

BEFORE THE SOUTH DAKOTA PUBLIC UTILITIES COMMISSION

In the Matter of the Application by Otter Tail Power)
Company on behalf of the Big Stone II Co-owners for)
an Energy Conversion Facility Siting Permit for the) Case No EL05-022
Construction of the Big Stone II Project)

Direct Testimony of
Marshall R. Goldberg of
MRG & Associates, Inc.

On Behalf of
Minnesotans for an Energy-Efficient Economy
Izaak Walton League of America – Midwest Office
Union of Concerned Scientists
Minnesota Center for Environmental Advocacy

May 19, 2006



1 **Q. Please state your name, business, and occupation.**

2 A. My name is Marshall R. Goldberg. I am a resource planner and policy analyst employed by
3 my own firm, MRG & Associates. My work includes the application of benefit-cost
4 analytical techniques as they are applied in the energy and natural resource public policy
5 arenas. It also includes the development of models to estimate energy consumption and
6 usage patterns and the use of input-output analysis to evaluate energy programs and
7 generation technologies for their income and employment impacts to support public policy
8 analysis.

9
10 **Q. What is your business address?**

11 A. My address is MRG & Associates, 17798 Starduster Drive, Nevada City, California, 95959.
12

13 **Q. Please describe your background and qualifications.**

14 A. I founded MRG & Associates in 1991, a firm that specializes in two areas: 1) energy and
15 resource management strategies; and 2) environmental, community and economic
16 development policies. In 1992, I received a master's degree in Community and Regional
17 Planning from the University of Oregon, Eugene. My degree focused on land use
18 planning and resource management. My resume is attached as Exhibit JI-3-A.

19
20 **Q. Please describe your experience in analyzing electricity generating technologies.**

21 A. I have analyzed energy and utility related issues for almost 15 years. My most recent projects
22 include developing input-output based models for the National Renewable Energy
23 Laboratory (NREL). The models were designed to estimate the jobs and economic impacts
24 associated with constructing and operating wind, coal and natural gas power plants in the
25 United States. In addition to developing these technology specific models, I have completed
26 more than two dozen studies analyzing the economic impacts associated with energy usage
27 and generating technologies. Among others, I have authored or co-authored studies for the
28 Wisconsin Department of Administration, Energy Division, the Mississippi Department of

1 Economic and Community Development, the Arizona Corporation Commission, the Illinois
2 Department of Commerce and Community Affairs, the Virgin Islands Department of
3 Planning and Natural Resources, the U.S. Department of Energy, the Arizona Department of
4 Commerce, the National Renewable Energy Laboratory, the Virgin Islands Anti-Litter and
5 Beautification Commission, the American Public Power Association, the American Council
6 for an Energy-Efficient Economy (ACEEE), the Union of Concerned Scientists, the Tellus
7 Institute, the Michigan Public Services Commission, and the Nevada Department of Business
8 and Industry.

9
10 Additional biographical information is provided as Exhibit JI-3-A.

11
12 **Q. What is the purpose of your testimony in this proceeding?**

13 A. I was retained by the Union of Concerned Scientists (UCS) to describe the economic impacts
14 of South Dakota wind power plant modeling that I recently completed for the National
15 Renewable Energy Laboratory (NREL). I was also asked to review recent coal power plant
16 economic development benefits analysis completed on behalf of the Big Stone Unit II Co-
17 owners. My testimony is offered on behalf of the Joint Intervenors.

18
19 **Q. Please provide an overview of your conclusions regarding the economic development**
20 **benefits of wind power as modeled for NREL, as they compare to the economic**
21 **development benefits quantified by the Big Stone II Co-owners for their proposed coal**
22 **power plant.**

23 A. I found that developing wind power plants in South Dakota, to provide an equivalent amount
24 of electricity generation as the proposed Big Stone Unit II plant, provides substantially
25 greater long-term economic benefits to the state as a whole.

