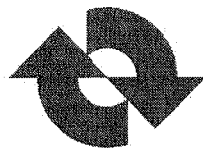


# Load Forecast 2009–2019



**Énergie NB Power**

Issued: January 2009

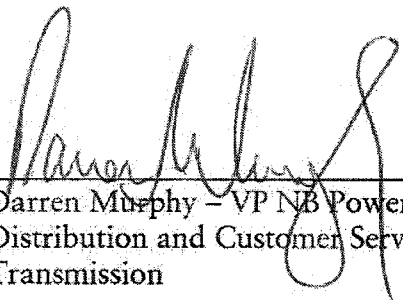
## 2009-2019 LOAD FORECAST



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Prepared: December 2008 - January 2009

Issued: January 2009

# 2009-2019 LOAD FORECAST

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## **FOREWORD**

This report documents the forecast of the electricity requirements of the in-province customers of NB Power Distribution and Customer Service Corporation (Disco) for the ten-year period from 2009/10 to 2018/19.

A load forecast is prepared based on a cause and effect analysis of past loads and trends. The cause and effect analysis is combined with data gathered through customer surveys and assessments of economic, demographic, technological and other factors that will affect the utilization of electrical energy. Appendix 1 summarizes the key assumptions used in this forecast

In addition to the forecast requirements of each sales classification and total energy supply by month, this document includes a forecast of the annual and monthly peak hour demands (the total amount of energy required in a one-hour period). Finally, the document includes the forecast annual system load factor (the average demand as a percentage of the peak hour demand). A management discussion of the forecast is included that compares the forecast to history and highlights the reasons for abnormalities.

The forecast results are used as follows:

- For the financial, facilities and supply planning activities of Disco;
- To support the New Brunswick System Operator's province-wide forecasting and assessment activities;
- To provide NB Power Generation Corporation with a forecast of in-province requirements.
- To provide NB Power Strategic Planning with long-term energy & demand requirements.

Energy requirements and the peak hour demand are affected by weather conditions, the most significant being temperature. The energy forecast is based on 30-year average temperatures (1971-2000). The annual demand forecast is based on the historical peak demands, which occur at a weighted average temperature of -24°C.

Actual experience is likely to differ from the forecast and such differences are usually larger in later years. Variations from the forecast can affect future financial and facilities requirements. This document includes a discussion of potential sources of variance and sensitivities, as well as a discussion of forecast accuracy over various timeframes.

## 1.0 SUMMARY

Electrical energy required to meet the in-province load is forecast to increase from 13,753 GWh in fiscal year 2008/09 to 15,096 GWh in fiscal year 2018/19 as shown in Table 1. During the same period, the maximum one-hour peak demand is forecast to increase from 2,980 MW to 3,180 MW.

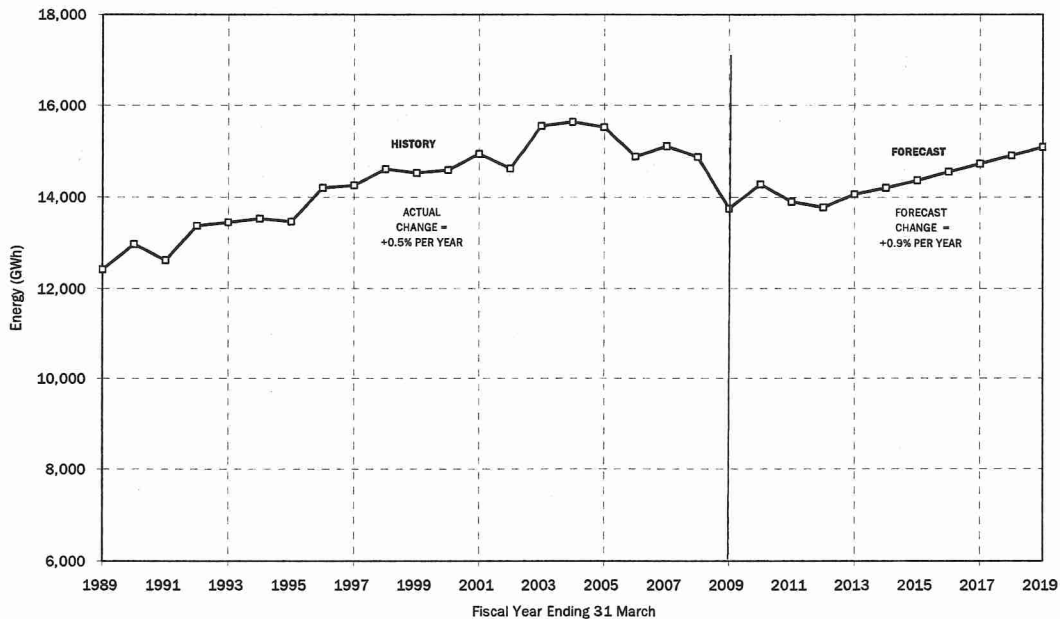
**Table 1: Forecast Summary**

FISCAL YEAR	ENERGY SUPPLY			PEAK DEMAND		
	GWh	ANNUAL INCREASE		MW	ANNUAL INCREASE	
		GWh	%		MW	%
<b>ACTUAL</b>						
2007/08	14,883			2,939		
<b>OUTLOOK</b>						
2008/09	13,753	-1130	-7.6%	2,980	41	1.4%
<b>FORECAST</b>						
2009/10	14,284	531	3.9%	3,000	20	0.7%
2010/11	13,903	-381	-2.7%	2,930	-70	-2.3%
2011/12	13,779	-124	-0.9%	2,940	10	0.3%
2012/13	14,066	287	2.1%	2,970	30	1.0%
2013/14	14,205	139	1.0%	2,990	20	0.7%
2014/15	14,368	163	1.1%	3,020	30	1.0%
2015/16	14,555	187	1.3%	3,060	40	1.3%
2016/17	14,732	177	1.2%	3,100	40	1.3%
2017/18	14,913	181	1.2%	3,140	40	1.3%
2018/19	15,096	183	1.2%	3,180	40	1.3%
Overall Increase (from 2008/09)	1,343			200		
Average 10-Year Annual Increase			0.9%			0.7%

The annual energy forecast and historical requirements are shown in Figure 1. Overall, energy is forecast to grow an average of 0.9 percent during the 2009/10 to 2018/19 period, compared to annual growth of 0.5 percent over the last 20 years.

In 2004/05, Disco's energy requirements crested and began to decline due to a number of industrial operations being closed in the pulp & paper, chemical and mining sectors. Numerous industrial distribution customers in the forestry sector also closed or reduced operational levels as market conditions for their products deteriorated. Warmer temperatures over this period have also suppressed actual loads and growth over the last 20 years. Prior to 2004/05, the annual 20 year average growth rate was 2.2 percent.

**Figure 1: Annual Energy Requirements**

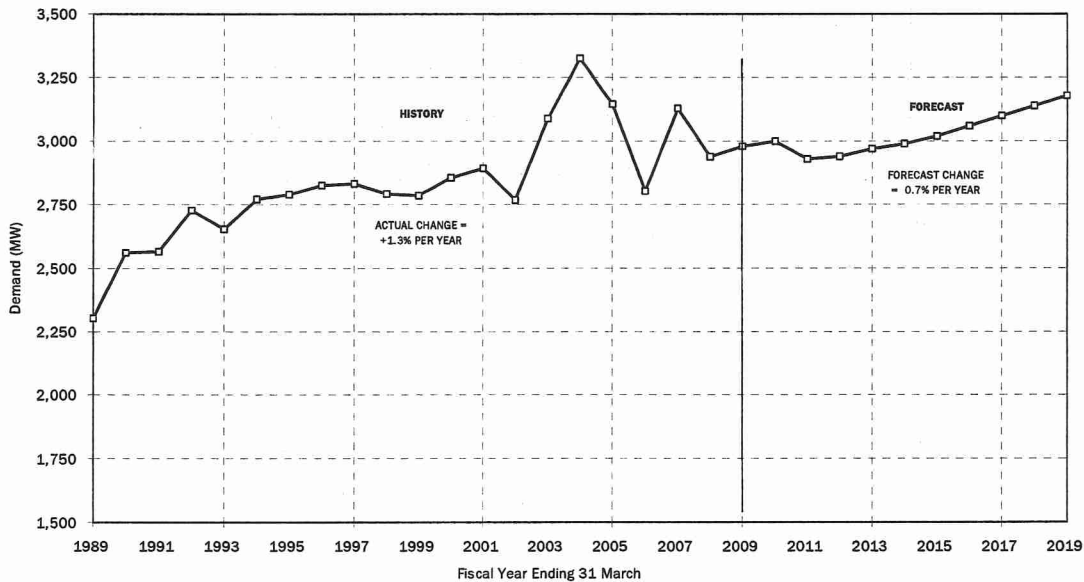


Annual forecasted growth is not uniform over the forecast period and growth in the early years of the forecast deviates from long-term historical growth. Disco's energy requirements are forecasted to increase by 3.9 percent in 2009/10, decline in 2010/11 and 2011/12 and then increase for the remainder of the forecast period. In 2009/10, high growth is expected even though the Provincial economy is not expected to grow (zero

GDP growth). Disco's higher energy requirements are being driven by stronger industrial sales from the LNG terminal station at Canaport and the beginning of drilling of a second Potash mine in Sussex. Also, the year-over-year increase is affected by warmer than normal temperatures in 2008/09. The negative growth in the following two years results from the publicly announced closure of Brunswick Mining & Smelting. This closure more than offsets any growth that would be expected in these years. The closure of this operation spans two fiscal years, which results in energy requirement decreases in both 2010/11 and 2011/12. The 2.1 percent growth in 2012/13 results from Provincial economic growth and the impact of the second potash mine coming into operation. In year five of the forecast, annual growth becomes more uniform as it returns closer to the long-term historical growth seen prior to 2004/05.

The annual demand forecast and historical loads are shown in Figure 2. The peak hour demand is forecasted to grow at an average annual rate of 0.7 percent, compared to annual growth of 1.3 percent over the last 20 years.

