NorthWestern Energy
Delivering a Bright Future

January 11, 2017

Mr. Will Rosquist
Administrator, Regulatory Division
Montana Public Service Commission
1701 Prospect Avenue
PO Box 2022601
Helena, Montana 59620-2601

Re: Docket No. D2016.5.39
QF-1 Avoided Cost Rate Filing
Vote Solar Set 3 Data Requests (025-046)

Dear Mr. Rosquist:

Enclosed for filing is a copy of NorthWestern Energy's responses to the Vote Solar Set 3 Data Requests in Docket No. D2016.5.39. It has been hand delivered to the Montana Public Service Commission and the Montana Consumer Counsel this date. It has also been e-filed on the PSC website, emailed to counsel of record, and sent via UPS overnight delivery to the remainder of the service list.

Should you have questions please contact Joe Schwartzenberger at (406) 497-3362.

Sincerely,

Tracy Lowney Killoy

Tracy Lowney Killoy
Administrative Assistant

CERTIFICATE OF SERVICE

I hereby certify that a copy of NorthWestern Energy's responses to the Vote Solar Set 3 Data Requests (VS-025-VS-046) in Docket No. D2016.5.39, the QF-1 Avoided Cost Rate Filing, has been hand-delivered to the Montana Public Service Commission and the Montana Consumer Counsel this date. It has also been e-filed on the Commission website, emailed to counsel of record, and sent via UPS overnight delivery to the attached service list.

Date: January 11, 2017

Tracy Lowney Killoy
Administrative Assistant
Regulatory Affairs

Docket Service List
Docket No. D2016.5.39

Will Rosquist
Public Service Commission
1701 Prospect Ave
Helena MT 59620-2601

Jason Brown
Montana Consumer Counsel
PO Box 201703
Helena MT 59620-1703

John Alke
NorthWestern Energy
208 N Montana Ave Suite 205
Helena MT 59601

Tracy Lowney Killoy
NorthWestern Energy
11 E Park Street
Butte MT 59701

Joe Schwartzenberger
NorthWestern Energy
11 E Park Street
Butte MT 59701

Jenny K Harbine
Anrora R. Janke
Earthjnstice
313 East Main St.
Bozeman MT 59715

DarAnne Dunning
Luxan & Murfitt, PLLP
P O Box 1144
Helena MT 59624

Al Brogan
NorthWestern Energy
208 N Montana Ave Suite 205
Helena MT 59601

Eric Christensen
Cairncross Hempelmann
524 Second Ave, Suite 500
Seattle WA 98104

Mike J Uda
Uda Law Firm, P.C.
7 West Sixth Avenue
Power Block West, Suite 4H
Helena MT 59601

Ryan N. Meyer
ElGuindy, Meyer & Koegel, PLLP
2990 Lava Ridge Court, Snite 205
Roseville CA 95661

Ryan R. Shaffer
Meyer, Shaffer & Stepans, PLLP
305 S. Fourth St. Suite 101
Missoula MT 59801

NorthWestern Energy
Docket No. D2016.5.39
Application for Approval of Avoided Cost Tariff Schedule QF-1

Vote Solar/Montana Environmental Information Center
Set 3 (025-046)

Data Requests received December 21, 2016

VS-025 Witness: Hansen Subject: Workpapers

Please provide the complete workpapers for Mr. Hansen's rebuttal testimony, with spreadsheets in Excel format with all formulas intact.

RESPONSE:

See the response to Data Request PSC-051.

NorthWestern Energy
Docket No. D2016.5.39
Application for Approval of Avoided Cost Tariff Schedule QF-1

Vote Solar/Montana Environmental Information Center
Set 3 (025-046)

Data Requests received December 21, 2016

VS-026 Witness: Hansen Subject: Natural Gas Price Forecast

Please provide the workpapers for the 11/17/2016 natural gas price forecast presented in Table 1 at page LPH-4 of Luke P. Hansen's prefiled rebuttal testimony on behalf of NorthWestern Energy (NWE). Please include and show separately in these workpapers: (1) the 11/17/2016 AECO-C Hub forward prices, (2) the assumed Canadian $ / US $ exchange rates, (3) all transportation components on the TransCanada Pipeline system, (4) all transportation components in the U.S. on NWE, and (5) the calculation of the levelized natural gas burnertip price.