1 **Q. What documents and/or resources have you reviewed in preparing your testimony**
2 **in this proceeding?**

3 A. I have reviewed the South Dakota economic impact assessment of 1,320 MW of wind power
4 completed in May, 2006, that I prepared for NREL's Wind Powering America Program
5 (Exhibit JI-3-B). I have also reviewed the prepared Direct Testimony and Exhibits of
6 Randall M. Stuefen; prepared Direct Testimony of Dick Edenstrom; and prepared Direct
7 Testimony of Janelle Johnson; all of which Big Stone II Co-owners filed in this proceeding
8 on March 15, 2006. In addition to the documents filed in this proceeding, I have reviewed a
9 number of other news articles, press releases and other documents relating to wind and coal
10 power plant development.

11
12 **Q. What is the Wind Powering America Program?**

13 A. The Wind Powering America Program is an initiative within the U.S. Department of Energy
14 to enhance our nation's power generation options, protect the local environment, increase our
15 energy and national security, and support regional economic development. The NREL
16 National Wind Technology Center supports the Wind Powering America Program objectives
17 in part by analyzing and comparing the economic development benefits of wind power and
18 other generation resources.

19
20 **Q. Please provide a summary of the South Dakota wind power economic impact**
21 **assessment you completed for NREL?**

22 A. Utilizing NREL's Jobs and Economic Development Impact (JEDI) Wind Model, my analysis
23 indicates that constructing and operating 1,320 MW of wind power in South Dakota, which
24 would provide the equivalent amount of electricity generation as a 600 megawatt coal-fired
25 power plant, provides significant short-term and long-term benefits to the South Dakota
26 economy and the residents of the state as a whole.

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29

1 **Q. Please explain what you mean by “short-term” and “long-term”.**

2 A. Short-term refers to those impacts which occur over a relatively short period of time. In this
3 instance I am referring to construction related impacts that will only benefit the businesses
4 and residents of South Dakota for a four year period. In contrast, long-term refers to impacts
5 that are ongoing for the life of the plant. For power plants this is typically 20 to 30 years or
6 more.

7
8 **Q. Please provide more detail regarding the NREL economic assessment.**

9 A. More specifically, I found that during the construction phase, wind plant construction related
10 expenditures will create over 4,000 jobs, \$100 million in wage and salary income, and over
11 \$345 million in economic output within the state of South Dakota (all dollar figures are 2005
12 dollars). More significantly, once the plants are up and running, they create 172 annual on-
13 site plant jobs and \$7.96 million in wage and salary income in South Dakota. When the total
14 statewide impacts are accounted for, the ongoing operations create 483 jobs, \$15.76 million
15 in wage and salary earnings, and \$34.98 million in economic output each year.

16
17 Additional detail is provided in Exhibit JI-3-B.

18
19 **Q. Can you briefly describe the NREL JEDI model used to complete the economic impact**
20 **assessment for wind power?**

21 A. Yes, the JEDI model was developed in 2002 for NREL to demonstrate the economic
22 development impacts associated with developing wind power plants in the United States. To
23 evaluate these impacts, the spreadsheet-based model relies on input-output or multiplier
24 analysis to trace supply linkages in the economy.

25
26 For example, the analysis shows how purchases of wind turbines not only benefit turbine
27 manufacturers, but also the fabricated metal industries and others businesses supplying inputs
28 to those manufacturers. The benefits that are ultimately generated by expenditures for wind
29 plants depend upon the extent to which those expenditures are spent locally and the structure

1 of the local economy. Consistent with the spending pattern and the state-specific economic
2 structure, different expenditures support a different level of employment, income, and
3 economic activity (output).

4
5 The model analyzes the total effect of developing a wind power plant by evaluating three
6 separate impacts for each expenditure. These include: direct effects, indirect effects and
7 induced effects. The sum of these three effects yields a total effect that results from a single
8 expenditure.

