mercury emission budget – a budget expressed in physical units of annual mercury emissions. Certain aspects of this rule, including the allocation of the cap between states, have been challenged,[47] so that the budget allocated to South Dakota under this rule cannot be considered final. Nevertheless, this budget presents the best available estimate of the future cap, and the Applicants discuss this budget in relation to Big Stone I and II's mercury emissions. Specifically, they state that South Dakota's mercury budget, according to March 2005 EPA rules, is 144 pounds per year starting in 2010, and it is reduced to 58 pounds per year starting in 2018.[48] The Applicants also state that their goal is to reduce mercury emissions to at least 144 pounds to avoid purchasing additional

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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.

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

Q. IS IT CORRECT THAT BURNS AND MCDONNELL'S PHASE I REPORT ON BIG STONE II ASSUMED MERCURY-MITIGATION TECHNOLOGY WITH LOWER MERCURY EMISSIONS THAN THE CURRENT DESIGN OF BIG STONE II?

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

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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.

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

D. Environmental Impacts

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

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

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

54 Direct Testimony of Daniel Jones, p. 5.

55 *Id.* p. 9.

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

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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.

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

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

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

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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.

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

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

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

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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.

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

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

Q. IS THE TERM "ENVIRONMENTAL EXTERNALITY" SYNONYMOUS TO THE TERM "ENVIRONMENTAL IMPACT?"

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

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[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.

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

Q. PLEASE SUMMARIZE THE EXTERNALITY VALUES AND AIR EMISSIONS USED IN YOUR ANALYSIS.

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

[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.

emissions – emissions associated with continuous operation of the plant throughout the year. In order to convert potential maximum emissions to "expected" emissions, Staff adjusted the potential maximum emissions downward by the plant capacity factor.

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

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

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

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

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

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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.

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

A. The wide range simply captures the uncertainties associated with estimating externalities. One source of such uncertainties is the need to assign monetary values to non-market goods, such as the value of human life or health. Another factor is the uncertainty about the dose-response functions – the physical relationship between specific levels of exposure to pollution and the resulting physical effects such as an asthma attack or cancer. An EPA's survey of externality studies[78] found that these two factors contribute significantly more to the variability of externality estimates than the third factor – regional-specific parameters such as population density, ambient air quality or the presence of fragile ecosystems. Because of these uncertainties it is customary in the externality literature to conduct an aggregation analysis – derive a range of externality values from a number of surveyed sources. The above mentioned EPA survey contains such aggregation analysis. Staff used this EPA survey as its main source of the externality values.

Q. WHAT WERE THE OTHER SOURCES OF YOUR EXTERNALITY VALUES?

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

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

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

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

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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 SO_2, 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.

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

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

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

A. No, they do not. By nature, air emissions are not confined to state boundaries, especially in the case of Big Stone II, which is located on the Minnesota border. In fact, most of the air emissions in question have a regional, rather than local nature in the sense that they are often transported hundreds of miles away from the source. For example, acid rain (which results from the emissions of nitrogen oxides and sulfur dioxide) may be carried by winds across state or national borders before it falls on the ground. It is estimated that at least 75% of the emitted mercury will likely be transported more that 50 km[84] from the emission 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.

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

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

A. No, it does not. As explained above, air emissions are often transported hundreds of miles away, thus contributing to air pollution in other areas. The negative impact of mercury emissions (to which the national ambient air quality standards do not apply[87]) is associated with its accumulation in fish, and as discussed above, fish in certain lakes in South Dakota and the two Minnesota counties neighboring Big Stone is already considered to be unsafe by state health departments.

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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/.

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

Q. PLEASE SUMMARIZE YOUR CALCULATION OF THE ENVIRONMENTAL IMPACTS OF BIG STONE II.

A. Table 4 contains Staff's estimate of the annual environmental impact associated 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**

The total annual impact is calculated as a product of Big Stone II's annual emissions, and the low and high externality values. As the table shows, carbon dioxide's contribution to the total impact is by far the largest: Under the externality values from the EPA literature survey, carbon dioxide constitutes on average 85% of the total environmental impact.[89] Under the carbon dioxide's externality adder used by the California PUC, carbon dioxide's share in total impact is 60%.[90] The total impact ranges between approximately $12 and $300 million if we use the carbon dioxide externality values from literature, and 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.