RESPONSE:

See spreadsheets provided in response to Data Request PSC-051, "natural gas price" and "natural gas pipeline transportation charges" for the AECO prices (column C of "natural gas price" spreadsheet), exchange rate (cell h17 of "natural gas pipeline transportation costs" spreadsheet), TransCanada (screen shot of NGTL tariff in "natural gas pipeline transportation costs" spreadsheet) and NorthWestern tariffs (cell h11 of "natural gas pipeline transportation costs" spreadsheet), and calculated Montana delivered prices (column K of "natural gas price" spreadsheet).

NorthWestern Energy
Docket No. D2016.5.39
Application for Approval of Avoided Cost Tariff Schedule QF-1

Vote Solar/Montana Environmental Information Center
Set 3 (025-046)

Data Requests received December 21, 2016

VS-027 Witness: Hansen Subject: Natural Gas Price Forecast

Please state the annual forecast basis differential for each year from 2017 to 2042, as the difference between (1) the 11/17/2016 forecast in Table 1 at page LPH-4 of Luke P. Hansen's pre-filed rebuttal testimony, and (2) the AECO-C hub forecast prices (in U.S. $/MMBtu). Also, please explain whether and why these differentials were or were not assumed to escalate over the forecast period.

RESPONSE:

The table below details the variance each year. The natural gas transportation rates are escalated each year at a 2% rate of inflation.

2017	$ 0.531
2018	$ 0.542
2019	$ 0.553
2020	$ 0.564
2021	$ 0.575
2022	$ 0.587
2023	$ 0.598
2024	$ 0.610
2025	$ 0.623
2026	$ 0.635
2027	$ 0.648
2028	$ 0.661
2029	$ 0.674
2030	$ 0.687
2031	$ 0.701
2032	$ 0.715
2033	$ 0.729
2034	$ 0.744
2035	$ 0.759
2036	$ 0.774
2037	$ 0.790
2038	$ 0.805
2039	$ 0.821
2040	$ 0.838
2041	$ 0.855
2042	$ 0.872

NorthWestern Energy
Docket No. D2016.5.39
Application for Approval of Avoided Cost Tariff Schedule QF-1

Vote Solar/Montana Environmental Information Center
Set 3 (025-046)

Data Requests received December 21, 2016

VS-028 Witness: Hansen Subject: Long-2 Condition

At page LPH-6, Mr. Hansen states that (1) during "Long-2" hours the market price is below the variable cost of thermal resources and those resources are not economically dispatched, and (2) the energy that is serving load during "Long-2" conditions comes from hydro, must-run thermal, and/or QF must-take resources.

a. Does NWE sell its excess power at the market price in such "Long-2" circumstances? If not, what is done with the NWE's excess generation? If NWE does sell into the market, does the market price represent the value NWE obtains from the sale of its excess generation?

b. Were load to increase by 1 kWh in a particular hour under "Long-2" conditions, would NWE's sales of its excess generation decrease by 1 kWh? If so, why does not the market price represent NWE's marginal cost, rather than zero?

c. In an energy market with multiple suppliers and demanders, does the market clearing price represent the value of energy for each market participant? Or is it NWE's position that there is a unique market value for each market participant?

RESPONSE:

a. NorthWestern does sell excess power in Long-2 situations. Energy is valued at zero during Long-2 situations because of Order 69.

b. If the company still had excess generation, the sales would decrease by 1 kWh under the example in the question. The energy is valued at zero because of Order 69.

c. The market clearing price does represent the value of energy in a given market. NorthWestern values QF energy at zero in Long-2 hours because of Order 69.