**Figure 2: Annual Demand Forecast**



The peak-hour demand forecast trend is similar to energy, except that it is forecasted to decline only in one fiscal year, 2010/11. This results from the timing of the closure of the Brunswick Mining and Smelting operations. Large variations in actual demands during the 2002/03 to 2006/07 period predominately result from industrial closures and extreme low temperatures at the time of system peak.

Total sales by sector are shown in Table 2.

**Table 2: Total Sales By Sector**

FISCAL YEAR	RESIDENTIAL (GWh)	GENERAL SERVICE (GWh)	STREET LIGHTS (GWh)	INDUSTRY (GWh)
<b>ACTUAL</b>				
2007/08	5,556	2,884	90	5,697
<b>OUTLOOK</b>				
2008/09	5,583	2,936	90	4,489
<b>FORECAST</b>				
2009/10	5,673	2,953	90	4,614
2010/11	5,723	2,909	91	4,431
2011/12	5,759	2,889	91	4,338
2012/13	5,789	2,887	91	4,588
2013/14	5,819	2,903	91	4,678
2014/15	5,872	2,934	92	4,747
2015/16	5,933	2,976	92	4,819
2016/17	5,995	3,024	92	4,878
2017/18	6,066	3,065	92	4,938
2018/19	6,141	3,105	92	4,998
Overall Increase (from 2008/09)	558	169	2	509
Average 10-Year Annual Increase	1.0%	0.6%	0.2%	1.1%

Annual sales growth in the Industrial and Residential sectors is forecasted to be the strongest over the ten year forecast period.

## **2.0 LOAD FORECAST 2009 TO 2019**

### **2.1 Introduction**

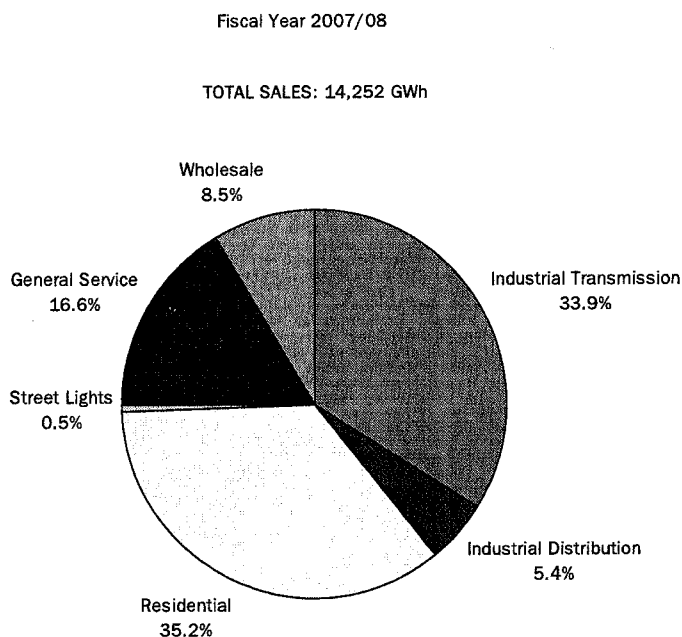
For forecasting purposes, Disco's electrical requirements are divided into three main groups: residential, general service, and industrial. The grouping reflects similarity in end uses of electricity; that is, the electrical requirements of customers in each group are similar and the customers within each group are to some extent homogenous. As a result electricity requirements within each group are affected by similar factors.

The residential classification includes year-round and seasonal households, churches, and farms. The general service classification comprises mostly commercial and institutional establishments. The industrial classification is for customers involved in the extraction of raw materials or in the manufacturing and processing of goods.

The residential, general service and industrial forecasts are then separated into six customer classifications - Residential, General Service, Street Lighting, Industrial Distribution, Industrial Transmission, and Wholesale (includes the sales to the preceding five classifications by the municipal utilities in the cities of Saint John and Edmundston).

Forecasts by customer classification are required for facilities and financial planning. The relative proportions of Disco's energy sales in fiscal year 2007/08 to each of the six customer classifications are shown in Figure 3. The following sections outline the methodology, inputs and results of the annual energy sales forecast. Also included is the monthly distribution of the annual energy requirements and the associated peak hour demand.

**Figure 3: Energy Sales by Customer Classification**



## **2.2 Residential Sales Forecast**

### **2.2.1 General**

In fiscal year 2007/08, residential customers accounted for 39 percent of the total in-province electrical energy sales (35 percent directly by Disco and four percent by Wholesale utilities).

The residential classification is made up mostly of year-round domestic (household) customers. It also includes some non-domestic customers such as farms and churches, which accounts for less than five percent of the total residential energy requirements. Also included in the residential classification are seasonal customers that account for less than one percent of the residential requirements. The electrical requirements for seasonal customers are small and are forecast by extrapolating historical trends.

Increases in the residential forecast are driven mainly by the addition of new customers and increasing annual household usage, somewhat offset by reductions associated with energy efficiency, natural gas, and price elasticity.

### **2.2.2 End Use Model**

Average household energy is comprised of electric space heating (45 percent), water heating (20 percent) and other uses (35 percent). The mixture of household energy can change over time as a result of a number of factors including; future penetration levels of electric space and water heating, as well as appliance trends and efficiency standards.

To account for such trends, the forecast for the total residential class is based upon an end use model that requires identification of the various applications of electricity. These applications include space heating, water heating and other household appliances. The penetration (saturation) level and the average use for each household application provide the basis for average use per customer. The number of customers is based on an analysis of population trends.

The model can be simply stated as:

$$\text{Energy} = \text{Year round Customers} \cdot \text{Average Use per Customer}$$

where,

$$\text{Average Use per Customer} = \sum (\text{Appliance} \cdot \text{Average Use})$$

Therefore,

$$\text{Energy} = \text{Year round Customers} \cdot \sum (\text{Appliance} \cdot \text{Average Use})$$

### **2.2.2.1 Number of Year-Round Customers**

In 2007/08, there were 322,566 year-round residential customers in New Brunswick. Of those, 286,312 were served directly by Disco and 36,254 were served by the municipal utilities in the cities of Saint John and Edmundston. The population of New Brunswick is forecast to increase by 4,200 people over the forecast period, which represents a 0.06 percent average annual increase. In New Brunswick, people are expected to continue living in smaller households and will result in an increase of 32,685 new year-round customers over the forecast period (see Appendix 2). As a result, the average number of persons per household is expected to decline from 2.35 in 2007/08 to 2.10 in 2018/19.

### **2.2.2.2 Appliance Efficiency Model**

An appliance efficiency model is used to estimate the changes in per unit consumption for a number of major household appliances: refrigerators, freezers, dishwashers, clothes washers and clothes dryers. Data on penetration of appliances, the probability of a particular customer acquiring an appliance and the expected life of the particular appliance is used to determine the expected average use for each appliance. All new appliances are assumed to meet existing energy efficiency standards so as older appliances are replaced, the energy efficiency of stock appliances increases over time.

The penetration levels of major household electrical appliances were based on data from Natural Resources Canada and compared to results from Disco's 2008 Energy Planning Survey of residential customers.

In recent years, most new homes have opted for electric space heating (80 percent) and water heating (90 percent). Despite the continued expansion of the natural gas network, this trend is assumed to continue.

In addition to the penetration levels of major appliances, estimates of average energy use per appliance are required to determine the forecast of annual energy consumption per

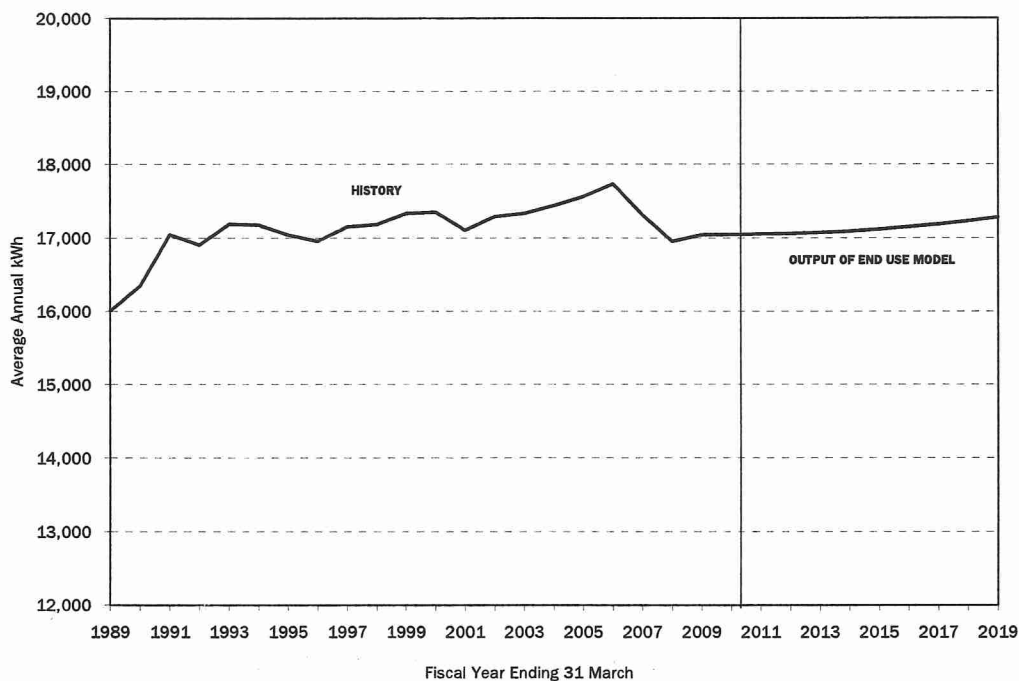
customer. The annual energy required for space heating is derived by analyzing data from the previous year's sales. Average energy required for water heating is based on historical trending of kilowatt-hours per person. For the remaining appliances, estimates of average annual usage are based on an appliance efficiency model.

### **2.2.2.3 Average Energy Use Per Year-Round Customer**

As indicated previously, the annual energy requirement of the year-round customers is a function of the stock of electrical appliances and the extent to which these appliances are used. Since 1987/88, the average use for year-round residential customers has increased from 14,942 kWh/year to 16,954 kWh/year in 2007/08; an average annual increase of 0.6 percent. This growth resulted from increases in the penetration of electric space heating and increased consumption from household appliances and plug load from electronic devices and was somewhat offset by reduced water heating needs per household. Over the last number of years, there has been little growth in the total consumption per year-round customer, as improvements in construction standards and conservation efforts by customers are offsetting growth.

