MINNESOTA RENEWABLE ENERGY STANDARD 2007

Introduction

The Commission required Applicants to provide a list of forecasted energy requirements to meet the Renewable Energy Standard, assuming capacity factors of 30%, 35% and 40%. (Exemption Order Point 7D).

In 2007, the Minnesota Legislature amended the then existing Renewable Energy Objective law. The purpose of the amendment was to significantly increase the amount of energy that is produced from environmentally friendly, renewable power sources. This paper summarizes the requirements of Minnesota's new Renewable Energy Objective, as amended. It also presents data that shows the amount of renewable based energy sales that are forecasted for the target years 2010, 2012, 2016, 2020 and 2025. Data is provided to show a rough estimate of how many megawatts of wind generation each utility will need to develop in order to meet the requirements of the new standard.

Renewable Energy Standard

The Minnesota Legislature amended Minn. Stat. § 216B.1691, Renewable Energy Objectives during the 2007 legislative session thereby transforming the "objective" into a "standard" (see Minnesota Session Laws 2007 – Chapter 3). The statute, as amended, requires Minnesota utilities to supply a certain percentage of their retail electric sales from renewable based energy generation for various target years. The renewable sales requirement escalates from a good-faith effort by utilities to provide 7% of their retail sales from renewable sources by 2010, to a mandated requirement that utilities provide 25% of their retail sales from renewable generation sources by 2025 Electric utilities that owned a nuclear generating facility as of January 1, 2007 (*i.e.*, Xcel Energy), are subject to an accelerated renewable schedule. Table 1.0 lists the requirements for both types of utility.

Table 1.0
Renewable Energy Standard 2007—Percent of Annual Retail Minnesota Sales to be Met with Renewable Generation

Year	Utility Requirement	*Nuclear Owners Requirement
2010	7%	15%
2012	12%	18%
2016	17%	25%
2020	20%	30%/25% must be wind
2025	25%	30%/25% must be wind

*** Utilities that own nuclear energy generation have an accelerated renewable requirement.**

The new standards apply to public utilities providing electric service, generation and transmission cooperative electric associations, municipal power agencies and power districts.

Utilities must generate or procure the renewable energy from one or more of the following eligible sources: (1) solar; (2) wind; (3) hydroelectric generation with a capacity of less than 100 MW; (4) hydrogen, provided that after January 1, 2010, the hydrogen must be generated from the resources listed in this clause; or (5) biomass, which includes, without limitation, landfill gas, an anaerobic digester system, and an energy recovery facility used to capture the heat value of mixed municipal solid waste or refuse-derived fuel from mixed municipal solid waste as a primary fuel.

Each electric utility must file a progress report with the Public Utilities Commission every two years. The report must demonstrate the efforts taken by each utility to comply with the new standards. It must also include the following information: 1) the status of the utility's renewable energy mix relative to the standards; (2) efforts taken to meet the standards; (3) any obstacles encountered or anticipated in meeting the standards; and (4) potential solutions to the obstacles.

Renewable Energy Requirements by Utility

Each utility that is subject to the new Renewable Energy Standard has provided sales and generation information. This information was then used to construct tables to show how many megawatt hours of renewable based sales are forecasted for each of the target years as set by the Legislature The sales forecast

data was then used to project the number of megawatts of renewable generation that each utility will need to acquire in order to comply with the renewable standard.

Total Minnesota Sales Forecast

The sales forecast data in Table 1 1 represents each utility's forecast of the number of megawatt hours of retail sales that will be sold in Minnesota for each of the target years. These data represent retail sales to customers but excludes system losses.

Minnesota Sales Forecast Total MWh (excluding losses)

Utility	2010 MWh	2012 MWh	2016 MWh	2020 MWh	2025 MWh
Xcel Energy	33,841,660	34,710,291	36,291,842	38,041,751	40,170,509
Minnkota Power Cooperative	1,973,328	2,059,025	2,240,176	2,426,605	2,359,200
Missouri River Energy Services	1,179,400	1,267,408	1,630,169	1,966,761	2,138,696
Great River Energy	12,871,342	13,609,300	15,223,111	17,188,395	20,190,440
Minnesota Power	9,369,871	9,760,626	10,092,373	10,292,209	
Dairyland Power Cooperative	903,642	941,858	1,002,647	1,062,675	1,136,760
Otter Tail Power	2,396,000	2,489,000	2,668,000	2,860,000	3,080,000
Southern Minnesota Municipal Power Agency*	3,246,800	3,413,366	3,739,311	4,013,060	4,321,968
Minnesota Municipal Power Agency	1,534,628	1,630,625	1,818,864	2,013,685	2,262,788
Central Minnesota Municipal Power Agency	502,514	515,766	539,811	560,670	585,400
Alliant Energy	896,714	924,641	986,411	1,053,195	1,143,140
Totals	**68,715,899**	**71,321,906**	**76,232,715**	**81,479,006**	**77,388,901**

