UND 5 Year Integrated Resource Plan

UND 5 Year Integrated Resource Plan to Western Area Power Association

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Introduction

This Integrated Resource Plan (IRP) includes the resource and load management options that best fit the University's forecasted energy and economic requirements. This IRP does discuss how to maintain and or improve electrical service to the University community, sustain the most economical electrical rates, reduce energy usage through energy management, and minimize environmental impacts.

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UND UNIVERSITY OF NORTH DAKOTA

UND 5 Year Integrated Resource Plan

The University of North Dakota (UND) is a member of the North Dakota University System. Within UND the facilities department provides the utility service to over 237 buildings across 549.63 acres. UND maintains its own utility grid which is classified as a state agency utility. UND is a Western Area Power end-use customer.

The overall growth in campus square footage from FY2000 through FY2017 was 24.5% while in the same time period the electrical supply increased 13.06%. The average growth rate for the 17 year period was 1.6% with the greatest amount of growth occurring in FY07 at 6.6% and FY17 at 5.5%. Over the last 5 years an average of 67% of the supply to the UND main grid was through the WAPA allocation with the remaining 33% supplied from Xcel Energy. Over the last 5 years an average of 60% of the electrical demand on the UND main grid was provided through the WAPA allocation with the remaining 40% supplied from Xcel Energy as a Tier I with ESR peak control participant. (See appendix A for historical and forecasted demand and supply).

UND maintains and operates a district steam distribution system that supplies steam to both UND and non-UND customers. The steam is generated with either coal, natural gas or fuel oil. Continuous monitoring is performed on the utilities to produce steam to assure the most efficient and cost effective means possible. Natural gas purchase agreements are in place to capitalize on the Universities ability to switch fuel sources in times of peak demand and reduce overall operating costs by participating in peak control programs.

UND currently has seven diesel generation units in operation with a total capacity of 10,075 KW. The campus has multiple feeder locations to assist in reliability and load balancing. Many buildings across campus fall outside the main UND campus grid and are fed directly from Xcel energy or alternate providers. Many of the buildings across the campus also have emergency generation capabilities to assist with emergency outages. In times of emergency peak load reduction the campus utility grid can be dispatched to reduce the load. Loads may be reduced through various types or combination of methods, which may include cycling off non critical equipment, apply peak shave strategies, and/or onsite generation. Major risk to system operation is the failure to the distribution network as a result of acts beyond human control in which case emergency generation is available for critical buildings and/or equipment.

The campus utilizes computer software to store historical billing data and for proper account allocation to the various departments across the campus. As outlined within this IRP it is a goal to develop a sustainable solution to assure savings are achieved over a period of time and implementation of continuous improvement methodologies. The campus has the ability to verify energy savings projects by the use of metering at most building location, with the remaining unmetered buildings expected to be metered by the end of calendar year 2017. An aggregated meter also is also available to meter the electricity as it enter onto the UND electrical grid. Some meters are connected to a SCADA system for data collection and analysis. Do to the varying occupancy levels and the flexibility of schedules imposed on a University benchmarking year to year must be examined closely to assure consistency amongst the variables. Energy across campus will be measured by the EUI as it considers all energy sources to avoid inadvertently reducing the demand and/or supply of one energy source at the expense of another. Energy loads are expected to decline for the upcoming years through the reduction of square footage across campus, in addition to reduction initiatives through continuous improvement projects. It is anticipated by the end of this IRP the University will reduce the amount of square footage by 3% which contributes to an estimated 1.4% of the demand and supply. Some reductions may be offset by changes in climate, building use or an increase or decrease of unknown external variables beyond our control. These reductions are contingent to approvals from the applicable local, State, and Federal agencies and or organizations that may have authority over the said square footage. Through Energy conservation initiatives it is our intent to reduce our overall impact to the Environment.

The goals for this 5 year IRP are as follows:

- Reduce consumption of the building with the highest Energy Use Intensity (EUI) in comparison to the Energy Star median EUI for that building type. Evaluate the buildings Energy assessments apply the applicable cost effective Energy Conservation Measures (ECM's) re-evaluate the building EUI and continue to reduce the consumption until it is not feasible to do so.
- Reduce the demand by setting demand limits per building and implementing automated load shedding through building automation. Buildings may need to be evaluated based on varying occupancies through the year, therefore an evaluation process shall be developed.
- Set building EUI baselines and continuously monitor the building performance and investigate deviations through a continuous commissioning process.

The milestones for this 5 year IRP are as follows:

