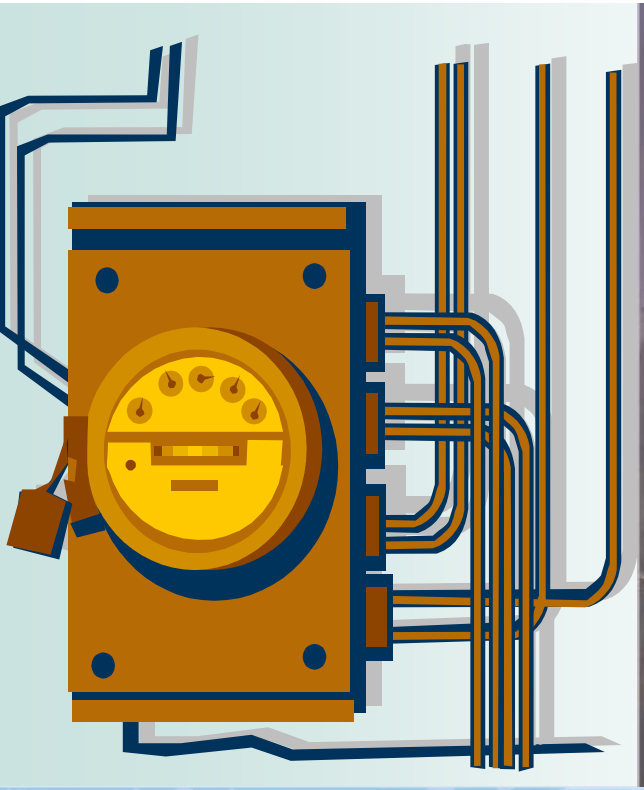
GSA

Energy Center of Expertise

Advanced Metering Effort



GSA's Plan and Progress to Date

Karen Curran
GovEnergy
New Orleans, LA

GSA' Metering Effort

- Began as response to GAO Audit on Demand Response Programs
- Further defined by EPACT 05 mandates
- Review of inventory and prioritization developed
  - Used our Energy Usage and Analysis System (EUAS) to generate various views of our inventory for ranking
- Completed Agency Metering Plan
- Advanced Metering Software Deployed -
  - Schneider Electric - PowerLogic ION EEM
  - ION Enterprise -Initial 11 bldgs in D.C. area connected

GSA's Metering Effort

- Communication requirements and process for integration into ION EEM
- Initial User training and administrator training for ION EEM
- Regions have requested and received proposals
- Regional Requests for funding – prioritized
- Initial funding received (which must be spent by end of year) and distributed to regional level
- Additional Focus – Advanced Meters standard for new construction and major modernization project

GAO Audit Impact

- GAO Audit GAO-04-844 Demand Response Programs
  - National Office guidance to regional organizations and, specifically, building operators clarifying the challenges to greater participation in demand response programs
    - Candidate building needs capability to monitor electricity consumption in real time.
    - Important to allow us to measure the success of your reduction effort.
  - http://www.gao.gov/highlights/d04844high.pdf

GSA's Advance Metering Plan

- GSA's Plan is intended to serve as the General Services Administration's Agency Metering Plan as required by Section 103 of the Energy Policy Act of 2005 (42 USC 8253(e)(3)).
- The GSA advanced metering system will be integrated with GSA's existing tracking program.
- Prioritize inventory to determine which bldgs meet the "practicable" test
- Deployment will occur over several years, with completion occurring in FY 2012.

Metering Plan: Inventory Ranking

- GSA Inventory
  - Goal tracked – 179,727,874 GSF and annual energy costs $311,683,124
  - Over 880 facilities ranging from 817 gsf to 4,153,854 gsf
- Generated sorted bldg reports for the following ranking criteria
  - (1) total annual cost of electricity (most recent 12-month period);
  - (2) annual electricity use per GSF;
  - (3) annual electricity consumption;
- Additional ranking criteria given high priority
  - (4) Demand response program is available either from the grid operator or local utility.

Additional Factors - Revealed

- High profile regional issues
- ESPC / UESC planned or in place
- Multiple bldg facilities – shared heating or cooling plants
- Verifying project savings

Energy Usage Analysis System :: WELCOME :: - Microsoft Internet Explorer

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GSA Energy Usage
ANALYSIS SYSTEM

Fiscal Year
2007 ::

REPORTS

Welcome to GSA's Energy Usage Analysis System (EUAS) Reporting Website

This site allows GSA managers, regional energy coordinators, and other authorized users to view and print reports showing the latest energy usage and cost data available for GSA operated buildings.

Data for these reports is provided by the National Energy and Water Management Center (NEWMC).

ENERGY PROGRAM

LOGIN

User Name

Password

SUBMIT RE

Done Trusted sites

Energy Usage Analysis System - Microsoft Internet Explorer

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REPORTS LOGOUT

User :: Guest ::

Fiscal Year ::

- Actual Data
- Comparison Report
- Energy Status
- Vendor Accounts
- Facility History
- Building History
- Building Address
- Sorted Building
- % Variance
- Energy

Sorted Building Report

Summary Type :

Nation

Region : -- Select --

State : -- Select --

District : -- Select --

Select

-- Select --

Scope by Building Categories :

A-STANDARD OWNED INVENTORY
B-EXEMPT OWNED INVENTORY
C-STANDARD ACTIVE LEASES
D-EXEMPT LEASES
E-REIMBURSABLE BUILDINGS
F-NOT USED
I-ENERGY INTENSIVE

Hold Ctrl key for selecting multiple categories
For category descriptions, please see help

Reporting Period :

Entire Fiscal Year

Month : -- Select --

Fiscal Year : -- Select --

Reporting Units :

BTU's/GSF

Cost/Unit
Total mmBTU's
Cost/GSF
BTU's/GSF
Actual Cost
Actual Units

Done

Trusted sites

Metering Plan: Funding Strategy

- Field devices will be funded on a prioritized schedule; using funds approved for metering in GSA's annual budget based on the 2005 Advanced Metering Strategic Assessment Plan Initiative.
- GSA has received $6 million in FY07 as a result of this request and will continue to request additional funds each budget cycle until the plan is adequately funded.
- Priority funding for regional hardware purchases and connection to the agency wide software program will occur based four previous listed factors with additional consideration for high profile regional issues and opportunity.

Tactical Process for integrating new meters to the ION EEM system

- GSA Regional Energy Coordinators have been instructed to contact Schneider Electric with the following details of proposed meters they intend to purchase:
  - » Manufacturer and model of the device
  - » Choice of communications medium (Ethernet or serial RS485, etc)
  - » If technically feasible, