

An Overview of Solar Possibilities and Crane's Power Profile Nov 2008 through Feb 2010

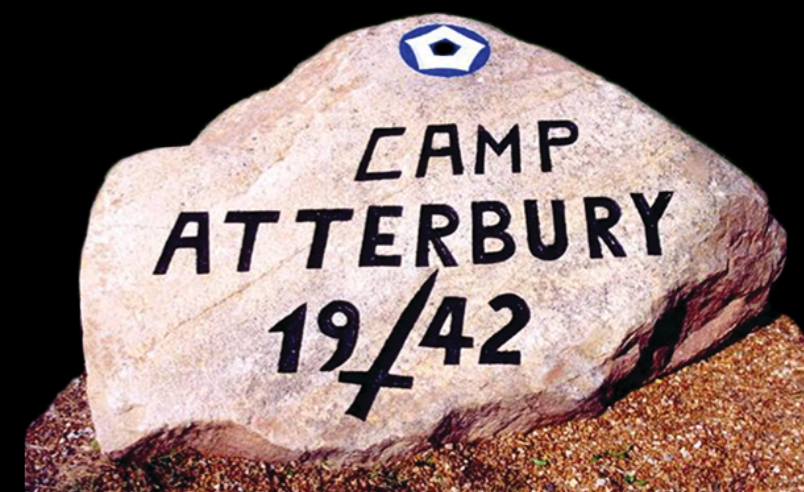
Alex R. Dzierba

Refer to:

www.secnav.navy.mil/eie/Pages/InstallationsFacilities.aspx



March 24, 2015



Original Analysis of NSA Crane Electrical Power



EG&G Division

Electrical Power Usage & Billing at NSA Crane

www.dzre.com/alex/Crane_Power_final.pdf

December 28, 2009

An Analysis of NSA Crane Electrical Power Usage Data[†]

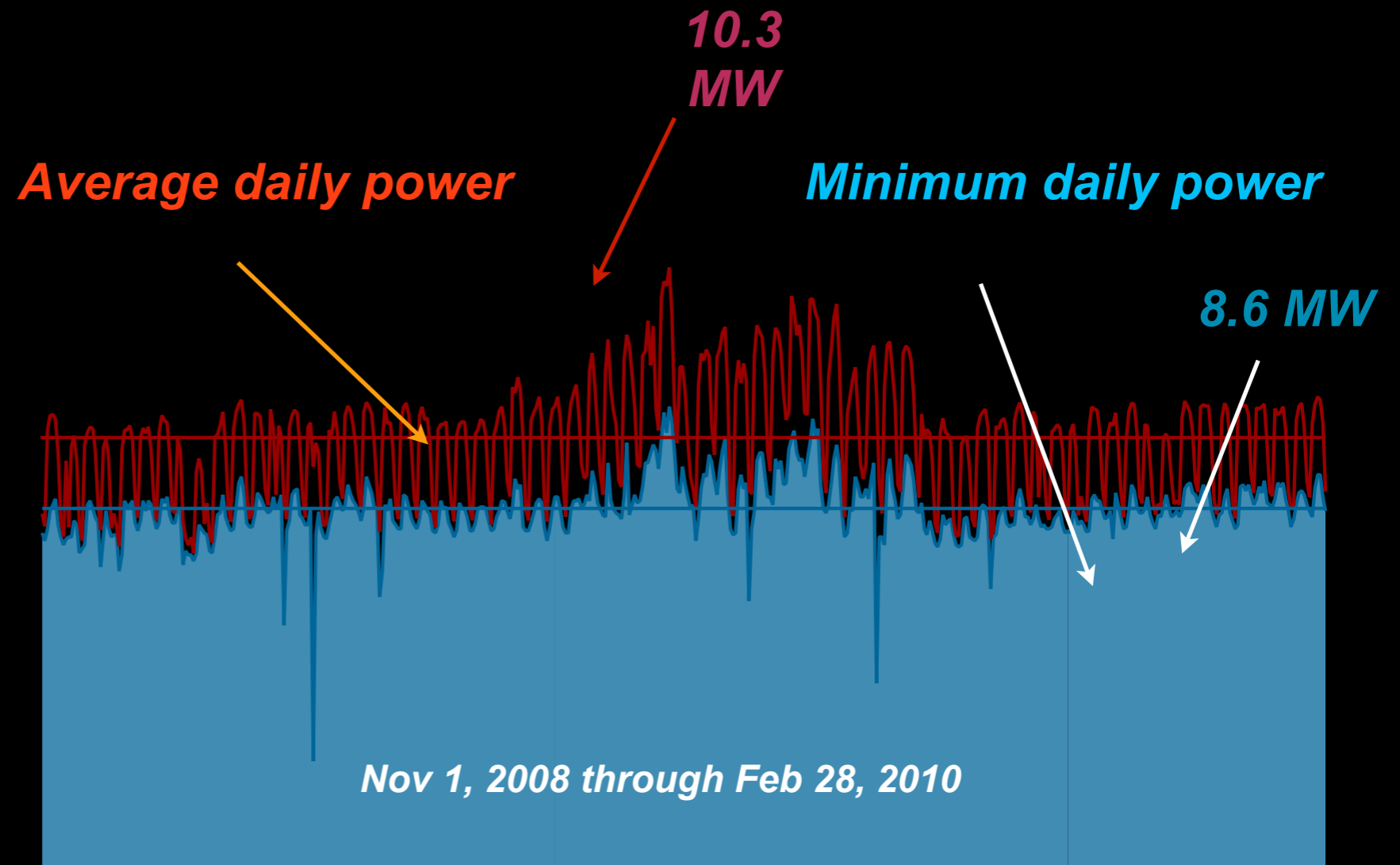
Alex R. Dzierba[‡]