The end use model predicts that average residential sales per household in fiscal year 2018/19 will be 17,282 kWh/year before any adjustments (energy efficiency, natural gas, price elasticity), an average annual increase 0.1% over the forecast period as shown in Figure 4. The results of the base residential forecast (total average use per customer times the number of customers) are adjusted for effects of incremental energy efficiency programs, natural gas conversions and price elasticity. The nature of these adjustments is described in Section 2.5.

**Figure 4: Residential Sales Per Household**



### **2.2.3 Residential Forecast Results**

The total New Brunswick residential electrical energy requirements are forecast to increase from 5,583 GWh in fiscal year 2008/09 to 6,141 GWh in fiscal year 2018/19.

The net increase in the forecast period is 558 GWh, an annual average increase of 1.0 percent. Year over year growth is higher in later years of the forecast as a result of reduced price elasticity impacts and the declining impact of natural gas due to the number of electric conversions to gas reaching maturity.

Table 3 summarizes the history and forecast of residential sales.

**Table 3: Residential Energy Sales**

FISCAL YEAR	TOTAL SALES (GWh)	ANNUAL INCREASE		SALES BY DISCO (GWh)	SALES BY MUNICIPAL UTILITIES (GWh)
		GWh	%		
<u>ACTUAL</u>					
2003/04	5,496			4,923	573
2004/05	5,567	71	1.3%	4,992	575
2005/06	5,336	-231	-4.1%	4,798	538
2006/07	5,352	16	0.3%	4,824	528
2007/08	5,556	204	3.8%	5,010	546
<u>OUTLOOK</u>					
2008/09	5,583	27	0.5%	5,034	549
<u>FORECAST</u>					
2009/10	5,673	90	1.6%	5,123	550
2010/11	5,723	50	0.9%	5,170	553
2011/12	5,759	36	0.6%	5,205	554
2012/13	5,789	30	0.5%	5,233	556
2013/14	5,819	30	0.5%	5,262	557
2014/15	5,872	53	0.9%	5,311	561
2015/16	5,933	61	1.0%	5,369	564
2016/17	5,995	62	1.0%	5,427	568
2017/18	6,066	71	1.2%	5,492	574
2018/19	6,141	75	1.2%	5,561	580
Overall Increase (from 2008/09)	558			527	31
Average 10-Year Annual Increase		56	1.0%		

## 2.3 General Service and Street Lighting Forecast

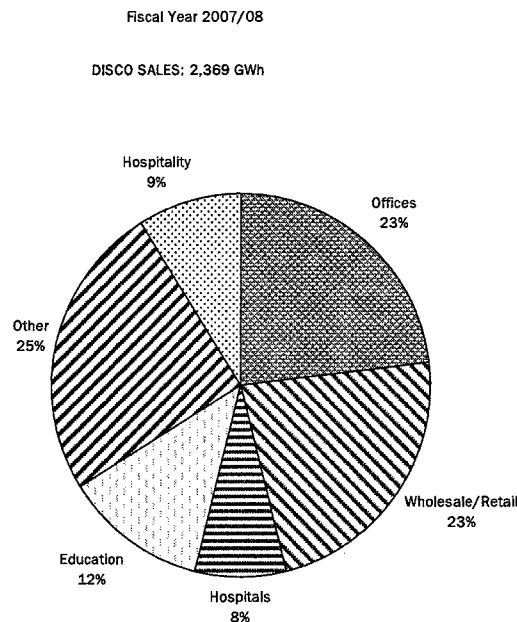
### 2.3.1 General

In the 2007/08 fiscal year, general service energy requirements accounted for 21 percent of the total in-province energy sales (17 percent directly by Disco and four percent by Wholesale utilities). Street lighting sales, which include unmetered services, account for an additional one percent of total provincial sales.

Sales to the general service classification include commercial (retail/wholesale, hotel/motel/restaurants, offices) and institutional customers (hospitals, schools, universities). At the end of March, 2008, there were 24,798 general service customers served by Disco and an additional 4,734 served by the wholesale utilities.

The proportions of total general service sales to each of the major customer groups are shown in Figure 5.

**Figure 5: General Service Sales by Industry Groups**



Approximately 70 percent of general service sales are commercial in nature and, therefore, considered to be directly related to the level of provincial economic activity. The remaining 30 percent of general service sales are to the institutional sector, which is indirectly related to the economic activity in the province. As the economic activity of the province increases, the activity in the institutional sector is also likely to increase.

### **2.3.2 Econometric Model**

General Service sales in New Brunswick reflect the level of commercial activity and are closely related to the provincial Gross Domestic Product. In addition, weather affects the level of sales. The sector is also sensitive to the price of electricity. The general service model relates changes in the level of sales to changes in the provincial GDP, the number of heating degree days, the real price of electricity, and the previous year's level of sales.

Annual gross domestic product growth of 2.0 percent is forecast between 2009/10 and 2018/19, which is based on a review of publicly available short-term forecasts by major financial institutions. The reasonableness of the economic growth forecast is checked through consultation with internal planning staff and informal discussions with the provincial Department of Finance. Annual growth is not uniform to reflect current economic challenges and capital projects that are planned. In 2009/10, no growth is assumed based on the latest Provincial Budget Update, followed by 1.8% in 2010/11 to reflect the Government's announced capital infrastructure investment plans. Growth after 2010/11 is expected to return to more historical levels.

Heating degree days were based on Environment Canada's weighted average provincial total for the 30-year period 1971 to 2000. The price elasticity is based on anticipated real price increases (actual rate changes less inflation) in general service rates over the forecast period. Like all rate classes, General Service rates are assumed to increase by 3 percent in 2009/10 and 2010/11. Beginning in 2011/12, General Service rates are assumed to not increase for five years to gradually allow Disco to lower the revenue to cost ratio of this class. The rate increase assumptions tend to stunt growth in early years

of the forecast. Energy efficiency savings are assumed to ramp-up quickly in the forecast, which also suppresses growth in the early years of the forecast.

Detailed model parameters and the “fit” of the model, which illustrates the performance of the model, are included in Appendix 3.

### **2.3.3 General Service Forecast Results**

Table 4 summarizes history and forecast of general service sales. The total New Brunswick general service energy requirements are forecast to increase from 2,936 GWh in fiscal year 2007/08 to 3,105 GWh in fiscal year 2018/19. The net increase in the forecast period is 169 GWh, an annual average increase of 0.6 percent.

Year over year growth is higher in later years of the forecast as a result of reduced price elasticity impact and the declining impact of natural gas on existing sales. Wholesale sales are expected to decline by 7 GWh over the forecast as natural gas adjustments reduce Wholesale sales more the Disco’s sales on a percentage basis. The general service forecast also includes estimates for improved energy efficiency as a result of Efficiency New Brunswick programs. These programs will reduce general service sales by an average of 8 GWh per year. Program savings are expected to ramp-up over a three year period to 10 GWh per year in 2012/13.

**Table 4: General Service Energy Sales**

FISCAL YEAR	TOTAL SALES (GWh)	ANNUAL INCREASE		SALES BY DISCO (GWh)	SALES BY MUNICIPAL UTILITIES (GWh)
		GWh	%		
<u>ACTUAL</u>					
2003/04	2,758			2,258	500
2004/05	2,787	29	1.1%	2,285	502
2005/06	2,757	-30	-1.1%	2,264	493
2006/07	2,799	42	1.5%	2,291	508
2007/08	2,884	85	3.0%	2,369	515
<u>OUTLOOK</u>					
2008/09	2,936	52	1.8%	2,412	524
<u>FORECAST</u>					
2009/10	2,953	17	0.6%	2,429	525
2010/11	2,909	-44	-1.5%	2,396	515
2011/12	2,889	-20	-0.7%	2,383	508
2012/13	2,887	-2	-0.1%	2,387	501
2013/14	2,903	16	0.6%	2,404	499
2014/15	2,934	31	1.1%	2,433	501
2015/16	2,976	42	1.4%	2,472	504
2016/17	3,024	48	1.6%	2,515	508
2017/18	3,065	41	1.4%	2,552	512
2018/19	3,105	40	1.3%	2,586	517
Overall Increase (from 2008/09)	169			174	(7)
Average 10-Year Annual Increase		17	0.6%		

### 2.3.4 Street Lighting Forecast Results

Street lighting sales include unmetered energy sold for street and area lighting plus other services such as sign lighting and traffic signals. The key factors affecting sales to this customer classification include new residential and commercial development. Forecast details are shown in Appendix 4. The use of more energy efficient luminaires is expected to continue limiting the average growth rate in street lighting energy sales, which is forecast to be 0.2 percent. Table 5 summarizes history and forecast of street lighting sales.

The total New Brunswick street light energy requirements are forecast to increase from 90 GWh in fiscal year 2008/09 to 92 GWh in fiscal year 2018/19. The net increase over the forecast period is 2 GWh.

