

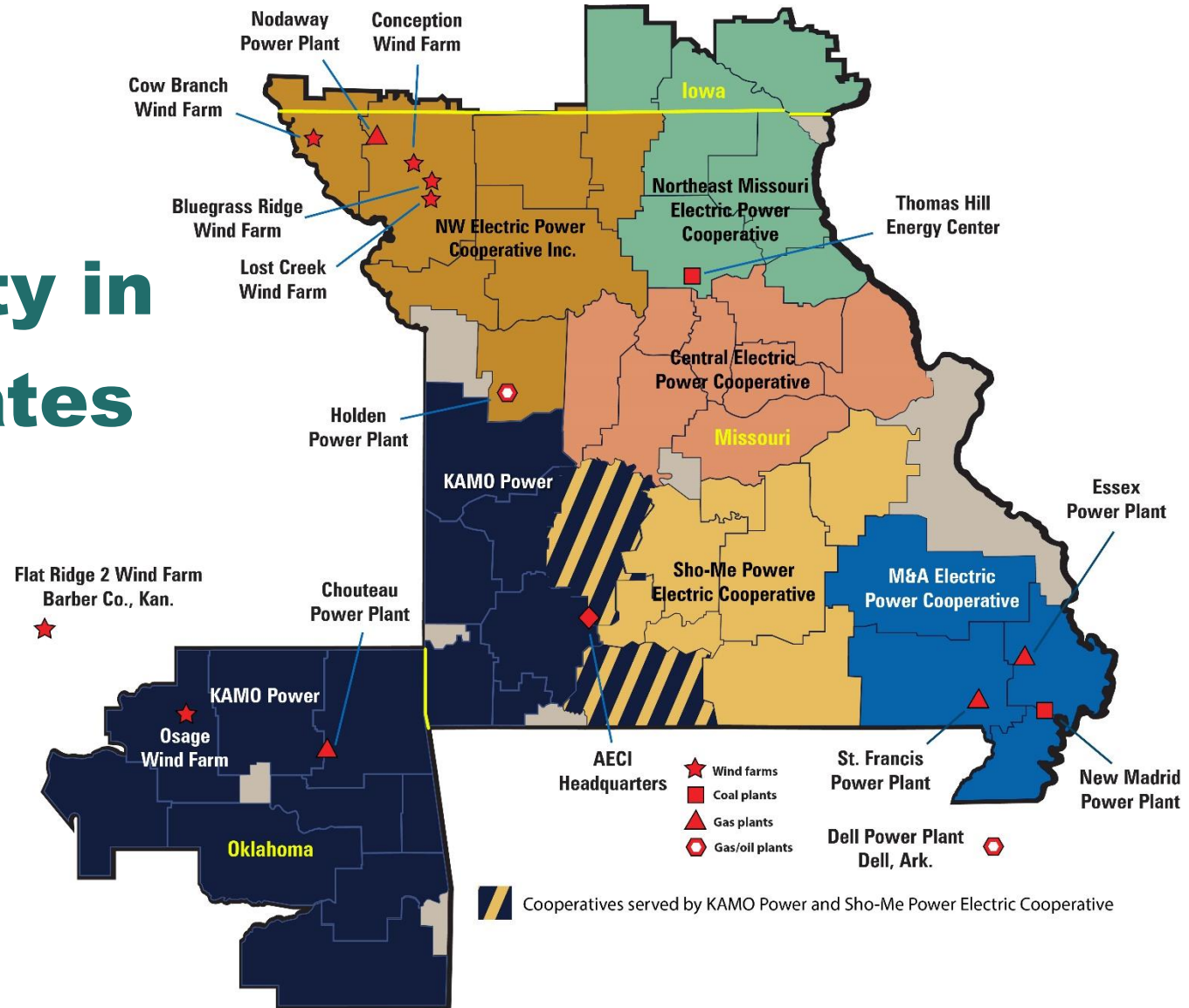


AECI Day Ahead Capacity Forecast 2020 FAMOS Symposium

Landon Pollard
Thermal Performance

Associated Electric Cooperative Inc.