* Southern Minnesota Municipal Power Agency sales forecast numbers are Net Inlet to Member System ("IMS") values. Net IMS does not include transmission line losses, WAPA served load, Rochester load above 216 MW, load served by local hydro units or other minor member load adjustments.

Renewable Based Sales

Table 1.2 presents the number of megawatt hours of retail sales that is projected to come from renewable generation sources. They are the product of total sales from Table 1.1, multiplied by the percentage requirements of the Renewable Energy Standard statute. For example, Central Minnesota Municipal Power Agency forecasts total Minnesota sales for 2020 to be 560,670 MWh, consequently 112,134 MWh must come from a renewable based source (total sales 560,670 MWh x 0.20% from Table 1 = 112,134 MWh).

Table 1.2
Minnesota Electric Sales in MWh Required from Renewable Generation

Utility	2010 MWh	2012 MWh	2016 MWh	2020 MWh	2025 MWh
Xcel Energy	5,076,249	6,247,852	9,072,960	11,412,525	12,051,152
Minnkota Power Cooperative	138,133	247,083	380,830	485,321	589,800
Missouri River Energy Services	82,558	152,089	277,128	393,352	534,674
Great River Energy	900,994	1,633,116	2,587,929	3,437,679	5,047,610
Minnesota Power	655,890	1,171,275	1,715,703	2,058,441	
Dairyland Power Cooperative	63,255	113,023	170,450	212,535	284,190
Otter Tail Power	167,720	298,680	453,560	572,000	770,000
Southern Minnesota Municipal Power Agency	227,276	409,604	635,683	802,612	1,080,492
Minnesota Municipal Power Agency	107,424	195,675	309,207	402,737	565,697
Central Minnesota Municipal Power Agency	35,176	61,892	91,768	112,134	146,350
Alliant Energy	62,770	110,957	167,690	210,639	285,785
Totals	**7,517,455**	**10,641,246**	**15,832,603**	**20,099,975**	**21,355,750**

Existing Renewable Generation

Existing renewable generation data was used to determine how many additional megawatts of generation each utility will need in order to comply with the standard. Table 1.3 shows how many megawatt hours of qualifying renewable energy that each utility had as of December 31, 2006. These numbers were provided by each utility.

Table 1.3
Renewable Energy Generation as of December 31, 2006

Utility	Qualifying Renewable Generation December 31, 2006 (MWh)
Xcel Energy	3,325,755
MinnKota Power Cooperative	5,487
Missouri River Energy Services	13,981
Great River Energy	553,467
Minnesota Power	518,000
Dairyland Power Cooperative	14,971
Otertail Power	44,961
Southern Minnesota Municipal Power Agency	34,087
Minnesota Municipal Power Agency	1,796
Central Minnesota Municipal Power Agency	16,024
Alliant Energy	29,105
Totals	**4,557,634**

Megawatts of Generation Needed

Tables 1.4 through 1.6 show approximately how many megawatts of wind generated energy each utility will need to acquire by each of the target years in order to comply with the Renewable Energy Statute. These projections are based on planning quality estimates that are subject to refinement and revision. These projections are also based on the assumption that all new generation will come from wind turbines. Given that some utilities will choose to acquire a mix of renewable generation sources from a combination of wind, hydro, refuse, etc., these wind projections are intended to be illustrative only.

Three separate projections were made based on capacity factors of 30%, 35% and 40%, respectively. Each utility's existing renewable generation as of December 31, 2006, was subtracted from the utility's renewable sales forecast data provided in Table 1.2 Those numbers were then divided by 8,760 hours as discounted by the appropriate capacity factor For example, CMMPA forecast

renewable sales of 112,134 MWh for year 2020. It had 16,024 MW of renewable generation at the end of 2006, therefore, CMMPA would need to acquire 37 MW of renewable generation (112,134 – 16,024 = 96,110 MWh/(8,760 x 30% capacity = 2,628 hours) = 37 MW of generation needed to comply with the renewable standard).