Abstract

This note is a summary of an analysis of NSA Crane's electrical power usage and billing data from Duke Energy for the period including November 2008 through November 2009. The data from Duke energy include the average power used over every 30 minute time interval during that period as well as billing information. This analysis included a study of the power usage as a function of time for individual months, correlations with temperature and details of the temporal power usage structure. Having these data spanning a full year will be a valuable resource in future modeling and simulation work to assess the effectiveness of various potential energy-saving strategies.

How Crane Currently Uses Electrical Power

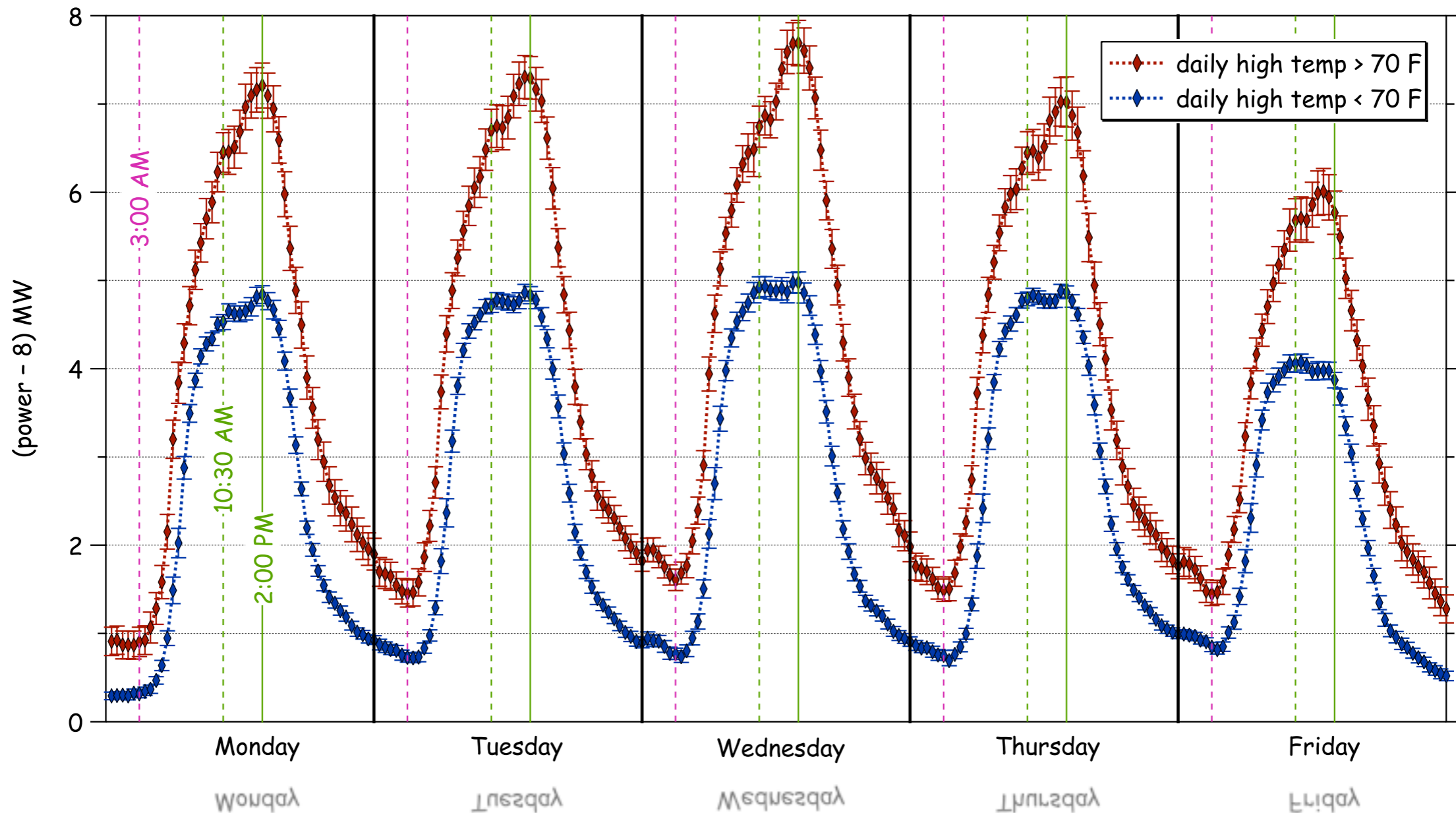
Power in MW	Crane
Minimum	8.6
Average	10.3
Peak Winter	13
Peak Summer	18



