PUBLIC DOCUMENT
CONFIDENTIAL INFORMATION HAS BEEN EXCISED

Northern States Power Company Docket No. EL23-___
Electric Operations - State of South Dakota Attachment C
COGENERATION AND SMALL POWER PRODUCTION FILING

Calculation of Net Annual Avoided Capacity Costs

[TRADE SECRET BEGINS

(1) Completed Cost of C.T. Unit (2023 $)		/kW
(2) Inflation Net of Technical Progress	*2.00%*	
(3) Average Service Life	*40*	Years
(4) Discount Rate (After Tax)		
Calculation of Marginal Capital Carry Charge Rate		
(5) Present Value of Revenue Requirements (2023)		/kW
(6) Annuity Factor Adjustment for Inflation **	5.72%	
(7) Present Value of Revenue Requirements Adjusted for Inflation (5)*(6)		/kW
(8) Marginal Capital Carrying Charge Rate (7)/(1)		
(9) First Year Revenue Requirement (1)*(8)		/kW
(10) Present Value at 6.82% for 0 years		/kW
(11) Present Value of Average Annual Fuel Savings		/kW
(12) Annual Avoided Capacity Cost (10)-(11)		/kW
(13) Adjusted for 15% Reserve Margin (12)*1.15		/kW
(14) Plus Fixed O & M $/kW (2023 $) (13)+O&M		/kW
(15) Adjusted for losses (14)*(1+(1-0.9652))		/kW
(16) NET ANNUAL AVOIDED CAPACITY COST	*$48.82*	/kW
(17) Net Annual Avoided Capacity Cost Average Over All Hours *(16)*100/8760*	0.557	¢/kWh
(18) In $/KWh (17)/100	$0.0056	/kWh

** AC = (r-j)*(1+j)^(t-1)*[1/(1-(1+j)^n/(1+r)^n)]
Where AC = Annual Charge in year t
t = Year (=1)
K = Total Present Value Cost of Original Investment
r = Discount Rate (Overall Marginal Cost of Capital) (6.82%)
j = Inflation Rate Net of Technology Progress (2%)
n = Expected Service Life of Investment (40 Years)

O&M $/kW/year average annual

TRADE SECRET ENDS]

Thermal Generic Information, IRP 2020-2034, Modeling Assumptions	
Source:	Engineering & Construction
Date/Vintage:	Sept 2018
Updated On:	12/21/2018
Updated By:	Jon Landrum
Verified (Yes/No):	Yes
Note:	Levelized cost includes initial cap ex, on-going cap ex, fixed O&M, and gas demand costs. CTs are assumed to be dual fuel. All Costs are 2018$

Thermal Generic Information	
Resource	**Generic CT**
Technology	7H
Location Type	Greenfield
Cooling Type	Dry
Book life	40
Nameplate Capacity (MW)	374
Summer Peak Capacity (MW)	331
Capital Cost ($000) 2018$	$193,500
Electric Transmission Delivery ($000) 2018$	$74,804
Ongoing Capital Expenditures ($000-yr) 2018$	$1,784
Gas Demand ($000-yr) 2018$	$2,165
Capital Cost ($/kW) 2018$	$517
Electric Transmission Delivery ($/kW) 2018$	$200
Ongoing Capital Expenditures ($/kW-yr) 2018$	$4.77
Gas Demand ($/kW-yr) 2018$	$5.79
Fixed O&M Cost ($000/yr) 2018$	$1,253
Variable O&M Cost ($/MWh) 2018$	$0.99
Levelized $/kw-mo (All Fixed Costs) $2018	$8.06
Summer Heat Rate 100% Loading (btu/kWh)	9,264
Summer Heat Rate 75% Loading (btu/kWh)	9,738
Summer Heat Rate 50% Loading (btu/kWh)	11,120
Summer Heat Rate 25% Loading (btu/kWh)	11,558
Forced Outage Rate	3%
Maintenance (weeks/yr)	2
CO2 Emissions (lbs/MMBtu)	118
SO2 Emissions (lbs/MWh)	0.00
NOx Emissions (lbs/MWh)	0.90
PM10 Emissions (lbs/MWh)	0.03
Mercury Emissions (lbs/MMWh)	0.00