NorthWestern Energy
Docket No. D2016.5.39
Application for Approval of Avoided Cost Tariff Schedule QF-1

Vote Solar/Montana Environmental Information Center
Set 3 (025-046)

Data Requests received December 21, 2016

VS-029 Witness: Hansen Subject: REC Pricing

At page LPH-5, Mr. Hansen disagrees that $5 per REC for 2017, increasing with inflation through 2021, is the value NWE would use for REC purchases. Mr. Hansen notes that NWE assigned a $0.90 per REC (per MWh?) value for RECs in 2017 in its 2015 Plan, and that 2016/2017 bid/ask prices are $0.33 to $0.38.

a. Please provide the units for these prices – are they per MWh?

b. Please provide workpapers/data on the REC values from the 2015 Plan in all years covered in the Plan, and describe how those prices were developed.

c. Please confirm that the overall bid prices were $0.33 per MWh and the overall ask prices were $0.38 per MWh for the 2016/2017 RECs from early December 2016. Were these for RECs generated in Montana?

RESPONSE:

a. The price is per REC.

b. See the "VS-029b" folder on the attached CD. The REC price in December of 2015 was $.40. NorthWestern escalated the price annually by $.25.

c. The $.33/$.38 prices were for the back half of 2016/front half of 2017 Green-e National Wind RECs.

NorthWestern Energy
Docket No. D2016.5.39
Application for Approval of Avoided Cost Tariff Schedule QF-1

Vote Solar/Montana Environmental Information Center
Set 3 (025-046)

Data Requests received December 21, 2016

VS-030 Witness: Hansen Subject: REC Pricing

At page LPH-5, Mr. Hansen discusses REC pricing. Please answer the following:

a. If NWE has enough RECs through 2026 to meet its RPS obligation, and if it monetizes additional RECs (e.g. in South Dakota), does this indicate that NWE sells excess RECs?

b. Does NWE sell excess RECs produced in Montana? If so, are these sales to entities in Montana, or in what other states has NWE sold RECs from its Montana plants?

c. If NWE sells or monetizes excess RECs, why are not current REC market prices in the West indicative of the value of RECs to NWE, and why did NWE assign zero value to such near-term RECs in its avoided cost calculations, esp. if NWE assigned a value to 2017 RECs in its 2015 IRP?

d. Please provide NWE's volumes (in MWh) and revenues in $, for all REC purchases and sales in each of the last five years (2011-2015) plus in 2016 to date.

RESPONSE:

a. NorthWestern does not currently sell excess RECs in Montana, but instead carries excess RECs over for future RPS obligations. NorthWestern sells RECs only in South Dakota as there is not currently a renewable portfolio statute in South Dakota.

b. See the response to part a, above.

c. NorthWestern does not currently sell or monetize excess RECs in Montana.

d. The table below details the RECs that have been sold in South Dakota.

DATE	RECs SOLD	TERM	$
10/19/2015	105,046	Back Half 2013/Back Half 2014	$105,046.00
8/19/2016	40,714	Front Half 2014	$ 8,142.80
8/19/2016	177,808	Back Half 2014	$ 51,564.32

NorthWestern Energy
Docket No. D2016.5.39
Application for Approval of Avoided Cost Tariff Schedule QF-1

Vote Solar/Montana Environmental Information Center
Set 3 (025-046)

Data Requests received December 21, 2016

VS-031 Witness: Bushnell Subject: Workpapers

Please provide the complete workpapers for Mr. Bushnell's rebuttal testimony, with spreadsheets in Excel format with all formulas intact.

RESPONSE:

See the response to Data Request PSC-051.