Table 1.4
MW Wind Generation Needed To Comply With 2007 Renewable Energy Standard 30% Capacity Factor

Utility	Renewable Generation December 31, 2006 MWh	MW Needed 2010 (7%)*	MW Needed 2012 (12%)*	MW Needed 2016 (17%)*	MW Needed 2020 (20%)*	MW Needed 2025 (25%)*
Xcel Energy	3,325,755	660	1,112	2,187	3,077	3,320
Minnkota Power Cooperative	5,487	50	92	143	183	222
Missouri River Energy Services	13,981	26	53	100	144	198
Great River Energy	553,467	132	411	774	1,097	1,710
Minnesota Power	518,000	52	249	456	586	
Dairyland Power Cooperative	14,971	18	37	59	75	102
Otter Tail Power	44,961	47	97	155	200	276
Southern Minnesota Municipal Power Agency	34,087	74	143	229	293	398
Minnesota Municipal Power Agency	1,796	40	74	117	153	215
Central Minnesota Municipal Power Agency	16,024	7	17	29	37	50
Alliant Energy	29,105	13	31	53	69	98
Total MW Needed	**NA**	**1,119**	**2,316**	**4,302**	**5,914**	**6,589**

†Targets for Xcel Energy are 2010 (15%), 2012 (18%), 2016 (25%), 2020 & 2025 (30%--of which 25% must be from wind energy).

Table 1.5
MW Wind Generation Needed To Comply With 2007 Renewable Energy Standard 35% Capacity Factor

Utility	Renewable Generation December 31, 2006 MWh	MW Needed 2010 (7%)*	MW Needed 2012 (12%)*	MW Needed 2016 (17%)*	MW Needed 2020 (20%)*	MW Needed 2025 (25%)*
Xcel Energy	3,325,755	571	953	1,874	2,638	2,846
Minnkota Power Cooperative	5,487	43	79	122	157	191
Missouri River Energy Services	13,981	22	45	86	124	170
Great River Energy	553,467	113	352	664	941	1,466
Minnesota Power	507,833	45	213	391	502	
Dairyland Power Cooperative	14,971	16	32	51	64	88
Otter Tail Power	44,961	21	63	114	153	217
Southern Minnesota Municipal Power Agency	34,087	63	122	196	251	341
Minnesota Municipal Power Agency	1,796	34	63	100	131	184
Central Minnesota Municipal Power Agency	16,024	6	15	25	31	43
Alliant Energy	29,105	11	27	45	59	84
Total MW Needed	**NA**	**945**	**1,964**	**3,668**	**5,051**	**5,630**

*Targets for Xcel Energy are 2010 (15%), 2012 (18%), 2016 (25%), 2020 & 2025 (30%--of which 25% must be from wind energy)

Table 1.6
MW Wind Generation Needed To Comply With 2007 Renewable Energy Standard 40% Capacity Factor

Utility	Renewable Generation December 31, 2006 MWh	MW Needed 2010 (7%)*	MW Needed 2012 (12%)*	MW Needed 2016 (17%)*	MW Needed 2020 (20%)*	MW Needed 2025 (25%)*
Xcel Energy	3,325,755	500	834	1,640	2,308	2,490
Minnkota Power Cooperative	5,487	38	69	107	137	167
Missouri River Energy Services	13,981	20	39	75	108	149
Great River Energy	553,467	99	308	581	823	1,283
Minnesota Power	507,833	39	186	342	440	
Dairyland Power Cooperative	14,971	14	28	44	56	77
Otter Tail Power	44,961	18	55	100	133	190
Southern Minnesota Municipal Power Agency	34,087	55	107	172	219	299
Minnesota Municipal Power Agency	1,796	30	55	88	114	161
Central Minnesota Municipal Power Agency	16,024	5	13	22	27	37
Alliant Energy	29,105	10	23	40	52	73
Total MW Needed	**NA**	**828**	**1,717**	**3,211**	**4,417**	**4,926**

*Targets for Xcel Energy are 2010 (15%), 2012 (18%), 2016 (25%), 2020 & 2025 (30%--of which 25% must be from wind energy).

Demand Side Management (DSM)

Tables 1.7 through 1.12 show how many megawatts of renewable generation is required when taking into account 1% and 1.5% DSM goals.

