

1 Wisconsin Department of Natural Resources
2 Direct Testimony of Ian Anderson
3 Hydrogeologist
4

5 South Shore Energy, LLC and Dairyland Power Cooperative
6 Nemadji Trail Energy Center Combined-Cycle Project
7 Docket 9698-CE-100
8

9 October 4, 2019
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13 **Q. Please state your name, business address, and occupation.**

14 A. My name is Ian Anderson. My business address is 101 S. Webster St., Madison, WI 53707. I am
15 employed by the Wisconsin Department of Natural Resources (WDNR) in the Bureau of
16 Drinking Water and Groundwater as a Hydrogeologist.

17 **Q. Please describe your educational background, experience, and professional training.**

18 A. I received a Bachelor of Science degree in Geology from the University of Wisconsin – Eau
19 Claire in 2004 and a Master of Science degree in Water Resources Management with a focus
20 on soils and groundwater from University of Wisconsin – Madison in 2015. I was previously
21 employed as a Geologist and later as a Junior Project Manager for BJAAM Environmental,
22 an environmental consulting firm in northeast Ohio, from 2005 to 2008. I have worked as a
23 permanent full-time employee for the WDNR since December 2012. My entire time at
24 WDNR has been in the Bureau of Drinking Water and Groundwater, Water Use Section,
25 where I am responsible for conducting technical reviews of applications for high capacity
26 well approvals to determine if the proposed well(s) may cause significant environmental
27 impacts to reviewable water resources. I apply hydrogeologic and hydrologic analytical
28 techniques to assess the magnitude of potential hydrologic impacts from groundwater
29 withdrawals. I complete environmental assessments, as needed, of proposed high capacity
30 wells that could result in significant adverse environmental impacts. I also develop and
31 recommend conditions or modifications to be included in high capacity well approvals to

1 ensure that significant impacts to water resources do not occur. In addition, I am responsible
2 for the development of administrative rules and other policy related to the regulation of high
3 capacity wells.

4 **Q. What are your responsibilities in this case?**

5 A. For the Nemadji Trail Energy Center Combined-Cycle Project (referred to hereafter as the
6 “proposed project” or “project”), as jointly proposed by South Shore Energy, LLC and Dairyland
7 Power Cooperative (collectively referred to hereafter as “the applicants”), my primary
8 responsibility has been to conduct the technical review of the high capacity well application
9 submitted for the proposed project. I provided technical support to Nicole Clayton from the
10 Water Use Section in the Bureau of Drinking Water and Groundwater who is responsible for
11 review of the water loss approval application and individual water use permit application. I
12 also assisted in authoring relevant sections of the Draft Environmental Impact Statement (DEIS)
13 and Final Environmental Impact Statement (FEIS).

14 **Q. What is the purpose of your testimony?**

15 A. My testimony describes WDNR’s review of the high capacity well approval application
16 submitted by the applicants and how my high capacity well technical review assists with the
17 WDNR’s assessment of the applicant’s water loss application and water use permit for the
18 proposed project. My testimony addresses the available groundwater supply for the proposed
19 project, the groundwater withdrawal regulations applicable to the proposed project, and the
20 potential impact to water resources from the proposed project.

21 **Q. Are you sponsoring any exhibits with your direct testimony?**

22 A. Yes, I am offering Ex.-WDNR-Anderson-1, Ex.-WDNR-Anderson-2, and Ex.-WDNR-Anderson-
23 3.

24 **Q. What information did you use for your high capacity well evaluation?**

1 A. My evaluation included review of the high capacity well approval application, the water loss
2 approval application and pertinent sections of the Certificate of Public Convenience and
3 Necessity (CPCN) application. To provide the necessary technical review for those
4 applications I relied on the applicant's aquifer pump test report and groundwater modeling
5 summary, several geologic maps and cross sections, the Surface Water Resources of
6 Douglas County report issued by WDNR (1973), technical reports prepared by the Wisconsin
7 Geologic & Natural History Survey (WGNHS), several dozen well construction reports, a
8 geologic cross-section that I developed using ArcMap, analytical tools and data developed by
9 the WDNR and used statewide in the evaluation of high capacity wells, discussions with the
10 applicants and their consultants, and discussions with other WDNR staff and WGNHS staff.