NorthWestern Energy
Docket No. D2016.5.39
Application for Approval of Avoided Cost Tariff Schedule QF-1

Vote Solar/Montana Environmental Information Center
Set 3 (025-046)

Data Requests received December 21, 2016

VS-032 Witness: Mike Babineaux Subject: SPP Method

Please provide the SPP NPC calculation tool, in Excel workbook format, that NWE obtained in October 2016, as described on page JBB-11. Also, please provide the complete SPP Planning Criteria description of the NPC tool calculations, which is excerpted in Exhibit JBB-5.

RESPONSE:

See the "VS-032" folder on the CD attached to Data Request VS-029.

NorthWestern Energy
Docket No. D2016.5.39
Application for Approval of Avoided Cost Tariff Schedule QF-1

Vote Solar/Montana Environmental Information Center
Set 3 (025-046)

Data Requests received December 21, 2016

VS-033 Witness: Babineaux Subject: SPP Method

Please provide all workpapers that show the calculation of a ten-year 6.1% capacity credit for solar, based on the SPP method.

RESPONSE:

See the "VS-033" folder on the CD attached to Data Request VS-029 for a completed SPP Net Planning Capability calculation workbook. The hourly load input data is NorthWestern's Montana hourly load from 2006 through 2015. The hourly solar generation input data was created using the National Renewable Energy Laboratory (NREL) System Advisor Model (SAM). The inputs to the SAM model include the indicative system design provided by DNV-GL for NorthWestern at a proxy site in Anaconda, Montana.

For other workpapers, see the files below that were provided in response to Data Request PSC-001a:

Solar_Exceedance - Top 10 percent QF Peak period – 20160416
lat46.105_lon-112.875_TMY
DNV Simulation

NorthWestern Energy
Docket No. D2016.5.39
Application for Approval of Avoided Cost Tariff Schedule QF-1

Vote Solar/Montana Environmental Information Center
Set 3 (025-046)

Data Requests received December 21, 2016

VS-034 Witness: Babineaux Subject: SPP Method

Regarding the SPP methodology described in Exhibit JBB-5, please respond to the following questions:

a. Did the top 3% load hours over a 10-year period result in approximately 220 hourly hours in each month of the year? In other words, using January as an example, if 3% of the 744 hours in January corresponds to the 22 hours in January with the highest NWE system loads, and ten years of data is considered, would that amount to 22 x 10 = 220 data points for the month of January?

b. In applying the SPP method, did you compute the modeled solar output that would be exceeded in 60% of the hours identified in above in part (a) of this question? For example, is the solar exceedance value in January for a ten-year calculation based on the solar production in hour 132 out of 220, when the 220 hours of solar output are sorted from the highest to the lowest value? If not, how did NWE perform this calculation.

c. Please verify that you combined monthly data for multiple years before calculating the 60% exceedance, as opposed to calculating 60% exceedance values for each month in the ten-year period.

d. Please identify the 12 monthly 60% exceedance values that were calculated, and that NWE used to develop its 6.1% capacity credit calculation.

e. What are the average monthly system loads for the top 3% of hours in each month of the ten-year period?

RESPONSE:

a. Yes, this criteria results in 220 hours for each of 12 months except February, which has about 202 hours.

b. In computing the Annual Net Renewable Capability value in cell I10, the 60% exceedance criteria was applied to the collection of hours that consisted of the top 3% of load hours in each of the 10 months (1 month for each of the ten years analyzed) containing an annual peak load hour (peak load months).

VS-034 cont'd

c. Yes, for the annual Net Planning Capability ("NPC") calculation over the 10-year period, the peak load month of each year was used. The top 3% of load hours from each of these 10 months was collected. This collection of hours was sorted by generation from largest to smallest, and the 60% exceedance requirement was applied to this.

d. The 12 monthly 60% exceedance values are shown in the "Summary" tab in cells I17 – I28 of the file that was provided in response to Data Request VS-033.

These values are not used in the calculation of the Annual Net Renewable Capability value (0.160523 MW or 6.1% of nameplate). As per the methodology described in the SPP Planning Criteria 7.1.5.3 (7) (d), the 60% exceedance criteria was applied to data from the 10 annual peak load months.

e. The table below shows the average load during the top 3% of load hours for each month during the 10-year period.