Table 1.7
MW Wind Generation Needed To Comply With 2007 Renewable Energy Standard 30% Capacity Factor and 1% DSM

Utility	Renewable Generation December 31, 2006 MWh	MW Needed 2010 (7%)*	MW Needed 2012 (12%)*	MW Needed 2016 (17%)*	MW Needed 2020 (20%)*	MW Needed 2025 (25%)*
Xcel Energy	3,325,755	647	1,088	2,152	3,034	3,274
Minnkota Power Cooperative	5,487	50	91	141	181	220
Missouri River Energy Services	13,981	26	52	99	143	196
Great River Energy	553,467	129	405	764	1,084	1,691
Minnesota Power	507,833	50	244	449	578	
Dairyland Power Cooperative	14,971	18	37	59	74	101
Otter Tail Power	44,961	46	95	154	198	273
Southern Minnesota Municipal Power Agency	34,087	73	141	226	289	394
Minnesota Municipal Power Agency	1,796	40	73	116	151	212
Central Minnesota Municipal Power Agency	16,024	7	17	28	36	49
Alliant Energy	29,105	13	31	52	68	97
Total MW Needed	**NA**	**1,098**	**2,274**	**4,241**	**5,838**	**6,508**

*Targets for Xcel Energy are 2010 (15%), 2012 (18%), 2016 (25%), 2020 & 2025 (30%--of which 25% must be from wind energy).

Table 1.8
MW Wind Generation Needed To Comply With 2007 Renewable Energy Standard 35% Capacity Factor and 1% DSM

Utility	Renewable Generation December 31, 2006 MWh	MW Needed 2010 (7%)*	MW Needed 2012 (12%)*	MW Needed 2016 (17%)*	MW Needed 2020 (20%)*	MW Needed 2025 (25%)*
Xcel Energy	3,325,755	554	933	1,845	2,600	2,807
Minnkota Power Cooperative	5,487	43	78	121	155	189
Missouri River Energy Services	13,981	22	45	85	122	168
Great River Energy	553,467	110	347	655	929	1,449
Minnesota Power	507,833	43	209	385	496	
Dairyland Power Cooperative	14,971	16	32	50	64	87
Otter Tail Power	44,961	39	82	132	170	234
Southern Minnesota Municipal Power Agency	34,087	62	121	194	248	338
Minnesota Municipal Power Agency	1,796	34	63	99	129	182
Central Minnesota Municipal Power Agency	16,024	6	15	24	31	42
Alliant Energy	29,105	11	26	45	59	83
Total MW Needed	NA	941	1,950	3,636	5,004	5,578

*Targets for Xcel Energy are 2010 (15%), 2012 (18%), 2016 (25%), 2020 & 2025 (30%--of which 25% must be from wind energy).

Table 1.9
MW Wind Generation Needed To Comply With 2007 Renewable Energy Standard 40% Capacity Factor and 1% DSM

Utility	Renewable Generation December 31, 2006 MWh	MW Needed 2010 (7%)*	MW Needed 2012 (12%)*	MW Needed 2016 (17%)*	MW Needed 2020 (20%)*	MW Needed 2025 (25%)*
Xcel Energy	3,325,755	485	816	1,614	2,275	2,456
Minnkota Power Cooperative	5,487	37	68	106	136	165
Missouri River Energy Services	13,981	19	39	74	107	147
Great River Energy	553,467	97	303	573	813	1,268
Minnesota Power	507,833	37	183	337	434	
Dairyland Power Cooperative	14,971	14	28	44	56	76
Otter Tail Power	44,961	35	72	115	149	205
Southern Minnesota Municipal Power Agency	34,087	54	106	170	217	296
Minnesota Municipal Power Agency	1,796	30	55	87	113	159
Central Minnesota Municipal Power Agency	16,024	5	13	21	27	37
Alliant Energy	29,105	9	23	39	51	72
Total MW Needed	**NA**	**823**	**1,706**	**3,181**	**4,378**	**4,881**

*Targets for Xcel Energy are 2010 (15%), 2012 (18%), 2016 (25%), 2020 & 2025 (30%--of which 25% must be from wind energy).