PUBLIC DOCUMENT
CONFIDENTIAL INFORMATION HAS BEEN EXCISED

Forecast of Marginal Energy Prices ($/MWh)
Estimated NSP

	Month	On Peak	Off Peak	Average
31	Jan-23	$58.71	$40.13	$46.42
28	Feb-23	$56.95	$40.20	$46.18
31	Mar-23	$38.07	$31.02	$33.64
30	Apr-23	$33.28	$25.29	$27.96
31	May-23	$34.27	$21.29	$25.90
30	Jun-23	$45.31	$22.11	$30.62
31	Jul-23	$59.01	$28.90	$38.61
31	Aug-23	$51.72	$26.89	$36.10
30	Sep-23	$37.31	$21.97	$27.08
31	Oct-23	$42.25	$31.13	$35.08
30	Nov-23	$42.00	$27.94	$32.86
31	Dec-23	$45.53	$33.41	$37.32

[TRADE SECRET BEGINS

31	Jan-24	
28	Feb-24	
31	Feb-24	
30	Mar-24	
31	Apr-24	
30	May-24	
31	Jun-24	
31	Jul-24	
30	Aug-24	
31	Sep-24	
30	Oct-24	
31	Nov-24	

TRADE SECRET ENDS]

PUBLIC DOCUMENT
CONFIDENTIAL INFORMATION HAS BEEN EXCISED

Northern States Power Company
Electric Operations - State of South Dakota
COGENERATION AND SMALL POWER PRODUCTION FILING

Docket No. EL23-___
Attachment C

ENERGY

NSP Average Summer/Winter Marginal Energy Costs 2023 - 2027

	Summer On	Summer Off	Average	Winter On	Winter Off	Average
2023	48.38	25.04	33.17	43.72	31.24	35.58
	[TRADE SECRET BEGINS					
2024						
2025						
2026						
2027						

NSP Annual Average Marginal Cost 2023 - 2027

	Annual On	Annual Off	Annual Average
2023	45.28	29.17	34.78

Summer months are June through September
Winter months are Jan-May and Oct-Dec

TRADE SECRET ENDS]

Peak Hour Calculation

NUMBER OF PEAK HOURS

The on peak period contains all hours between 9:00 a.m. and 9:00 p.m., Monday through Friday, except the following holidays: New Year's Day, Good Friday, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day. When a designated holiday occurs on Saturday, the preceding Friday will be designated a holiday. When a designated holiday occurs on Sunday, the following Monday will be designated a holiday.

The off peak period contains all other hours not included in the on peak period. Definition of on peak and off peak period is subject to change with change in Company's system operating characteristics.

	On-Peak	Off-Peak
Winter	2,023	3,809
Summer	1,022	1,906
Total	3,045	5,715

On-Peak Days/Week	5 Days
On-Peak Hour Block	12 Hours

	Day in Month	On Peak Hours	Off Peak Hours
June	30	257	463
July	31	266	478
4th of July		-12	12
August	31	266	478
September	30	257	463
Labor Day		-12	12
October	31	266	478
November	30	257	463
Thanksgiving		-12	12
December	31	266	478
Christmas		-12	12
January	31	266	478
New Year's Day		-12	12
February	28	240	432
March	31	266	478
Easter		-12	12
April	30	257	463
May	31	266	478
Memorial Day		-12	12
		3,045	5,715

Line Loss Calculation

	Summer On-Peak	Summer Off-Peak	Average Summer	Winter On-Peak	Winter Off-Peak	Average Winter	Annual On-Peak	Annual Off-Peak	Annual All Hours
Overall Loss Factors	0.9232	0.9364	0.9318	0.9225	0.9334	0.9296	0.9227	0.9344	0.9303
Loss Factors Representing 50% of Overall Loss Factor	0.9616	0.9682	0.9659	0.9612	0.9667	0.9648	0.9613	0.9672	0.9652

NSP (MN & Subs)
NSP System Peak Demands
#REF!

	System MW	
Month	**Full**	**Net**
1	6,174	1,306
2	5,892	1,024
3	5,676	808
4	5,191	323
5	6,377	1,509
6	8,332	3,464
7	9,073	4,205
8	8,500	3,632
9	7,352	2,484
10	5,520	652
11	5,641	773
12	6,173	1,305
Annual Average Hourly Load	**4,868**	
Average of Monthly Peaks		
Year	6,658	1,790
Summer	8,314	3,446
Winter	5,831	963
Total	14,145	4,409
Summer:Winter Ratio	**1.4260**	**3.5805**
Summer Percent	58.78%	78.17%
Winter Percent	41.22%	21.83%
	100.00%	100.00%

Notes:
Full system ratio used to weight actual summer class peaks
Net system ratio used to split total peaking plant into summer and winter