**Table 5: Street Light Sales**

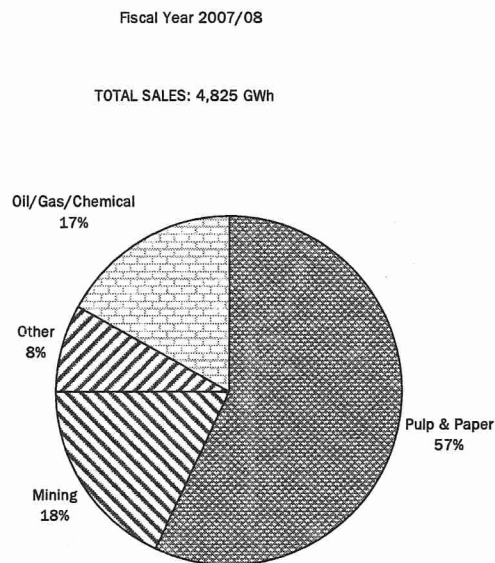
FISCAL YEAR	TOTAL SALES GWh	ANNUAL INCREASE		SALES BY DISCO GWh	SALES BY MUNICIPAL UTILITIES GWh
		GWh	%		
<u>ACTUAL</u>					
2003/04	93			74	19
2004/05	93	0	0.0%	74	19
2005/06	94	1	1.1%	75	19
2006/07	90	-4	-4.3%	75	15
2007/08	90	0	0.0%	75	15
<u>OUTLOOK</u>					
2008/09	90	0	0.0%	75	15
<u>FORECAST</u>					
2009/10	90	0	0.4%	75	15
2010/11	91	0	0.4%	76	15
2011/12	91	0	0.3%	76	15
2012/13	91	0	0.2%	76	15
2013/14	91	0	0.2%	76	15
2014/15	92	0	0.2%	77	15
2015/16	92	0	0.2%	77	15
2016/17	92	0	0.2%	77	15
2017/18	92	0	0.2%	77	15
2018/19	92	0	0.2%	77	15
Overall Increase <i>(from 2008/09)</i>	2			2	0
Average 10-Year Annual Increase		0	0.2%		

## 2.4 Industrial Sales Forecast

### 2.4.1 General

New Brunswick's industrial customers consume about 40 percent of the total in-province electrical energy. Industrial customers are divided into two groups: industrial transmission (customers who are served at transmission voltages of 34 kV and above) and industrial distribution (customers who are served at distribution voltages of 25 kV or less). There are 39 customers served at the transmission voltages, which constitute the majority of industrial sales. The portions of total industrial transmission sales for fiscal year 2007/08 to each of the main industry groups are shown in Figure 6.

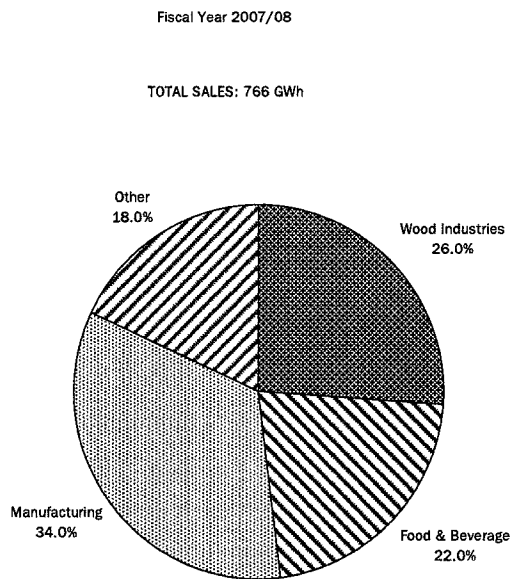
**Figure 6: Industrial Transmission Sales**



The industrial transmission forecast includes the closure of two mining operations, Brunswick Mining & Smelting and NB Coal, within the forecast period. These closures are in addition to operations that have been permanently closed prior to the preparation of this forecast.

Disco serves some 1,900 industrial customers at distribution voltages, while the wholesale utilities serve approximately another 70. Together they account for approximately 14 percent of the total industrial electrical energy requirements. The major industrial distribution groups are wood industries, food and beverage, manufacturing, and other operations. The portions of Disco's industrial distribution sales to the main industry groups for fiscal year 2007/08 are shown in Figure 7.

**Figure 7: Industrial Distribution Sales**



An overview of the key industrial groups and the factors that can affect their future electrical requirements are briefly outlined in the following sections.

#### **2.4.2 Pulp and Paper Industry**

In fiscal year 2003/04, sales to the Pulp and Paper industrial group were some 67 percent of the industrial transmission sales, compared to 57 percent in 2007/08. This sales reduction results from the closure of two paper mills, Bowater Maritimes & UPM Kymmene due to world market and economic conditions. Additional mill closures are not assumed to occur during the forecast period.

#### **2.4.3 Mining and Smelting Industry**

The electricity intensive mineral industries in New Brunswick are related to base metal and potash mines. The base metal industry includes mining and concentration of ore bodies with zinc, copper, lead and silver. Zinc concentrate is the primary product that is shipped out of the province to smelters in Canada and Europe for production of zinc metal. Lead concentrate is refined into lead ingots in Belledune. The potash mines in southeast New Brunswick export essentially their entire product. Production is tied to the worldwide demand for potash, used in fertilizer. The size and quality of the ore body limit the useful life of mines. Brunswick Mining & Smelting has publicly announced the planned closure of its operation in 2010, while Potash of Saskatchewan has announced an expansion. The impacts of both announcements have been included in the forecast.

#### **2.4.4 Industrial Forecast Model**

The historic increases in the total industrial electricity requirements can be linked to increases in provincial gross domestic product (GDP) for the goods producing industries. Over the past twenty-two years, for every one percent increase in the goods producing gross domestic provincial product, the industrial electricity requirements increased by 0.89 percent. In previous forecasts, a one percent increase in the goods producing gross domestic provincial product would result in industrial electricity requirements increasing by more than one percent. This lower sensitivity to economic activity is attributed to recent industrial closures being included in the historical data. Statistical details on the

industrial model are provided in Appendix 5.

The total industrial electric energy requirements are based on a forecast of goods producing gross domestic provincial product and its historical relationship with electricity requirements. The resulting industrial electrical requirements are then split between customer-owned generation and the amount to be supplied by Disco and municipalities. An annual forecast for each of the industrial transmission customers is prepared based on input from Disco's account management team and the sum is compared to the output of the econometric model. This allows the forecast to be adjusted to include known industrial closures and expansions.

#### **2.4.5 Industrial Forecast Results**

The industrial forecast is based on growth in the goods-producing GDP, and is derived from the historical relationship between goods-producing GDP and overall GDP in New Brunswick. The key input assumption is for an average annual growth in GDP of 2.0 percent over the forecast period and announced mining closures and expansions.

Energy efficiency savings are expected as a result of Efficiency New Brunswick's industrial programs. Savings will begin to be realized in 2009/10 and increase to 110 GWh per year by the fourth year of the forecast.

Natural gas is not expected to directly replace existing industrial electrical load through fuel switching since most electricity sales to industry, over 90 percent, are for motive power (motors or pumps) and lighting. Natural gas will continue to displace fuels that produce process heating, currently generated by oil or hog fuels.

Large industrial transmission customers now have the option of choosing an alternate supplier of electricity or of adding or increasing self-supply. No allowance is made in the forecast for any loss of customer load in either of these manners. Currently, there are no announcements for such projects.

The history and forecast of the total industrial electricity requirements are shown in Table 6.

**Table 6: Industrial Energy Requirements**

FISCAL YEAR	INDUSTRIAL REQUIREMENTS	CUSTOMER GENERATION	TRANSMISSION SALES	DISTRIBUTION SALES
	GWh	GWh	GWh	GWh
<b>ACTUAL</b>				
2003/04	7,065	800	5,342	923
2004/05	6,928	800	5,181	947
2005/06	6,448	800	4,708	940
2006/07	6,881	800	5,166	915
2007/08	6,497	800	4,825	872
<b>OUTLOOK</b>				
2008/09	5,129	640	3,711	778
<b>FORECAST</b>				
2009/10	5,254	640	3,836	778
2010/11	5,071	640	3,645	786
2011/12	4,978	640	3,542	796
2012/13	5,228	640	3,782	806
2013/14	5,318	640	3,861	817
2014/15	5,387	640	3,919	828
2015/16	5,459	640	3,981	838
2016/17	5,518	640	4,030	848
2017/18	5,578	640	4,079	859
2018/19	5,638	640	4,128	870
Overall Increase (from 2008/09)	509	0	417	92
Average 10-Year Annual Increase	1.0%	0.0%	1.1%	1.1%

Sales to transmission voltage customers are shown in Table 7. Both firm sales and non-firm sales are shown. Non-firm sales, to transmission customers, make-up part of their overall energy requirement; however, infrequent, short duration interruptions can be accommodated by the customer. While non-firm energy and demand are included in the forecast of in-province requirements, they are excluded for capacity planning purposes.

The forecast decreases in 2010/11 and 2011/12 as a result of the closure of operations at Brunswick Mining & Smelting. The significant increase in 2012/13 results mainly from the Potash of Saskatchewan expansion.

The base for forecasting industrial growth is the 2008/09 outlook. In 2008/09, total industrial sales were over 1 TWh lower than the previous year. This reduction results from the closures of two paper mills; Bowater Maritimes and UPM Kymmene, as well as Olin Chemical and Blue Note Caribou. The reduction in non firm sales results from industrial closures and two customers switching a portion of their interruptible loads to firm supply in early 2008/09.

**Table 7: Industrial Transmission Energy Sales**

FISCAL YEAR	TOTAL	ANNUAL INCREASE		FIRM	NON-FIRM
	SALES GWh	GWh	%	SALES GWh	SALES GWh
<b>ACTUAL</b>					
2003/04	5,342			4,325	1,017
2004/05	5,181	-161	-3.0%	4,200	981
2005/06	4,708	-473	-9.1%	3,917	791
2006/07	5,165	457	9.7%	4,290	875
2007/08	4,823	-342	-6.6%	3,972	851
<b>OUTLOOK</b>					
2008/09	3,711	-1112	-23.1%	3,368	343
<b>FORECAST</b>					
2009/10	3,836	125	3.4%	3,461	375
2010/11	3,645	-191	-5.0%	3,270	375
2011/12	3,542	-103	-2.8%	3,167	375
2012/13	3,782	240	6.8%	3,407	375
2013/14	3,861	80	2.1%	3,486	375
2014/15	3,919	58	1.5%	3,544	375
2015/16	3,981	62	1.6%	3,606	375
2016/17	4,030	49	1.2%	3,655	375
2017/18	4,079	49	1.2%	3,704	375
2018/19	4,128	49	1.2%	3,753	375
Overall Increase (from 2008/09)	417			385	32
Average 10-Year Annual Increase		42	1.1%		

Sales to distribution voltage customers (both Disco and Wholesale) are shown in Table 8. The net increase over the forecast period is 92 GWh. Economic and market conditions have resulted in significant reductions in industrial distribution sales since 2004/05. A number of sawmills and forestry-related customers have closed or reduced operations. Historical industrial distribution sales tend to be cyclical in nature. Growth is expected to begin in 2010/11 and sales are expected to return close to 2007/08 levels by the end of the forecast period.

