BEFORE THE STATE OF MINNESOTA
OFFICE OF ADMINISTRATIVE HEARINGS
FOR THE MINNESOTA PUBLIC UTILITIES COMMISSION

In the Matter of the Application by Otter Tail Power Company and Others for Certification of Transmission Facilities in Western Minnesota **And** **In the Matter of the Application to the Minnesota Public Utilities Commission for a Route Permit for the Big Stone Transmission Project in Western Minnesota**	**))))))))**	**OAH No. 12-2500-17037-2** **MPUC Dkt. No. CN-05-619** **and** **OAH No. 12-2500-17038-2** **MPUC Dkt. No. TR-05-1275**

Direct Testimony of Timothy Woolf Synapse Energy Economics, Inc.

On Behalf of

Fresh Energy
Izaak Walton League of America – Midwest Office
Wind on the Wires
Union of Concerned Scientists
Minnesota Center for Environmental Advocacy

PUBLIC VERSION
PROTECTED INFORMATION REDACTED

November 29, 2006

Table of Contents

I. INTRODUCTION AND QUALIFICATIONS

Q. What is your name, position and business address?

A. My name is Timothy Woolf. I am the Vice-President of Synapse Energy Economics, Inc, 22 Pearl Street, Cambridge, MA 02139.

Q. On whose behalf are you testifying in this case?

A. I am testifying on behalf of Fresh Energy, Wind on the Wires, Izaak Walton League of America – Midwest Office, Union of Concerned Scientists, and Minnesota Center for Environmental Advocacy ("Joint Intervenors").

Q. Please describe Synapse Energy Economics.

A. Synapse Energy Economics is a research and consulting firm specializing in electricity industry regulation, planning and analysis. Synapse works for a variety of clients, with an emphasis on consumer advocates, environmental advocates, regulatory commissions, and other government agencies.

Q. Please describe your experience in the area of electric utility regulation and planning.

A. My experience is summarized in my resume, which is attached as Exhibit JI-5-A. Electric power system planning and regulation have been a major focus of my professional activities for the past 24 years. In my current position at Synapse, I investigate a variety of issues related to the electric industry; with a focus on energy efficiency, renewable resources, environmental policies, integrated resource planning, and many aspects of consumer protection.

Q. Please describe your professional experience before beginning your current position at Synapse Energy Economics.

A. Before joining Synapse Energy Economics, I was the Manager of the Electricity Program at Tellus Institute, a consulting firm in Boston, Massachusetts. In that capacity I managed a staff that provided research, testimony, reports and regulatory support to state energy offices, regulatory commissions, consumer advocates and environmental organizations in the US. Prior to working for Tellus Institute, I was employed as the Research Director of the Association for the

Conservation of Energy in London, England. I have also worked as a Staff Economist at the Massachusetts Department of Public Utilities, and as a Policy Analyst at the Massachusetts Executive Office of Energy Resources. I hold a Masters in Business Administration from Boston University, a Diploma in Economics from the London School of Economics, a BS in Mechanical Engineering and a BA in English from Tufts University.

Q. Have you previously conducted work regarding energy efficiency in Minnesota?

A. Yes. In 2004 I was hired by the Minnesota Office of Legislative Auditor to review the avoided cost methodologies and assumptions used by the Minnesota investor owned utilities in preparing their Conservation Improvement Programs.

Q. Have you testified previously before the Minnesota Public Utilities Commission?

A. No, I have not.

II. OVERVIEW OF TESTIMONY

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to review the Applicants' assumptions regarding the opportunities for implementing demand-side management (DSM) resources as an alternative to the Big Stone II Project, the generating facility and its respective transmission lines.

Q. Why is it important for the Applicants to consider DSM as an alternative to the Big Stone II Project?

A. The Minnesota Certificate of Need statute clearly states DSM should be fully considered in evaluating the need for new large energy facilities. It states that "no proposed large energy facility shall be certified for construction unless the applicant can show that demand for electricity cannot be met more cost-effectively through energy conservation and load management measures…"[1] The statute clearly emphasizes DSM as an alternative to a new large energy facility,

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[1] Minnesota Stat. 216B.243 Certificate of need for large energy facility, Subd.3.

by mentioning it four separate times, and by noting that applicants should (a) consider the effect of *existing* energy conservation programs,[2] (b) consider the effect of *increased* efficiency and load management programs,[3] and (c) consider any *feasible combinations* of energy conservation improvements that can replace *part or all* of the energy to be provided by the proposed facility.[4] In sum, the Minnesota statute clearly gives preference to cost-effective efficiency resources over a new large energy facility like the Big Stone II Project.

Q. How can a utility proposing a large energy facility show that the facility will meet demand for electricity more cost effectively than energy conservation and load management measures?

A. In order to show that a new large energy facility is more cost-effective than investing in energy efficiency, a utility must compare the facility with DSM based on a comprehensive assessment of all available DSM options. Such a comprehensive assessment should at least consider the DSM options shown to be achievable and cost effective by other utilities.

Q. Have the Applicants conducted comprehensive assessments of DSM resources as an alternative to the Big Stone II Project?

A. No. Each of the Applicants uses different assumptions and methodologies to assess the potential for DSM resources, and each of the Applicants obtains very different results with regard to DSM alternatives. However, all of the Applicants understate the full cost-effective potential for DSM in their service territories, and thus understate the potential alternatives to the Big Stone II Project. In most cases the Applicants have analyzed amounts of DSM resources that are significantly less than what is now being achieved as standard practice by DSM programs at many electric utilities. Moreover, as my colleagues David A. Schlissel and Anna

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2 Ibid. at Subd.3(2).

3 Ibid. at Subd.3(6).

4 Ibid. at Subd. 3(8).

Sommer testify, each of the Applicants underestimates the cost of Big Stone II. If the Applicants had appropriately priced the Big Stone II facility, then their analyses would have identified greater amounts of cost-effective DSM.

Q. What analyses have you performed to reach these general conclusions?

A. First, I prepare a set of benchmarks that indicate the amount of cost-effective DSM potential that would be available in essentially any electric utility service territory, based on a review of recent experience in the industry and several studies of energy efficiency potential. These benchmarks are described in Section III.

Second, I compare the Applicants' DSM assumptions with these benchmarks and find that the Applicants tend to understate DSM potential by a significant amount. Finally, I review the Applicants' input assumptions and methodologies used in their modeling in support of the certificate of need, and describe why these lead to a significant understatement of DSM potential. These comparison and reviews are provided in Section IV, separately for each of the Applicants.

Q. Are your findings used by other Joint Intervenor witnesses in this docket?

A. Yes. My findings are used in the direct testimony of David A. Schlissel and Anna Sommer, submitted in this proceeding on November 29, 2006.

III. GENERIC BENCHMARKS OF ENERGY EFFICIENCY POTENTIAL

Q. Please describe what you mean by generic benchmarks of energy efficiency potential.

A. There is now a significant amount of experience with electric utility DSM programs – both in terms of the number of utilities operating DSM programs and the number of years of program operation – that can be used to identify overall trends in the industry. In order to assess these overall trends, it is useful to develop generic benchmarks that allow for comparing energy efficiency activities across a variety of utilities of different sizes and types, as well as across different years.

Q. Why are such efficiency savings benchmarks relevant for assessing the extent to which the Applicants have conducted a comprehensive assessment of DSM alternatives to Big Stone II?

A. As described in more detail below, the efficiency savings benchmarks are a means of comparing the amount of DSM resources considered by the Applicants to the amount of DSM resources that have been achieved by other electric utilities. Any comprehensive assessment of DSM alternatives should consider – at a minimum – the amount of DSM resources that have been achieved by other electric utilities. The amount of DSM resources achieved by other electric utilities provides a rough indication of the amount of achievable, cost-effective DSM resources potentially available to the Applicants.

Q. What efficiency savings benchmarks do you use in your analysis?

A. I have developed a set of benchmarks indicating the amount of achievable cost-effective DSM resources on an electricity system. These are presented in Tables 1 and 2. The benchmarks are defined as the amount of electricity that can be saved from DSM, as a percentage of annual retail electric sales. Dividing the savings by retail sales helps to normalize the benchmarks across utilities of different sizes.

Table 1. Efficiency Savings Benchmarks - Percent of Retail Sales: Residential Sector

	Low	Medium	High
Average Savings Per Year	0.2%	0.4%	0.6%
Cumulative Savings Over 5 Years	1%	2%	3%
Cumulative Savings Over 10 Years	2%	4%	6%
Cumulative Savings Over 15 Years	3%	6%	9%

Table 2. Efficiency Savings Benchmarks – Percent of Retail Sales: Commercial and Industrial Sector

	Low	Medium	High
Average Savings Per Year	0.6%	0.8%	1.0%
Cumulative Savings Over 5 Years	3%	4%	5%
Cumulative Savings Over 10 Years	6%	8%	10%
Cumulative Savings Over 15 Years	9%	12%	15%

The primary benchmark, presented in the first row of each table, is the average efficiency savings per year, as a result of one year's energy efficiency activities. This ranges from a low of 0.2% per year for residential to a high of 1.0% per year for commercial and industrial. The other three rows in each table indicate the amount of cumulative efficiency savings that could be achieved if the average annual savings were achieved each year for a number of years.

I present the Low, Medium and High cases to indicate a range of efficiency potential at different levels of costs (as described below). Also, the Low, Medium and High cases are used in modeling DSM opportunities in the testimony of David A. Schlissel and Anna Sommer.

Q. How did you determine these benchmarks?

A. The sources of information that I used for developing the benchmarks are presented in Exhibit JI-5-B. I reviewed a variety of studies that indicate the amount of DSM savings that have been achieved in recent years by several US and Canadian electric utilities. Some of these studies are national and regional analyses that review the activities of many utilities, while some of the studies focus on a single utility or state. In total, these studies provide a good indication of the range of experience with successful utility DSM programs in recent years.

Utilities are only allowed to implement cost-effective DSM programs; therefore it is safe to conclude that the amount of DSM savings they achieve are cost-effective. Also, since I use DSM savings that have actually been achieved by utilities in the recent past, it is safe to conclude that these DSM savings are readily achievable. Exhibit JI-5-C presents a summary of DSM savings achieved in recent years by several electric utilities.

Q. Is it possible that certain DSM programs are cost-effective for some utilities but not for others?

A. Yes. Utilities with higher avoided costs will tend to have a greater potential for cost-effective DSM savings. However, experience with energy efficiency programs and energy efficiency potential studies indicates that there is a large amount of energy efficiency saving potential in virtually all electric service territories at very low cost. Even utilities with relatively low avoided costs can have a large potential for cost-effective efficiency savings. In addition, there is ample evidence that even the leading DSM utilities that achieve the highest amount of efficiency savings are not implementing all of the DSM resources that are cost effective in their service territories.[5]

Furthermore, in developing the efficiency savings benchmarks presented above, I have addressed the potential difference in cost-effectiveness across utilities in two ways. First, the amount of efficiency savings used for the benchmarks are considerably lower than savings that have been achieved in several states. While my High benchmark for the residential sector is 0.6% savings per year, several utilities have achieved savings of at least 1.0% per year in this sector. Similarly, while my High benchmark for the C&I sector is 1.0% savings per year, several utilities have achieved savings of 1.1% and 1.2% per year in this sector. Second, I have used three different levels for each sector to indicate the fact that efficiency savings at higher levels tend to be more expensive.

Q. Is it possible that DSM programs are less difficult, and therefore less costly, to implement for some utilities than others?

A. Yes. For example, relatively large utilities have an advantage of economies of scale with regard to program administration, marketing and delivery. As another example, it is typically more expensive to provide DSM services to residential customers than commercial and industrial customers, so utilities with larger proportions of residential customers – particularly low-income customers – might find it more difficult to implement some DSM programs.