Assuming electricity is generated by burning coal, each MW of average power results in 9,000 tons of CO₂ emitted into the atmosphere per year.

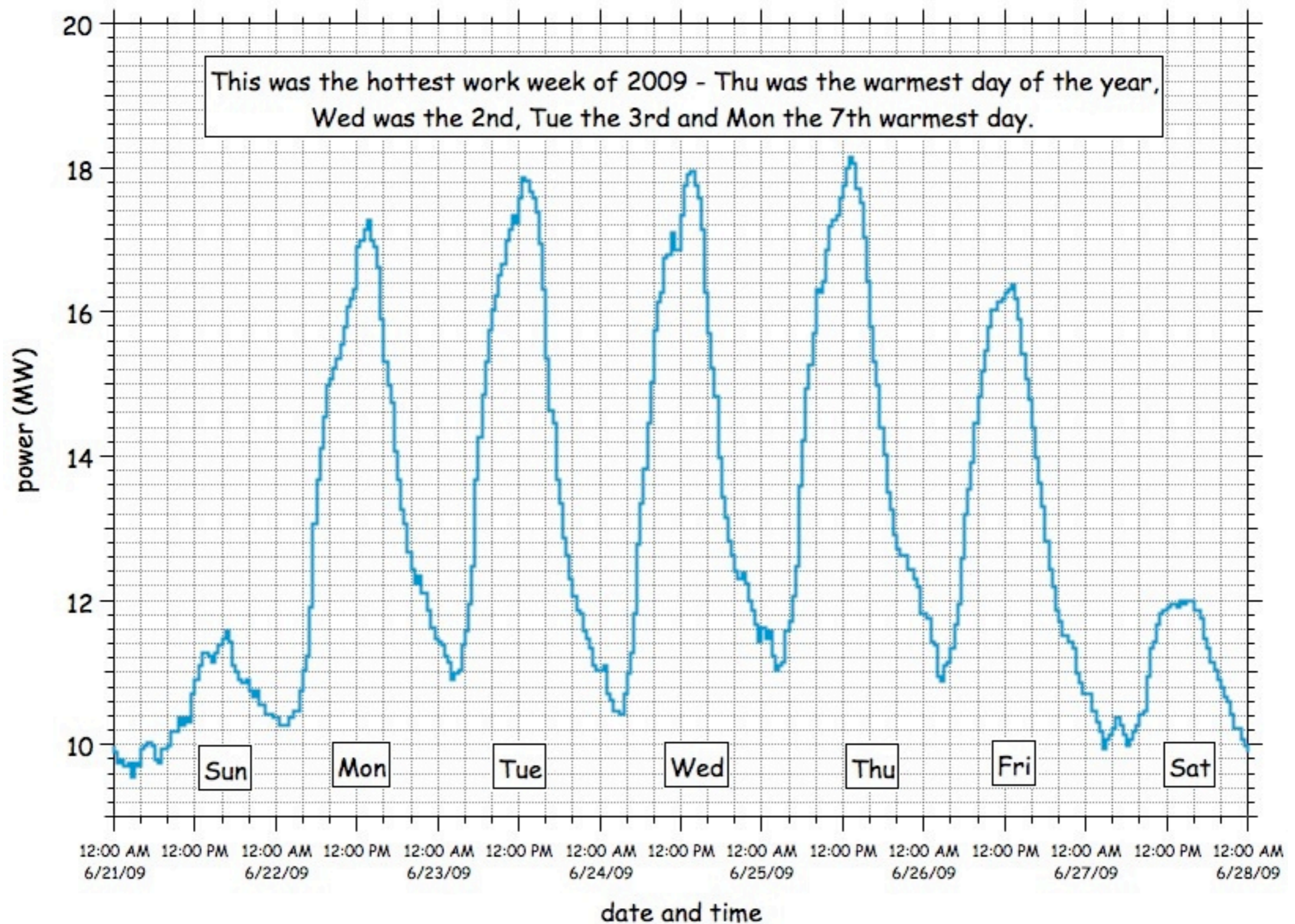
At Crane, each MW of average power costs \$0.45M per year assuming 3¢/kWh - energy charge and \$15/kW - demand charge.

Average Daily Power Profile



Crane Power Data for Week of 6/21/09

Power Metered Every 30 min

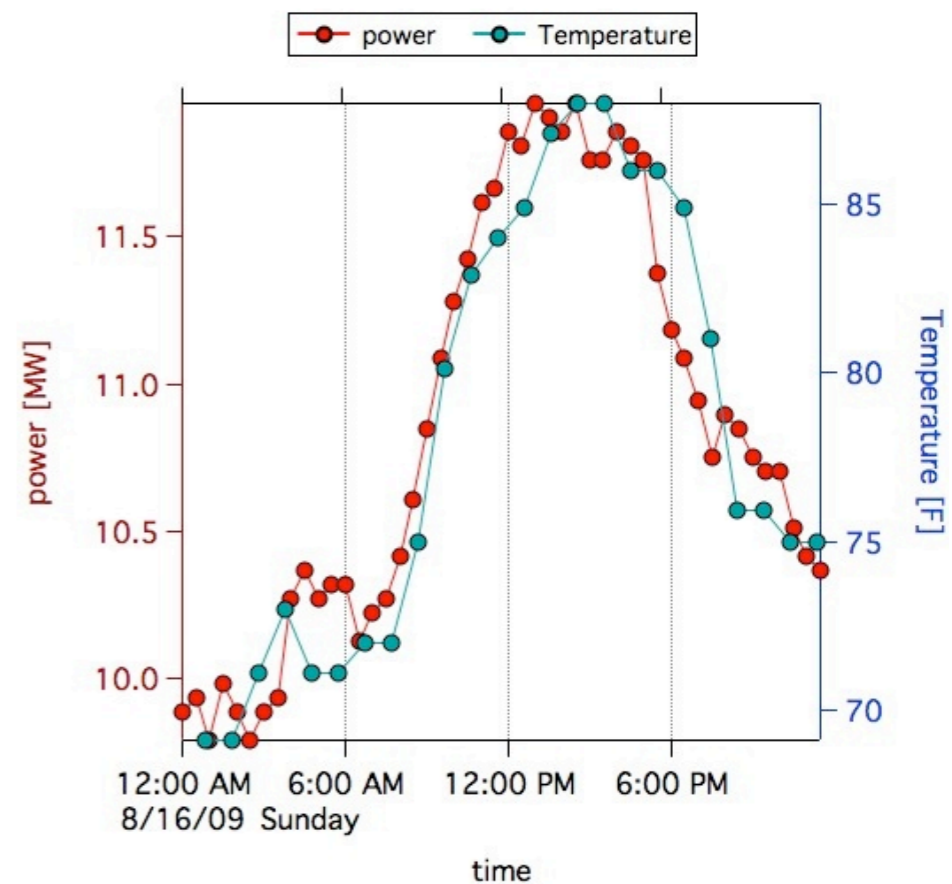
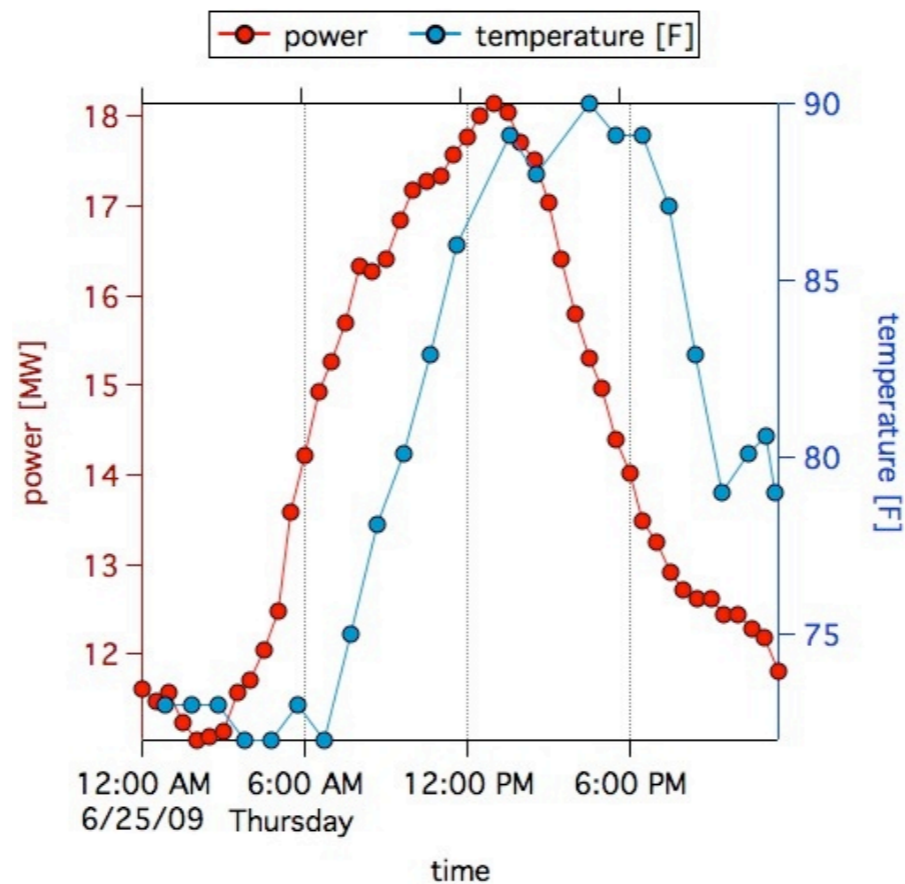
