5 Forecast & Capability

LONG RANGE FORECAST

The 2004 Long Range Forecast is the first forecast to be completed under the Regulatory Economics area of Regulatory Services at Otter Tail. Since the late 1980's Otter Tail had used the SHAPES II-PC end-use load forecasting model. The latest forecast was completed using an econometric forecasting model in accordance with the Commission's Order in the last resource plan filing, Docket No. E-017/RP-02-1168, which directed the Company to implement a different energy and demand forecasting methodology. The development of this forecast commenced with a meeting between staff of the Department of Commerce and Otter Tail to determine the general approach to employ. With input from the Department, Christiansen Associates of Madison, WI was chosen to develop a traditional econometric forecasting model. The forecasting detail is included in the forecast report that is included with the Minnesota Electric Utility Annual Report included later in this filing. The specific energy and demand forecast values are shown in the following tables and discussion.

[TRADE SECRET DATA BEGINS]

[TRADE SECRET DATA ENDS]

ENERGY FORECAST

The system input forecast for the low series, base forecast, and high series is shown in Table 5-A. The forecast model produces raw sales data. System losses are then added to the raw sales data to provide the

system requirements. Historical impacts from past conservation programs have impacted the data used to develop the forecast, and therefore are implicitly reflected in the data used for the forecast as they have

Table 5-A
Otter Tail Power 2004 System Input Forecast (GWh)
Includes System Losses

Year	Low Series	Base Forecast	High Series
2006	3,830.996	4,230.675	4,699.851
2007	3,886.726	4,298.113	4,781.217
2008	3,956.850	4,381.293	4,879.937
2009	4,003.135	4,431.530	4,949.667
2010	4,063.249	4,504.094	5,037.176
2011	4,124.522	4,578.330	5,127.035
2012	4,200.327	4,669.186	5,236.051
2013	4,250.327	4,731.790	5,314.019
2014	4,314.041	4,810.075	5,410.078
2015	4,382.847	4,890.084	5,508.709
2016	4,457.890	4,986.475	5,626.371
2017	4,509.732	5,052.962	5,711.047
2018	4,575.677	5,135.765	5,814.776
2019	4,641.912	5,219.412	5,920.141
2020	4,723.817	5,321.330	6,047.007

impacted historical sales used in the database. Potential conservation impacts from future programs are not included in the development of the forecast. Such potential conservation programs are treated as available alternatives in the optimization model for developing the resource plan.

Graph 5-1 illustrates the three forecast series energy requirements compared to historical data. Table 5-B shows the rate of growth over the planning period represented by each series. Table 5-C demonstrates the variations for energy for the low and high forecast scenarios.

Graph 5 - 1
System Input Energy
1999 - 2020

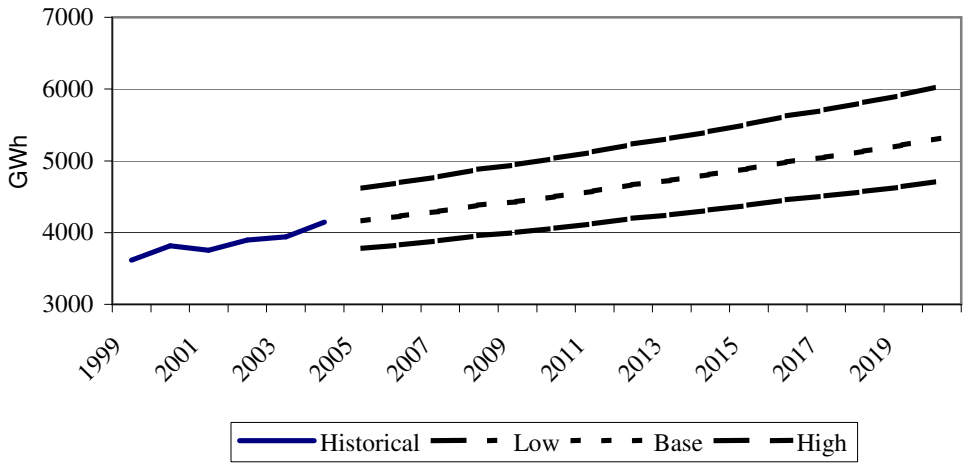


Table 5-B 2004 Energy Forecast Statistics Average Compounded Growth Rates			
Time Period	**Low Series**	**Base Forecast**	**High Series**
2006 to 2020	1.508%	1.652%	1.817%