However, I have considered this issue in developing the energy savings benchmarks. The utilities that I reviewed in developing the benchmarks are of many different sizes and in many different locations. Thus, the benchmarks indicate approximate trends across different types of utilities. In addition, I have

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5 See, for example, Summit Blue and Regulatory Assistance Project, *Demand-Side Management: Determining Appropriate Spending Levels and Cost-Effectiveness Testing*, prepared for the Canadian Association of Members of Public Utility Tribunals, January 2006, at page 1.

separated the benchmarks by residential versus commercial and industrial sectors, in order to address the issue related to different customer make-up. Furthermore, as described above, my benchmarks are not based on the highest amount of savings achieved by other utilities, but on a significantly lower amount. This very roughly captures some of the challenges that some utilities may face versus others.

Finally, small utilities can join together to implement DSM resources, in much the same way that the Applicants have joined together to build Big Stone II, thereby achieving economies of scale and lower costs of saved energy.

Q. Please summarize the DSM savings information presented in Exhibit JI-5-C.

A. This exhibit presents a summary of the annual energy savings as a percent of retail sales for several electric utilities, for the residential sector, the commercial and industrial sector and total system, where available. Note that there is a wide range of energy savings across utilities, ranging from less than 0.2% per year to well over 1.0% per year. Also note that there is typically more efficiency savings achieved from the commercial and industrial sector than the residential sector. On average the residential savings are approximately 0.5% per year, and the commercial and industrial savings are approximately 0.7% per year.

Q. Did you also review energy efficiency potential studies in developing your benchmarks?

A. Yes. I also reviewed a variety of studies that estimate the technical, economic and achievable potential for energy efficiency in several utility service territories.[6] These efficiency potential studies do not indicate what has been achieved, but they attempt to indicate what could be achieved. These studies help to provide some context and some reference points relative to the amount of efficiency savings that are actually being achieved by utilities.

The studies I reviewed typically identify the technical efficiency potential (i.e., potential efficiency savings regardless of cost or implementation barriers), the

[6] See Exhibit JI-5-B.

economic potential (i.e., potential cost-effective efficiency savings regardless of implementation barriers), and the achievable potential (i.e., the potential cost-effective efficiency savings accounting for implementation barriers). The achievable potential is most relevant to the energy savings benchmarks.

It is important to note that there are a variety of techniques to estimate the achievable potential from the economic potential, and as a result the studies tend to identify a wide range of achievable potentials. It is even more important to note that the amount of efficiency that can be achieved by any one utility is a function of many things, some of which the utility has control over, such as the marketing of the energy efficiency programs and the amount of incentives offered to customers to participate in the program. As such, the achievable potential estimates should not be seen as fixed limits, but instead as rough indications based on the assumptions used by the authors of the studies.

Exhibit JI-5-D presents a summary of the achievable efficiency savings from several recent efficiency potential studies. Some of these studies are national and regional analyses that review the activities of many utilities, while some of the studies focus on a single utility or state. In total, these studies provide a good indication of the range of efficiency potential estimates made in recent years.

Q. Please summarize the information presented in Exhibit JI-5-D.

A. This exhibit presents the achievable energy efficiency savings in the same format as Exhibit JI-5-C, for comparison purposes. That is, it presents the annual achievable efficiency savings as percent of retail sales for the residential sector, the commercial and industrial sector, and both sectors combined, where available. As with the actual savings presented in Exhibit JI-5-C, the potential savings estimates vary considerably.

Q. Specifically how did you use the information presented in Exhibit JI-5-C and Exhibit JI-5-D to develop the energy saving benchmarks above?

A. I primarily used the actual experience with energy savings (Exhibit JI-5-C) to identify indicators of what would be considered low, medium and high savings for each sector. For the commercial and industrial sector, most of the utilities have been able to achieve at least 0.6% savings, so I chose that to be the Low benchmark. Several utilities – including Otter Tail Power (OTP) and Xcel Energy – have been able to achieve at least 1.0% savings in this sector, so I chose that to be the High benchmark. I chose the mid-point of these two to be the Medium benchmark. A similar approach was used to develop the residential benchmarks.

I also considered the achievable potential efficiency savings (Exhibit JI-5-D) as a check on the benchmarks. In general, the benchmarks are consistent with these potential savings estimates. With regard to the Missouri River Energy Services (MRES) results and the Otter Tail Power results, I reviewed these utilities' source studies and found that they contain assumptions and methodologies that limit the achievable efficiency savings. These are discussed in Section IV below, in the relevant subsections.

Q. Please describe the cost of saved energy that you apply to the energy savings benchmarks.

A. Table 3 presents the cost of saved energy assumptions for each of the energy savings benchmarks. The annual savings represents the amount of money that a utility would need to spend in one year to achieve the relevant energy efficiency savings in one year. However, the measures installed with the money spent in that one year would continue to result in energy savings for the life of the efficiency measures. Assuming an average efficiency measure life of 13 years, the cost of saved energy for lifetime savings is equal to the annual cost divided by 13. This can be considered a levelized cost and is comparable to annual and levelized costs typically calculated for power plant generation.

Table 3. Cost of Saved Energy for the Efficiency Savings Benchmarks

	Low	Medium	High
Residential:			
Cost of saved energy – annual savings ($/MWh)	260	390	520
Cost of saved energy – lifetime savings ($/MWh)	20	30	40
Commercial and Industrial:			
Cost of saved energy – annual savings ($/MWh)	195	325	455
Cost of saved energy – lifetime savings ($/MWh)	15	25	35

Q. How did you derive these costs of saved energy?

A. I derived these costs of saved energy using a similar approach that I used to develop the energy savings benchmarks. I reviewed several studies that indicate the cost of saved energy recently experienced by several electric utilities. The information I used is presented in Exhibit JI-5-E. This information is from the same studies and for the same utilities that I reviewed for the energy efficiency savings benchmarks. Note that there is a wide range in the cost of saved energy, and that high costs of saved energy are not necessarily correlated to high amounts of energy saved. This may be due to the economies of scale associated with larger energy efficiency programs.

From these results I chose those costs which best approximate the cost of saved energy associated with my energy savings benchmarks. Note that I chose relatively high costs, particularly for the High benchmark, in order to account for the possibility that utilities with less experience or of smaller size, such as some of the Applicants, might incur slightly higher cost of saved energy.

Q. What is the primary purpose for your cost of saved energy assumptions?

A. The primary purpose of these cost of saved energy assumptions is for input to the modeling analysis performed by my colleagues David A. Schlissel and Anna Sommer. In addition, they indicate very generally that there is a lot of energy efficiency available at relatively low costs.

Q. How do you use the energy savings benchmarks in your testimony?

A. In Section IV below I apply these benchmarks to each of the Applicants, by multiplying the percentages in Tables 1 and 2 by each Applicant's forecast of 2007 retail sales. This results in an estimate of the amount of energy savings each Applicant could expect to achieve at the benchmark levels. The results are presented separately for each Applicant in Exhibit JI-5-F.

This approach allows for a consistent comparison of the DSM alternatives assumed by each Applicant, as well as a comparison of each Applicant's DSM assumptions relative to the experiences of other electric utilities offering DSM programs. When evaluating DSM alternatives to Big Stone II, each Applicant should analyze at least as much energy efficiency as indicated by the High benchmarks, because these benchmarks provide an indication of how much energy efficiency is (a) readily achievable and (b) cost-effective relative to supply-side resources.

Q. Do you consider your High benchmarks to represent the maximum amount of cost-effective, achievable DSM?

A. No, not at all. As indicated above, there are many utilities that already achieve much more efficiency savings than my High benchmarks, and evidence indicates that there are more cost-effective savings available. Therefore, my High benchmark is not to be considered a maximum amount. Instead, it should be considered as a rough indication of the *minimum* amount of DSM that one would expect to see in a *comprehensive* assessment of DSM opportunities, because it indicates the amount of DSM that is readily achievable and cost-effective. If the Big Stone II Applicants do not even analyze this amount, then they are clearly not conducting a comprehensive analysis, and thus are not meeting the standard of the Minnesota Certificate of Need statute.

IV. REVIEW OF APPLICANTS' EFFICIENCY POTENTIAL ESTIMATES

a. Missouri River Energy Services

Q. Please summarize how Missouri River Energy Services (MRES) developed its assumptions for DSM alternatives to the Big Stone II Project.

A. MRES relied upon a DSM potential study prepared by Summit Blue to develop its DSM assumptions.[7] This study estimates technical, economic and achievable potential for energy efficiency among the municipal utilities that MRES serves (although it only presents the results for the achievable potential). MRES then took the amount of DSM that was considered achievable by the Summit Blue Study and combined it into ten DSM portfolios that were modeled in the Strategist planning model. The Strategist analysis found that all ten of the DSM

7 Summit Blue, Missouri River Energy Services DSM Potential Study, April 2006. Confidential Report.

options were cost-effective, i.e., were found to be a part of the optimal resource plan.[8]

MRES also conducted a supplemental resource planning analysis, to identify how the optimal plan might change with higher Big Stone II Project costs. They assumed the same ten DSM options as the previous analysis, and again found that all ten options were cost-effective.[9]

Q. How do the MRES DSM assumptions compare with your energy savings benchmarks?

A. Exhibit JI-5-F presents a comparison of the MRES DSM assumptions with the amount of DSM savings associated with my energy savings benchmarks. As indicated, the MRES DSM assumptions are significantly below the High benchmark, and even below the Low benchmark.

Q. Why do you think that the MRES DSM assumptions are so much lower than your energy savings benchmarks?

A. The Summit Blue DSM potential study for MRES does not identify the full amount of cost-effective achievable DSM. This study estimates that MRES members could save 233,250 MWh over a period of 15 years.[10] This is equivalent to roughly 15,550 MWh per year, which is roughly 0.4% of MRES retail electric sales in 2007.[11] This is considerably less than amounts that have already been achieved by many utilities, as indicated in Exhibit JI-5-C.

8 Applicants' Exhibit 18, Direct testimony of Gerald A. Tielke, Missouri River Energy Services, June 1, 2006.

9 Applicants' Exhibit 35, Supplemental Direct Testimony of J.P. Schumacher, Missouri River Energy Services, October2, 2006.

10 Applicants' Exhibit 18, Direct testimony of Gerald A. Tielke, Missouri River Energy Services, June 1, 2006, at page 12.

11 According to MRES Appendix K, its retail electric sales in 2007 is forecast to be 4,176,324 MWh.

Q. Are there specific assumptions and methodologies in the Summit Blue study that suggest that it understates the full amount of cost-effective achievable DSM?

A. Yes. First, Summit Blue limited the amount of DSM savings opportunities as a result of discussions with MRES staff. This included reducing demand savings for some measures, and excluding certain residential efficiency options.[12] Some of the excluded residential efficiency measures (refrigerators, clotheswashers, dishwashers, and building envelope measures) are frequently included in utility DSM programs. MRES asked Summit Blue to reject these measures because the cost was assumed to be $1000/kW or more. Using a $/kW avoided cost in this way suggests that the avoided energy costs ($/MWh) were not factored into the decision, which clearly undermines the economics of these efficiency measures that typically save significant amounts of energy. It is standard practice to account for both the avoided energy and avoided capacity costs associated with DSM resources.

Second, in order to derive the achievable potential, Summit Blue limited the market penetration of the efficiency measures to 20% over the forecast period, except for certain lighting measures that have demonstrated higher market penetration factors in other service territories.[13] While I agree that there is a practical limit to the market penetration of efficiency measures, it is certainly possible to achieve higher than 20% penetration, especially over a period of 15 years.

Third, the Summit Blue study conducts a benchmarking assessment, to confirm its estimates of achievable DSM potential. The benchmarking assessment compares the actual energy savings experienced by MRES, Otter Tail Power, Southern Minnesota Municipal Power Agency, and Xcel. (This information is included in the table in Exhibit JI-5-C.) Summit Blue finds that its estimate of achievable

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[12] Summit Blue, Missouri River Energy Services DSM Potential Study, April 2006, at pages 1-2. Confidential Report.