**Table 8: Industrial Distribution Energy Sales**

FISCAL YEAR	TOTAL SALES GWh	ANNUAL INCREASE		SALES BY DISCO GWh	SALES BY MUNICIPAL UTILITIES GWh
		GWh	%		
<u>ACTUAL</u>					
2003/04	923			828	95
2004/05	947	24	2.6%	855	92
2005/06	939	-8	-0.8%	844	95
2006/07	915	-24	-2.6%	811	104
2007/08	872	-43	-4.7%	766	106
<u>OUTLOOK</u>					
2008/09	778	-94	-10.8%	683	95
<u>FORECAST</u>					
2009/10	778	0	0.0%	683	95
2010/11	786	8	1.0%	690	96
2011/12	796	10	1.3%	699	97
2012/13	806	10	1.3%	708	98
2013/14	817	11	1.4%	718	99
2014/15	828	11	1.3%	728	100
2015/16	838	10	1.2%	737	101
2016/17	848	10	1.2%	746	102
2017/18	859	11	1.3%	756	103
2018/19	870	11	1.3%	766	104
Overall Increase (from 2008/09)	92			83	9
Average 10-Year Annual Increase		9	1.1%		

## 2.5 Summary of Major Forecast Adjustments

### 2.5.1 Natural Gas

The natural gas service territory is based on the existing transmission pipelines. The load forecast provides for the effect of natural gas on electric sales. Specific estimates are included for each sector. The impact of natural gas was considered for both existing and new sales. Space heating, water heating, commercial cooking, and commercial drying are considered as potential markets for natural gas, for both existing and new sales.

The forecast assumes that the displacement of existing electric load by natural gas will occur slower in the early years and increase as more gas infrastructure is put in place. This reflects the current pace of natural gas development. The new load lost to natural gas is modeled as reduced penetration rates for electricity in new sales for the residential and general service sectors.

Table 9 shows the reductions associated with natural gas in existing residential and general service sales year by year.

**Table 9: Cumulative Natural Gas Impacts on Existing Sales**

FISCAL YEAR	TOTAL IMPACT	RESIDENTIAL	GENERAL SERVICE
	GWh	GWh	GWh
2009/10	31	20	11
2010/11	57	34	23
2011/12	86	50	36
2012/13	118	67	51
2013/14	148	84	64
2014/15	171	95	76
2015/16	193	106	87
2016/17	211	116	95
2017/18	224	122	102
2018/19	234	127	107

## 2.5.2 Energy Efficiency

The forecast also includes estimates of energy efficiency measures that consumers are expected to naturally implement and those that are the direct result of Efficiency New Brunswick programs. The impact of improving construction standards in the residential sector is expected to increase the thermal shell efficiency of homes in the province, reducing average heating requirements by 0.25 percent per year. This equates to 79 GWh and 20 MW in the last year of the forecast.

Estimates of Efficiency New Brunswick's program savings are included in the forecast for the Residential, General Service and Industrial classes. These estimates are based on discussions and information from agency staff. These program savings lower the forecast by 366 GWh and 75 MW in 2018/19.

Table 10 shows the energy efficiency estimates used in the forecast.

**Table 10: Energy Efficiency In Final Year of Forecast**

	2018/19 Energy Efficiency	
	GWh	MW
<b>Naturally Occurring:</b>		
Residential (Thermal Shell Improvements)	79	20
<b>Efficiency NB Programs:</b>		
Residential Programs	158	40
General Service Programs	98	20
Industrial Programs	110	15
Sub-Total	366	75
<b>Total</b>	<b>445</b>	<b>95</b>

### **2.5.3 Price Elasticity**

The forecast includes estimates of the effect of changes in price for both residential and general service. The price elasticity adjustment is based on anticipated real price increases in rates over the forecast period. Elasticity effects for the residential sector are estimated only for Disco's portion of residential sales. The effect for general service is provincial in scope, including both Disco and the wholesale customers.

Price elasticity is forecast to reduce residential sales by 288 GWh by 2018/19. General Service sales will be reduced by 253 GWh in the final year, 210 GWh for Disco, and 43 GWh for wholesale.

### **2.6 System Losses**

The delivery of electricity from generation source to the end user involves high voltage transmission, transformation to lower voltages and ultimate distribution to the customers at standard service voltages. There are losses associated with each of these stages.

The amount of losses is a function of the load levels, technical characteristics of the transmission and distribution system and the distance between the generation sources and the customers.

The basis of forecast energy losses on the transmission system is the Open Access Transmission Tariff loss factor, which will increase from 2.5 to 4.0 percent on February 1, 2009. In early 2010/11, transmission losses are assumed to be reduced to 2.5 percent to reflect a more historical generation/purchase dispatch mix that is expected when Point Lepreau returns to service after the refurbishment project. Beginning in early 2011/12, savings from the International Power Line are expected to be realized and the loss factor is estimated to reduce by 0.3 percent thereafter. Loss factors or percentages are then multiplied by the amount of energy delivered over the system to meet Disco's (including its customers) requirements.

Distribution losses are forecast based an analysis of the energy supplied over the distribution system compared to the billed distribution sales. Energy losses on the distribution system are estimated at 4.0 percent of the total distribution supply over the forecast period.

## **2.7 Overall Forecast Results**

### **2.7.1 General**

The total energy supply requirements for Disco are the combined total of the sales to the six customer classifications plus transmission and distribution losses related to those sales.

In order for the forecast to be used effectively in the overall utility planning process, it is necessary to spread the total sales and associated system losses over the year. The monthly spread is particularly useful for planning system operations and estimating the peak hour and non-coincident demands. The following sections outline the overall forecast results of annual requirements by customer class, monthly energy supply and peak hour and non-coincident demands.

### **2.7.2 Annual Requirements**

Results of the residential, general service and industrial forecasts are allocated to the sales classifications and, where applicable, further allocated to the municipal wholesale utilities in the cities of Saint John and Edmundston. Table 11 summarizes the forecast sales to each of the six customer classifications: Residential, General Service, Street Lighting, Industrial Distribution, Industrial Transmission, and Wholesale. Also included in the table are the forecasted transmission and distribution losses, total energy supply (total sales plus losses), associated peak hour and non-coincident demands, and annual load factors.

**Table 11: Annual Energy, Demand, and Load Factor Forecast**

FISCAL YEAR	DISCO'S IN-PROVINCE ENERGY REQUIREMENTS (GWh)									PEAK DEMAND (MW)	LOAD FACTOR (%)	NCP (MW) <sup>1</sup>
	RESIDENTIAL	GENERAL SERVICE	STREET LIGHTS	INDUST. DIST.	DIST. LOSSES	INDUST. TRANS.	WHOLE-SALE	TRANS. LOSSES	TOTAL ENERGY REQUIREMENT			
<b>ACTUAL</b>												
1998/99	4,387	2,037	72	704	315	5,282	1,069	663	14,529	2,786	59.5	
1999/00	4,371	2,093	73	765	320	5,159	1,126	688	14,595	2,856	58.2	
2000/01	4,587	2,111	74	804	332	5,261	1,171	603	14,943	2,893	59.0	
2001/02	4,463	2,119	74	792	333	5,208	1,132	500	14,621	2,768	60.3	
2002/03	4,871	2,219	74	831	358	5,322	1,217	651	15,543	3,089	57.4	
2003/04	4,923	2,258	74	828	373	5,342	1,226	616	15,640	3,326	53.5	
2004/05	4,992	2,285	74	855	335	5,181	1,219	555	15,496	3,146	56.1	
2005/06	4,798	2,264	75	844	371	4,708	1,174	591	14,825	2,803	60.2	2,985
2006/07	4,824	2,291	75	811	350	5,166	1,176	395	15,088	3,129	54.9	3,269
2007/08	5,010	2,369	75	766	330	4,825	1,207	301	14,883	2,939	57.6	3,170
<b>OUTLOOK</b>												
2008/09	5,034	2,412	75	683	319	3,711	1,192	327	13,753	2,980	52.5	3,100
<b>FORECAST</b>												
2009/10	5,123	2,429	75	683	345	3,836	1,194	599	14,284	3,000	54.4	3,110
2010/11	5,170	2,396	76	690	348	3,645	1,188	390	13,903	2,930	54.2	3,070
2011/12	5,205	2,383	76	699	349	3,542	1,183	342	13,779	2,940	53.5	3,110
2012/13	5,233	2,387	76	708	350	3,782	1,179	351	14,066	2,970	54.1	3,140
2013/14	5,262	2,404	76	718	353	3,861	1,179	352	14,205	2,990	54.2	3,160
2014/15	5,311	2,433	77	728	356	3,919	1,186	358	14,368	3,020	54.3	3,190
2015/16	5,369	2,472	77	737	362	3,981	1,193	364	14,555	3,060	54.3	3,230
2016/17	5,427	2,515	77	746	367	4,030	1,202	368	14,732	3,100	54.2	3,270
2017/18	5,492	2,552	77	756	370	4,079	1,214	373	14,913	3,140	54.2	3,310
2018/19	5,561	2,586	77	766	374	4,128	1,226	378	15,096	3,180	54.2	3,350
Growth per year (since 2008/09)	1.0%	0.7%	0.3%	1.2%	1.6%	1.1%	0.3%	1.5%	0.9%	0.7%		0.8%

<sup>1</sup> System actual NCP was not reported prior to market restructuring.

### 2.7.3 Monthly Energy Supply

The annual energy sales are apportioned by month for revenue and cash flow projections. The monthly spread of the annual forecast requirements is also required for scheduling the operation and maintenance of facilities. The monthly energy supply forecast is shown in Table 12.