Month	Avg Load of Top 3% Load Hrs	Month	Avg Load of Top 3% Load Hrs	Month	Avg Load of Top 3% Load Hrs	Month	Avg Load of Top 3% Load Hrs	Month	Avg Load of Top 3% Load Hrs
1/2006	900	1/2008	1,089	1/2010	1,078	1/2012	1,037	1/2014	982
2/2006	1,023	2/2008	958	2/2010	947	2/2012	957	2/2014	1,125
3/2006	864	3/2008	894	3/2010	847	3/2012	903	3/2014	978
4/2006	787	4/2008	879	4/2010	815	4/2012	814	4/2014	826
5/2006	789	5/2008	799	5/2010	808	5/2012	794	5/2014	828
6/2006	947	6/2008	935	6/2010	900	6/2012	973	6/2014	880
7/2006	1,072	7/2008	1,021	7/2010	1,006	7/2012	1,106	7/2014	1,081
8/2006	994	8/2008	1,037	8/2010	981	8/2012	1,066	8/2014	1,061
9/2006	883	9/2008	853	9/2010	844	9/2012	880	9/2014	887
10/2006	882	10/2008	828	10/2010	817	10/2012	862	10/2014	822
11/2006	1,022	11/2008	870	11/2010	1,073	11/2012	950	11/2014	1,053
12/2006	971	12/2008	1,141	12/2010	1,060	12/2012	1,009	12/2014	1,085
1/2007	1,048	1/2009	1,059	1/2011	1,082	1/2013	1,034	1/2015	993
2/2007	983	2/2009	942	2/2011	1,103	2/2013	940	2/2015	950
3/2007	890	3/2009	1,002	3/2011	948	3/2013	924	3/2015	928
4/2007	842	4/2009	826	4/2011	842	4/2013	880	4/2015	807
5/2007	797	5/2009	798	5/2011	771	5/2013	807	5/2015	800
6/2007	1,005	6/2009	911	6/2011	905	6/2013	947	6/2015	1,099
7/2007	1,142	7/2009	995	7/2011	1,042	7/2013	1,131	7/2015	1,080
8/2007	1,016	8/2009	944	8/2011	1,016	8/2013	1,091	8/2015	1,092
9/2007	887	9/2009	930	9/2011	916	9/2013	983	9/2015	931
10/2007	821	10/2009	868	10/2011	839	10/2013	874	10/2015	816
11/2007	977	11/2009	890	11/2011	981	11/2013	985	11/2015	1,016
12/2007	1,002	12/2009	1,131	12/2011	1,017	12/2013	1,164	12/2015	1,024

NorthWestern Energy
Docket No. D2016.5.39
Application for Approval of Avoided Cost Tariff Schedule QF-1

Vote Solar/Montana Environmental Information Center
Set 3 (025-046)

Data Requests received December 21, 2016

VS-035 Witness: Babineaux Subject: SPP Method

Regarding the SPP methodology calculator shown in Exhibit JBB-6, please respond to the following questions:

a. Was the 6.1% capacity credit stated at Line 13, page JBB-12 calculated based on the data shown in JBB-6, as the 0.160523 MW value in Cell I10 divided by the 2.612 MW nameplate capacity in Cell E4 equals 6.1%?

b. Does the 0.160523 MW value shown in the formula bar of Exhibit JBB-6, and displayed as 0.2 MW in cell I10 of JBB-6, represent a single peak hourly value over an annual or ten-year period? If so, what hour and year? If not, exactly what hours does it represent and how is it calculated?

c. Please describe how the peak hour value in cell I10 relates to the monthly net renewable values shown further below in cells I17:I28 of JBB-6.