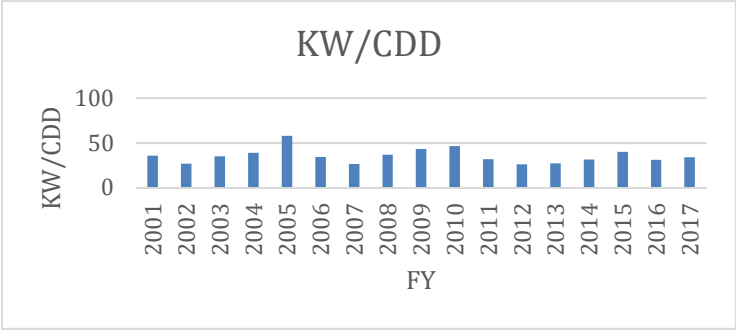
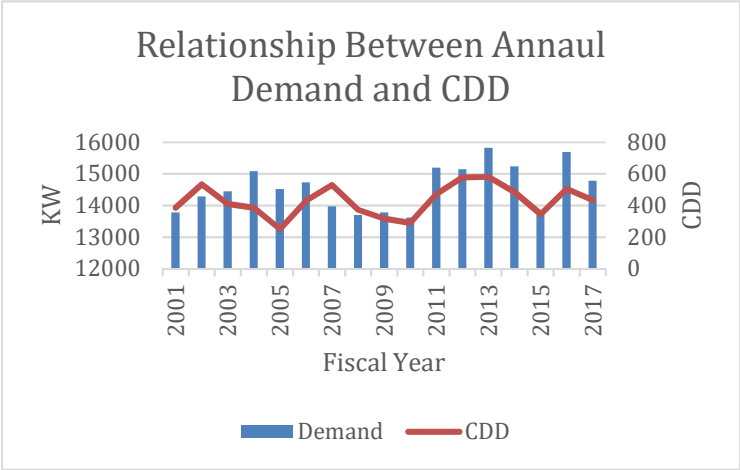
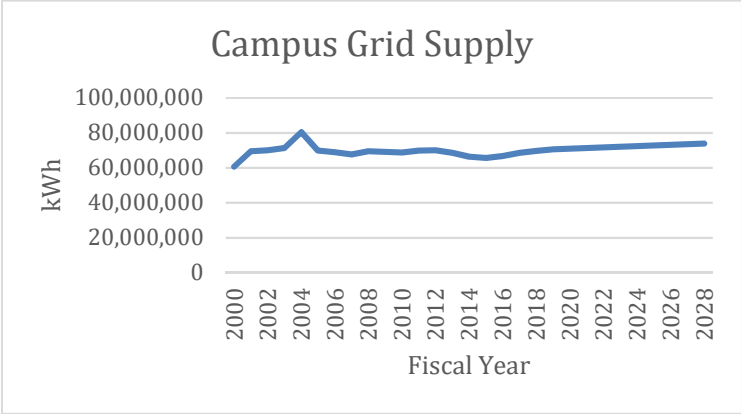
- Year 1 – Pareto the building list based on highest EUI and compare to Energy Star median EUI for that building type. Define the first building to become the "model building(s)". Apply low to no cost ECM's to the model building, with a concentrated effort on reforming occupant and technician based behavioral changes. Develop a budget strategy, to obtain resources for ECM's, that aligns with the Campus strategic plan.
- Year 2 - Define the demand limits for the model building(s) and implement a peak demand shedding strategy.
- Year 3 - Define the ideal EUI baseline and establish continuous monitoring program to assure building performance is sustained through proper energy management.
- Year 4 and beyond – Horizontally expand the lessons learned from the model building(s) to the next highest EUI building(s) and apply the applicable countermeasures. Apply continuous improvement methodologies to continue to reduce both demand and supply.
- The rate of expansion is dependent on availability of State resources. FY17 will be used as the baseline for benchmarking. Consumption per cooling degree day (kW/CDD) will be the method of evaluation of the overall demand reductions, with the primary focus on the months of highest demand. The EUI (Btu/sf) for the buildings will be the method of evaluation of the overall supply reductions. Methods of evaluation will be evaluated annually during the annual progress reporting process to assure the most applicable method is used and updated accordingly. Energy reductions may also be correlated using the most applicable indicators. Indicators may include but not limited to Heating Degree Days, Cooling Degree Days, Full time students, Full time employees, and or number of occupants.

Involvement and participation occurs in various forms across the campus. The Universities strategic plan sets the baseline for the activities that will occur which can influence the amount of utilities required to operate. Based on the strategic plan activities that require new infrastructure is reviewed to assure the most cost effective energy efficient practices are applied. Capital planning projects are reviewed on an ongoing bases which can outline utility impact milestones. Internal indicators are reviewed on a regular basis to assist in demand and supply irregularity response.

The average WAPA Aggregated cost/kWh for the past 5 years was .03475 cents. The average aggregated supplemental electricity from Xcel was .06743 cents/kWh. The total main grid aggregated cost/kWh was .04426 cents/kWh. (See figure 1 for breakdown by fiscal year)

Figure 1
Unit Cost per kWh of Electrical Energy

	WAPA Aggregated Cost/KWH	Xcel Aggregated Cost/KWH	Campus Aggregated Cost/KWH
FY 2013	0.03495	0.06037	0.04251
FY 2014	0.03526	0.06775	0.04441
FY 2015	0.03529	0.07031	0.04473
FY 2016	0.03533	0.06999	0.04516
FY 2017	0.03292	0.06870	0.04453

Appendix A

Demand (KW)		Supply (kWh)	
Fiscal Year	Campus Grid	Fiscal Year	Campus Grid
1996	10882	1996	54,381,651
1997	10511	1997	52,005,614
1998	11413	1998	57,404,048
1999	11309	1999	57,010,322
2000	11184	2000	60,655,893
2001	13781	2001	69,554,068
2002	14285	2002	70,022,046
2003	14442	2003	71,374,233
2004	15080	2004	80,442,858
2005	14516	2005	69,938,791
2006	14730	2006	68,880,894
2007	13971	2007	67,678,263
2008	13695	2008	*69,416,256*
2009	13780	2009	69,224,147
2010	13612	2010	68,735,447
2011	15199	2011	69,871,248
2012	15147	2012	69,993,975
2013	15819	2013	68,599,548
2014	15230	2014	66,334,246
2015	13811	2015	65,720,917
2016	15686	2016	66,706,731
2017	14779	2017	68,578,443
2018	14986	2018	*69,607,120*
2019	15196	2019	*70,651,226*
2020	15408	2020	*71,710,995*
2021	15624	2021	*72,786,660*
2022	15843	2022	*73,878,460*
2023	16065	2023	*74,986,637*
2024	16290	2024	*76,111,436*
2025	16518	2025	*77,253,108*
2026	16749	2026	*78,411,904*
2027	16983	2027	*79,588,083*
2028	17221	2028	*80,781,904*