[13] Summit Blue, Missouri River Energy Services DSM Potential Study, April 2006, at page 3. Confidential Report.

DSM potential is roughly consistent with the amount of efficiency savings achieved by these neighboring utilities in recent years.[14] However, these are not the appropriate benchmarks for determining what might be the fully achievable cost-effective DSM savings. The efficiency savings of the utilities in the benchmarking assessment are a result of the Conservation Improvement Programs (CIP), which are designed to spend at least 1.5% of gross operating revenues on energy conservation and load management programs, but are not necessarily designed to achieve the full cost-effective potential for DSM. Minnesota Conservation Improvement Programs tend to be very cost-effective. It is quite likely that additional spending on DSM programs would result in additional cost-effective efficiency savings. The energy savings benchmarks that I have developed – based on a wider range of utilities and budgets – are a better indication of the minimum achievable DSM potential.

Fourth, the amount of DSM savings that can be achieved in practice depends in part upon actions taken by the utility. Utilities can increase efficiency budgets, provide higher financial incentives for customer participation, offer technical assistance, and implement aggressive marketing campaigns in order to increase the amount of DSM that can be achieved. Therefore, the achievable DSM potential should not be seen as a clearly-defined, rigid limit. And it should certainly not be confined to past utility practices that do not even attempt to implement all possible cost-effective DSM.

Finally, it is important to note that by limiting the amount of cost-effective DSM potential that is input into Strategist, the model is not able to properly compare alternatives to Big Stone II. Without including the full range of potential DSM, the MRES model simply cannot be said to have truly selected Big Stone II over more DSM.

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[14] Ibid. at pages 5 and 8.

Q. Are there any other indications that the MRES DSM assumptions do not reflect the full amount of efficiency savings potential?

A. Yes. First, when the DSM portfolios from the Summit Blue study were modeled in Strategist, they were all identified as cost-effective. This suggests that there might be additional cost-effective DSM opportunities that were not even input to the Strategist model. It is critical that a broad range of DSM savings and costs is modeled, in order to find the point at which some DSM options are rejected as too expensive. The MRES analysis does not confirm that such a point was reached.

Second, when MRES prepared the supplemental resource analysis, with higher Big Stone II costs, they should have considered the potential for additional DSM resources. With higher avoided costs, it is likely that there would be higher amounts of cost-effective DSM available. Otter Tail Power found this to be the case for their system. Otter Tail Power's supplemental resource planning analysis identified 10% more cost-effective DSM resources relative to the original analysis.[15] The fact that MRES did not even allow the model to consider additional DSM options in the supplemental analysis suggests that they were not making a comprehensive assessment of DSM potential.

Q. Are you aware of any reason why MRES should not be able to achieve at least the level of DSM savings indicated by your High benchmark?

A. No.

Q. Does the MRES analysis meet the standard of the Minnesota Certificate of Need statute, which requires a comprehensive comparison of DSM alternatives to new energy facilities?

A. No, it does not. A comprehensive comparison of MRES DSM alternatives would analyze at least twice as much DSM as was considered by MRES.

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[15] Otter Tail Power Company, Supplemental Information and Analysis Results on Its Resource Plans, at page 9 in Docket No. E017/RP-05-968.

b. Montana-Dakota Utilities

Q. Please summarize how Montana-Dakota Utilities (MDU) developed its assumptions for DSM alternatives to the Big Stone II Project.

A. The MDU DSM assumptions are based on the company's 2005 Integrated Resource Plan (IRP), submitted to the Montana Public Service Commission and North Dakota Public Service Commission on September 15, 2005. The IRP analyzed several potential DSM programs. Some of these DSM programs were rejected as not being cost-effective. Others were not included, but will continue to be reviewed by MDU. In the preferred resource plan, the company includes only three DSM programs. One of these programs is intended to promote electric space heating, so it cannot be considered as an alternative to Big Stone II. The remaining two programs are load control programs, designed to shave peak load but not to necessarily save much energy.[16]

MDU hired PA Consulting to help in developing its supplemental resource plan prepared for this docket. PA Consulting used the Strategist model to update the 2005 IRP. Their analysis included three DSM options. DSM Option 1 was based on the two load control programs from the 2005 IRP. DSM Options 2 and 3 were not defined by PA Consulting, except for the assumed savings and costs.[17]

Q. How do the MDU DSM assumptions compare with your energy savings benchmarks?

A. Exhibit JI-5-F presents a comparison of the MDU DSM assumptions with the amount of DSM savings associated with my energy savings benchmarks. As indicated, the MDU DSM assumptions are only a small fraction of the benchmarks I have developed.

Q. Why do you think that the MDU DSM assumptions are so much lower than your energy savings benchmarks?

A. The MDU 2005 IRP contains many methodological problems that severely limit the amount of energy efficiency potential. First, the avoided costs are applied in

[16] Montana-Dakota Utilities Company, 2005 Integrated Resource Plan, September 2005, at pages v, 3-13 through 3-16.

[17] Applicant's Exhibit 41-B.

terms of $/kW-year, based on the cost of a combustion turbine.[18] Using an avoided cost that is based solely on capacity costs ignores the energy benefits (in $/MWh) provided by DSM resources. This significantly understates the potential for a wide variety of otherwise cost-effective energy efficiency options. It is standard practice to evaluate DSM relative to both the avoided cost of capacity and the avoided cost of energy.

Second, the 2005 IRP applies both the Ratepayer Impact test and the Societal Benefits test in determining whether DSM is cost-effective.[19] The Ratepayer Impact test is not an appropriate test for comparing alternatives to Big Stone II, because it does not compare the direct costs of DSM to the direct costs of Big Stone II. The Ratepayer Impact test is an unfair comparison of DSM resources with supply-side resources, and will significantly understate the estimates of DSM potential.

Third, the selection of DSM programs in the 2005 IRP is very limited. There are very few programs targeted to the commercial and industrial sector, particularly given the savings potential for that sector. Many of the programs are load control programs, as opposed to energy savings programs. Several of the programs are designed to increase electricity consumption by promoting electric space heat.[20] This narrow selection of programs does not even begin to include the full range of potentially cost-effective efficiency resources.

Fourth, it is not clear whether the Strategist model was even used to identify the amount of DSM that would be cost-effective. It appears as though MDU simply chose a subset of the DSM programs (Option A), but rejected another subset of programs (Option B) for later analysis, without testing them in the model.[21]

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[18] Ibid. at page 3-5.

[19] Ibid. at page 3-9.

[20] Ibid. at page 3-10.

[21] Ibid. at page 3-15.

Q. Are there any other indications that the MDU DSM assumptions do not reflect the full amount of efficiency savings potential?

A. Yes. The supplemental resource planning analysis conducted by PA Consulting includes only a very limited assessment of DSM options. Only three options, representing a very small portion of MDU's load, were considered. While the PA Consulting study provides very little information about these options, it appears as though they are designed primarily as load control measures, with very little energy savings.

Also, as indicated in Exhibit JI-5-F, the small amount of DSM that is evaluated in the company's resource plan is held constant, as opposed to increasing each year with annual DSM implementation activities. This approach significantly understates the amount of cumulative DSM savings that can be achieved through on-going DSM activities.

Q. Are you aware of any reason why MDU should not be able to achieve at least the level of DSM savings indicated by your High benchmark?

A. No.

Q. Does the MDU analysis meet the standard of the Minnesota Certificate of Need statute, which requires a comprehensive comparison of DSM alternatives to new energy facilities?

A. No, it does not. A comprehensive comparison of MDU DSM alternatives would include much more DSM than what was considered by MDU. It would also include a more thoughtful and better documented approach to identifying and evaluating DSM opportunities.

c. Central Minnesota Municipal Power Agency

Q. Please summarize how Central Minnesota Municipal Power Agency (CMMPA) developed its assumptions for DSM alternatives to the Big Stone II Project.

A. CMMPA used their Conservation Improvement Program reports to estimate the costs and benefits of DSM as an alternative to the Big Stone II Project. The company estimated that the average cost of the CMMPA Conservation Improvement Programs are higher than the marginal avoided cost of generation and capacity. CMMPA concluded, consequently, that increased funding of these programs would not be cost-effective, and that DSM does not represent an alternative resource to Big Stone.[22]

CMMPA hired R. W. Beck to assist with their supplemental resource planning analysis for the October 2006 testimony. Beck used the same approach of basing all of the DSM assumptions on recent experience with the CMMPA Conservation Improvement Programs. They used the Strategist model and found that the CIP-based DSM measures were not cost-effective, with Utility Test benefit cost ratios of 0.11 for conservation programs and 0.13 for direct load control programs.[23]

Q. How do the CMMPA DSM assumptions compare with your energy savings benchmarks?

A. Exhibit JI-5-F presents a comparison of the CMMPA DSM assumptions with the amount of DSM savings associated with my energy savings benchmarks. As indicated, CMMPA considered a very small amount of DSM in its modeling analysis, but this DSM was not accepted by the model as part of the optimal resource plan.

Q. Why do you think that the CMMPA DSM assumptions are so low?

A. The company severely limited its review of DSM potential by using only historical Conservation Improvement Program results as input. There are many other ways to implement efficiency programs; and different efficiency measures, marketing techniques, customer incentives and budget levels that could result in markedly different results than what has been achieved to date by the CCMPA Conservation Improvement Programs. As one example, the Otter Tail Power Company's Conservation Improvement Programs have been highly cost effective. The Otter Tail Power Company's 2006/2007 CIP benefit cost ratios are estimated

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[22] Applicants' Exhibit 22, Direct Testimony of Robert L. Davis, R.W. Beck, on behalf of Central Minnesota Municipal Power Agency, June 1, 2006, at pages 9-10.

[23] R.W. Beck, Resource Expansion Analysis, Big Stone II Participating Members, Updated Analysis, October 1, 2006.

to be 2.51 for the Total Resource Cost Test and 5.34 for the Utility Test.[24] Such high benefit-cost ratios suggest that there may be even more cost-effective DSM on the Otter Tail System. Furthermore, as indicated in Exhibit JI-5-C, there is ample evidence of other utilities that have found cost-effective DSM opportunities.

Q. Are there any other indications that the CMMPA DSM assumptions do not reflect the full amount of efficiency savings potential?

A. Yes. The R. W. Beck study provides very little documentation of the DSM screening, but it does indicate that the DSM screening was severely limited by the input assumptions used. First, the study assumes that only the amount and type of DSM from the CMMPA Conservation Improvement Programs are available. As discussed above, this is not an accurate depiction of the full potential for achievable, cost-effective DSM.

Second, the study assumes that DSM resources cannot begin implementation until 2011. Such a late start date does not allow enough time for programs to ramp up and accumulate savings in order to affect the Big Stone II installation date of 2011.

Third, the R. W. Beck study assumes that conservation programs will experience a free-ridership rate of 50%.[25] This is a very high assumption with no supporting analyses. Free-ridership rates typically range from 0% to 10%, and sometimes 20%. Free-ridership rates can sometimes reach 50% or more, but at this point most utilities will modify the efficiency program or even eliminate the measure in order to reduce the free-ridership. Also, free-ridership effects are frequently offset by spillover effects, which were not accounted for by the Beck study.[26]

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[24] Otter Tail Power Company, 2006/2007 Conservation Improvement Programs, July 1, 2005.

[25] "Free-riders" are those customers who participate in a DSM program but who would have adopted the efficiency measure even if the program did not exist. The energy savings associated with free-riders are subtracted from the benefits of the DSM program in estimating cost-effectiveness.

[26] "Spillover" refers to energy savings associated with customers who adopt efficiency measures as a result of a DSM program without participating in the program. The energy savings associated with spillover are added to the benefits of the DSM program in estimating cost-effectiveness.

Assuming an average 50% free-ridership across all measures significantly limits DSM potential, and indicates a bias against DSM on the part of the analyst.