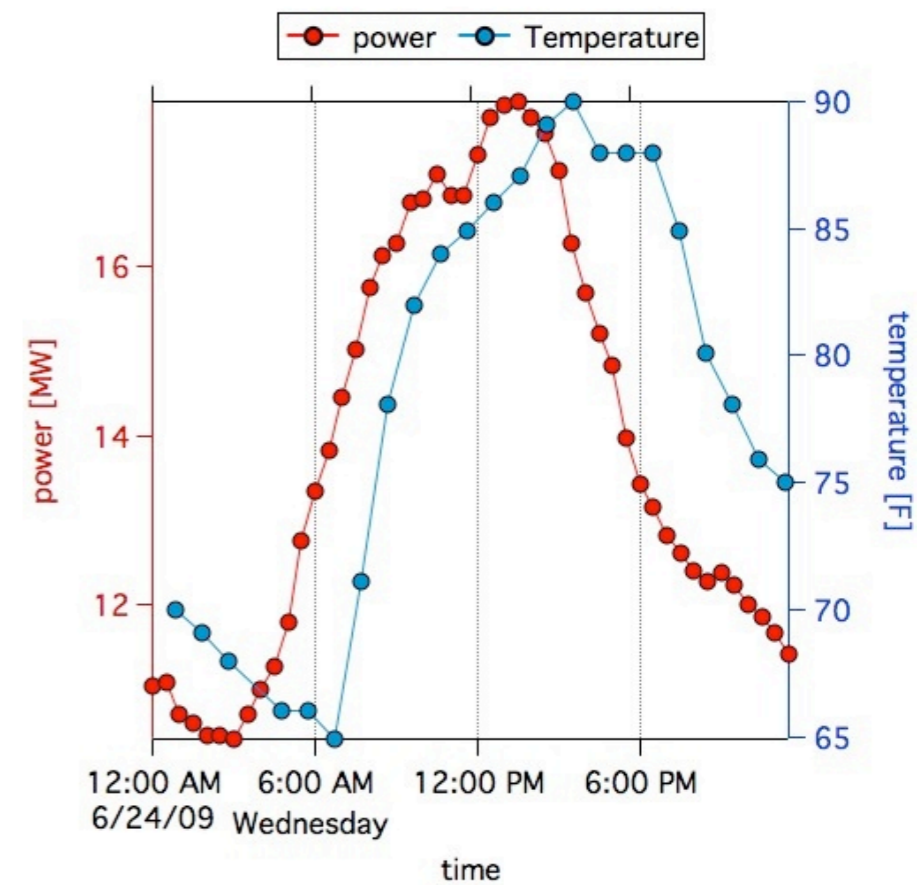
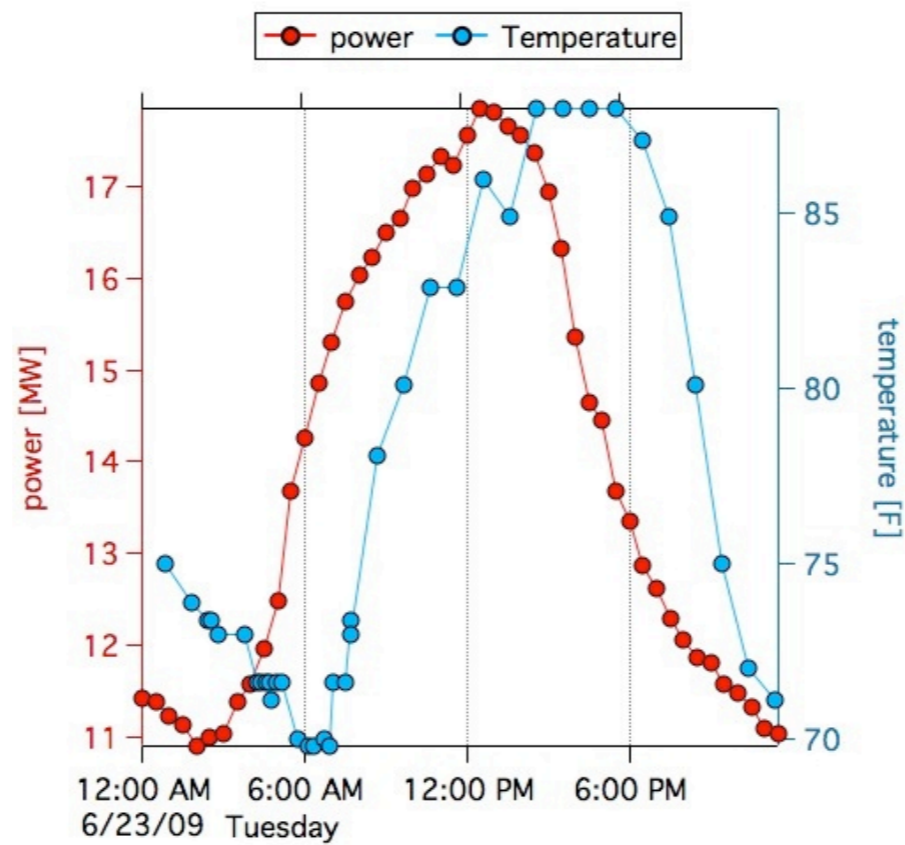