AECI supplies electricity in three states



AECI uses a mix of resources

Take Control & Save[®]
A Cooperative Effort for Energy Efficiency

... to produce clean, affordable,
reliable electricity for members



COAL
2,353 MW



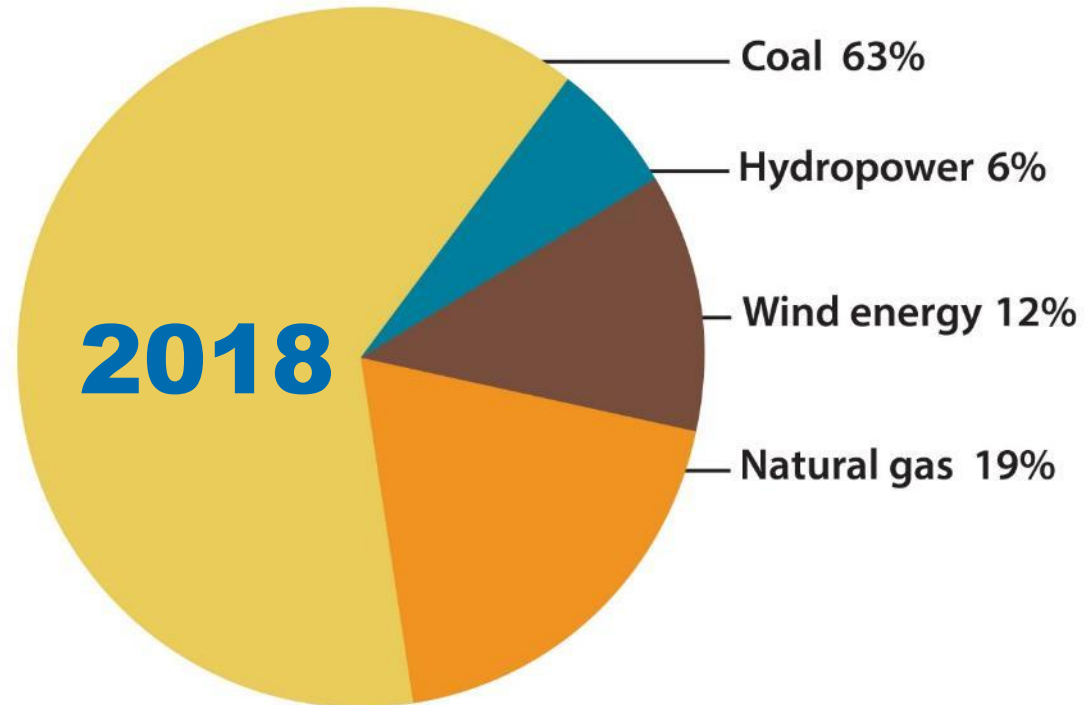
GAS
2,753 MW



HYDROELECTRIC
478 MW



WIND
768 MW



Dell Power Plant

2ON1

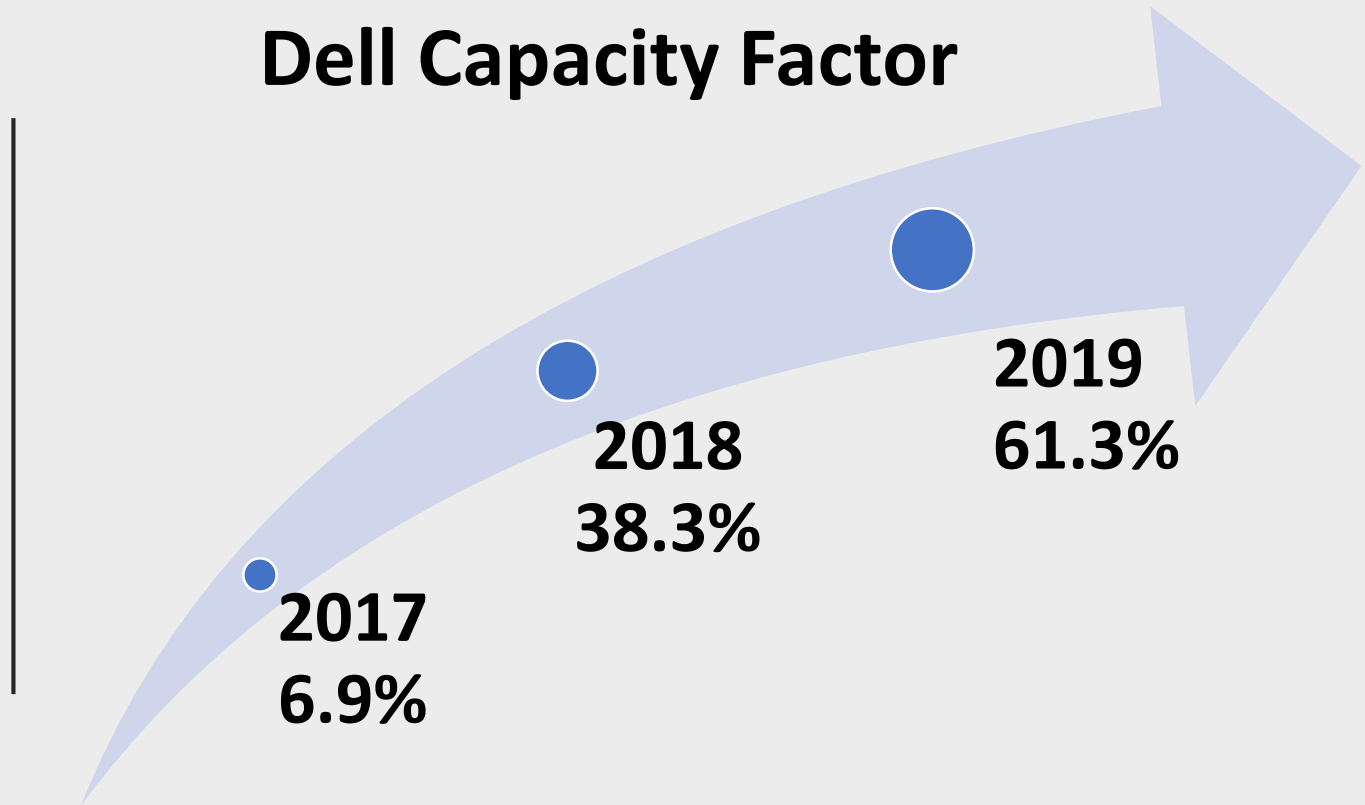
7FA.03

D11

Duct Burners

Inlet Chillers

Dell Capacity Factor



Day Ahead Forecast Data Entry

Next Step is automating
this from manual entry to
pulling data from weather
forecasting website.

DELL POWER PLANT

DAILY NET CAPACITY

Date: 11/18/2019

24 Hour Weather Forecast Input Data

Hour (CDT)	Temperature (°F)	Relative Humidity (%)
0	64	65
1	63	67
2	62	72
3	62	72
4	61	78
5	61	81
6	60	87
7	60	90
8	60	93
9	62	87
10	63	87
11	64	84
12	65	78
13	66	75
14	66	70
15	67	63
16	67	59
17	67	54
18	65	54
19	61	58
20	57	62
21	53	64
22	51	63
23	49	66