**Table 12: In-Province Monthly Energy**

Year	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	TOTAL
	(GWh)												
<b>FORECAST</b>													
2009/10	1,178	1,047	936	921	922	965	1,106	1,249	1,506	1,598	1,443	1,412	14,284
2010/11	1,176	1,039	931	890	887	916	1,066	1,211	1,463	1,549	1,401	1,374	13,903
2011/12	1,139	1,003	896	881	881	909	1,061	1,198	1,455	1,568	1,413	1,375	13,779
2012/13	1,166	1,033	926	914	914	941	1,087	1,227	1,483	1,578	1,426	1,372	14,066
2013/14	1,176	1,044	936	923	923	950	1,095	1,238	1,490	1,585	1,435	1,413	14,205
2014/15	1,192	1,058	950	934	935	961	1,107	1,251	1,507	1,603	1,449	1,425	14,368
2015/16	1,206	1,071	963	950	948	973	1,122	1,266	1,527	1,619	1,467	1,443	14,555
2016/17	1,220	1,081	972	962	961	986	1,134	1,280	1,542	1,640	1,483	1,470	14,732
2017/18	1,237	1,093	984	973	970	998	1,149	1,295	1,565	1,659	1,503	1,485	14,913
2018/19	1,252	1,107	997	984	983	1,010	1,164	1,313	1,585	1,681	1,523	1,495	15,096

**2.7.4 Monthly Peak Hour and Non-Coincident Demands**

In addition to the total annual energy, the maximum energy requirement in a one-hour period is also critical for planning system operations and new supply sources. The maximum energy required in a one-hour period is referred to as peak hour demand.

The peak hour demand for each month of the forecast as shown in Table 13 is derived by applying estimated load factors to the forecast monthly energy supply.

As with the monthly energy spread, the peak demands were estimated separately for the base energy and any adjustments (e.g. natural gas, energy pricing, and price elasticity) on a month by month basis. The base energy-associated demand was combined with the adjustment-associated demand to give the final peak demand for each month. Disco is a winter peaking system driven by electric space heating in homes and businesses, with the peak normally occurring in February.

**Table 13: In-Province Monthly Peak Hour Demand**

Year	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	Maximum
	(MW)												
<b>FORECAST</b>													
2009/10	2,160	1,840	1,630	1,580	1,570	1,710	2,080	2,380	2,750	2,970	3,000	2,620	3,000
2010/11	2,190	1,830	1,620	1,530	1,520	1,620	2,020	2,320	2,680	2,890	2,930	2,550	2,930
2011/12	2,140	1,770	1,560	1,520	1,510	1,610	2,010	2,300	2,670	2,910	2,940	2,560	2,940
2012/13	2,180	1,820	1,610	1,570	1,560	1,660	2,060	2,350	2,710	2,940	2,970	2,570	2,970
2013/14	2,200	1,840	1,630	1,580	1,570	1,670	2,070	2,370	2,730	2,950	2,990	2,630	2,990
2014/15	2,230	1,860	1,650	1,600	1,600	1,690	2,100	2,390	2,760	2,990	3,020	2,670	3,020
2015/16	2,250	1,890	1,670	1,630	1,620	1,720	2,120	2,420	2,800	3,020	3,060	2,710	3,060
2016/17	2,280	1,910	1,690	1,650	1,640	1,740	2,150	2,450	2,830	3,060	3,100	2,730	3,100
2017/18	2,310	1,940	1,720	1,670	1,660	1,760	2,180	2,480	2,870	3,100	3,140	2,780	3,140
2018/19	2,340	1,960	1,740	1,690	1,680	1,790	2,210	2,520	2,900	3,140	3,180	2,790	3,180

Non-coincident peak (NCP) is the sum of the distribution, wholesale and industrial transmission peak loads and do not necessarily occur at the same time interval. NCP is used to calculate transmission tariff and ancillary costs. Table 14 shows the monthly non-coincident peak forecast.

**Table 14: Monthly Non-Coincident Peak Demand**

Year	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	Maximum
	(MW)												
<b>FORECAST</b>													
2009/10	2,380	2,080	1,910	1,780	1,770	1,960	2,240	2,510	2,930	3,070	3,110	2,760	3,110
2010/11	2,430	2,100	1,920	1,750	1,730	1,890	2,210	2,480	2,900	3,030	3,070	2,720	3,070
2011/12	2,390	2,050	1,870	1,740	1,730	1,880	2,210	2,470	2,900	3,070	3,110	2,760	3,110
2012/13	2,440	2,100	1,920	1,790	1,780	1,940	2,250	2,520	2,950	3,090	3,140	2,760	3,140
2013/14	2,460	2,120	1,940	1,810	1,790	1,950	2,270	2,540	2,970	3,110	3,160	2,830	3,160
2014/15	2,480	2,150	1,960	1,830	1,820	1,970	2,300	2,570	3,000	3,150	3,190	2,870	3,190
2015/16	2,520	2,170	1,980	1,860	1,840	2,000	2,320	2,600	3,040	3,180	3,230	2,900	3,230
2016/17	2,540	2,200	2,010	1,880	1,860	2,020	2,350	2,630	3,070	3,210	3,270	2,930	3,270
2017/18	2,580	2,230	2,040	1,900	1,880	2,050	2,380	2,660	3,110	3,260	3,310	2,980	3,310
2018/19	2,610	2,250	2,060	1,930	1,910	2,080	2,410	2,690	3,150	3,290	3,350	2,990	3,350

### **3.0 FORECAST VARIATION**

#### **3.1 General**

The actual electric energy requirements and peak demands are expected to differ from the forecast. Furthermore, these differences are usually larger in the later years of the forecast. In view of the significance of the forecast for facility and financial planning, it is useful to understand the causes of significant variances.

In a specific year, the actual sales can be significantly affected by fluctuations in weather and the operational levels of large industrial customers. The forecast is based on past results that have been adjusted for such temporary fluctuations.

In the long-term, the forecast will differ from actual experience as the factors that contribute to load do not materialize as forecast or do not have the expected impact. For example, provincial economic growth may exceed (or fall short of) the forecast value or the impact of economic growth on electricity requirements may in the future be less (or more) than expected. The take-up of energy efficiency programs may be more (or less) rapid than expected, and displace more (or less) existing load than forecast.

Weather adjustments to historical energy supply are made based on a weighted 30-year average of the heating degree-days in each month. Adjustments to historical peak demand are made based on the difference between weighted average temperature in the eight hours leading up to the peak hour and -24°C (the weighted average temperature experienced for peak demands since 1976). Similarly, historical peak hour demands are adjusted for non-routine reductions in the operations of major industries.

### 3.2 Sensitivities

Major factors that impact the actual requirements for electricity and sensitivities to variations in forecast inputs have been estimated and are presented in Table 15.

**Table 15: Sensitivities of Major Forecast Inputs**

	Impact in year 2018/19	
	Energy GWh	Demand MW
Temperature colder by one degree Celsius at peak		+ 40
± 150 degree days per year	± 150	
± 100 residential customers per year (1,000 in 2018)	± 16	± 4
0.1 % change in rate of GDP growth	± 38	± 10
Loss/gain of 50 MW industrial customer	± 375	± 50
Efficiency NB Program savings +/- 25%	± 90	± 20
0.5% change in residential plug load growth rate	± 88	± 20

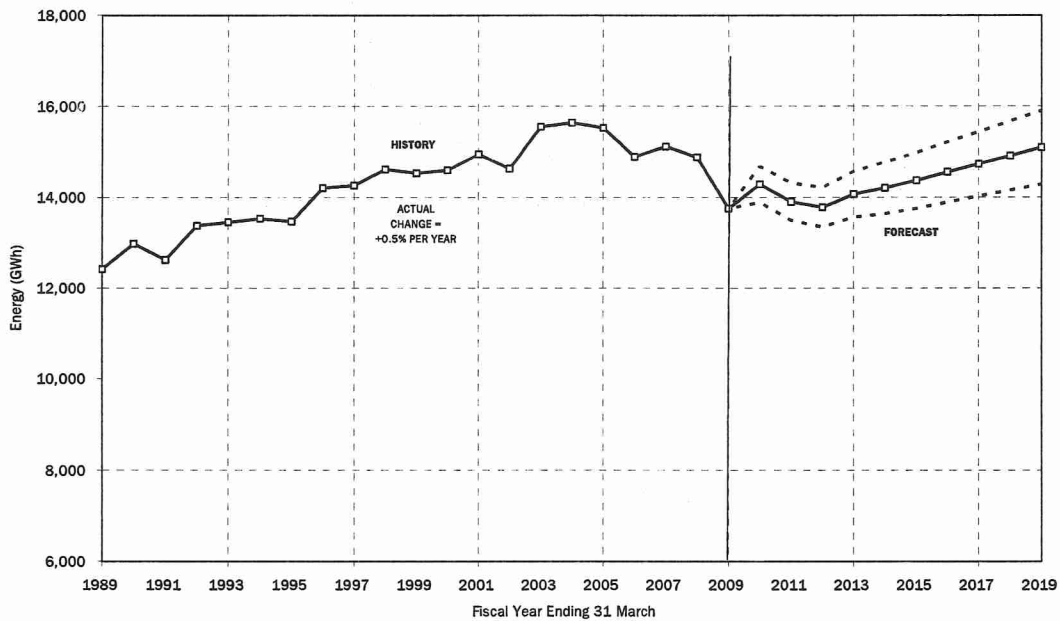
Figure 8 and 9 illustrate the combined impact a number of these sensitivities could have on the forecast. The high and low cases include the following assumptions.

- new/closure of 50 MW industrial customer
- Efficiency NB program savings +/- 25% of estimate
- Change of +/- 1.0% to GDP growth rate in all years of the forecast, except the first year which continues to be assumed to have zero growth.