d. Please confirm that, if one averages the monthly net renewable values shown in cells I17:I28 of JBB-6, the monthly SPP capacity credit method results in a value of 0.86, which when divided by a 2.612 MW nameplate rating yields a solar capacity value of 33% of nameplate. Please explain why this is not the correct result of the SPP methodology, which states "the recommended methodology to evaluate the net planning capability established for wind or solar facilities shall be determined on a monthly basis" (see Exhibit JBB-5).

e. Please confirm that, if one averages the monthly net renewable values for the months of December, January, February, July, and August, as shown in cells I17, I18, I23, I24, and I28 of JBB-6, the monthly SPP capacity credit method results in a value of 0.94, which when divided by a 2.612 MW nameplate rating yields a solar capacity value of 36% of nameplate. Please explain why this is not an appropriate application of the SPP method to the peak load months on the NWE system.

RESPONSE:

a. Yes.

b. No, the values shown in the formula bar and cell I10 are not a peak load value for any year or the 10-year period. It is the 60th percentile value of the collection of

VS-035 cont'd

all of the top 3% load hours for the 10 annual peak load months within the 10-year period. This is calculated in accordance with 7.1.5.3(7) of the SPP Planning Criteria. This calculation is performed as follows:

i. For each year, determine the peak load month.
ii. Collect the top 3% of load hours for each of those 10 peak load months.
iii. Sort all of these hours by generation from largest to smallest, and determine the generation amount exceeded at least 60 percent of the time.

c. The value in each cell in the range I17 – I28 is calculated as if that particular month is the peak load month in every year of the period. On the other hand, the value in cell I10 is the NPC calculated over the period utilizing the actual peak load month in each year, and will not necessarily be equal to any values in cells I17 – I28.

d. The average of the values in cells I17-I28 is approximately 0.8683666, and when divided by 2.612, results in approximately 33.2% of nameplate. This is the incorrect methodology based on the description in 7.1.5.3 (7)(d) in the planning criteria, which describes that an annual net capability may be determined based on the peak load month of the season of interest. In this case, for the value in cell I10, the season of interest is a full year, as opposed to the four seasonal values in cells G14-J14. In addition, results from using the NPC calculation tool workbook, sent to NorthWestern by SPP for use in determining the annual NPC, are not consistent with the method described in this question.

e. Yes, the average of the monthly values for December, January, February, July, and August is approximately 0.943 MW, which represents approximately 36% of the nameplate capacity. This is not an appropriate application of the SPP method for NorthWestern's peak load months because it is inconsistent with the SPP methodology as stated in the Planning Criteria. For example, SPP's NPC methodology, as stated, uses hours from the peak load month of each year in the period. The method described in this question suggests using hours from five months of each year in the period.

NorthWestern Energy
Docket No. D2016.5.39
Application for Approval of Avoided Cost Tariff Schedule QF-1

Vote Solar/Montana Environmental Information Center
Set 3 (025-046)

Data Requests received December 21, 2016

VS-036 Witness: Babineaux Subject: SPP Method

Regarding the SPP methodology calculator shown in Exhibit JBB-6, Please provide the ten years of generation output data that were used to run the SPP tool, as shown in Cells E10 to C20.

RESPONSE:

See the response to Data Request VS-033.

NorthWestern Energy
Docket No. D2016.5.39
Application for Approval of Avoided Cost Tariff Schedule QF-1

Vote Solar/Montana Environmental Information Center
Set 3 (025-046)

Data Requests received December 21, 2016

VS-037 Witness: Bushnell Subject: Retail Load

Please explain whether it is NWE's position that its costs of serving retail load are completely independent of the peak loads of the entire NWE balancing area, including the peak loads of the rural electric co-ops and retail choice customers on NWE's transmission system? If this is NWE's position, please explain in detail why its retail costs are independent of its costs to serve these other customers on its system.

RESPONSE:

The costs of energy supply resources used to meet the needs of NorthWestern's retail customer load are not related to the cost of the energy supplies used to meet the needs of non-retail customer loads, which are not served by NorthWestern.