Table 5-C Energy Forecast Sensitivity Results 2004 Econometric Forecast % Deviation From Base		
Year	**Low Series System Energy Requirements**	**High Series System Energy Requirements**
2006	-9.45%	+11.00%
2010	-9.79%	+11.84%.
2015	-10.37%	+12.65%
2020	-11.23%	+13.64%

5-4 Forecast & Capability

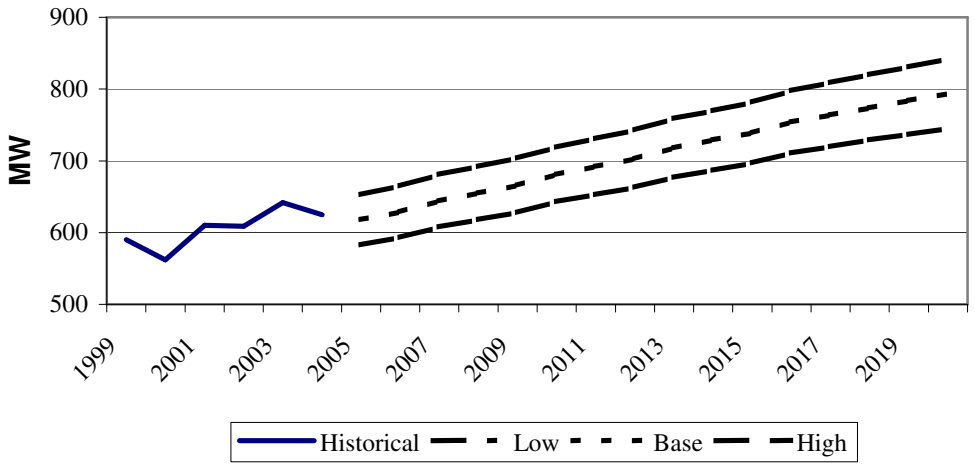
DEMAND FORECAST

The uncontrolled seasonal peak demand forecast is shown in Table 5-D and Graphs 5-2 and 5-3. Please note that the data is shown in the MAPP seasonal format. Thus, the January-April 2006 peak is shown as being in the 2005 winter season that runs from November 2005 through April 2006.

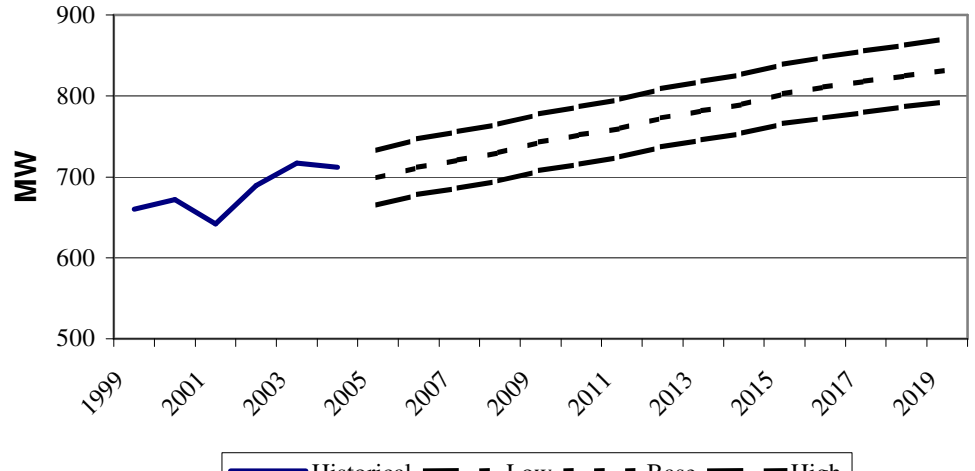
Table 5-D
2004 Load Forecast Seasonal Peak Demands
Uncontrolled Load (MW) by MAPP Season

Year	Summer			Winter		
	Low	Base	High	Low	Base	High
2005	-	-	-	665	699	733
2006	593	629	665	678	712	747
2007	608	644	681	686	721	756
2008	618	655	692	695	730	765
2009	628	666	704	708	743	778
2010	643	681	719	716	752	787
2011	653	692	731	725	760	796
2012	663	703	743	737	773	809
2013	677	718	759	746	782	818
2014	687	729	770	754	790	827
2015	697	739	782	766	803	839
2016	711	754	798	773	811	848
2017	720	764	809	780	818	856
2018	729	774	820	787	825	863
2019	737	784	831	793	832	871
2020	745	794	842	-	-	-

Graph 5 - 2
Summer Season Uncontrolled Peak Demand
1999 - 2020



Graph 5 - 3
Winter Season Uncontrolled Peak Demand
1999 - 2019



5-6 Forecast & Capability

Table 5-E demonstrates the percent variance of each alternative peak demand series from the base forecast of demand.