11 **Q. Please describe the need for a high capacity well approval for the proposed project?**

12 A. A high capacity well approval is required to construct or withdraw water from any well,
13 excluding residential and fire protection wells, on a property on which the combined
14 pumping capacity of all wells on that property is 100,000 gallons per day or more. In the case
15 of the proposed project, the applicants have proposed to construct and withdraw water from
16 five new non-potable wells on the property, each with a pumping capacity of 750 gallons per
17 minute. The total proposed pump capacity is 5,400,000 gallons per day, thus the proposed
18 wells may not be constructed and water may not be withdrawn from the proposed wells
19 without a high capacity well approval from the State of Wisconsin. Wis. Stat. § 281.34(2).

20 **Q. What issues did you investigate as part of your review of the high capacity well application?**

21 A. In this case, my review of the high capacity well application focused at first on the potential
22 impacts to the municipal well at the Village of Oliver (Wisconsin Unique Well Number
23 BF718). While evaluating the potential for impairment from the proposed wells to the Village
24 of Oliver well, it became apparent that there was not a sustainable source of groundwater to

1 meet the stated needs of the project. I communicated this to the applicants during a July 18,
2 2019 conference call, and in several subsequent calls with the applicants.

3 **Q. Please describe further how you determined that there is not a sustainable source of**
4 **groundwater for the project?**

5 A. My preliminary analysis indicated that there was a possibility that the Oliver well could
6 potentially be affected by drawdown resulting from the proposed NTEC wells. This may
7 seem unlikely, because the Oliver well is approximately 7.3 miles west of the project site, but
8 pumping stress travels quite far in a confined setting such as this. As I continued to develop
9 my conceptual geologic model by reviewing numerous well construction reports, it became
10 apparent that it is extremely unlikely that the sand and gravel below the proposed Nemadji
11 River site is hydraulically connected to the sand in the lower interval of the Oliver well.
12 These sand deposits are separated by the clay that predominates the unconsolidated deposits
13 of the area. My conceptual geologic model of the hydrostratigraphy in the area is included
14 within my NTEC Tech Memo, dated September 30, 2019, which is attached to my testimony
15 as Ex.-WDNR-Anderson-1.

16 **Q. Did you rely on any other documents in preparing your conceptual model?**

17 A. Yes. I also relied on a Precambrian bedrock geologic map (Sims, 1992), attached to my
18 testimony as Ex.-WDNR-Anderson-2. I also reviewed many well construction reports to
19 develop my conceptual model, and I attached the six well construction reports referenced in
20 the cross-section (figure 3 of the tech memo) to my testimony as Ex.-WDNR-Anderson-3.

21 **Q. Was your conclusion regarding the sand and gravel aquifer below the proposed project**
22 **site supported by any other information?**

23 A. Yes. The conclusion that the sand and gravel beneath the Nemadji River site is an isolated
24 lens was reinforced by the applicants' pumping test analysis. This analysis is found in figure
25 5 of my tech memo which is attached to my testimony as Ex.-WDNR-Anderson-1. The

1 pumping test drawdown curve has a distinct inflection point where the drawdown rate
2 increases. The break in slope seen on the aquifer test plots indicate a no-flow boundary such
3 as when the pumping stress encounters the lateral terminus of the sand and gravel. In other
4 words, the rate of drawdown accelerated because the cone of depression encountered a
5 barrier to flow, like clay. Thus, the pumping test data indicate an isolated sand and gravel
6 deposit that is not a sufficient water supply for the project.

7 **Q. What was your role in the water loss approval preliminary review?**

8 A. I provided technical support to Nicole Clayton of DNR's Water Use Section in her review of
9 the water loss approval application. Specifically, I provided hydrogeologic expertise to assist
10 Ms. Clayton in making preliminary determinations under Wis. Stat. § 281.35 (5)(d),
11 including whether "...the proposed withdrawal will not have a significant detrimental effect
12 on the quantity and quality of the waters of the state." In this case that analysis was focused
13 on whether or not the proposed withdrawal is likely to deplete the groundwater beneath the
14 Nemadji River site, whether there may be public and/or private well impacts or impacts to
15 other natural resources.