NorthWestern Energy
Docket No. D2016.5.39
Application for Approval of Avoided Cost Tariff Schedule QF-1

Vote Solar/Montana Environmental Information Center
Set 3 (025-046)

Data Requests received December 21, 2016

VS-038 Witness: Bushnell Subject: Retail Load

Is NWE's transmission and distribution planning based on serving the total loads of its balancing area, or only upon serving NWE's retail load? Would the NWE transmission or distribution systems be considered to have adequate capacity if they were only able to serve reliably the peak level of NWE's retail load?

RESPONSE:

For transmission, planning is based upon the total anticipated load for the balancing area ("BA"). For distribution, planning is based upon the forecast retail loads – both energy and capacity.

For transmission, NorthWestern's transmission business unit is the entity that is responsible for assuring that the BA load is served at all times, including at time of BA peak loads – NorthWestern's retail load is one component of NorthWestern's BA load. For distribution, NorthWestern would have adequate capacity "if it were only able to serve reliably the peak level of NWE's retail load".

NorthWestern Energy
Docket No. D2016.5.39
Application for Approval of Avoided Cost Tariff Schedule QF-1

Vote Solar/Montana Environmental Information Center
Set 3 (025-046)

Data Requests received December 21, 2016

VS-039 Witness: Bushnell Subject: Solar Capacity Contribution

Please provide workpapers showing the calculation of the 3.4% PV capacity contribution under the ten-year 85% exceedance value calculation that you performed (see page JBB-7).

RESPONSE:

See the file named "NWE method – 10 yrs Beach solar data" provided in response to Data Request PSC-051.

NorthWestern Energy
Docket No. D2016.5.39
Application for Approval of Avoided Cost Tariff Schedule QF-1

Vote Solar/Montana Environmental Information Center
Set 3 (025-046)

Data Requests received December 21, 2016

VS-040 Witness: Bushnell Subject: Peak Loads

At page JBB-5, you state that "Northwestern is a winter peaking utility which experiences bimodal seasonal peaks."

a. Please confirm that the maximum load for the most recent four years shown in Table 1 was a summer peak in two years (2012 and 2015) and a winter peak in two years (2013 and 2014).

b. For how many hours in the ten-year period from 2006 to 2015 did NWE hourly load exceed 1,200 MW? Please confirm that the only time this occurred during these years was: (1) twice in December 2008, (2) twice in December 2009, (3) four times in December 2013, and (4) once in February 2014.

c. Please confirm that there were no hourly loads above 1,200 MW in 2006, 2007, 2010, 2011, 2012, 2014, and 2015.

d. How many hourly loads in 2015 were above 90% of the annual maximum? How many of these occurred during winter months?

RESPONSE:

a. Confirmed.

b. Nine times:

- Hours 17 and 18 on December 15, 2008;
- Hours 17 and 18 on December 8, 2009;
- Hours 18 and 19 on December 5, 2013;
- Hours 18 and 19 on December 6, 2013; and
- Hour 18 on February 6, 2014.

c. All years are confirmed, except for 2014 which had hourly loads exceeding 1,200 MW.

d. In 2015, 90 percent of the annual maximum hourly load was approximately 1,032 MW. A total of 131 load hours exceeded 90 percent of the annual maximum, and eight of those hours occurred in winter. However, the same analysis for other years (within the 10 years of data) varies widely, as indicated in the chart below showing the same data (requested above) for all ten years.

VS-040 cont'd

Year	90%	Total	Winter	Summer
2006	1,010	90	12	67
2007	1,059	94	9	85
2008	1,103	31	31	0
2009	1,097	20	20	0
2010	1,049	44	28	0
2011	1,025	117	91	23
2012	1,020	163	18	145
2013	1,145	17	12	5
2014	1,085	40	28	11
2015	1,032	131	8	79

Winter: January, February, and December
Summer: July and August

VS-041 Witness: Bushnell Subject: Table 3

Please provide the ten years of hourly wind data, and the associated workpapers, that were used to develop Table 3.

