Load Management, Energy Efficiency & Conservation

Collaborative solutions that make sense

Table of Contents

About Nebraska Public Power District

NPPD's mission is to safely generate and deliver low-cost reliable energy and provide outstanding customer service. Working in partnership with the state's rural public power districts, cooperatives and municipalities, NPPD helps serve an estimated one million Nebraskans with retail or wholesale electric power and energy-related products and services.

Load Management, Energy Efficiency & Conservation

What is it?

A utility's fluctuating electrical load reflects the constant changes in consumer behavior. For NPPD, a summer-peaking utility, demand for energy increases in the summer months when temperatures rise, air conditioners hum and farmers begin irrigating. Many factors impact the supply and demand for energy such as economic conditions, changes in fuel costs, advances in electrical technologies and weather patterns.

NPPD helps reduce costs associated with spikes in the demand for energy through load management, energy efficiency and conservation programs.

At NPPD, irrigation dominates all other types of load as the most prevalent in its load control programs, accounting for 99 percent of the reported load controlled at peak in 2010.

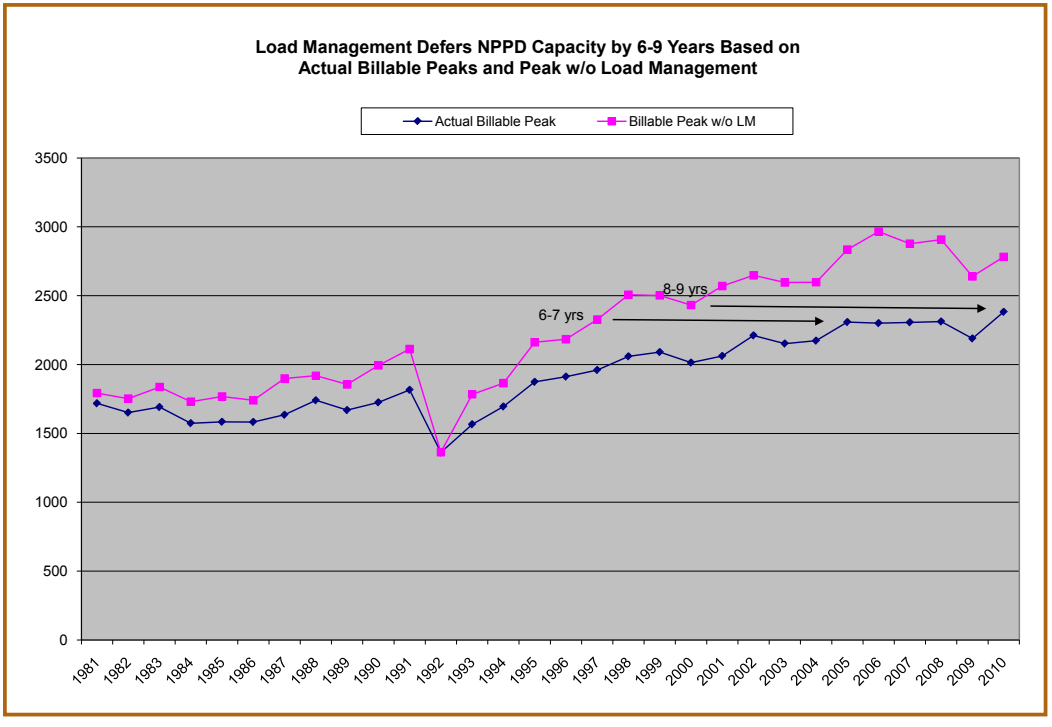
At NPPD, load management is associated with the price signals sent to customers that prompt them to make changes as to when they use energy (e.g., billable demand program). For purposes of this booklet, energy efficiency and conservation relates to the District's efforts to provide customers with programs, ideas or incentives on how to use energy more efficiently or use less energy, regardless of time of day.

How it works

Load management saves NPPD and its customers money by reducing generation capacity needs and minimizing the amount of energy the District must purchase on the open market at peak times when prices are typically high.

Responding to the needs of NPPD's native load customers is also achieved with a diverse mix of generation resources as well as a reliable energy delivery system. However, as NPPD's infrastructure resources age and peak loads increase, it is important that the utility continues making long-term investments to maintain reliability.

NPPD's long-term Integrated Resource Plan is one way the District determines its needs for the future. Understanding how load management ties into this process is important because, to a certain extent, it plays a key role in postponing additions of major generation resources to the District's fleet of power plants, as shown in the chart below.