Table 5-E
Peak Forecast Sensitivity Results
2004 Econometric Forecast
% Deviation From Base

Years	Summer Season		Winter Season	
	Low Peak Demand	High Peak Demand	Low Peak Demand	High Peak Demand
2005	-5.72%	+5.72%	-4.86%	+4.86%
2010	-5.58%	+5.58%	-4.71%	+4.71%
2015	-5.68%	+5.82%	-4.56%	+4.68%
2020	-6.17%	+6.05%	-4.69%	+4.69%

LOAD MANAGEMENT FORECAST

The Company has included a forecast of load management control capability in previous filings. The last load management capability forecast was completed in 2002[1], which was included in the 2002 resource plan filing.

Over the history of the load management system the Company has had considerable flexibility in the use of this system to control peak demands. In recent years Otter Tail began to experience some operational difficulties with the system. First, the amount of effective control began to decline, as a number of the radio receivers failed due to age. The load management capability forecast had always included an adjustment for failed receivers, but in recent years the failure rate climbed as units were now 20 years old or older. Otter Tail is now in the midst of a four-year project to replace all load management radio receivers with newer technology. At this time slightly over half of the receivers have been replaced. The new technology will use a different radio control system that may have a different coverage effectiveness. Until the new system if fully operational and performance observations can be made, the Company is unable to develop a new forecast.

[1] OTP Report BD02-2

As the penetration of controllable loads has increased, the operation of the load management system has been forced to change in the past few years. Years ago, some of the load over the morning winter peak could be shed, and then restored to fill the mid-day load valley prior to being shed for the evening peak. Controllable load has increased to the point where it is so effective there is no longer a valley between morning and evening peak periods. To obtain effective peak control, some loads now must be controlled from about 8 am until almost midnight or later. Controllable loads that have a load payback when restored are particularly problematic as they have the potential to create a new peak after load restoration. The net impact of this is that control periods become quite long and more frequent. Otter Tail has noted that some controlled load customers are switching their controlled load to full-time service to avoid the inconvenience of control. So far additional controllable loads being added have exceeded those being lost, but Otter Tail now has to be very judicious in the use of the load management system to limit the number of control hours during the year. For the development of this forecast, the analysis restricted load management control for capacity reasons to 300 hours per year.

In past resource plan filings Otter Tail was able to allow the model to dispatch the load management system. It is not possible to limit the control hours directly in the model. To incorporate the effect and benefits of the load management system, planning personnel pre-managed the system load prior to the optimization modeling. Beginning in 2008 the limit of 300 hours per year of control for capacity purposes begins to limit operation of the system. Beginning with 2008, the amount of load management benefit for capacity control was restricted to the MW limits shown in Table 5 – F.

Table 5 – F
MW Limits of Load Management Control by Month
2008 – 2020

Month	MW	Month	MW
January	80	July	25
February	65	August	29
March	18	September	0
April	0	October	0
May	0	November	20
June	16	December	67

5-8 Forecast & Capability

DEVELOPMENT OF PLANNING SCENARIOS

From the load forecast data, three planning scenarios were developed for consideration. In reviewing the long-range forecast results, the base energy forecast data appears to be consistent with historic actual system input data. The planning scenarios use the energy forecast as the basis for the three scenarios.

The base peak demand forecast does not line up with historic peaks. This fact can be observed in Graphs 5 – 2 and 5 – 3. The high peak forecast for both summer and winter seasons appears to be consistent with the historic uncontrolled peaks. The econometric peak demand forecast does not fully capture the effect of temperature on summer and winter peak demands. This is a very critical element of planning, since under the MAPP rules members must maintain a ***minimum*** 15% reserve margin above the annual peak at all times during the year. Historic uncontrolled peaks have already exceeded the uncontrolled peaks developed in the long-range econometric forecast.