DELL POWER PLANT

DAILY NET CAPACITY

Date: 11/18/19

Hour (CDT)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Temperature (°F)	64	63	62	62	61	61	60	60	60	62	63	64	65	66	66	67	67	67	65	61	57	53	51	49
Relative Humidity (%)	65	67	72	72	78	81	87	90	93	87	87	84	78	75	70	63	59	54	54	58	62	64	63	66
1X1 ND NC	230	230	231	231	232	232	232	232	232	231	230	229	228	228	228	227	228	228	229	232	234	236	237	238
1X1 ND WC																								
1X1 DB NC	255	255	256	256	256	256	257	256	256	255	255	254	254	253	253	253	253	253	254	256	258	259	260	261
1X1 DB WC																								
2X1 ND NC	503	505	506	506	507	507	509	509	509	506	504	503	502	500	501	499	499	499	502	508	512	516	518	520
2X1 ND WC																								
2X1 DB NC	556	557	558	558	560	560	561	561	561	558	557	556	555	553	554	552	552	552	555	560	564	567	569	571
2X1 DB WC																								

No Duct Burners = ND, No Chillers =NC, Duct Burner in Service = DB, Chillers in Service = WC

Minimum Net Capacity 1X1 159

Minimum Net Capacity 2X1 355

DELL POWER PLANT

UPDATED NET CAPACITY

Date: 11/17/19

Hour (CDT)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Temperature (°F)	64	63	62	62	61	61	60	60	60	62	63	64	65	66	66	67	67	67	65	61	57	53	51	49
Relative Humidity (%)	65	67	72	72	78	81	87	90	93	87	87	84	78	75	70	63	59	54	54	58	62	64	63	66
1X1 ND NC	230	230	231	231	232	232	232	232	232	231	230	229	228	228	228	227	228	228	229	232	234	236	237	238
1X1 ND WC																								
1X1 DB NC	255	255	256	256	256	256	257	256	256	255	255	254	254	253	253	253	253	253	254	256	258	259	260	261
1X1 DB WC																								
2X1 ND NC	503	505	506	506	507	507	509	509	509	506	504	503	502	500	501	499	499	499	502	508	512	516	518	520
2X1 ND WC																								
2X1 DB NC	556	557	558	558	560	560	561	561	561	558	557	556	555	553	554	552	552	552	555	560	564	567	569	571
2X1 DB WC																								

Day Ahead Model Data:

Correction Curves
Performance Test Data
RH & Ambient Temps
Operational Data
Spinning Reserve

Daily Net Capacity									
Hour (CDT)	0	1	2	3	4	5	6	7	8
Ambient Temperature (°F)	64	63	62	62	61	61	60	60	60
Relative Humidity	65	67	72	72	78	81	87	90	93
1X1 ND NC Tamb Correction MW Factor	0.9847	0.9880	0.9913	0.9913	0.9946	0.9946	0.9978	0.9978	0.9978
1X1 ND NC RH Correction MW Factor	1.0007	1.0004	0.9998	0.9998	0.9993	0.9990	0.9987	0.9985	0.9982
1X1 DB NC Tamb Correction MW Factor	0.9857	0.9887	0.9918	0.9918	0.9948	0.9948	0.9979	0.9979	0.9979
1X1 DB NC RH Correction MW Factor	1.0006	1.0004	0.9999	0.9999	0.9994	0.9992	0.9989	0.9987	0.9986
2X1 ND NC Tamb Correction MW Factor	0.9868	0.9896	0.9923	0.9923	0.9950	0.9950	0.9977	0.9977	0.9977
2X1 ND NC RH Correction MW Factor	1.0001	1.0001	1.0000	1.0000	0.9999	0.9999	0.9999	0.9999	0.9998
2X1 DB NC Tamb Correction MW Factor	0.9876	0.9902	0.9927	0.9927	0.9952	0.9952	0.9977	0.9977	0.9977
2X1 DB NC RH Correction MW Factor	1.0001	1.0001	1.0000	1.0000	0.9999	0.9999	0.9999	0.9999	0.9999