Curtailment Types

Reductions to NPPD's total system peak has an overall positive effect for customers; however, success of load management is primarily attributed to the kind and amount of interruptible load available for curtailment. NPPD's wholesale customers control or manage end-use loads such as irrigation wells, air-conditioners, water heaters and municipal pumping stations. NPPD and its wholesale customers also gain load reductions through curtailment agreements with end-use industrial customers.

Irrigation load control

Irrigation dominates all other end-use loads as the most prevalent, accounting for 99 percent of the reported load controlled at peak in 2010. Over the past 40 years, connected irrigation horsepower (hp) served by NPPD has grown from 300,554 hp in 1970 to 1.9 million hp in 2010, equating to a 4.7 percent annual growth rate. In 2010, 443 megawatts of irrigation load was curtailed at the time of the District's system peak. Due to the volume and type of load curtailment enacted during peak times, NPPD realizes a unique load curve, which is managed through its billable demand and energy curtailment programs.

Load Reduction at NPPD System Peak in 2010 (447 MW total)

Irrigation
443 MW (99.2%)

Municipal Pumping/Industrial
20 MW (0.4%)

Air Conditioning
1 MW (0.2%)

Water Heater
1 MW (0.2%)

Energy Curtailment Program
NA in 2010

Available Programs

Billable Demand Program

NPPD's Billable Demand Program, implemented in 1982, has evolved over the years, but remains in effect today. Under this program, wholesale customers manage their loads based on when NPPD's system load is at or near peak levels. If hourly load projections indicate the load will not be at or near peak levels, NPPD may choose to waive demand charges during on-peak hours.

Wholesale customers are notified of this decision as to whether it is a "billable" or "non-billable" day via a daily message from NPPD's Doniphan Control Center. On a non-billable day, a customer's demand charges are waived and they do not need to control or reduce load to reduce costs. The opposite is true on a billable day where customers are charged for demand and may choose to implement load control measures to reduce overall costs, as they see fit.

NPPD's on-peak hours are 9 a.m. to 11 p.m., Monday through Sunday. This rate structure has ultimately shifted the time when NPPD's peak occurs, resulting in NPPD having a rather unique load growth curve as depicted in the top graph on page 10.

Instead of incurring a typical system peak on a weekday between 6 and 8 p.m., NPPD is peaking around 11 p.m. (when all load control groups have been released back onto the electric grid) or on Sundays. One way the District has addressed this issue is by lengthening the hours available for billable demand (from 10 a.m. to 10 p.m. to 9 a.m. to 11 p.m.); however, other options for resolution and management of the program continue to be explored with customer input.

Energy Curtailment Program (ECP)

In addition to Billable Demand, in 2000, NPPD implemented another load management program focused on energy curtailment. This program pays customers a market price per megawatt-hour for voluntarily curtailing load during peak periods.

While billable demand realizes load savings primarily through irrigation load control, the ECP program focuses on curtailment by industries and businesses as well. Nucor Steel in Norfolk, an NPPD retail industrial customer, is the largest participant in this program.

Customers may also participate by volunteering to run local generation as long as this output is not obligated under a capacity purchase agreement with NPPD.

The combination of both billable demand and ECP allows NPPD to effectively reduce a significant amount of electrical demand during its highest peak usage hours. Although ECP was not used in 2010, in past years NPPD effectively controlled another 40 to 75 MWs at peak through this program.

Before Billable Demand

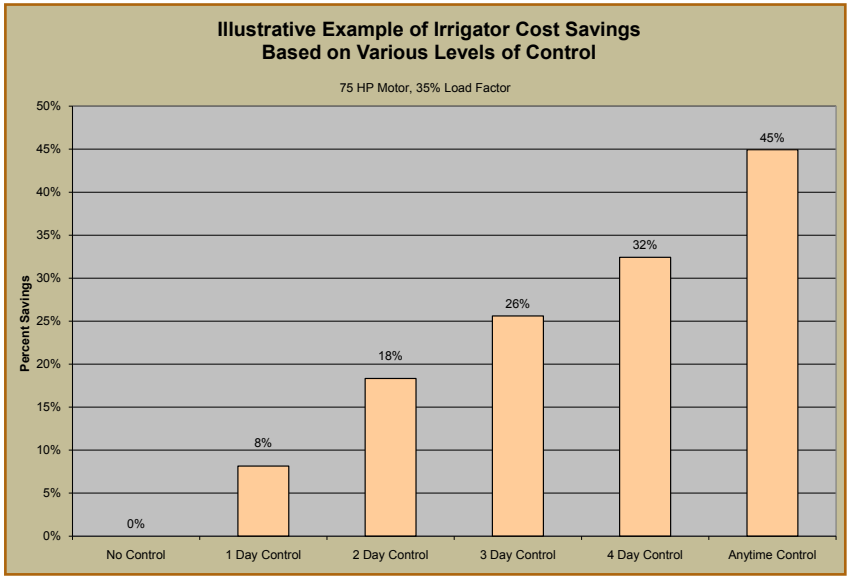
Prior to 1982, NPPD charged customers for demand based on their individual peak loads, regardless of when they occurred. Wholesale customer response to this rate design included managing their individual peak with load control, consisting primarily of irrigation load.