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

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

A. The proper context for the environmental effects – which are negative "external"[91] effects of Big Stone II to society and the environment – is to compare them to the positive socio-economic effects of Big Stone II. The Applicants quantified two sources of the positive socio-economic effects of Big Stone II: First, the Applicants estimated the direct, indirect and induced economic impacts of Big Stone II construction and operation to the state of South Dakota (the multiplier analysis).[92] Second, the Applicants estimate additional state and local property, sales, use and excise tax effects.[93] Although the socio-economic impact is calculated for a more limited geographic region (state of South Dakota), it nevertheless provides a useful reference point. At the same time it is important to keep in mind that because of this geographic "mismatch," the positive impacts, as well as the net impacts (the difference between positive and negative impacts) are 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.

economic benefits does not include "primary" consumer benefits of the project associated with the production of electricity.[94] Again, this is another factor that makes Staff's analysis a "pessimistic" scenario.

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

A. The socio-economic impact does vary significantly between the phases of construction and operation. For example, the Applicants estimate[95] that the economic impact of the four-year construction is between $745.1 and $810.4 million,[96] while the annual economic impact of operation is $3.6 million.[97] Similarly, sales taxes during construction are estimated as $11 million,[98] and as "materially insignificant"[99] during operation.

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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 marker 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.

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* Without Escalation $	SD Economic Impact* With Escalation $	Property Tax Impact**	Sales, Use, Excise Tax Impact**	Total Impact Min	Total Impact 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	*insignificant*		
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 figuers was not specified; Staff assumed year 2005)*

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

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

Q. WHAT ARE THE MAIN CONCLUSIONS FROM THIS TABLE?

A. Staff made three main conclusions. First, if we account for the negative impacts of all pollutants including carbon dioxide, for which the EPA literature survey gives a wide range of externality values, the net impact of Big Stone II lies in a wide range between negative $1.4 billion and positive $0.6 billion, and averaging negative $0.4 billion.[102] This result is shown in Table 6A. As seen from the row titled "Net Impact Excluding CO_2," the negative net impact is driven by the presence of externality effects associated with carbon dioxide: If we exclude carbon dioxide externalities, the total net impact of Big Stone II is positive.

Second, if we adopt a moderate level of the carbon dioxide's externality value, such as the adder used by the California PUC, the net impact of Big Stone 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.

Table 6A, with the only difference being the externality value for carbon dioxide 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*

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

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

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

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

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

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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.

analysis, which are currently set at 3% for the "social discount rate" and 7% for the "opportunity cost of capital."[107]

Staff adopted the EPA's discount rate of 3% to test the sensitivity of its analysis that compares environmental costs and economic benefits of the Big Stone II project. Table 7A below represents a version of Table 6A (Staff's base 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*

As seen from Table 7A, the decrease in the discount rate significantly decreased the net impact: For example, the average total net impact (including the impact of carbon dioxide) decreased from negative $0.4 billion in Table 6A to negative $2.3 billion in Table 7A. Similarly, the average net impact excluding carbon dioxide 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.

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

Although the average net impacts appear to be unfavorable to the Applicants, the fact that the upper boundary of the estimated net impact remains to be positive is significant: As explained above, because of the "generic" nature of the externality values used in Staff's calculation and the fact that South Dakota is likely to be a "cleaner" and less densely populated state than a typical area where externality studies were performed, the upper boundary of the net impact[108] is likely to be a more accurate estimate of Big Stone II's net impacts than the lower boundary. It is also important to re-iterate that the positive economic impact estimated by the Applicants and utilized in Staff's calculations does not account for "primary" consumer benefits of the project – consumer surplus from the production of electricity.

Q. ARE THERE ANY OTHER LIMITATIONS OF YOUR ANALYSIS BESIDES THE ALREADY DISCUSSED LIMITATIONS?

A. Yes. Staff's estimates of the environmental impacts are based on the key air emissions, and do not account for other natural resource uses such as land and water. As mentioned above, land and water impacts are expected to be 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.

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

E. Community Impact

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

A. The potential negative impact on the community is associated mainly with the substantial influx of people in the area during construction. Specifically, the Applicants estimated that at its peak, Big Stone II's construction will employ 1,400 workers, which, counting the family members, may bring approximately 3,556 people into the area.[110] This number constitutes 11% of the total population 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.

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

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

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

A. Staff identified two areas where the negative impact is expected to be most noticeable: housing and law enforcement. The Applicants contracted the First District Association of Local Governments[115] ("First District") to conduct a community survey, including a study of the availability of temporary lodging, including motels and rental properties such as houses, apartments, mobile homes and mobile home pads. According to their survey, there are 2,242 motel beds in 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.