Fourth, the Beck study assumes that DSM programs will cost $170/MWh, based on the Conservation Improvement Program costs and savings. It appears that this cost represents the cost of achieving *annual* DSM savings, i.e., the cost incurred in a single year to achieve the resulting efficiency savings in a single year.[27] The cost of achieving *lifetime* DSM savings would equal this amount divided by the average measure life of the efficiency measures. Assuming an average measure life of 13 years, the cost of achieving lifetime DSM savings would be roughly $13/MWh. From this perspective, the CMMPA programs are likely to be relatively cost-effective, and the costs are low relative to those of other utilities' DSM programs. (See Exhibit-JI-2-E for a comparison with other utilities.)

Thus, it is not clear why the Beck study found the CMMPA DSM programs to be so uneconomic. It is possible that the Beck study authors erroneously assumed the higher annual DSM costs in place of the much lower lifetime DSM costs. This would explain why the benefit-cost ratios in the Beck study are so low. If instead the Beck analysis is sound, and the CMMPA DSM programs are indeed so uneconomic, then CMMPA should seriously evaluate those programs for opportunities for improvement. There is no reason to implement such poorly performing DSM programs when there are plenty of examples of ways to operate successful, cost-effective programs.

Q. Are you aware of any reason why CMMPA should not be able to achieve at least the level of DSM savings indicated by your High benchmark?

A. No.

[27] CCMPA response to MCEA IR 198.

Q. Does the CMMPA analysis meet the standard of the Minnesota Certificate of Need statute, which requires a comprehensive comparison of DSM alternatives to new energy facilities?

A. No, it does not. A comprehensive comparison of CMMPA DSM alternatives would consider much more DSM than what was considered by CMMPA. It would also include a much more thoughtful approach to identifying and assessing DSM opportunities.

d. Otter Tail Power Company

Q. Please summarize how Otter Tail Power Company developed its assumptions for DSM alternatives to Big Stone II.

A. OTP uses the IRP-Manager model to assess DSM resources in the 2005 Resource Plan.[28] Two DSM potential studies were used in developing the 2005 Resource Plan; one from 1993 and a more recent study of commercial and industrial opportunities conducted in 2002 by Summit Blue and Regional Economic Research. The 2005 Resource Plan started with 25 conservation technologies, and these were screened by OTP to eliminate those that no longer were appropriate or were unlikely to be cost-effective. In the 2005 Resource Plan, the IRP-Manager model did not select all of the conservation technologies available, but it did select greater amounts of DSM than in past resource plans.[29] In OTP's supplemental resource plan, the IRP-Manager model selected an additional 10% DSM savings (relative to the 2005 Resource Plan) as a result of the increased cost of the Big Stone II Project.[30]

Q. How do the OTP DSM assumptions compare with your energy savings benchmarks?

A. Exhibit JI-5-F presents a comparison of the OTP DSM assumptions with the amount of DSM savings associated with my energy savings benchmarks. As

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[28] Otter Tail Power Company, Application for Resource Plan Approval 2006-2020, submitted July 1, 2005 in Docket No. E017/RP-05-968.

[29] Ibid. at pages 8-13 and 8-14.

[30] Otter Tail Power Company, Supplemental Information and Analysis Results on Its Resource Plans at page 9 in Docket No. E017/RP-05-968.

indicated, the OTP DSM assumptions are significantly below the High benchmark, and even below the Low benchmark.

Q. Why do you think that the OTP DSM assumptions are so much lower than your energy savings benchmarks?

A. The 2002 DSM potential study by Summit Blue limits the amount of achievable potential beyond that which can be achieved in practice. This study uses a formulaic approach to model all the barriers that tend to prevent customers from adopting the full amount of cost-effective efficiency products. As a result the achievable potential results are only a small fraction of the economic potential results.[31] The formulaic approach used in the OTP Summit Blue Study results in estimates of achievable potential that are significantly less than amounts that are frequently achieved in practice. The Summit Blue study indicates that the achievable potential in the C&I sector is roughly 0.4% per year for the first five years of operation (assuming customer incentives are double the ones used at the time of the study). This percentage is below even our Low benchmark (0.6%) and far below our High Benchmark (1.0%). In practice, utilities frequently achieve cost-effective efficiency savings in the C&I sector at much greater levels than 0.4%, as indicated in Exhibit JI-5-C. In fact, OTP itself has achieved energy efficiency savings of 0.9% and 1.0% of retail sales in the C&I sector in 2004 and 2005, as indicated in Exhibit JI-5-C. Thus, the 2002 Summit Blue study for OTP identifies significantly less energy efficiency potential in the C&I sector than the Company is already achieving through its Conservation Improvement Programs. This indicates that the Summit Blue study dramatically underestimated the actual achievable potential from OTP's C&I sector.

Q. Are there any indications that the OTP IRP-Manager modeling assumptions do not reflect the full amount of efficiency savings potential?

A. Yes. The amount of DSM that was eventually chosen in the OTP supplemental resource plan is also lower than the amount of DSM that the company has already

[31] Summit Blue and Regional Economic Research, Otter Tail Power Company, Commercial and Industrial Market Assessments, DSM Potentials Report for the State of Minnesota, August 2002, at pages 1-6 and 1-7.

been achieving through its Conservation Improvement Programs recently. The supplemental resource plan assumed that the Company will save approximately 8,000 MWh per year in the next few years, ramping up to nearly 11,000 MWh per year in 2015.[32] In 2005, Otter Tail Power's CIP programs saved nearly 11,000 MWh, and in 2006 they are expected to save roughly 12,600 MWh. So the DSM savings included in the resource planning process are less than what the company is already achieving, which means that the company is (a) not fully considering the potential for *existing* DSM as an alternative to Big Stone II, and (b) not considering any *additional* DSM as an alternative to Big Stone II. As noted above, OTP's Conservation Improvement Programs are very cost-effective, indicating that there is likely to be additional cost-effective savings from them.

Furthermore, the Company is apparently considering DSM savings opportunities only within its service territory in Minnesota. OTP currently operates direct load control programs throughout its service territory, but operates conservation programs only in Minnesota. OTP has not even analyzed the potential for DSM savings in its service territories outside of Minnesota. These service territories outside of Minnesota contribute to roughly 48% of the total OTP system sales, and thus represent a significant untapped opportunity. There is no justification for OTP to limit its DSM activities to just Minnesota; DSM savings anywhere within the OTP service territory can be used as an alternative to the power from Big Stone II.

Q. Are you aware of any reason why OTP should not be able to achieve at least the level of DSM savings indicated by your High benchmark?

A. No.

[32] Otter Tail Power Company, Supplemental Information and Analysis Results on Its Resource Plans, at page 12.

Q. Does the OTP analysis meet the standard of the Minnesota Certificate of Need statute, which requires a comprehensive comparison of DSM alternatives to new energy facilities?

A. No, it does not. A comprehensive comparison of OTP DSM alternatives would fully consider the potential from current Conservation Improvement Programs, would fully consider the potential from additional or expanded Conservation Improvement Programs, and would consider efficiency opportunities in the entire OTP service territory.

e. Great River Energy

Q. Please summarize how Great River Energy (GRE) developed its assumptions for DSM alternatives to the Big Stone II Project.

A. It appears that GRE used a 2006 Quantec study that estimates the technical potential and the achievable potential of DSM in the GRE service territory.[33] The amount of DSM savings that were considered in the GRE resource planning is apparently based on the estimates of achievable potential identified in the Quantec study. That study estimated that the total achievable potential over 20 years is **[TRADE SECRET MATERIAL BEGINS TRADE SECRET MATERIAL ENDS]** at costs ranging from **[TRADE SECRET MATERIAL BEGINS TRADE SECRET MATERIAL ENDS]**; and that 52% of this potential **[TRADE SECRET MATERIAL BEGINS TRADE SECRET MATERIAL ENDS]** can be achieved at a cost of less than $40/MWh.[34]

Also, the DSM savings estimates considered by GRE are roughly equivalent to what GRE is currently achieving through its Conservation Improvement Program. Note in Exhibit JI-5-F that the efficiency savings considered by GRE is 33,449 MWh, and the CIP efficiency savings was 29,230 MWh in 2005 and are estimated

[33] Quantec, Energy Efficiency Potential, prepared for Great River Energy, July 2006. Confidential report. Provided in response to Joint Intervenors IR No. 220.

[34] Ibid. at page 2. All the costs listed here from the Quantec study are in terms of lifetime cost of saved energy, as opposed to annual cost of saved energy.

to be 34,333 MWh in 2006 and 35,411 MWh in 2007.[35] In sum, it appears that the amount of DSM savings considered in the Big Stone II alternative analysis is based on the Quantec estimates, and is roughly consistent with the amount of efficiency savings currently being achieved in GRE's Conservation Improvement Programs.

Q. How do the GRE DSM assumptions compare with your energy savings benchmarks?

A. Exhibit JI-5-F presents a comparison of the GRE DSM assumptions with the amount of DSM savings associated with my energy savings benchmarks. As indicated, the GRE DSM assumptions are significantly below the High benchmark, and even below the Low benchmark.

It is important to note that GRE provides inconsistent evidence regarding the amount of energy savings that was included in their modeling of Big Stone alternatives. In their direct testimony in this docket, my colleagues David A. Schlissel and Anna Sommer explain that GRE included DSM savings from only a single year's worth of DSM programs, as opposed to the DSM savings that would result from the cumulative effect of multi-year DSM programs. Consequently, the GRE modeling analysis included very little DSM savings. In Exhibit JI-5-F, the information labeled "Considered" indicates the amount of DSM savings that would result from the cumulative effect of multi-year DSM programs; and the information labeled "In Resource Plan" indicates the amount of DSM savings that would result from only a single year's worth of DSM programs. The latter amount was apparently used by GRE as inputs in the modeling of Big Stone alternatives. Thus, the amount of DSM savings that were used in the preferred resource plan were dramatically limited as a result of apparently erroneous input assumptions, and were not based on the economics of the DSM.

[35] From Applicants' Response to Joint Intervenors IR 102.

Q. Why do you think that the GRE DSM assumptions (indicated as the amount "considered" in Exhibit JI-5-F) are so much lower than your energy savings benchmarks?

A. The Quantec study uses estimates of market penetration rates to determine the total achievable efficiency savings available over the 20-year time horizon. The application of these market penetration rates results in estimates of achievable potential that are lower than what many utilities frequently achieve, as indicated by my benchmarks. It also results in estimates of achievable potential that are roughly equal to the amount of savings currently being achieved through the CIP. These results suggest that the market penetration rates used in the Quantec study are too low and tend to understate the full amount of achievable cost-effective efficiency potential.

Q. Are you aware of any reason why GRE should not be able to achieve at least the level of DSM savings indicated by your High benchmark?

A. No.

Q. Does the GRE analysis meet the standard of the Minnesota Certificate of Need statute, which requires a comprehensive comparison of DSM alternatives to new energy facilities?

A. No, it does not. A comprehensive comparison of GRE's DSM alternatives would consider potential DSM savings beyond what is currently being achieved through the Conservation Improvement Programs. Furthermore, GRE apparently erred in its DSM analysis by assuming DSM associated with only a single year of DSM activity. Consequently, the DSM potential included in the Big Stone II Project alternative analysis is equal to only a fraction of the amount of efficiency savings that are currently being achieved by GRE.

f. Southern Minnesota Municipal Power Agency

Q. Please summarize how Southern Minnesota Municipal Power Agency (SMMPA) developed its assumptions for DSM alternatives to the Big Stone II Project.