The likelihood of all three sensitivities occurring at the same time is unknown, but was chosen to provide a reasonable upper and lower limit to the forecast. Forecasted annual

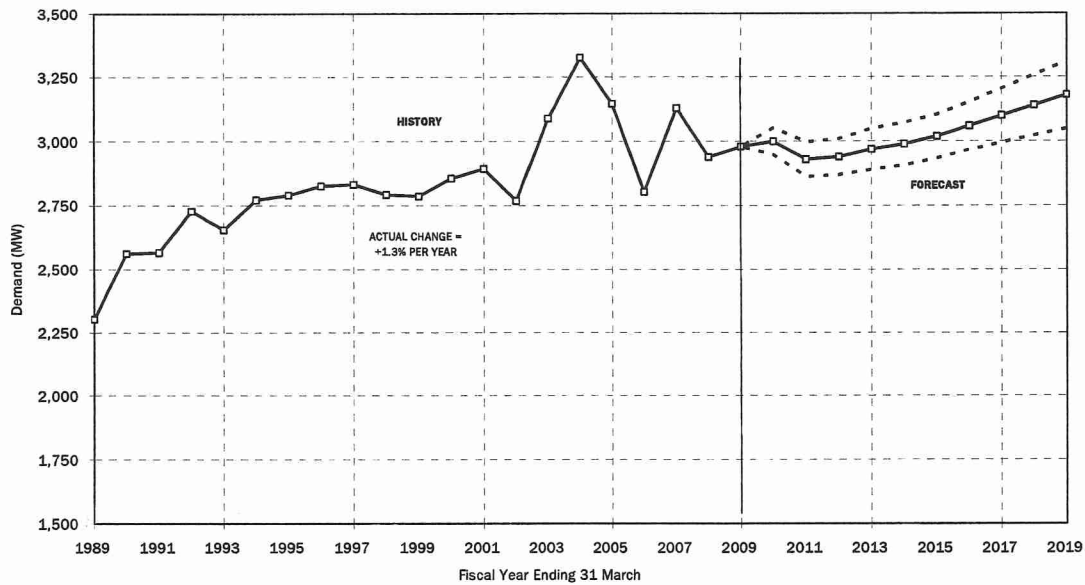
average growth is 0.9 percent, compared to 1.5 percent and 0.4 percent in the high and low cases respectively.

**Figure 8: High & Low Energy Requirement Forecast Scenarios**



The impact of heating-degree variations from the 30 year average has not been included in the high and low cases, but can be significant in a particular year. Historical variations greater than 200 GWh have occurred due to abnormally warm or cold temperatures in a fiscal year.

**Figure 9: High & Low Peak-Hour Demand Forecast Scenarios**



### 3.3 Past Differences

A comparison of forecast to actual results, for forecasts produced since 1990/91, is shown in Table 16. This table compares the forecast of energy supply and peak hour demand actual to actual and weather adjusted results.

The short-term forecasts tend to be fairly close, with most of the variance in any year being related to a combination of weather and industrial operating conditions. As the forecast period increases, the accuracy of the forecast decreases. For example, the absolute average in year 10 is greater than the absolute average in the first year as shown in Table 16. On a weather adjusted basis, the forecast tends to be accurate to within about one percent per year. Demand forecasts tend to be slightly less accurate than energy. Though not shown, there are more occurrences in which the forecast is higher than actual. This reflects the increased likelihood of industrial closures than a new unplanned industrial load and warmer than normal temperatures in recent years.

**Table 16: Forecast Accuracy**

**Absolute Average**

Year of Forecast	Energy Requirements	Weather Adjusted Energy Requirements	Peak Demand	Weather Adjusted Peak Demand
1	2.3%	1.6%	4.7%	3.0%
2	2.5%	2.0%	4.6%	3.2%
3	3.4%	3.2%	5.5%	3.5%
4	3.8%	3.0%	6.6%	4.9%
5	5.2%	4.1%	8.4%	5.6%
6	6.3%	4.8%	10.0%	6.8%
7	8.1%	6.3%	13.3%	9.0%
8	9.1%	7.3%	14.1%	9.9%
9	9.9%	8.4%	14.1%	11.0%
10	10.8%	9.8%	12.8%	11.3%

# Appendix

## Appendix 1 – Key Assumptions

### 1. New Brunswick GDP average growth of 2.0% per year over forecast period.

- Based on survey of private and public sector forecasts and consultation with internal planning staff and Department of Finance on the long-term prospects for Provincial economy.
- Annual growth is not uniform to reflect current economic challenges and capital projects that are planned. In 2009/10, no growth is assumed based on the latest Provincial Budget Update, followed by 1.8% in 2010/11 to reflect the Government’s announced capital infrastructure investment plans. Growth after 2010/11 is expected to return to more historical levels.

Fiscal Year	Real GDP % Change
2009/10	0.0%
2010/11	1.8%
2011/12	2.3%
2012/13	2.3%
2013/14	2.3%
2014/15	2.3%
2015/16	2.2%
2016/17	2.2%
2017/18	2.2%
2018/19	2.2%

- Sensitivity: 0.1% change in annual GDP growth  
2009/10: 0 GWh, 0 MW  
2018/19: 38 GWh, 10 MW

### 2. Industrial Transmission

- Continued operation of existing large industrial customers through the forecast period. Individual loads adjusted based on known information about customers future operational plans.
- Bowater Maritimes. UPM Kymmene, Olin Chemicals and Blue Note Caribou Mines assumed to remain closed over the forecast period.
- Industrial shutdowns within the forecast period include:

NB Coal Midlands in January 2010  
Brunswick Mines in July 2010  
Brunswick Smelting in January 2011

- New customers and load additions include:
  - Potash of Saskatchewan second mine (sinking of shaft and compaction load until full production begins early 2015).
- Load growth based on the historical relationship of sales to Real Goods Producing GDP.
- No new industrial self-generation.
- All existing transmission customers (including Wholesale customers) assumed to continue on standard service supply.
- Industrial transmission forecast for demand and energy includes Pt. Lepreau generating station requirements during maintenance outages and during the refurbishment.

### 3. Rate Increases

- Average rate increase of 3.0 percent assumed for 2009/10 to 2013/14 period, followed by 2.0 percent average rate increases (no real price increase) in remaining years.
- General Service class assumed to be zero for 2011/12 to 2016/17 period and 1.0 percent in 2016/17 to achieve rate design goals (revenue to cost ratio of 1.05 by 2016/17).
- Make-up revenue from rate design initiatives assumed to be equally shared between residential and industry. Residential rate increase at 1.25 times the average during rate design initiatives.
- Sensitivity: 1% increase in 2009/10 rate increase decreases the total forecast by 42 GWh, 10 MW in 2018/19

### 4. Residential Price Elasticity

- Price elasticity is -0.21 percent per +1.0 percent change in the real price of residential electricity.
- CPI assumed to be 2.5 percent in 2009/10, 2.4 percent in 2010/11 and 2011/12, followed by 2.0 percent thereafter based on Business Plan

## 5. Number of Residential Customers

- Average of 3,270 new year-round customers in the Province per year based on trending of historical growth. Year-over-year customer growth declines in later years of forecast (approximately 3,775 in first year to 3,165 in last year)
- Household size declines on average 0.9 percent (or 0.02 persons per household) over the forecast period.
- Provincial population forecast to grow by 4,200 (0.06 percent) over the forecast period. This represents a slight increase from the last forecast when population was assumed to remain flat. The assumption is based on Conference Board of Canada forecast, Province's Population Growth Strategy and informal discussions with Provincial staff. The Province plans to update its population forecast in early 2009 when new census data becomes available.
- Sensitivity: 1,000 new year round customers impacts the forecast by approximately 16 GWh, 4 MW/year

## 6. Normal Temperatures

- Based on estimated 1971-2000, 30-year normal degree days (4,776 d-d/year).
- The sensitivity of changing to a rolling 30-year average is approximately -50 GWh.

## 7. Natural Gas

- Gas territory unchanged from previous forecast. Total gas service territory will encompass 30% of the province. Of this 2/3 (20% of total province) will be passed by a distribution pipeline.
- Efficiency New Brunswick's pilot program to convert homes with electric baseboards to natural gas supports the number of conversions assumed to occur in 2008/09.

## 8. Conservation and energy efficiency

- Incremental energy efficiency savings resulting from Efficiency NB programs to residential, commercial and industrial customers have been included in

addition to naturally occurring conservation historically modeled.

- Program saving estimates are based on information from Efficiency NB and discussion with agency staff. Savings in the General Service and Residential segments assumed to start in 2008/09, while savings in the Industrial sector are assumed to start in 2009/10. The General Service and Industrial programs have been phased in over a three year period.
- Breakdown of energy efficiency savings in the forecast:

	2018/19 Energy Efficiency	
	GWh	MW
<b>Naturally Occurring:</b>		
Residential (Thermal Shell Improvements)	79	20
<b>Efficiency NB Programs:</b>		
Residential Programs	158	40
General Service Programs	98	20
Industrial Programs	110	15
Sub-Total	366	75
<b>Total</b>	<b>445</b>	<b>95</b>

- Residential model includes 0.25% per year heating load reduction to reflect natural thermal shell improvements. This is half of the reduction assumed in the previous forecast to account for “free-riders” of Efficiency NB programs (i.e. some customers assumed to conserve without access to a loan/rebate).
- Naturally occurring General Service energy efficiency savings have been removed from the forecast to account for “free-riders” of Efficiency NB programs and to ensure the approach used for General Service is consistent with Industrial.
- Consumption use of new major appliances has been decreased to reflect appliance efficiency legislation and consumer buying habits. These ratings are based on Federal Government data published in December 2006 for appliances shipped in Canada.
- General Service reduced by 5 GWh by end of forecast to account for alternate energy sources that customers may install such as micro turbines, solar and wind.

- Impact of alternate energy / net metering in Residential is not considered to be material in the forecast period. Current connected capacity of net metered customers is 35 kW.

#### 9. Losses

- Transmission losses assumed to be 4.0 percent for 2009/10 and return to 2.5 percent in 2010/11 to reflect a more historical generation/purchase dispatch mix that is expected when Point Lepreau returns to service.
- Annual International Power Line related loss reduction of 45 GWh (improvement in losses of 0.3%) assumed to be reflected in the transmission tariff loss factor beginning April 2011.

#### 10. Wood use for home heating

- Remain constant over the life of the forecast

#### 11. Retail Competition in the electricity market

- Retail competition not to occur in the forecast period.