Hour 0					Hour 1					Hour 2					Hour 3				
Temp (°F)					Temp (°F)					Temp (°F)					Temp (°F)				
MW Factor					MW Factor					MW Factor					MW Factor				
	2X1 DB NC	2X1 ND NC	1X1 DB NC	1X1 ND NC		2X1 DB NC	2X1 ND NC	1X1 DB NC	1X1 ND NC		2X1 DB NC	2X1 ND NC	1X1 DB NC	1X1 ND NC		2X1 DB NC	2X1 ND NC	1X1 DB NC	1X1 ND NC
0	0.9997	0.9996	0.9998	1.0000	0	0.9998	0.9997	0.9998	1.0000	0	0.9999	1.0001	1.0000	0.9999	0	0.9999	1.0001	1.0000	0.9999
20	1.0000	1.0000	1.0000	1.0000	20	1.0000	1.0000	1.0000	1.0000	20	1.0000	1.0000	1.0000	1.0000	20	1.0000	1.0000	1.0000	1.0000
40	1.0000	1.0000	1.0000	1.0000	40	1.0000	1.0000	1.0000	1.0000	40	1.0000	1.0000	1.0000	1.0000	40	1.0000	1.0000	1.0000	1.0000
59.8	1.0000	1.0000	1.0004	1.0000	59.8	1.0000	1.0000	1.0002	1.0003	59.8	1.0000	1.0000	0.9999	0.9999	59.8	1.0000	1.0000	0.9999	0.9999
80	1.0004	1.0005	1.0016	1.0016	80	1.0003	1.0003	1.0010	1.0010	80	0.9999	0.9999	0.9996	0.9996	80	0.9999	0.9999	0.9996	0.9996
100	1.0024	1.0011	1.0073	1.0038	100	1.0016	1.0009	1.0047	1.0026	100	1.0000	0.9992	0.9998	0.9999	100	1.0000	0.9992	0.9998	0.9999
120	1.0045	1.0021	1.0133	1.0073	120	1.0010	1.0018	1.0087	1.0051	120	1.0000	0.9984	0.9993	0.9999	120	1.0000	0.9984	0.9993	0.9999

Hour 4					Hour 5					Hour 6					Hour 7				
Temp (°F)					Temp (°F)					Temp (°F)					Temp (°F)				
MW Factor					MW Factor					MW Factor					MW Factor				
	2X1 DB NC	2X1 ND NC	1X1 DB NC	1X1 ND NC		2X1 DB NC	2X1 ND NC	1X1 DB NC	1X1 ND NC		2X1 DB NC	2X1 ND NC	1X1 DB NC	1X1 ND NC		2X1 DB NC	2X1 ND NC	1X1 DB NC	1X1 ND NC
0	0.9996	1.0006	1.0005	1.0001	0	0.99941	1.00093	1.00074	1.00020	0	0.99887	1.00171	1.00158	1.00080	0	0.9986	1.0021	1.0020	1.0011
20	1.0000	1.0000	1.0000	1.0000	20	1.00004	1.00005	1.00005	1.00005	20	1.00006	1.00007	1.00008	1.00008	20	1.0001	1.0001	1.0001	1.0001
40	1.0000	1.0000	1.0000	0.9999	40	1.00003	1.00003	0.99995	0.99992	40	1.00004	1.00004	0.99992	0.99987	40	1.0000	1.0000	0.9999	0.9998
59.8	1.0000	0.9999	0.9995	0.9994	59.8	0.99997	0.99993	0.99981	0.99915	59.8	0.99995	0.99989	0.99896	0.99871	59.8	0.9999	0.9999	0.9988	0.9983
80	0.9993	0.9992	0.9979	0.9979	80	0.99903	0.99883	0.99699	0.99700	80	0.99828	0.99794	0.99502	0.99507	80	0.9979	0.9975	0.9940	0.9941
100	0.9989	0.9952	0.9967	0.9971	100	0.99841	0.99563	0.99424	0.99460	100	0.99787	0.99261	0.98508	0.98563	100	0.9976	0.9921	0.9820	0.9811
120	0.9978	0.9896	0.9915	0.9938	120	0.99689	0.98607	0.98632	0.98885	120	0.99561	0.98268	0.97117	0.97174	120	0.9950	0.9810	0.9636	0.9632