A. SMMPA's 2006 IRP includes a detailed assessment of the potential for DSM as an alternative to the Big Stone II Project. A variety of efficiency measures were screened for cost-effectiveness to determine the economic potential. The achievable DSM potential was determined by applying "payback acceptance curves" and "unwillingness factors" to the economic DSM potential. The remaining amount of achievable, cost-effective potential was passed on for comparison with supply-side resources using the EGEAS model. The remaining DSM technologies were combined into four groups for the EGEAS modeling. All four groups were determined to be cost-effective and were selected as part of the preferred resource plan.[36]

Q. How do the SMMPA DSM assumptions compare with your energy savings benchmarks?

A. Exhibit JI-5-F presents a comparison of the SMMPA DSM assumptions with the amount of DSM savings associated with my energy savings benchmarks. As indicated, SMMPA stands out among all other Applicants with estimates of DSM savings that exceed my High benchmark levels for most years of the study period.

Q. Why do you think that the SMMPA DSM assumptions are so much higher than those of the other Applicants, relative to the benchmarks?

A. According to SMMPA's testimony, the company has a history of supporting conservation and load control. Its member services department is responsible for the development of DSM programs, and provides members with assistance in implementing DSM programs. Recent DSM budgets were equal to roughly 2% of its members' gross operating revenue, which is considerably higher than what is required for Conservation Improvement Programs.[37] Apparently SMMPA has learned the benefits available from DSM, and has incorporated DSM opportunities more fully than other Applicants into its analysis of Big Stone II alternatives.

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[36] Southern Minnesota Municipal Power Agency, 2006 IRP, PUC Docket No. RP-06-605.

[37] Applicants' Exhibit No.20__, Direct testimony of Larry Anderson, Southern Minnesota Municipal Power Agency, June 1, 2006, at page 8.

Q. Does your analysis indicate that SMMPA has identified the full amount of cost-effective achievable potential that could act as an alternative to Big Stone II?

A. Not necessarily. As I describe in Section III above, my High benchmarks should be viewed as the minimum amount of DSM that should be considered in such an analysis. Other utilities have achieved greater amounts of DSM than this, and those utilities still do not typically achieve all cost effective potential.

In addition, note that the amount of DSM savings considered by SMMPA is 29 to 30 GWh per year. In 2005, SMMPA achieved roughly 24 GWh in efficiency savings through the Conservation Improvement Programs.[38] A comprehensive assessment of DSM opportunities should consider significantly more DSM potential than what has already been achieved in recent years. Note that all of the DSM programs included in the EGEAS model were determined to be cost effective and were selected for the preferred resource plan. This suggests that the modeling analysis did not necessarily find the point at which DSM becomes uneconomic. Further analysis might have identified additional cost-effective achievable DSM opportunities.

Finally, as described by my colleagues David A. Schlissel and Anna Sommer in their direct testimony in this docket, the Applicants should account for the avoided costs associated with complying with future climate change regulations. This would increase the avoided costs on the SMMPA system, and increase the cost-effective potential of DSM resources available to SMMPA.

Q. Does the SMMPA analysis meet the standard of the Minnesota Certificate of Need statute, which requires a comprehensive comparison of DSM alternatives to new energy facilities?

A. No, it does not. While the SMMPA analysis was significantly more comprehensive than those of the other Applicants, and indicates much greater understanding and support of DSM than the other Applicants, it is not as comprehensive as it should be. A comprehensive analysis should consider a

[38] Applicants' Exhibit No.20, Direct testimony of Larry Anderson, Southern Minnesota Municipal Power Agency, June 1, 2006, at page 9.

much larger increase over historic DSM experience; should include more analysis to identify the point at which DSM becomes uneconomic; and should account for the avoided costs associated with complying with future climate change regulations.

g. Heartland Consumer Power District

Q. Please summarize how Heartland Consumer Power District (Heartland) developed its assumptions for DSM alternatives to the Big Stone II Project.

A. Heartland does not analyze the potential for DSM resources as an alternative to the Big Stone II Project. Heartland notes that as a wholesale power supplier it does not maintain energy conservation or efficiency programs. Heartland's customers do operate some DSM programs on their own, and have achieved a small amount of savings from these programs in the past. Heartland notes that the savings from these programs are captured in their load forecasts.[39]

Q. How do the Heartland DSM assumptions compare with your energy savings benchmarks?

A. Exhibit JI-5-F presents the amount of DSM savings that could be achieved by Heartland and its customers if they were to achieve my energy savings benchmarks. As indicated, Heartland has ignored a significant amount of cost-effective DSM that could represent a viable alternative to all or part of its share of the Big Stone II Project.

Q. Are you aware of any reason why Heartland should not be able to achieve at least the level of DSM savings indicated by your High benchmark?

A. No. Heartland implies that by being a wholesale power supplier it does not have the responsibility for analyzing or promoting DSM resources. However, this is not necessarily true. Heartland could take on this responsibility in the same way that it has taken on purchasing baseload power from Big Stone II. SMMPA has taken on the responsibility of analyzing and implementing DSM on behalf of its members, and SMMPA is a wholesale power supplier like Heartland.

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[39] Heartland Consumer Power District, Certificate of Need Application for Transmission Lines in Western Minnesota, Appendix K, Conservation Programs.

Q. Does the Heartland analysis meet the standard of the Minnesota Certificate of Need statute, which requires a comprehensive comparison of DSM alternatives to new energy facilities?

A. No, it does not. In order to meet the standards of the Minnesota Certificate of Need statute, Heartland must demonstrate that the Big Stone II Project is more cost-effective than alternative DSM resources. Heartland has not even made an attempt at such a demonstration.

V. SUMMARY OF POTENTIAL DSM SAVINGS

Q. Please summarize your findings regarding the extent to which DSM resources represent an alternative to Big Stone II.

A. Exhibit JI-5-G presents a summary of the potential efficiency savings that could be achieved if the Applicants were to reach the High savings benchmark. This exhibit also presents the amount of generation that is projected from the Big Stone II Project, and the portion of the Big Stone generation that could be met through energy efficiency if the High savings benchmark were achieved.

As indicated in Exhibit JI-5-G, a large portion of the Big Stone generation could be met from energy efficiency savings:

- In 2011 (the first year of Big Stone II operation) DSM could save roughly 17% to 21% of the Big Stone II energy for OTP and CMMPA; roughly 25% to 29% for MRES and SMMPA; and as much as 46% for GRE. For all applicants combined, DSM could save nearly one-third of the Big Stone II energy.
- By 2016 DSM could save over 30% of the Big Stone II energy for MRES, MDU, CMMPA and OTP; and over 100% for GRE. For all applicants combined, DSM could save roughly one-half of the Big Stone II energy.

Energy efficiency clearly has the potential to play a critical role as an alternative to the Big Stone II Project.

Q. Please summarize your findings regarding the extent to which the Applicants considered DSM as an alternative to the Big Stone II Project.

A. Exhibit JI-5-H presents the difference between (a) the potential efficiency savings indicated by the High savings benchmark, and (b) the Applicant's assumptions regarding DSM. This difference represents the potential DSM savings that were ignored or missed by the Applicants in their modeling of alternatives to the Big Stone II Project. This exhibit also presents the amount of generation that is projected from the Big Stone II Project, and the portion of the Big Stone generation that could be met through the energy efficiency ignored or missed by the Applicants.

As indicated in Exhibit JI-5-H, a large portion of the Big Stone generation could be met from energy efficiency savings that were ignored or missed by the Applicants:

- In 2011 the DSM missed by the Applicants could save roughly 10% to 20% of the Big Stone II energy for OTP, MRES and CMMPA; and as much as 43% for GRE. For all applicants combined, the missed DSM could save roughly 21% of the Big Stone II energy.
- By 2016 the DSM missed by the Applicants could save between 19% and 30% of the Big Stone II energy for MRES, MDU, CMMPA and OTP; and roughly 100% of the Big Stone Energy for GRE. For all applicants combined, missed DSM could save 38% of the Big Stone II energy.

The Applicants' modeling of alternatives to the Big Stone II Project clearly missed or ignored a significant amount of cost-effective achievable DSM resources.

Q. Does this conclude your testimony?

A. Yes, it does.

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PROFESSIONAL EXPERIENCE

Synapse Energy Economics Inc., Cambridge, MA. Vice President, 1997-present. Conducting research, writing reports, and presenting expert testimony pertaining to consumer, environmental, and public policy implications of electricity industry regulation. Primary focus of work includes electricity industry regulation and restructuring, electric power system planning, energy efficiency programs and policies, renewable resources, power plant performance and economics, air quality, and many aspects of consumer and environmental protection.

Tellus Institute, Boston, MA. Senior Scientist, Manager of Electricity Program, 1992-1997.
Responsible for managing six-person staff that provided research, testimony, reports and regulatory support to consumer advocates, environmental organizations, regulatory commissions, and state energy offices throughout the US.

Association for the Conservation of Energy, London, England. Research Director, 1991-1992.
Researched and advocated legislative and regulatory policies for promoting integrated resource planning and energy efficiency in the competitive electric industries in the UK and Europe.

Massachusetts Department of Public Utilities, Boston, MA. Staff Economist, 1989-1990.
Responsible for regulating and setting rates of Massachusetts electric utilities. Drafted integrated resource planning regulations. Evaluated utility energy efficiency programs.

Massachusetts Office of Energy Resources, Boston, MA. Policy Analyst, 1987-1989. Researched and advocated integrated resource planning regulations. Participated in demand-side management collaborative with electric utilities and other parties.

Energy Systems Research Group, Boston, MA. Research Associate, 1983-1987. Performed critical evaluations of electric utility planning and economics, including production cost modeling and assessment of power plant costs and performance.

Union of Concerned Scientists and Massachusetts Public Interest Research Group, Cambridge and Boston, MA. Energy Analyst, 1982-1983. Analyzed environmental and economic issues related to nuclear plants, renewable resources and energy efficiency.

EDUCATION

Masters, Business Administration. Boston University, Boston, MA, 1993.
Diploma, Economics. London School of Economics, London, England, 1991.
B.S., Mechanical Engineering. Tufts University, Medford, MA, 1982.
B.A., English. Tufts University, Medford, MA, 1982.

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Rhode Island Public Utilities Commission (Docket No. 3463). Oral testimony regarding the settlement of Narragansett Electric Company's 2004 Demand-Side Management Programs. On behalf of the Division of Public Utilities and Carriers. November 21, 2003.

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Connecticut Department of Public Utility Control (Docket No. 01-10-10). Direct testimony regarding the United Illuminating Company's service quality performance standards in their performance-based ratemaking mechanism. On behalf of the Connecticut Office of Consumer Counsel. April 2, 2002.

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Connecticut Department of Public Utility Control (Docket No. 99-09-03 Phase II). Direct testimony on Connecticut Natural Gas Company's proposed performance-based ratemaking mechanism. On behalf of the Connecticut Office of Consumer Counsel. September 25, 2000.