Upon review of the forecast data and consistency with actual historical data, Otter Tail developed three planning scenarios as identified in Table 5 – G.

Table 5 – G
Planning Scenarios

Scenario	Energy Forecast	Demand Forecast
Low Growth	Low	Base
Base Growth	Base	High
High Growth	High	Modified High[2]

The three planning scenarios were used as the basis for developing long-range resource plans for each scenario. The following pages contain Tables 5 – H, 5 – I, and 5 – J, which show the equivalent MAPP load and capability status prior to the development of the resource plans. These tables are meant to be used as a starting point for the development of Otter Tail's Resource Plan, and illustrate the capacity deficits that exist prior to plan development, based on the Company's committed resources.

[2] The modified high demand forecast was developed by using the percentage difference between the Base and High Energy forecasts to increase the High Demand forecast.

Table 5-H
2006-2020 Low Growth Planning Scenario Load & Capability Prior to Resource Plan Information
Includes Resources Set at 2005 Accreditation Levels (MW)

For Demonstration Purposes Only - Do Not Use as Final OTP Load & Capability

MAPP LOAD & CAPABILITY	WIN	SUM	WIN	SUM	WIN	SUM	WIN	SUM	WIN	SUM	WIN	SUM	WIN	SUM	WIN
CALCULATION	2005	2006	2006	2007	2007	2008	2008	2009	2009	2010	2010	2011	2011	2012	2012
SEASONAL MAX. DEMAND	699	629	712	644	721	655	730	666	743	681	752	692	760	703	773
SCHEDULE L PURCHASES	63	20	71	29	80	29	80	29	80	29	80	29	80	29	80
SEASONAL SYSTEM DEMAND	636	609	641	615	641	626	650	637	663	652	672	663	680	674	693
ANNUAL SYSTEM DEMAND	674	640	641	641	641	641	650	650	663	663	672	672	680	680	693
FIRM PURCHASES - TOTAL	6	5	6	5	6	5	6	5	6	5	6	5	6	5	6
FIRM SALES - TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SEASONAL ADJ NET DEMAND	630	604	635	610	635	621	644	632	657	647	666	658	674	669	687
ANNUAL ADJ NET DEMAND	659	659	635	635	635	635	644	644	657	657	666	666	674	674	687
NET GENERATING CAP	701	667	701	667	701	667	701	667	701	667	701	667	701	667	701
PART. PURCHASE - TOTAL	102	52	52	52	52	52	52	52	52	2	2	2	2	2	2
PART. SALES - TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ADJ NET CAPABILITY	803	719	753	719	753	719	753	719	753	669	703	669	703	669	703
NET RESERVE CAP OBLIG	99	99	95	95	95	95	97	97	99	99	100	100	101	101	103
TOTAL FIRM CAP OBLIG	729	703	730	705	730	716	741	729	756	746	766	758	775	770	790
SURPLUS OR DEFICIT(-) CAP	74	16	23	14	23	3	12	-10	-3	-77	-63	-89	-72	-101	-87

MAPP LOAD & CAPABILITY	SUM	WIN	SUM	WIN	SUM	WIN	SUM	WIN	SUM	WIN	SUM	WIN	SUM	WIN	SUM
CALCULATION	2013	2013	2014	2014	2015	2015	2016	2016	2017	2017	2018	2018	2019	2019	2020
SEASONAL MAX. DEMAND	718	782	729	790	739	803	754	811	764	818	774	825	784	832	794
SCHEDULE L PURCHASES	29	80	29	80	29	80	29	80	29	80	29	80	29	80	29
SEASONAL SYSTEM DEMAND	689	702	700	710	710	723	725	731	735	738	745	745	755	752	765
ANNUAL SYSTEM DEMAND	693	702	702	710	710	723	725	731	735	738	745	745	755	755	765
FIRM PURCHASES - TOTAL	5	6	5	6	5	6	5	6	5	6	5	6	5	6	5
FIRM SALES - TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SEASONAL ADJ NET DEMAND	684	696	695	704	705	717	720	725	730	732	740	739	750	746	760
ANNUAL ADJ NET DEMAND	687	696	696	704	705	717	720	725	730	732	740	739	750	749	760
NET GENERATING CAP	667	701	667	701	667	701	667	701	667	556	522	556	522	556	522
PART. PURCHASE - TOTAL	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
PART. SALES – TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ADJ NET CAPABILITY	669	703	669	703	669	703	669	703	669	558	524	558	524	558	524
NET RESERVE CAP OBLIG	103	104	104	106	106	108	108	109	110	110	111	111	113	113	115
TOTAL FIRM CAP OBLIG	787	800	799	810	811	825	828	834	840	842	851	850	863	859	875
SURPLUS OR DEFICIT(-) CAP	-118	-97	-130	-107	-142	-122	-159	-131	-171	-284	-327	-292	-339	-301	-351