9
10 **Q. What are direct effects?**

11 A. Direct effects are the on-site or immediate effects created by an expenditure. In constructing
12 a wind plant, it refers to the on-site jobs of the contractors and crews hired to construct the
13 plant, among others.

14
15 **Q. What are indirect effects?**

16 A. Indirect effects refer to the increase in economic activity that occurs when a contractor,
17 vendor or manufacturer receives payment for goods or services and in-turn is able to pay
18 others who support their business. For instance, this includes the banker who finances the
19 contractor, the accountant who keeps the contractor's books, and the steel mills and electrical
20 manufacturers and other suppliers that provide the necessary materials, among others.

21
22 **Q. What are induced effects?**

23 A. Induced effects refer to the change in wealth that occurs or is "induced" by the
24 spending of those persons directly and indirectly employed by the project.

1 **Q. How does the JEDI model accomplish the analysis of total economic effect of an**
2 **expenditure?**

3 A. To accomplish this analysis, JEDI relies on state-specific multipliers and personal
4 expenditure patterns. These state-by-state multipliers, for employment, wage and salary
5 income and output, and personal expenditure patterns are adapted from the IMPLAN
6 Professional model.¹ The changes in expenditures brought about by investments in
7 developing and operating wind power plants are matched with their appropriate multipliers
8 for each sector affected by the change in expenditure.

9

10 **Q. Did the Big Stone II Co-owners also utilize multipliers in their analysis?**

11 A. Yes, it appears they did. In Mr. Stuefen's testimony, on page 11, he references using the
12 IMPLAN model to formulate the employment impacts related to construction of the Big
13 Stone II plant.

14

15 **Q. You noted earlier that the impacts from wind plant operations provide the most**
16 **significant and long-term benefit to the businesses and residents of South Dakota.**
17 **Were you able to compare these benefits with the Big Stone II Co-owners' estimates**
18 **for the proposed coal power plant?**

19 A. Yes. In this instance, I found that 1,320 MW of wind power plants will create 172 new plant
20 worker jobs in South Dakota. This is almost five times as many as those reported by Mr.
21 Stuefen for the proposed Big Stone II coal plant (35). In addition to these on-site jobs, the
22 direct expenditures on goods and services from the wind plant, combined with the spending
23 by the plant workers, and the associated indirect and induced impacts from all the operating
24 related spending, results in an additional 311 jobs, for a total of 483 statewide (172 plus 311)

¹ See, Minnesota IMPLAN Group (MIG, Inc), Stillwater, Minnesota, www.IMPLAN.com. IMPLAN (Impact Analysis for PLANning) Professional is a social accounting and impact analysis tool.

1 jobs. This compares with Mr. Stuefen's estimate of an additional 29 jobs for the coal plant, a
2 total of 64 overall (35 and 29). Further, the total output (economic activity) related to the
3 wind plant operations is projected to be approximately \$34.9 million annually. See Exhibit
4 JI-3-B. Mr. Stuefen estimates the coal plant will contribute approximately \$6.8 million
5 annually to the state economy. For consistency, all dollar values are adjusted to 2005 dollars.
6

7 Another important benefit to South Dakotans of wind plants, as opposed to the proposed
8 coal plant, is the revenue individual property owners receive from leasing their land to
9 site the wind turbines, as well as the property taxes paid to local jurisdictions. I estimated
10 that land lease payments amount to just over \$3.5 million dollars annually for the life of
11 the wind plants. No similar annual benefit for the proposed coal plant was noted in any
12 of the documents I reviewed.
13

14 I also estimated that local property taxes total just over \$2 million annually for the 20-30 year
15 life of the wind plants. According to testimony of Ms. Janelle Johnson, on page 3, the
16 proposed coal plant will generate \$4.7 million annually for the ten year period following the
17 first date of commercial operation. It is not clear from her analysis if there will be any
18 additional tax payment to the local jurisdiction after this period. It should also be noted that
19 since the wind turbines will be sited in more than one county, the benefits of the associated
20 tax payments will be spread over a larger area and in effect, benefit more residents and
21 schools in South Dakota than the tax payments from the proposed coal plant.
22