Although effective, NPPD and its wholesale customers soon took a more wholistic approach, creating a program (i.e. billable demand) that gave customers the ability to serve load requirements during time periods when NPPD system demand was low and baseload resources were readily available.

Load Control

Approximately 87 percent of the total irrigated load served by NPPD and its wholesale customers is enrolled in a load management program. Rates paid by end-use irrigators in these programs vary by the amount of time customers are willing to be controlled off at peak times. The more days per week an irrigator is willing to be controlled, the lower their fixed charge (horsepower charge) and energy usage rates.

The chart below is an illustrative example of estimated annual cost savings that an irrigator might expect based on various levels of load control. Rates based on "no control" have the highest annual costs (zero savings), whereas rates for "anytime control" have the lowest cost. Going to a "1 day control" saves about 8 percent, "3 day control" saves 26 percent, and "anytime control" saves nearly 45 percent of the costs an irrigator with "no control" options might expect to pay annually.



Irrigation customers benefit from a wide range of cost savings depending on the type of load management program in which they are enrolled.

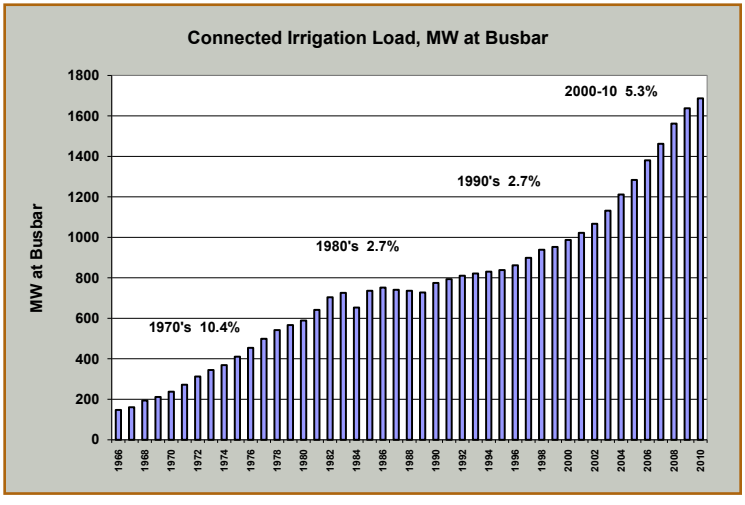
Load Growth

Since 2000, total connected irrigation load at busbar in NPPD's service territory increased from 987 MW to 1,686 MW in 2010 an average annual increase of 5.3 percent. Key reasons for the rapid growth in electric irrigation load during the past decade is due primarily to a sharp increase in the price of natural gas, propane and diesel fuel. In addition, as farm operations become larger, irrigators appreciate the convenience and price stability of electricity which make it a competitive option to fossil fuel alternatives.

Other contributing factors include spikes in the installation of electric irrigation systems statewide due to well drilling moratoriums that took effect in several Natural Resource Districts, as well as other drought-related issues. Results from NPPD's latest Irrigation Energy Source Survey show that electric market share in horsepower for powering irrigation wells rose from 24.8 percent in 2001 to 34.7 percent in 2010. Most new irrigation load in NPPD's service area is enrolled in a load management program, thereby increasing the amount of energy available for curtailment at peak times.

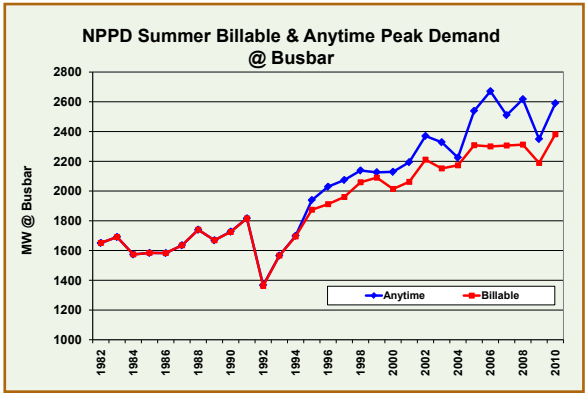
Connected irrigation load in NPPD's service area has grown about 60% since 2000.