FAMOS Dashboard View

Allows for real-time changes to “today’s” ambient conditions



NOV-18-2019

Hour (CDT)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Temperature (°F)	62.0	62.0	62.0	62.0	61.0	61.0	60.0	60.0	60.0	62.0	63.0	64.0	65.0	66.0	66.0	67.0	67.0	67.0	65.0	61.0	57.0	53.0	51.0	49.0
Relative Humidity (%)	65.0	67.0	72.0	72.0	78.0	81.0	87.0	90.0	93.0	87.0	87.0	84.0	78.0	75.0	70.0	63.0	59.0	54.0	54.0	58.0	62.0	64.0	63.0	66.0
1X1 ND NC	229.6	230.3	230.9	230.9	231.6	231.5	232.2	232.1	232.1	230.6	229.8	229.1	228.5	227.8	227.9	227.4	227.6	227.7	229.2	232.0	234.4	236.4	237.4	238.4
1X1 ND WC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1X1 DB NC	254.7	255.2	255.6	255.6	256.1	256.0	256.5	256.5	256.5	255.3	254.7	254.2	253.8	253.3	253.4	253.1	253.2	253.4	254.4	256.5	258.1	259.4	260.0	260.7
1X1 DB WC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2X1 ND NC	503.3	504.7	506.0	506.0	507.4	507.4	508.8	508.8	508.8	505.9	504.5	503.1	501.8	500.4	500.5	499.2	499.3	499.4	502.1	507.5	512.2	516.0	518.0	519.9
2X1 ND WC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2X1 DB NC	556.1	557.3	558.5	558.5	559.7	559.7	560.9	560.9	560.9	558.4	557.1	555.9	554.7	553.5	553.5	552.4	552.4	552.5	554.9	559.8	563.9	567.2	568.9	570.5
2X1 DB WC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

No Duct Burners = ND, No Chillers = NC, Duct Burner in Service = DB, Chillers in Service WC

Minimum Net Capacity 1X1: 159

Minimum Net Capacity 2X1: 355

NOV-17-2019

Hour (CDT)	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Temperature (°F)	64.0	63.0	62.0	62.0	61.0	61.0	60.0	60.0	60.0	62.0	63.0	64.0	65.0	66.0	66.0	67.0	67.0	67.0	65.0	61.0	57.0	53.0	51.0	49.0
Relative Humidity (%)	65.0	67.0	72.0	72.0	78.0	81.0	87.0	90.0	93.0	87.0	87.0	84.0	78.0	75.0	70.0	63.0	59.0	54.0	54.0	58.0	62.0	64.0	63.0	66.0
1X1 ND NC	229.6	230.3	230.9	230.9	231.6	231.5	232.2	232.1	232.1	230.6	229.8	229.1	228.5	227.8	227.9	227.4	227.6	227.7	229.2	232.0	234.4	236.4	237.4	238.4
1X1 ND WC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1X1 DB NC	254.7	255.2	255.6	255.6	256.1	256.0	256.5	256.5	256.5	255.3	254.7	254.2	253.8	253.3	253.4	253.1	253.2	253.4	254.4	256.5	258.1	259.4	260.0	260.7
1X1 DB WC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2X1 ND NC	503.3	504.7	506.0	506.0	507.4	507.4	508.8	508.8	508.8	505.9	504.5	503.1	501.8	500.4	500.5	499.2	499.3	499.4	502.1	507.5	512.2	516.0	518.0	519.9
2X1 ND WC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2X1 DB NC	556.1	557.3	558.5	558.5	559.7	559.7	560.9	560.9	560.9	558.4	557.1	555.9	554.7	553.5	553.5	552.4	552.4	552.5	554.9	559.8	563.9	567.2	568.9	570.5
2X1 DB WC	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

No Duct Burners = ND, No Chillers = NC, Duct Burner in Service = DB, Chillers in Service WC

Minimum Net Capacity 1X1: 159

Minimum Net Capacity 2X1: 355

[illegible]

Thanks

- Landon Pollard
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