Table 1.10
MW Wind Generation Needed To Comply With 2007 Renewable Energy Standard 30% Capacity Factor and 1.5% DSM

Utility	Renewable Generation December 31, 2006 MWh	MW Needed 2010 (7%)*	MW Needed 2012 (12%)*	MW Needed 2016 (17%)*	MW Needed 2020 (20%)*	MW Needed 2025 (25%)*
Xcel Energy	3,325,755	637	1,076	2,135	3,012	3,251
Minnkota Power Cooperative	5,487	50	91	141	180	219
Missouri River Energy Services	13,981	26	52	99	142	195
Great River Energy	553,467	127	402	759	1,078	1,681
Minnesota Power	507,833	49	242	446	574	
Dairyland Power Cooperative	14,971	18	37	58	74	101
Otter Tail Power	44,961	46	95	153	197	271
Southern Minnesota Municipal Power Agency	34,087	72	141	225	288	392
Minnesota Municipal Power Agency	1,796	40	73	115	150	211
Central Minnesota Municipal Power Agency	16,024	7	17	28	36	49
Alliant Energy	29,105	12	31	52	68	96
Total MW Needed	**NA**	**1,083**	**2,254**	**4,211**	**5,799**	**6,467**

*Targets for Xcel Energy are 2010 (15%), 2012 (18%), 2016 (25%), 2020 & 2025 (30%--of which 25% must be from wind energy).

Table 1.11
MW Wind Generation Needed To Comply With 2007 Renewable Energy Standard 35% Capacity Factor and 1.5% DSM

Utility	Renewable Generation December 31, 2006 MWh	MW Needed 2010 (7%)*	MW Needed 2012 (12%)*	MW Needed 2016 (17%)*	MW Needed 2020 (20%)*	MW Needed 2025 (25%)*
Xcel Energy	3,325,755	546	922	1,830	2,582	2,787
Minnkota Power Cooperative	5,487	43	78	121	154	188
Missouri River Energy Services	13,981	22	44	84	122	167
Great River Energy	553,467	109	344	651	924	1,441
Minnesota Power	507,833	42	207	382	492	
Dairyland Power Cooperative	14,971	15	31	50	63	86
Otter Tail Power	44,961	39	81	131	169	233
Southern Minnesota Municipal Power Agency	34,087	62	120	193	247	336
Minnesota Municipal Power Agency	1,796	34	62	99	129	181
Central Minnesota Municipal Power Agency	16,024	6	15	24	31	42
Alliant Energy	29,105	11	26	44	58	82
Total MW Needed	**NA**	**929**	**1,932**	**3,610**	**4,971**	**5,543**

*Targets for Xcel Energy are 2010 (15%), 2012 (18%), 2016 (25%), 2020 & 2025 (30%--of which 25% must be from wind energy).

Table 1.12
MW Wind Generation Needed To Comply With 2007 Renewable Energy Standard 40% Capacity Factor and 1.5% DSM

Utility	Renewable Generation December 31, 2006 MWh	MW Needed 2010 (7%)*	MW Needed 2012 (12%)*	MW Needed 2016 (17%)*	MW Needed 2020 (20%)*	MW Needed 2025 (25%)*
Xcel Energy	3,325,755	478	807	1,601	2,259	2,439
Minnkota Power Cooperative	5,487	37	68	105	135	164
Missouri River Energy Services	13,981	19	39	74	107	146
Great River Energy	553,467	95	301	570	808	1,261
Minnesota Power	507,833	37	181	337	434	
Dairyland Power Cooperative	14,971	14	27	44	55	76
Otter Tail Power	44,961	34	71	115	148	204
Southern Minnesota Municipal Power Agency	34,087	54	105	169	216	294
Minnesota Municipal Power Agency	1,796	30	54	86	113	159
Central Minnesota Municipal Power Agency	16,024	5	13	21	27	37
Alliant Energy	29,105	9	23	39	51	72
Total MW Needed	NA	813	1,691	3,161	4,352	4,850

*Targets for Xcel Energy are 2010 (15%), 2012 (18%), 2016 (25%), 2020 & 2025 (30%--of which 25% must be from wind energy).

Summary of Forecasts

By the year 2025, Minnesota electric utilities will be required to generate or acquire approximately 15 million to 20 million MWh of power from renewable energy sources. In order to provide that much power and comply with the standard, utilities will need to generate or procure approximately 5,000 to 6,000 MW of wind generation by 2025. As previously stated, not all utilities will choose to generate or procure all of their needed generation from wind sources. Some utilities have indicated that they will utilize a mix of renewable energy to meet this requirement.

The numbers provided in this document are intended to provide a snapshot of the approximate number of megawatts of renewable generation that was on line at the end of 2006 and the number of megawatts of wind generation (or mixed renewable generation) that will be needed by 2025. These numbers are subject to change as subsequent forecasts are made by the utilities. Indeed, the projections provided in this document will be reduced in the near term because additions to some utility's renewable portfolios are planned.

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