RESPONSE:

See the files named "Beach method – 10 yrs wind data" and "NWE method – 10 yrs wind data" provided in response to Data Request PSC-051.

NorthWestern Energy
Docket No. D2016.5.39
Application for Approval of Avoided Cost Tariff Schedule QF-1

Vote Solar/Montana Environmental Information Center
Set 3 (025-046)

Data Requests received December 21, 2016

VS-042 Witness: Bushnell Subject: Table 3

Please reproduce the results in Table 3, using ten years of combined wind and solar data, scaled so that equal nameplate MW amounts of wind and solar generation are assumed. This request is important to evaluate the synergies of winter-peaking wind and summer-peaking solar, and to evaluate whether the combined wind and solar capacity is greater than the capacity of each resource individually.

RESPONSE:

There is no way to meaningfully conduct the study requested, particularly in the very short time frame inherent in responding to data requests. NorthWestern already has a large presence of wind on its system; the solar presence on the NorthWestern system is currently very small. Given the huge mismatch between wind and solar regimes, it is not possible to conduct a realistic or meaningful exceedance analysis that assumes an equal presence between the two regimes.

NorthWestern Energy
Docket No. D2016.5.39
Application for Approval of Avoided Cost Tariff Schedule QF-1

Vote Solar/Montana Environmental Information Center
Set 3 (025-046)

Data Requests received December 21, 2016

VS-043 Witness: Hansen Subject: AERO

Please provide workpapers or source documents supporting the 25-year levelized capital cost of an AERO generation unit built in 2018 equal to $109.05 per kW-year

RESPONSE:

See the "VS-043" folder on the CD attached to Data Request VS-029. Cell k104 in tab "Resource Capital Levelized Cost" shows the rate of $109.05.

NorthWestern Energy
Docket No. D2016.5.39
Application for Approval of Avoided Cost Tariff Schedule QF-1

Vote Solar/Montana Environmental Information Center
Set 3 (025-046)

Data Requests received December 21, 2016

VS-044 Witness: Hansen Subject: AERO

Please provide workpapers or source documents supporting the O&M costs of an AERO generation unit starting at $6.42 per kW-year in 2018, and growing by 2% per year.

RESPONSE:

See the "VS-043" folder on the CD attached to Data Request VS-029. Tab "Resource Cost Summary" details the charge of $6.05 in 2015 dollars. This is escalated at 2% per year until 2018.

NorthWestern Energy
Docket No. D2016.5.39
Application for Approval of Avoided Cost Tariff Schedule QF-1

Vote Solar/Montana Environmental Information Center
Set 3 (025-046)

Data Requests received December 21, 2016

VS-045 Witness: Bushnell Subject: AERO

You state that your calculations of the 25-levelized capacity costs of an AERO generation unit built in 2018 presented at page JBB-17 supersede the calculations provided in JBB-2 in your pre-filed testimony.

a. Please explain the why you reduced the levelized capital cost by 22%, from $139.99 to $109.05 per kW-year.

b. Please explain why you reduced the 2018 O&M cost by 23%, from $11.37 to $6.42 per kW-year.

RESPONSE:

a. Please see Mr. Bushnell's testimony at pages JBB-16 through JBB-17. Also see Montana Public Service Commission Order No. 7338b in Docket No. D2014.1.5.

b. See the response to part a, above.

NorthWestern Energy
Docket No. D2016.5.39
Application for Approval of Avoided Cost Tariff Schedule QF-1

Vote Solar/Montana Environmental Information Center
Set 3 (025-046)

Data Requests received December 21, 2016

VS-046 Witness: Cashell Subject: Workpapers

Please provide the complete workpapers, if any, for Mr. Cashell's rebuttal testimony.

RESPONSE:

There are no workpapers.