23 **Q. Were you able to make similar comparisons for the estimated economic impacts during**
24 **the construction period?**

25 A. In general, yes. Although most of the underlying assumptions inherent in the coal plant
26 analysis were not stated in the Big Stone II Co-owner testimony I reviewed, I found that the
27 Stuefen analysis estimates an annual average of 1,210 jobs per year during the four year
28 construction period, while the wind analysis estimates an annual average of 1,002 jobs. This

1 estimate assumes the wind plants are also built over a four year period. However, as with
2 any modeling, the comparisons must be interpreted with care since the assumptions play a
3 key role in determining the results. Although it is not clear to me how the in-state share of
4 coal plant expenditures (used in the coal plant analysis) were determined, the Stuefen
5 analysis assumes over 50 percent of the construction expenditures are spent in South Dakota.
6 In response to a question posed by the South Dakota PUC staff to explain the basis for the
7 assumption that 50% of the induced impact of construction takes place in the local area, Mr.
8 Stuefen states that “for lack of a good substantiated data estimate of what percentage of
9 household income that will be spent locally and that outside the area, the midpoint estimate
10 of 50% of induced spending was assumed.” In other words, there is no credible empirical
11 estimate for this assumption, so the results must be viewed with caution.

12
13 It is certainly arguable that the in-state expenditures and corresponding impacts for
14 construction could be considerably lower for the Big Stone II Project, given that large coal
15 plant projects like this typically involve very specialized equipment and labor that is often
16 imported from outside the region. For example, MidAmerican Energy’s new coal plant that
17 was recently built in Council Bluffs, Iowa relied heavily on imported equipment and labor.
18 According to a press release from MidAmerican, “Mitsui & Company is responsible for
19 managing the Council Bluffs construction project, while Hitachi Ltd. is providing boilers,
20 power turbines and other critical technology expertise. Both companies are based in Japan, a
21 leader in the development of supercritical technology. The engineering firm of Sargent &
22 Lundy, Chicago, is the design engineer. Kvaerner Songer from Washington, Pa., serves as
23 the general work contractor.” Babcock and Wilcox of Ohio also provided emission control
24 equipment for the project.²

25
26 In contrast, the wind plant analysis, using the default assumptions in the JEDI model,
27 conservatively assumes in-state construction related expenditures are approximately 12

² See, <http://www.midamericanenergy.com/newsroom/asp/newsdetails.aspx?id=219&type=archive>.

1 percent of the total construction cost. This is in large part due to the high percentage of wind
2 plant costs attributed to equipment such as wind turbines, towers, and blades. Currently,
3 South Dakota does not have any manufacturers of this equipment so it must be purchased
4 from out of state manufacturers. At the same time, a very high percentage of local businesses
5 and labor are used during the actual construction. If the wind analysis assumed even a small
6 portion of the major equipment (turbines, blades and towers) were manufactured in South
7 Dakota (a distinct possibility if new wind industries located to the state or existing business
8 retooled and ramped up to meet this demand) the “local” impacts would rise significantly.
9

10 **Q. In terms of economic benefit to the state, how should these construction benefits be**
11 **viewed?**

12 A. First, it is important to recognize that while the 1,000 plus jobs created from the
13 construction of either plant is certainly significant, this benefit must be tempered
14 somewhat by the fact that these new jobs are short term. That is, to the extent that
15 businesses and workers from South Dakota are involved in the construction of the plants,
16 these benefits will only last during the construction period. This can create a significant
17 boom-bust cycle on a local economy and can put a significant strain on the area’s capacity
18 to provide goods and services to meet the temporary demand. On the other hand, the
19 benefits derived from the ongoing operations have more permanent long-lasting impacts
20 and are truly the gauge for how best to support local and statewide economic
21 development and future-oriented initiatives. As I found in my analysis, and noted earlier,
22 the wind plants have the potential to create seven and a half times as many long term jobs
23 as the coal plant. Another added benefit is the fact that the economic activity (both plant
24 jobs and expenditures) from the wind plant operations will not be limited to one specific
25 county, rather they could be dispersed throughout many counties where the plants are
26 located and throughout the state as a whole. By contrast, the economic activity associated
27 with the coal plant will largely be concentrated in a much smaller more localized area.
28