Power and Temperature Through the Day

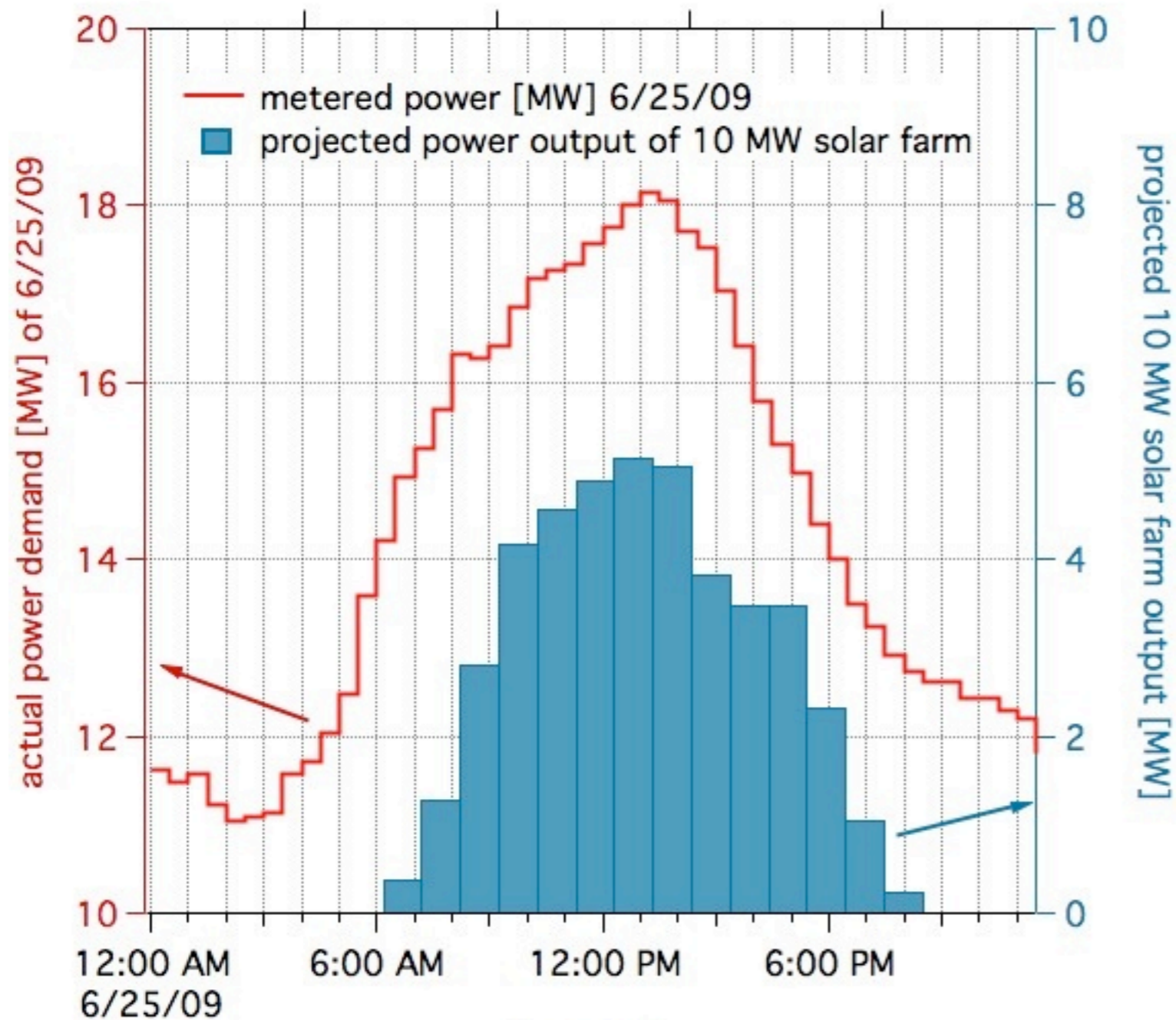
These are shown for the three hottest workdays of 2009 and the hottest Sunday of 2009.

Temperatures and power are not in sync for workdays - activities drive the power use. For Sunday the power use correlates with temperature.

Temperature data from wunderground.com



Projected Performance of 10 MW Solar Farm for NSA Crane compared to June 2009 Data



Note: left axis spans 10 to 20 MW and the right axis spans 0 to 10 MW.

- Power metered every 30 min
- Data for 6/25/09 shown
- Project 10 MW solar farm output



PVWatts® Calculator

pvwatts.nrel.gov/pvwatts.php

PVWatts predicts hourly output for Crane area over the entire year. Here I averaged over June numbers.

Projected power output of farm in phase with when power is needed

Cost Savings with 10 MW Solar Farm

	Using 2009 Charges	Using 2015 Charges
Output power averaged over the year	1.27 MW	1.27 MW
Total annual energy	11,154 MW-h	11,154 MW-h
12-Month Total peak-shaving	52 MW	52 MW
Annual Energy Savings	\$334,620 @3.0¢/kWh	\$479,622 @4.3¢/kWh
Annual Demand Savings	\$780,000 @\$15.00/kW	\$1,044,160 @\$20.08/kW
Total Annual Savings	\$1,114,620	\$1,523,782
ROI Assuming \$20M or \$2per watt installed	18 years	13 years

March 20 Solar Eclipse - Netherlands



Thank you to Theo Jurriens from Groningen Netherlands