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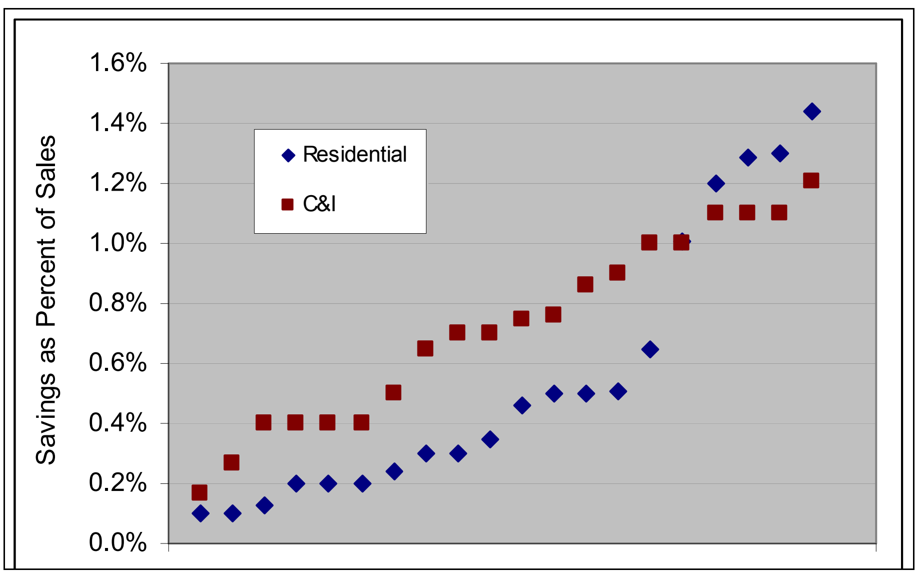
Summary of Energy Efficiency Savings Recently Achieved by Various Utilities and States

Utility/Region	Savings Year	Annual Savings (% of Sales) Res	C&I	Total	Study/Source
BC Hydro	2005	1.2%	0.7%	0.9%	Summit Blue for Nova Scotia, 2006
Connecticut	2004	0.7%	0.8%	---	Optimal, VEIC, GEE for ACEEE, 2006
Maine	2004	0.1%	0.2%	---	Optimal, VEIC, GEE for ACEEE, 2006
Manitoba Hydro	2005	0.2%	0.4%	0.3%	Summit Blue for Nova Scotia, 2006
Massachusetts	2004	1.3%	1.1%	---	Optimal, VEIC, GEE for ACEEE, 2006
MRES	2004	0.2%	0.4%	---	Summit Blue for MRES, 2006
New Hampshire	2004	0.4%	0.7%	---	Optimal, VEIC, GEE for ACEEE, 2006
New Jersey	2004	0.5%	0.5%	---	Optimal, VEIC, GEE for ACEEE, 2006
New Jersey	2005	0.2%	0.4%	0.3%	Summit Blue for Nova Scotia, 2006
New York (LIPA)	2004	0.5%	0.3%	---	Optimal, VEIC, GEE for ACEEE, 2006
New York (NYSERDA)	2004	0.2%	1.2%	---	Optimal, VEIC, GEE for ACEEE, 2006
New York (NYSERDA)	2005	0.3%	1.0%	0.9%	Summit Blue for Nova Scotia, 2006
Otter Tail	2004	0.5%	0.9%	---	Summit Blue for MRES, 2006
Otter Tail	2005	0.5%	1.0%	0.9%	Summit Blue for Nova Scotia, 2006
Rhode Island	2005	1.0%	0.7%	0.8%	NGRID, 2005 Year-End Report, 2006
SMMPA	2003	0.3%	0.4%	---	Summit Blue for MRES, 2006
Vermont	2004	1.4%	0.9%	---	Optimal, VEIC, GEE for ACEEE, 2006
Vermont	2005	1.3%	0.7%	1.0%	Summit Blue for Nova Scotia, 2006
Xcel	2004	0.1%	1.1%	---	Summit Blue for MRES, 2006
Xcel	2005	0.1%	1.1%	0.9%	Summit Blue for Nova Scotia, 2006
Average	---	0.5%	0.7%	---	From above
Median	---	0.4%	0.7%	---	From above



See Exhibit JI-5-B for full citations of the sources used.

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Summary of Recent Studies of Efficiency Potential

	Annual Savings (% of Sales)			
Utility/Region	Res	C&I	Total	Study/Source
California	---	---	1.0%	ACEEE, Meta-analysis, 2004
Connecticut	1.3%	1.4%	1.3%	GDS, Connecticut study
Illinois	0.4%	---	---	Midwest En Eff Alliance, 2006
Indiana	0.5%	---	---	Midwest En Eff Alliance, 2006
Iowa	0.5%	---	---	Midwest En Eff Alliance, 2006
Kentucky	0.7%	---	---	Midwest En Eff Alliance, 2006
Michigan	0.5%	---	---	Midwest En Eff Alliance, 2006
Minnesota	0.4%	---	---	Midwest En Eff Alliance, 2006
Missouri	0.6%	---	---	Midwest En Eff Alliance, 2006
MRES	0.2%	0.5%	---	Summit Blue for MRES, 2006
Ohio	0.5%	---	---	Midwest En Eff Alliance, 2006
Otter Tail	---	0.4%	---	Summit Blue for OTP, 2002
Puget	---	---	0.6%	ACEEE, Meta-analysis, 2004
Southwest	---	---	1.9%	ACEEE, Meta-analysis, 2004
United States	---	---	1.2%	ACEEE, Meta-analysis, 2004
Vermont	---	---	3.1%	ACEEE, Meta-analysis, 2004
Vermont	2.1%	---	1.9%	GDS, Vermont study
Wisconsin	0.4%	---	---	Midwest En Eff Alliance, 2006
Average	0.5%	0.1%	0.6%	From above
Median	0.5%	0.5%	1.3%	From above

See Exhibit JI-5-B for full citations of the sources used.

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Summary of Cost of Saved Energy Recently Experienced by Various Utilities and States

		CSE - Annual $/MWh			CSE - Lifetime $/MWh			
Region	Year	Res	C&I	Total	Res	C&I	Total	Study/Source
BC Hydro	2005	110	210	160	8	16	12	Summit Blue for Nova Scotia, 2006
Connecticut	2004	196	175	---	15	13	---	Optimal, VEIC, GEE for ACEEE, 2006
Maine	2004	250	156	---	19	12	---	Optimal, VEIC, GEE for ACEEE, 2006
Manitoba Hydro	2005	300	310	310	23	24	24	Summit Blue for Nova Scotia, 2006
Massachusetts	2004	233	312	---	18	24	---	Optimal, VEIC, GEE for ACEEE, 2006
New Hampshire	2004	435	175	---	33	13	---	Optimal, VEIC, GEE for ACEEE, 2006
New Jersey	2004	286	128	---	22	10	---	Optimal, VEIC, GEE for ACEEE, 2006
New Jersey	2005	770	100	260	59	8	20	Summit Blue for Nova Scotia, 2006
New York (LIPA)	2004	357	270	---	27	21	---	Optimal, VEIC, GEE for ACEEE, 2006
N. York (NYSERDA)	2004	526	111	---	40	9	---	Optimal, VEIC, GEE for ACEEE, 2006
N. York (NYSERDA)	2005	90	170	170	7	13	13	Summit Blue for Nova Scotia, 2006
Otter Tail	2005	250	90	110	19	7	8	Summit Blue for Nova Scotia, 2006
Rhode Island	2005	249	243	246	19	19	19	NGRID, 2005 Year-End Report, 2006
Vermont	2004	232	167	---	18	13	---	Optimal, VEIC, GEE for ACEEE, 2006
Vermont	2005	250	300	270	19	23	21	Summit Blue for Nova Scotia, 2006
Xcel	2005	1580	130	180	122	10	14	Summit Blue for Nova Scotia, 2006
Average	---	382	190	213	29	15	16	From above
Median	---	250	173	213	19	13	16	From above

See Exhibit JI-5-B for full citations of the sources used. The lifetime costs of saved energy were estimated by dividing the annual costs of saved energy by 13. This is based on the assumption that all of the measures contained in each utility's energy efficiency programs have an average operating life of 13 years.

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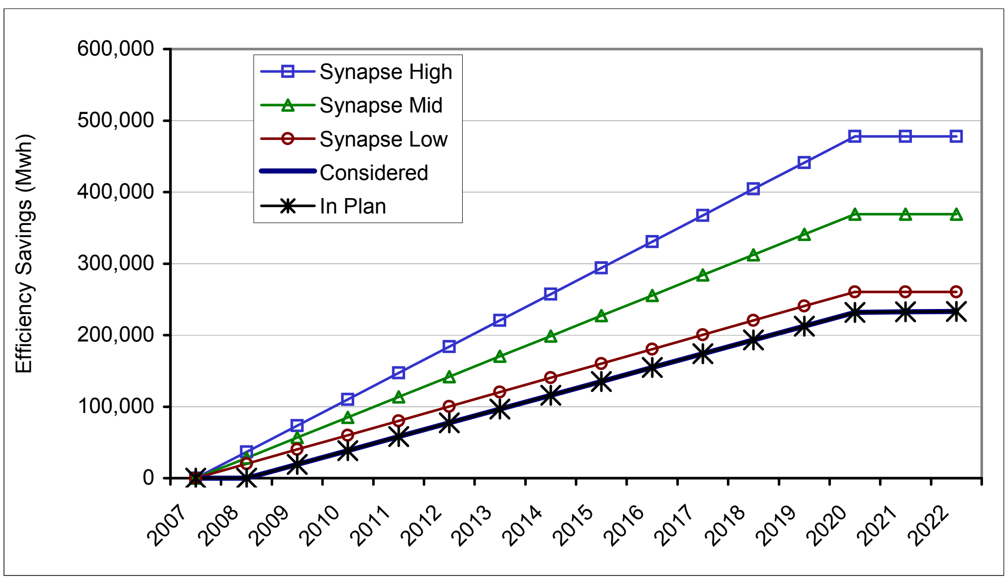
Comparison of Synapse Efficiency Benchmarks with Applicant Assumptions
Missouri River Energy Services

Energy Efficiency Savings As An Alternative to Big Stone II (MWh)					
	Synapse Benchmarks			MRES	
Year	Low	Mid	High	Considered	In Resource Plan
2007	0	0	0	0	0
2008	20,046	28,399	36,752	0	0
2009	40,093	56,798	73,503	19,329	19,329
2010	60,139	85,197	110,255	38,658	38,658
2011	80,185	113,596	147,007	57,987	57,987
2012	100,232	141,995	183,758	77,316	77,316
2013	120,278	170,394	220,510	96,645	96,645
2014	140,324	198,793	257,262	115,974	115,974
2015	160,371	227,192	294,013	135,303	135,303
2016	180,417	255,591	330,765	154,632	154,632
2017	200,464	283,990	367,517	173,961	173,961
2018	220,510	312,389	404,268	193,290	193,290
2019	240,556	340,788	441,020	212,619	212,619
2020	260,603	369,187	477,771	231,948	231,948
2021	260,603	369,187	477,771	232,480	232,480
2022	260,603	369,187	477,771	233,012	233,012



The Synapse benchmarks presented here were derived by multiplying the percentage benchmarks presented in Tables 1 and 2 of the Direct Testimony of Timothy Woolf, times the company's forecasted 2007 retail sales, which were taken from Appendix K of the application. Assuming for simplicity an average measure life of 13 years, the efficiency savings level off after the 13th year.