5-10 Forecast & Capability

Table 5-I
2006-2020 Base Case Planning Scenario Load & Capability Prior to Resource Plan Information
Includes Resources Set at 2005 Accreditation Levels (MW)

For Demonstration Purposes Only - Do Not Use as Final OTP Load & Capability

MAPP LOAD & CAPABILITY	WIN	SUM	WIN	SUM	WIN	SUM	WIN	SUM	WIN	SUM	WIN	SUM	WIN	SUM	WIN
CALCULATION	2005	2006	2006	2007	2007	2008	2008	2009	2009	2010	2010	2011	2011	2012	2012
SEASONAL MAX. DEMAND	733	665	747	681	756	692	765	704	778	719	787	731	796	743	809
SCHEDULE L PURCHASES	80	29	80	29	80	29	80	29	80	29	80	29	80	29	80
SEASONAL SYSTEM DEMAND	653	636	667	652	676	663	685	675	698	690	707	702	716	714	729
ANNUAL SYSTEM DEMAND	665	653	667	667	676	676	685	685	698	698	707	707	716	716	729
FIRM PURCHASES - TOTAL	6	5	6	5	6	5	6	5	6	5	6	5	6	5	6
FIRM SALES - TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SEASONAL ADJ NET DEMAND	647	631	661	647	670	658	679	670	692	685	701	697	710	709	723
ANNUAL ADJ NET DEMAND	659	648	661	662	670	671	679	680	692	693	701	702	710	711	723
NET GENERATING CAP	701	667	701	667	701	667	701	667	701	667	701	667	701	667	701
PART. PURCHASE - TOTAL	102	52	52	52	52	52	52	57	52	2	2	2	2	2	2
PART. SALES - TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ADJ NET CAPABILITY	803	719	753	719	753	719	753	719	753	669	703	669	703	669	703
NET RESERVE CAP OBLIG	99	97	99	99	101	101	102	102	104	104	105	105	107	107	108
TOTAL FIRM CAP OBLIG	746	728	760	746	771	759	781	772	796	789	806	802	817	816	831
SURPLUS OR DEFICIT(-) CAP	57	-9	-7	-27	-18	-40	-28	-53	-43	-120	-103	-133	-114	-147	-128

MAPP LOAD & CAPABILITY	SUM	WIN	SUM	WIN	SUM	WIN	SUM	WIN	SUM	WIN	SUM	WIN	SUM	WIN	SUM
CALCULATION	2013	2013	2014	2014	2015	2015	2016	2016	2017	2017	2018	2018	2019	2019	2020
SEASONAL MAX. DEMAND	759	818	770	827	782	839	798	848	809	856	820	863	831	871	842
SCHEDULE L PURCHASES	29	80	29	80	29	80	29	80	29	80	29	80	29	80	29
SEASONAL SYSTEM DEMAND	730	738	741	747	753	759	769	768	780	776	791	783	802	791	813
ANNUAL SYSTEM DEMAND	730	738	741	747	753	759	769	769	780	780	791	791	802	802	813
FIRM PURCHASES - TOTAL	5	6	5	6	5	6	5	6	5	6	5	6	5	6	5
FIRM SALES - TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SEASONAL ADJ NET DEMAND	725	732	736	741	748	753	764	762	775	770	786	777	797	785	808
ANNUAL ADJ NET DEMAND	725	732	736	741	748	753	764	763	775	774	786	785	797	796	808
NET GENERATING CAP	667	701	667	701	667	701	667	701	667	556	522	556	522	556	522
PART. PURCHASE - TOTAL	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
PART. SALES - TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ADJ NET CAPABILITY	669	703	669	703	669	703	669	703	669	558	524	558	524	558	524
NET RESERVE CAP OBLIG	109	110	110	111	112	113	115	114	116	116	118	118	120	119	121
TOTAL FIRM CAP OBLIG	834	842	846	852	860	866	879	876	891	886	904	895	917	904	929
SURPLUS OR DEFICIT(-) CAP	-165	-139	-177	-149	-191	-163	-210	-173	-222	-328	-380	-337	-393	-346	-405