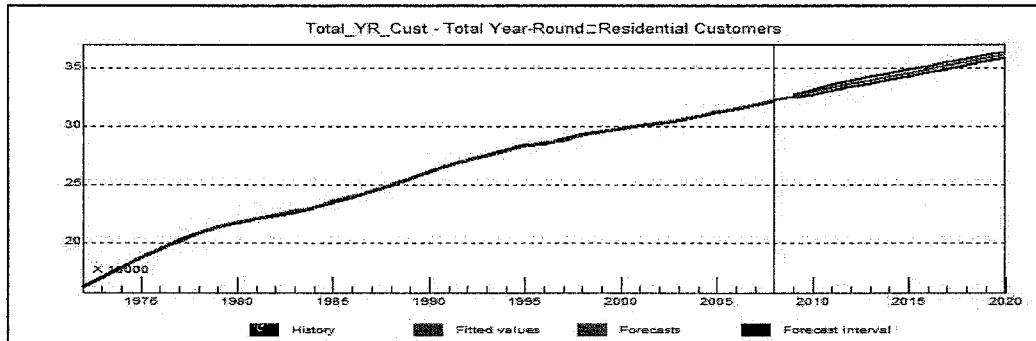
#### 12. Residential end-use model calibration

- Unit Energy Consumptions (UECs) of stock appliance updated based on 2005 Canadian data published by Natural Resources Canada. Canadian UECs assumed to reflect New Brunswick as federal legislation mandates efficiency standards for manufacturers.
- Number of stock appliances calibrated to reflect New Brunswick data based on 2005 Natural Resources Canada published data.
- Calibration changes in the model affect the allocation of energy usage, but the total amount of energy/customer was not changed. The calibration effects growth assumptions for each energy use which drives forecast results.
- Miscellaneous appliance or “plug” load assumed to grow by 3.3% per year based on latest data from Natural Resources Canada. This compares to 2.7% assumed in the previous forecast.

#### 13. Methodology

- Consistent with the methodology reviewed by the Public Utilities Board in 2007 with refinements to the model as a result of an independent audit.

## Appendix 2 – Forecast of Number of Residential Customers



### Forecast Report for Total\_YR\_Cust

#### Model Details

##### Dynamic regression

Regression(5 regressors, 0 lagged errors)

Term	Coefficient	Std. Error	t-Statistic	Percentile
Population	0.1193	0.03311	3.604	0.9989
_TREND	987.1	208.2	4.741	1
_CONST	-1970355	418515	-4.708	0.9999
Total_YR_Cust[-1]	1.186	0.1378	8.607	1
Total_YR_Cust[-2]	-0.4981	0.1082	-4.561	0.9999

#### Within-Sample Statistics

Sample size	35	No. parameters	5
Mean	260862.67	Std. deviation	41942.14
Adj. R-square	1	Durbin-Watson	2.32
Ljung-Box(18)	38.2 P=1.00	Forecast error	812.11
BIC	969.24	MAPE	0.23
MAD	566.93		

#### Variable specification test battery

Term	Test Value	Percentile
Population[-1]	1.177	0.722

Dynamics tests successful.

#### Dynamics test battery

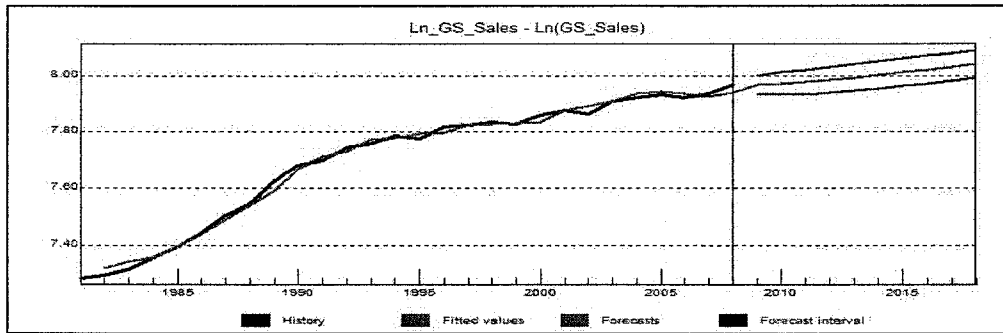
Term	Test Value	Percentile
_AUTO[-1]	4.909	0.973
_AUTO[-2]	1.718	0.810

Variable specification tests successful.

#### Forecast Data

Date	2.5 Lower	Forecast	Annual	97.5 Upper
2009	324795	326268	326268	327742
2010	327755	330041	330041	332327
2011	331009	333658	333658	336308
2012	334312	337056	337056	339801
2013	337521	340272	340272	343022
2014	340825	343380	343380	346134
2015	343685	346451	346451	349217
2016	346757	349533	349533	352309
2017	349865	352645	352645	355426
2018	353007	355788	355788	358569
2019	356172	358953	358953	361734

## Appendix 3 – General Service Econometric Model



### Forecast Report for Ln\_GS\_Sales

#### Model Details

Dynamic regression  
Regression(4 regressors, 0 lagged errors)

Term	Coefficient	Std. Error	t-Statistic	Percentile
Ln_GDP	0.1302	0.06054	2.15	0.9577
Ln_HDD	0.1201	0.03371	3.563	0.9983
Ln_Price	-0.2537	0.08918	-2.844	0.9908
Ln_GS_Sales[-1]	0.7731	0.06963	11.1	1

#### Within-Sample Statistics

Sample size	27	No. parameters	4
Mean	7.72	Std. deviation	0.21
Adj. R-square	0.99	Durbin-Watson	1.61
Ljung-Box(18)	33.5 P=0.99	Forecast error	0.02
BIC	0.02	MAPE	0.17
MAD	0.01		

#### Variable specification test battery

Term	Test Value	Percentile
Ln_GDP[-1]	2.434	0.881
Ln_HDD[-1]	6.247	0.988
Ln_Price[-1]	0.019	0.109
_CONST	3.482	0.938
_TREND	1.113	0.709

Dynamics tests successful.

#### Dynamics test battery

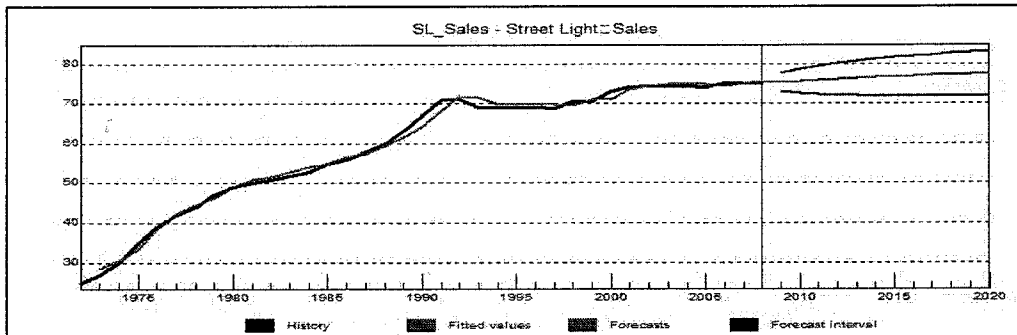
Term	Test Value	Percentile
Ln_GS_Sales[-2]	0.795	0.628
_AUTO[-1]	0.865	0.648
_AUTO[-2]	2.603	0.893

Variable specification tests successful.

#### Forecast Data

Date	2.5 Lower	Forecast	Annual	97.5 Upper
2009	7.94	7.97	7.97	8
2010	7.93	7.97	7.97	8.01
2011	7.93	7.98	7.98	8.02
2012	7.94	7.98	7.98	8.03
2013	7.95	7.99	7.99	8.04
2014	7.95	8.00	8.00	8.05
2015	7.96	8.01	8.01	8.06
2016	7.97	8.02	8.02	8.07
2017	7.98	8.03	8.03	8.08
2018	7.99	8.04	8.04	8.09

## Appendix 4 – Forecast of Disco’s Streetlight Sales



### Forecast Report for SL\_Sales

#### Model Details

Dynamic regression  
Regression(1 regressors, 1 lagged errors)

Term	Coefficient	Std. Error	t-Statistic	Percentile
PopulationOct1	0.0001053	0	14.72	1
_AUTO[-1]	0.9371	0.01675	55.96	1

#### Within-Sample Statistics

Sample size	36	No. parameters	2
Mean	60.44	Std. deviation	14.2
Adj. R-square	0.99	Durbin-Watson	1.21
Ljung-Box(18)	45.3 P=1.00	Forecast error	1.15
BIC	1.23	MAPE	1.52
MAD	0.86		

#### Variable specification test battery

Term	Test Value	Percentile
PopulationOct1[-1]	1.392	0.762
_CONST	0.901	0.657
_TREND	0.044	0.167

Dynamics tests successful.

#### Dynamics test battery

Term	Test Value	Percentile
SL_Sales[-1]	4.472	0.966 *
SL_Sales[-2]	0.414	0.480
_AUTO[-2]	5.151	0.977 *
Common factor test Chi Square(1)	0.634	0.574

Variable specification tests successful.

#### Forecast Data

Date	2.5 Lower	Forecast	Annual	97.5 Upper
2009	73.2	75.4	75.4	77.6
2010	72.7	75.7	75.7	78.7
2011	72.4	76.0	76.0	79.5
2012	72.2	76.2	76.2	80.2
2013	72.1	76.4	76.4	80.7
2014	72.0	76.6	76.6	81.2
2015	71.9	76.8	76.8	81.6
2016	71.9	76.9	76.9	82.0
2017	71.9	77.1	77.1	82.3
2018	71.9	77.2	77.2	82.6
2019	71.9	77.4	77.4	82.8

## Appendix 5 – Industrial Econometric Model

**Independent Variable:** Natural Log(Real Goods Producing Gross Domestic Product) or Ln(GP GDP)

**Dependent Variable:** Total NB Power Industrial Sales

**Base Number of Years:** 22

### Regression:

Coefficient $X_n$	0.8925	1.228778	Y-Intercept
Standard Error $X_n$	0.1385	1.1452	Standard Error of Intercept
R Square	0.6536	0.0704	Standard Error of Estimate
F-Statistic	42	22	Degrees of Freedom
Sum of Squares	0.2055	0.1089	Residual Sum of Squares
t-statistic	6.44		

### Summary Regression Statistics for Base:

Years	Coeff	R <sup>2</sup>	t-statistic	Period
Base	0.8925	0.6536	6.44	1984/85 - 2007/08