1 **Q. Are there other economic benefits that should be considered?**

2 A. Yes. If the state of South Dakota decided to build 1,320 MW of wind power, this level of
3 development, given the relatively small and developing nature of the U.S. wind
4 manufacturing industry, could certainly help stimulate a wind manufacturing industry in
5 South Dakota. New industries might locate in South Dakota to meet the demand and
6 existing businesses could expand, developing new products and services to meet industry
7 demands. A new and/or expanded industry can serve both in-state and domestic needs, as
8 well as the needs of the rapidly growing international market. Thus, encouraging existing or
9 new electric service providers in the South Dakota market to install wind powered electric
10 generating resources, instead of coal or natural gas plants, should be thought of as an
11 important economic development strategy to boost local employment opportunities and
12 economic activity throughout the state.

13

14 **Q. Would this potentially be true for coal plants as well?**

15 A. No. Unlike the wind manufacturing industry, coal plant equipment producers are part of
16 a fairly small and well established industry that is less apt to build new manufacturing
17 plants or relocate to take advantage of one plant being built.

18

19 **Q. Are there any examples where wind development is stimulating local**
20 **manufacturing growth and capabilities?**

21 A. There certainly are. For instance, last summer California based Clipper Windpower
22 decided to open a \$22 million wind turbine manufacturing plant in Cedar Rapids, Iowa to
23 take advantage of regional commitments to wind development. The plant is expected to
24 employ up to 140 people. Most recently, Alliant Energy contracted with Clipper to build
25 and develop 150 MW of wind power in Iowa.

26

27 Suzlon Rotor Corporation, a wind turbine manufacturer from India, is building a new
28 wind turbine blade and nose cone manufacturing facility in Pipestone, Minnesota. Suzlon

1 chose this location due to the high cost of transporting materials from overseas.
2 Representatives from Suzlon estimate that the 37-acre facility will create 100-200 jobs
3 and bring \$14 million in new investment to the area. Suzlon has supplied wind turbines
4 to several locally owned wind projects in Southwest Minnesota.

5
6 Other communities that have benefited from regional wind commitments include Grand
7 Forks, North Dakota, where LM Glasfiber, Inc. of Denmark responded to new wind
8 initiatives in the Midwest and opened a wind turbine blade manufacturing plant. They
9 recently completed a \$3 million expansion of the facility that increased the number of
10 employees to 200. West Fargo, North Dakota, home to DMI Industries, Inc., has also
11 benefited. Originally a tool and die machine manufacturer, the company decided to make
12 a business transition to capture a rapidly expanding and profitable wind market. Their
13 main focus now is on manufacturing towers for wind turbines. DMI now employs over
14 200 workers and is growing.

15
16 **Q. What conclusions can you draw from your analysis?**

17 A. Assuming economic development and new job creation are appropriate objectives of
18 South Dakota decision-makers, then a significant commitment to developing wind
19 resources in the state would provide much greater long-term economic benefits than
20 increasing the state's reliance on coal. NREL's wind resource assessment for South
21 Dakota shows that it has the best wind potential of any state in the country, yet the state
22 lags way behind most of its neighbors and several others states around the country in
23 terms of wind development. By encouraging substitution of wind power plants for
24 conventional electricity supply options, the state can take advantage of an important and
25 significant economic development opportunity and help ensure the state's future
26 economic and environmental well-being.

27
28

1 **Q. Do you have any other comments you would like to make?**

2 A. No.

3

4 **Q. Does this complete your testimony?**

5 A. Yes, it does.

6