Table 5-J
2006-2020 High Growth Planning Scenario Load & Capability Prior to Resource Plan Information
Includes Resources Set at 2005 Accreditation Levels (MW)

For Demonstration Purposes Only - Do Not Use as Final OTP Load & Capability

MAPP LOAD & CAPABILITY	WIN	SUM	WIN	SUM	WIN	SUM	WIN	SUM	WIN	SUM	WIN	SUM	WIN	SUM	WIN
CALCULATION	2005	2006	2006	2007	2007	2008	2008	2009	2009	2010	2010	2011	2011	2012	2012
SEASONAL MAX. DEMAND	812	739	829	758	840	771	851	785	866	803	878	818	889	832	905
SCHEDULE L PURCHASES	80	29	80	29	80	29	80	29	80	29	80	29	80	29	80
SEASONAL SYSTEM DEMAND	732	710	749	729	760	742	771	756	786	774	798	789	809	803	825
ANNUAL SYSTEM DEMAND	732	732	749	749	760	760	771	771	786	786	798	798	809	809	825
FIRM PURCHASES - TOTAL	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
FIRM SALES - TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SEASONAL ADJ NET DEMAND	726	705	743	724	754	737	765	751	780	769	792	784	803	798	819
ANNUAL ADJ NET DEMAND	726	726	743	743	754	754	765	765	780	780	792	792	803	803	819
NET GENERATING CAP	701	667	701	667	701	667	701	667	701	667	701	667	701	667	701
PART. PURCHASE - TOTAL	52	52	52	52	52	52	52	52	52	2	2	2	2	2	2
PART. SALES - TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ADJ NET CAPABILITY	753	719	753	719	753	719	753	719	753	669	703	669	703	669	703
NET RESERVE CAP OBLIG	109	109	111	111	113	113	115	115	117	117	119	119	120	120	123
TOTAL FIRM CAP OBLIG	835	814	854	835	867	850	880	866	897	886	911	903	923	918	932
SURPLUS OR DEFICIT(-) CAP	-82	-95	-101	-116	-114	-131	-127	-147	-144	-217	-208	-234	-220	-249	-228

MAPP LOAD & CAPABILITY	SUM	WIN	SUM	WIN	SUM	WIN	SUM	WIN	SUM	WIN	SUM	WIN	SUM	WIN	SUM
CALCULATION	2013	2013	2014	2014	2015	2015	2016	2016	2017	2017	2018	2018	2019	2019	2020
SEASONAL MAX. DEMAND	852	916	865	928	880	943	900	954	914	965	928	975	942	986	956
SCHEDULE L PURCHASES	29	80	29	80	29	80	29	80	29	80	29	80	29	80	29
SEASONAL SYSTEM DEMAND	823	836	836	848	851	863	871	874	885	885	899	895	913	906	927
ANNUAL SYSTEM DEMAND	825	836	836	848	851	863	871	874	885	885	899	899	913	913	927
FIRM PURCHASES - TOTAL	5	6	5	6	5	6	5	6	5	6	5	6	5	6	5
FIRM SALES - TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SEASONAL ADJ NET DEMAND	818	830	831	842	846	857	866	868	880	879	894	889	908	900	922
ANNUAL ADJ NET DEMAND	819	830	831	842	846	857	866	868	880	879	894	893	908	907	922
NET GENERATING CAP	667	701	667	701	667	701	667	701	667	556	522	556	522	556	522
PART. PURCHASE - TOTAL	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
PART. SALES – TOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ADJ NET CAPABILITY	669	703	669	703	669	703	669	703	669	558	524	558	524	558	524
NET RESERVE CAP OBLIG	123	125	125	126	127	129	130	130	132	132	134	134	136	136	138
TOTAL FIRM CAP OBLIG	941	955	956	968	973	986	996	998	1012	1011	1028	1023	1044	1037	1060
SURPLUS OR DEFICIT(-) CAP	-272	-252	-287	-265	-304	-283	-327	-295	-343	-453	-504	-465	-520	-478	-536

5-12 Forecast & Capability