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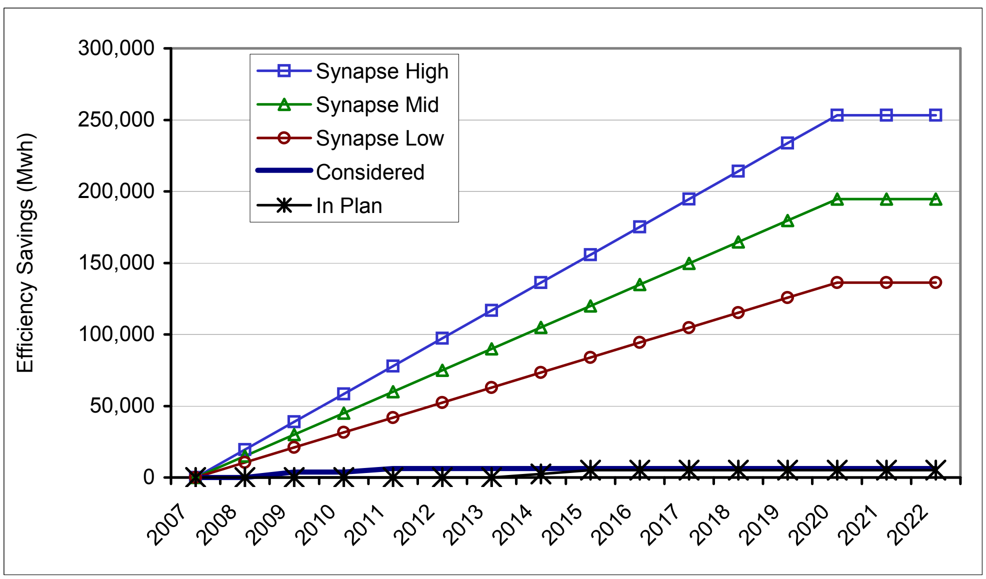
Comparison of Synapse Efficiency Benchmarks with Applicant Assumptions
Montana-Dakota Utilities

Energy Efficiency Savings As An Alternative to Big Stone II (MWh)					
	Synapse Benchmarks			MDU	
Year	Low	Mid	High	Considered	In Resource Plan
2007	0	0	0	0	0
2008	10,480	14,977	19,473	0	0
2009	20,961	29,953	38,946	3,825	0
2010	31,441	44,930	58,419	3,825	0
2011	41,921	59,906	77,892	6,375	0
2012	52,402	74,883	97,364	6,375	0
2013	62,882	89,860	116,837	6,375	0
2014	73,362	104,836	136,310	6,375	2,550
2015	83,843	119,813	155,783	6,375	5,100
2016	94,323	134,789	175,256	6,375	5,100
2017	104,803	149,766	194,729	6,375	5,100
2018	115,284	164,743	214,202	6,375	5,100
2019	125,764	179,719	233,675	6,375	5,100
2020	136,244	194,696	253,147	6,375	5,100
2021	136,244	194,696	253,147	6,375	5,100
2022	136,244	194,696	253,147	6,375	5,100



The Synapse benchmarks presented here were derived by multiplying the percentage benchmarks presented in Tables 1 and 2 times the company's forecasted 2007 retail sales, which were taken from Appendix K of the application. Assuming for simplicity an average measure life of 13 years, the efficiency savings level off after the 13th year.

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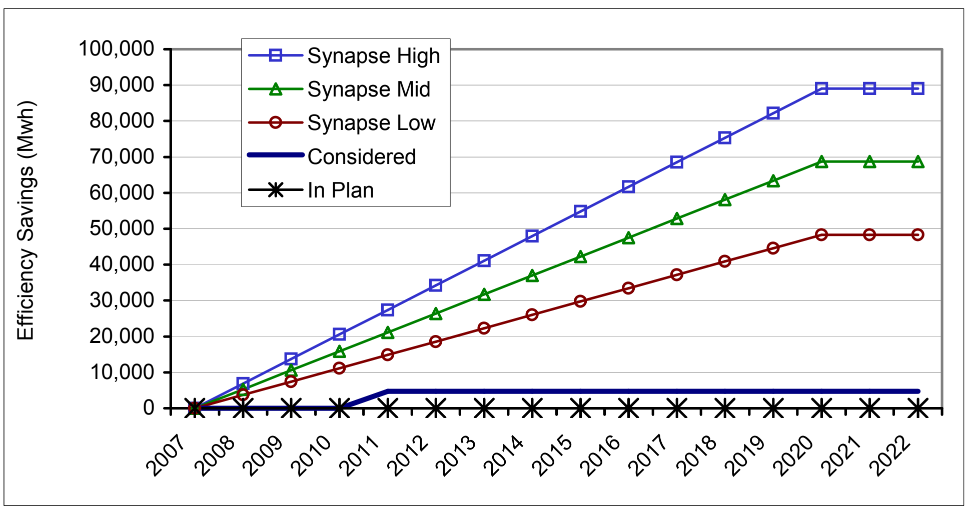
Comparison of Synapse Efficiency Benchmarks with Applicant Assumptions
Central Minnesota Municipal Power Agency

Energy Efficiency Savings As An Alternative to Big Stone II (MWh)					
	Synapse Benchmarks			CMMPA	
Year	Low	Mid	High	Considered	In Resource Plan
2007	0	0	0	0	0
2008	3,716	5,283	6,850	0	0
2009	7,431	10,566	13,701	0	0
2010	11,147	15,849	20,551	0	0
2011	14,863	21,132	27,402	4,726	0
2012	18,579	26,415	34,252	4,726	0
2013	22,294	31,699	41,103	4,726	0
2014	26,010	36,982	47,953	4,726	0
2015	29,726	42,265	54,804	4,726	0
2016	33,441	47,548	61,654	4,726	0
2017	37,157	52,831	68,505	4,726	0
2018	40,873	58,114	75,355	4,726	0
2019	44,588	63,397	82,206	4,726	0
2020	48,304	68,680	89,056	4,726	0
2021	48,304	68,680	89,056	4,726	0
2022	48,304	68,680	89,056	4,726	0



The Synapse benchmarks presented here were derived by multiplying the percentage benchmarks presented in Tables 1 and 2 times the company's forecasted 2007 retail sales, which were taken from page 2-10 of the October R.W. Beck Updated Analysis for CMMPA. Assuming for simplicity an average measure life of 13 years, the efficiency savings level off after the 13th year.

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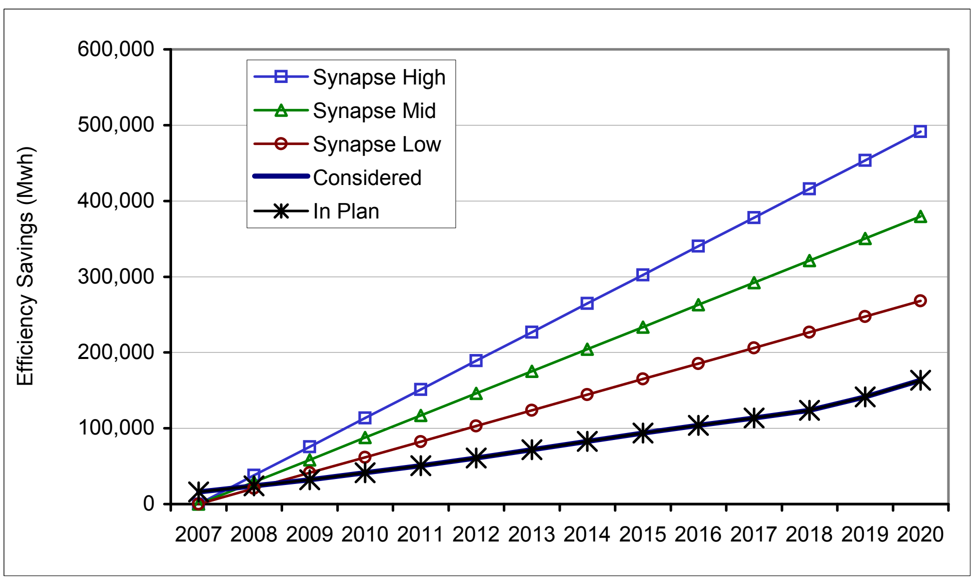
Comparison of Synapse Efficiency Benchmarks with Applicant Assumptions
<u>Otter Tail Power Company</u>

Energy Efficiency Savings As An Alternative to Big Stone II (MWh)					
	Synapse Benchmarks			OTP	
Year	Low	Mid	High	Considered	In Resource Plan
2007	0	0	0	16,136	16,136
2008	20,613	29,209	37,805	24,204	24,204
2009	41,226	58,418	75,611	32,273	32,273
2010	61,839	87,628	113,416	41,412	41,412
2011	82,452	116,837	151,222	50,620	50,620
2012	103,065	146,046	189,027	60,809	60,809
2013	123,678	175,255	226,833	71,792	71,792
2014	144,291	204,464	264,638	82,775	82,775
2015	164,904	233,674	302,444	93,757	93,757
2016	185,517	262,883	340,249	103,719	103,719
2017	206,130	292,092	378,054	113,680	113,680
2018	226,743	321,301	415,860	123,642	123,642
2019	247,356	350,511	453,665	141,314	141,314
2020	267,969	379,720	491,471	163,478	163,478
2021	---	---	---	---	---
2022	---	---	---	---	---



The Synapse benchmarks presented here were derived by multiplying the percentage benchmarks presented in Tables 1 and 2 times the company's forecasted 2007 retail sales, which were taken from Appendix K of the application. Assuming for simplicity an average measure life of 13 years, the efficiency savings level off after the 13th year.

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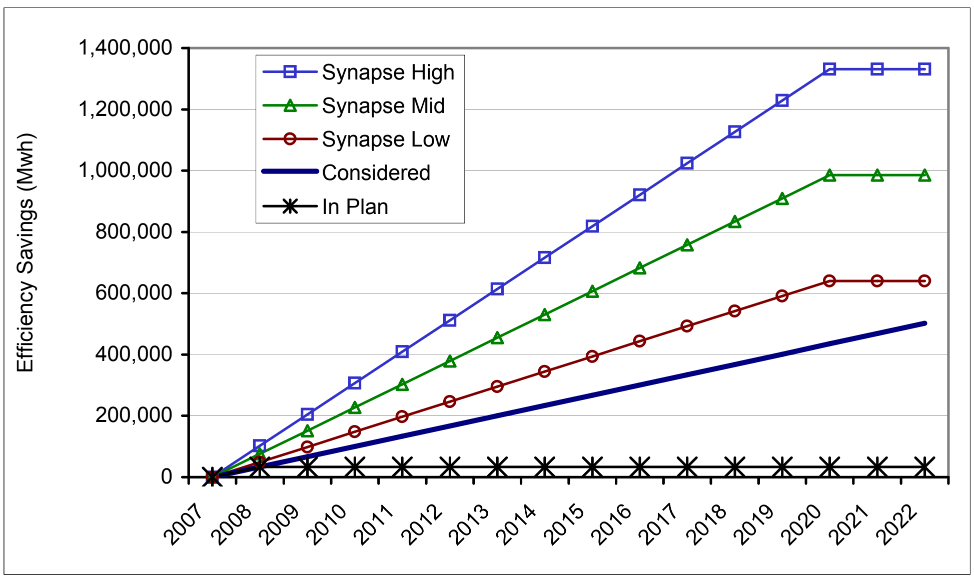
Comparison of Synapse Efficiency Benchmarks with Applicant Assumptions
Great River Energy

Energy Efficiency Savings As An Alternative to Big Stone II (MWh)					
	Synapse Benchmarks			GRE	
Year	Low	Mid	High	Considered	In Resource Plan
2007	0	0	0	0	0
2008	49,250	75,808	102,366	33,449	33,449
2009	98,500	151,616	204,733	66,898	33,449
2010	147,750	227,424	307,099	100,347	33,449
2011	196,999	303,232	409,465	133,796	33,449
2012	246,249	379,040	511,831	167,245	33,449
2013	295,499	454,848	614,198	200,694	33,449
2014	344,749	530,656	716,564	234,143	33,449
2015	393,999	606,464	818,930	267,592	33,449
2016	443,249	682,273	921,297	301,041	33,449
2017	492,498	758,081	1,023,663	334,490	33,449
2018	541,748	833,889	1,126,029	367,939	33,449
2019	590,998	909,697	1,228,395	401,388	33,449
2020	640,248	985,505	1,330,762	434,837	33,449
2021	640,248	985,505	1,330,762	468,286	33,449
2022	640,248	985,505	1,330,762	501,735	33,449

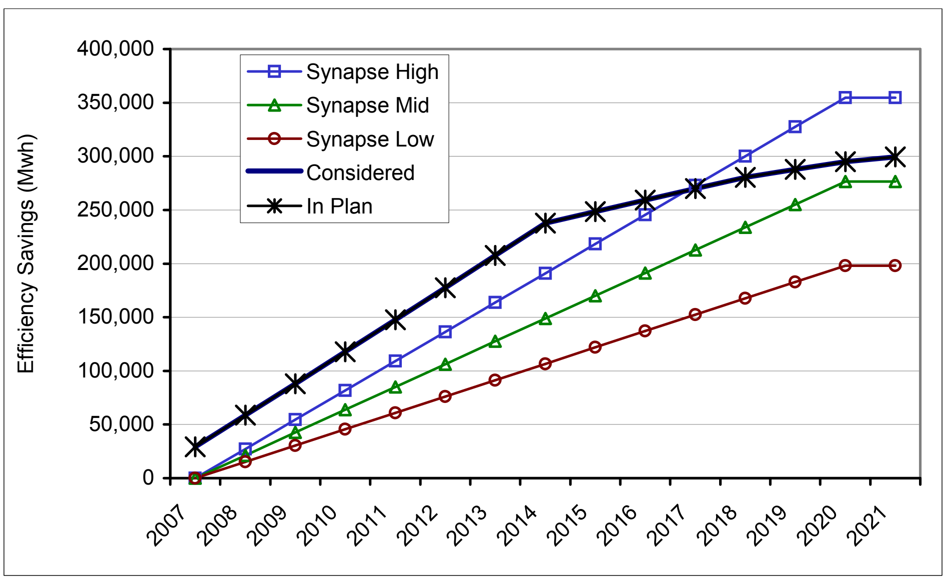


The Synapse benchmarks presented here were derived by multiplying the percentage benchmarks presented in Tables 1 and 2 times the company's forecasted 2007 retail sales, which were taken from page 3 of the Supplemental Testimony of William Pritchard. Assuming for simplicity an average measure life of 13 years, the efficiency savings level off after the 13th year.