16 **Q. What were the results of your analysis of private well impacts?**

17 A. There may be private wells in the area that could potentially be impacted by the proposed
18 groundwater withdrawal, if they are hydraulically connected to the sand and gravel below the
19 Nemadji River site. DNR has requested that the applicants conduct a survey of private wells in
20 the area under application requirements for the Water Loss Approval. The applicants have
21 conveyed a willingness to conduct the private well survey, but DNR has not received that
22 information to date.

23 **Q. What is the significance of the predicted magnitude of drawdown on nearby private wells?**

24 A. I have not conducted a thorough analysis because I am waiting for additional information on
25 active private wells in the area from the applicant. However, one private well (WUWN

1 TJ253) located nearby that I used in my hydrostratigraphic conceptualization may or may not
2 be hydraulically connected to the sand and gravel lens found beneath the Nemadji River site.
3 If this well, or other wells, are hydraulically connected, there may be impacts to these nearby
4 wells.

5 **Q. Are there effective ways to mitigate potential impacts to private wells?**

6 A. No, recharge is limited to the sand and gravel aquifer lens, due to the thick overlying clay. The
7 most effective way to avoid potential impacts to private wells would be to explore alternative
8 water supply sources, such as Lake Superior.

9 **Q. In your opinion, would the construction and operation of the proposed high capacity wells
10 result in significant adverse impacts to any waters of the state?**

11 A. This question pertains to the water loss approval required under Wis. Stat. § 281.35. The water
12 loss approval requires that the department must determine, “That the proposed withdrawal will
13 not have a significant detrimental effect on the quantity and quality of the waters of the state.”
14 Wis. Stat. § 281.35(5)(d)6. “Waters of the state” as defined in Wis. Stat. § 281.01(18), includes
15 “those portions of Lake Michigan and Lake Superior within the boundaries of this state, and all
16 lakes, bays, rivers, streams, springs, ponds, wells, impounding reservoirs, marshes, watercourses,
17 drainage systems and other surface water or groundwater, natural or artificial, public or private,
18 within this state or its jurisdiction.” Based on available data, it appears that the operation of the
19 proposed NTEC wells is likely to deplete groundwater from the sand and gravel seam beneath the
20 Nemadji River site. As a result, my opinion is that DNR could not determine, given the project as
21 proposed, that the proposed withdrawal would not have a significant detrimental effect on the
22 quantity of a water of the state (groundwater).

23 **Q. From an environmental review perspective, does the application for high capacity wells
24 meet the WDNR’s approval criteria?**

25 A. Ms. Clayton testifies that the applicants are required to obtain a water loss approval. Under Wis.
26 Stat. § 281.34(5)(e)1., if a water loss approval is required, DNR must include in the high capacity

1 well approval conditions to ensure that the criteria of the water loss approval are met. The water
2 loss approval requires the department to determine that the proposed withdrawal will not have a
3 significant detrimental effect on the waters of the state. Groundwater, as defined in Wis. Stat. §
4 281.01(18), is a water of the state, and depleting a given area of groundwater would constitute
5 having a significant detrimental effect on the quantity of a water of the state. If the applicant can
6 produce information to demonstrate that the proposed withdrawal will not have a significant
7 detrimental effect on groundwater quantity, then the department would evaluate if a condition
8 could be included in a high capacity well approval to ensure that these criteria will be met.

9 **Q. In your opinion, will the high capacity wells produce the required quantity of water that the**
10 **applicants have stated is needed for the proposed project?**

11 A. No. Based on my review, the sand and gravel found beneath the Nemadji River site is not a
12 regionally extensive aquifer as indicated by the applicants on page 6 of their groundwater
13 modeling summary report. I reviewed several dozen well construction reports around the City
14 of Superior and only two wells had more than 15 feet of sand and gravel, and most wells had
15 only a few feet of sand and gravel. My conceptual model of a discrete lens of sand and gravel
16 below the Nemadji River site is corroborated by the well construction reports (Ex.-WDNR-
17 Anderson-3) and the applicants' pump test data (Ex.-WDNR-Anderson-1). This is further
18 explained in my NTEC Tech Memo, dated September 30, 2019 (Exhibit-WDNR-Anderson-
19 1).

20 **Q. Does this conclude your testimony?**

21 A. Yes, it does.