Year	Connected	Growth
1990	775 MW	2.4%
2000	987 MW	3.7%
2001	1,022 MW	3.5%
2002	1,067 MW	4.4%
2003	1,132 MW	6.1%
2004	1,212 MW	7.1%
2005	1,284 MW	5.9%
2006	1,380 MW	7.5%
2007	1,462 MW	5.9%
2008	1,562 MW	6.8%
2009	1,637 MW	4.9%
2010	1,686 MW	3.0%

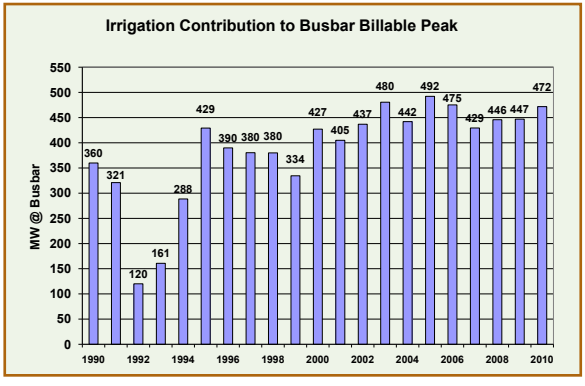


As NPPD's system peak grows, controlling load during peak hours becomes even more valuable.

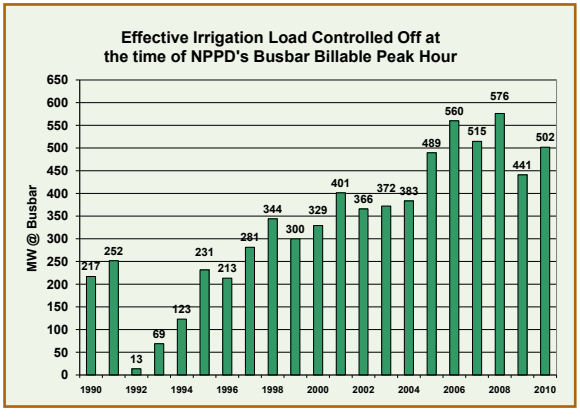
NPPD's 2010 Anytime Peak of 2,590 megawatts occurred Sunday, Aug. 1, and was 208 MW higher than NPPD's billable peak for that year.



Irrigation's contribution to NPPD's highest 2010 billable summer peak was estimated at 472 MW.



Effective irrigation load controlled off during NPPD's highest billable summer peak was estimated at 502 MW.



NPPD takes proactive measures to monitor changes in load growth through customer input in load forecasting and contingency planning.

The District is also committed to making necessary investments in its system to meet increased demand.

Table 2

At the Busbar System Outlet — **In Megawatts**

Year	System Billable Summer Peak Demand	Connected Irrigation MW @ Busbar	Effective Irrigation Controlled Off at Peak	Peak Non-Irrigation Controlled Off at Peak	Est. Peak Demand without Control
1976	1,423	499	6	0	1,429
1977	1,559	542	1	0	1,560
1978	1,549	566	13	0	1,562
1979	1,567	589	28	0	1,595
1980	1,720	642	57	0	1,777
1981	1,718	704	71	3	1,792
1982	1,651	726	94	7	1,752
1983	1,691	653	135	11	1,837
1984	1,574	736	147	10	1,731
1985	1,584	752	168	15	1,767
1986	1,583	741	143	14	1,740
1987	1,635	736	243	22	1,900
1988	1,740	727	154	26	1,920
1989	1,668	753	160	27	1,855
1990	1,725	775	217	19	1,961
1991	1,816	793	252	29	2,097
1992	1,362	811	13	5	1,380
1993	1,566	821	69	7	1,642
1994	1,695	830	123	11	1,829
1995	1,874	838	231	15	2,120
1996	1,912	862	213	28	2,153
1997	1,960	899	281	25	2,266
1998	2,059	939	344	53	2,456
1999	2,090	952	300	53	2,443
2000	2,014	987	329	59	2,402
2001	2,062	1,022	401	107	2,570
2002	2,211	1,067	366	71	2,648
2003	2,152	1,132	372	77	2,601
2004	2,173	1,212	383	113	2,669
2005	2,308	1,284	489	35	2,832
2006	2,300	1,380	560	106	2,966
2007	2,306	1,462	515	57	2,878
2008	2,312	1,562	576	18	2,906
2009	2,189	1,637	441	9	2,639
2010	2,382	1,686	502	4	2,888

Nebraska Public Power District ¤ 1414 15th Street ¤ Columbus, NE 68601 ¤ www.nppd.com
G136925.ZIP

Nebraska Public Power District

Always there when you need us