CONFIDENTIAL VERSION
CONTAINS PROTECTED INFORMATION

Comparison of Synapse Efficiency Benchmarks with Applicant Assumptions
Southern Minnesota Municipal Power Agency

Energy Efficiency Savings As An Alternative to Big Stone II (MWh)					
	Synapse Benchmarks			SMMPA	
Year	Low	Mid	High	Considered	In Resource Plan
2007	0	0	0	29,251	29,251
2008	15,234	21,261	27,288	58,627	58,627
2009	30,467	42,522	54,577	88,129	88,129
2010	45,701	63,783	81,865	117,764	117,764
2011	60,934	85,044	109,154	147,528	147,528
2012	76,168	106,305	136,442	177,438	177,438
2013	91,401	127,566	163,730	207,480	207,480
2014	106,635	148,827	191,019	237,669	237,669
2015	121,869	170,088	218,307	248,369	248,369
2016	137,102	191,349	245,596	259,226	259,226
2017	152,336	212,610	272,884	269,914	269,914
2018	167,569	233,871	300,172	280,471	280,471
2019	182,803	255,132	327,461	287,808	287,808
2020	198,036	276,393	354,749	294,949	294,949
2021	198,036	276,393	354,749	299,519	299,519
2022	198,036	276,393	354,749	0	0



The Synapse benchmarks presented here were derived by multiplying the percentage benchmarks presented in Tables 1 and 2 times the company's forecasted 2007 retail sales, which were taken from Appendix K of the application. Assuming for simplicity an average measure life of 13 years, the efficiency savings level off after the 13th year.

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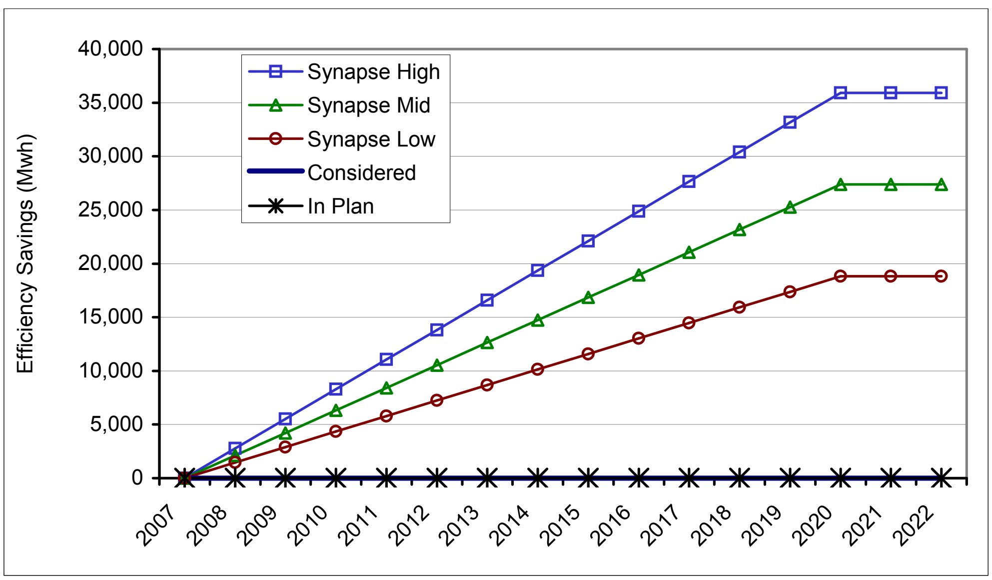
CONTAINS PROTECTED INFORMATION

Comparison of Synapse Efficiency Benchmarks with Applicant Assumptions
Heartland Consumers Power District

Energy Efficiency Savings As An Alternative to Big Stone II (MWh)					
	Synapse Benchmarks			Heartland	
Year	Low	Mid	High	Considered	In Resource Plan
2007	0	0	0	0	0
2008	1,448	2,106	2,764	0	0
2009	2,895	4,211	5,527	0	0
2010	4,343	6,317	8,291	0	0
2011	5,791	8,423	11,055	0	0
2012	7,238	10,528	13,818	0	0
2013	8,686	12,634	16,582	0	0
2014	10,134	14,740	19,346	0	0
2015	11,581	16,845	22,110	0	0
2016	13,029	18,951	24,873	0	0
2017	14,477	21,057	27,637	0	0
2018	15,924	23,162	30,401	0	0
2019	17,372	25,268	33,164	0	0
2020	18,819	27,374	35,928	0	0
2021	18,819	27,374	35,928	0	0
2022	18,819	27,374	35,928	0	0



The Synapse benchmarks presented here were derived by multiplying the percentage benchmarks presented in Tables 1 and 2 times the company's forecasted 2007 retail sales, which were taken from Appendix K of the application. The forecasted 2007 retail sales include only those customers expecting to remain on the Heartland system after 2017. Assuming for simplicity an average measure life of 13 years, the efficiency savings level off after the 13th year.

CONFIDENTIAL VERSION
CONTAINS PROTECTED INFORMATION

Comparison of Potential Efficiency Savings With Generation from the Big Stone II Project

Potential Efficiency Savings at the High Savings Benchmark (GWh)

	MRES	MDU	CMMPA	OTP	GRE	SMMPA	Heartland	Total
2007	0	0	0	0	0	0	0	0
2008	37	19	7	38	102	27	3	233
2009	74	39	14	76	205	55	6	467
2010	110	58	21	113	307	82	8	700
2011	147	78	27	151	409	109	11	933
2012	184	97	34	189	512	136	14	1,166
2013	221	117	41	227	614	164	17	1,400
2014	257	136	48	265	717	191	19	1,633
2015	294	156	55	302	819	218	22	1,866
2016	331	175	62	340	921	246	25	2,100
2017	368	195	69	378	1,024	273	28	2,333
2018	404	214	75	416	1,126	300	30	2,566
2019	441	234	82	454	1,228	327	33	2,800
2020	478	253	89	491	1,331	355	36	3,033

From Exhibit JI-5-F.

Projected Generation from Big Stone II (GWh)

	MRES (a)	MDU (a)	CMMPA (a)	OTP (c)	GRE (b)	SMMPA (c)	Heartland (d)	Total
2010	0	0	0	0	0	0	0	0
2011	588	0	131	894	884	378	128	3,003
2012	914	537	208	894	884	378	219	4,034
2013	911	550	204	894	884	378	219	4,041
2014	911	561	202	894	884	378	219	4,049
2015	911	558	193	894	884	378	219	4,038
2016	914	562	205	894	884	378	219	4,056
2017	911	443	216	894	884	378	219	3,945
2018	911	443	217	894	884	378	219	3,947
2019	911	451	229	894	884	378	219	3,966
2020	914	456	213	894	884	378	219	3,958

(a) From response to MCEA IR 138. (b) Calculated assuming a capacity factor of 87%.
(c) Calculated assuming a capacity factor of 88%. (d) From response to MCEA Irs 138 & 139.

Potential Efficiency Savings as a Portion of Big Stone II Generation

	MRES	MDU	CMMPA	OTP	GRE	SMMPA	Heartland	Total
2010	---	---	---	---	---	---	---	---
2011	25%	---	21%	17%	46%	29%	9%	31%
2012	20%	18%	16%	21%	58%	36%	6%	29%
2013	24%	21%	20%	25%	69%	43%	8%	35%
2014	28%	24%	24%	30%	81%	51%	9%	40%
2015	32%	28%	28%	34%	93%	58%	10%	46%
2016	36%	31%	30%	38%	104%	65%	11%	52%
2017	40%	44%	32%	42%	116%	72%	13%	59%
2018	44%	48%	35%	47%	127%	79%	14%	65%
2019	48%	52%	36%	51%	139%	87%	15%	71%
2020	52%	56%	42%	55%	151%	94%	16%	77%

CONFIDENTIAL VERSION
CONTAINS PROTECTED INFORMATION

Efficiency Savings Missed by Applicants in Modeling Alternatives to the Big Stone II Project

Difference Between High Benchmark and Efficiency Savings Assumed by Applicants (GWh)								
	MRES	MDU	CMMPA	OTP	GRE	SMMPA	Heartland	Total
2007	0	0	0	-16	0	-29	0	-45
2008	37	19	7	14	69	-31	3	117
2009	54	39	14	43	171	-34	6	293
2010	72	58	21	72	274	-36	8	469
2011	89	78	27	101	376	-38	11	644
2012	106	97	34	128	478	-41	14	817
2013	124	117	41	155	581	-44	17	990
2014	141	134	48	182	683	-47	19	1,161
2015	159	151	55	209	785	-30	22	1,350
2016	176	170	62	237	888	-14	25	1,544
2017	194	190	69	264	990	3	28	1,737
2018	211	209	75	292	1,093	20	30	1,930
2019	228	229	82	312	1,195	40	33	2,119
2020	246	248	89	328	1,297	60	36	2,304

From Exhibit JI-5-F.

Projected Generation from Big Stone II (GWh)								
	MRES (a)	MDU (a)	CMMPA (a)	OTP (c)	GRE (b)	SMMPA (c)	Heartland (d)	Total
2010	0	0	0	0	0	0	0	0
2011	588	0	131	894	884	378	128	3,003
2012	914	537	208	894	884	378	219	4,034
2013	911	550	204	894	884	378	219	4,041
2014	911	561	202	894	884	378	219	4,049
2015	911	558	193	894	884	378	219	4,038
2016	914	562	205	894	884	378	219	4,056
2017	911	443	216	894	884	378	219	3,945
2018	911	443	217	894	884	378	219	3,947
2019	911	451	229	894	884	378	219	3,966
2020	914	456	213	894	884	378	219	3,958

(a) From response to MCEA IR 138. (b) Calculated assuming a capacity factor of 87%.
(c) Calculated assuming a capacity factor of 88%. (d) From response to MCEA Irs 138 & 139.

Potential Efficiency Savings Missed by Applicants -- as a Portion of Big Stone II Generation								
	MRES	MDU	CMMPA	OTP	GRE	SMMPA	Heartland	Total
2010	---	---	---	---	---	---	---	---
2011	15%	---	21%	11%	43%	-10%	9%	21%
2012	12%	18%	16%	14%	54%	-11%	6%	20%
2013	14%	21%	20%	17%	66%	-12%	8%	25%
2014	16%	24%	24%	20%	77%	-12%	9%	29%
2015	17%	27%	28%	23%	89%	-8%	10%	33%
2016	19%	30%	30%	26%	100%	-4%	11%	38%
2017	21%	43%	32%	30%	112%	1%	13%	44%
2018	23%	47%	35%	33%	124%	5%	14%	49%
2019	25%	51%	36%	35%	135%	10%	15%	53%
2020	27%	54%	42%	37%	147%	16%	16%	58%