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

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

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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.

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

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

Q. WHAT WILL BE THE NEGATIVE IMPACTS RELATED TO LAW ENFORCEMENT?

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

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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.

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

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

Q. WERE ANY OTHER NOTICEABLE NEGATIVE IMPACTS ON THE LOCAL COMMUNITY IDENTIFIED?

A. No. The Applicants surveyed local governments and local infrastructure services including schools, health facilities, fire departments, local water and sewer 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.

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

Several minor adverse effects of the project on communities should be mentioned. As discussed above, traffic is expected to increase during construction, however, the Application discussed possible mitigation measures including radar signs, traffic counters and arranged private transportation to and from the site if traffic and parking become an issue.[135] The Draft Environmental Impact Statement[136] suggested several measures to mitigate adverse transportation impacts, including coordination with County authorities to mitigate severe road damage (TR-1); organization of bus transportation or car pooling to reduce congestion (TR-2); and delivery of heavy equipment in such a manner as to

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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.

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

The Application also mentions that railroad traffic will increase from three to four deliveries per week to six to eight deliveries per week. Because of the existence of an underpass and overpass in Milbank, the additional train traffic should not have an effect on road traffic. Although the increased rail traffic will increase the level of noise, the intensity of traffic is comparable to what it was in the past – specifically, one train a day between 1975 and 1995.[137] Additional noise may be created by night time construction activity, which the Applicants plan to perform in cases where technology requires a continuous 24-hour activity. However, the Applicants anticipate that there will be only 20 instances that will require such night-time operations.[138]

The project may cause displacement of two to three households: the Application identified two properties that may need to be vacated in order to accommodate construction. These properties have either been purchased or are under option to be purchased.[139] Another household is located in close proximity to the future site, and the Applicants made an offer to purchase this property in 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.

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

Q. WHAT ARE THE MAIN POSITIVE IMPACTS OF THE PROJECT ON THE LOCAL COMMUNITY?

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

IV. OTHER CONSIDERATIONS

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

A. Yes. Given the huge investment associated with this project, it is appropriate for the Commission to consider the risks to both the consumers and utilities themselves in making this financial commitment. While the Applicants in this proceeding who serve customers in South Dakota have not at this point filed for recovery of this investment, that day will likely come. Likewise, for the Co-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.

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

Q. PLEASE DISCUSS HOW RATEPAYERS COULD BE IMPACTED IF RISKS ARE NOT APPROPRIATELY CONSIDERED.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Q. DO YOU AGREE WITH MR. ENDRIZZI THAT THERE IS "NO END IN SIGHT" WITH RESPECT TO THIS ISSUE?

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

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

Hochstetter was recently quoted "We're going to have a really huge problem if railroads aren't held accountable for reliable deliveries and reasonable prices."[145] This problem is so serious that the U.S. Senate Committee on Energy and Natural Resources scheduled a special hearing on this issue on May 25, 2006.[146]

Q. HOW DO EMMISSION AND TAX ISSUES INCREASE RISK TO RATEPAYERS AND THE UTILITIES?

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

V. CONCLUSIONS

Q. WHAT ARE YOUR RECOMMENDATIONS REGARDING THE APPLICATION?

A. Although the upcoming rounds of testimonies by other parties, including the Applicants, may cause Staff to alter its recommendations, Staff's preliminary 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.

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

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

In addition, Staff supports recommendations contained in the Draft Environmental Impact Statement[147] that concern plant construction and operation, including the following:

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

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

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

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

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

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

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

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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

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

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

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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 Otraslei), 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

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

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

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* Without Escalation $	SD Economic Impact* With Escalation $	Property Tax Impact**	Sales, Use, Excise Tax Impact**	Total Impact Min	Total Impact 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	*insignificant*		
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 figuers 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.

CALCULATION OF ANNUAL EXTERNALITIES -- BIG STONE II

Pollutant	Nominal Dollars			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	$ 5,747,091	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**	**$ 296,631,659**	**$ 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

Note: Externalities from Operation

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**	**$ 388,363,103**

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

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

THIS TAB LISTS EXTERNALITY IMPACT

Table 3. Big Stone II Ann
Used to Calculate

Pollutant	Source of Externality Values
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

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	*p. 3-2 of Application and p. 9 of Draft Permit*		*Reduction in Boiler Emissions (see below)*		*p. 3-2 of Application and p. 9 of Draft Permit*		
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**

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

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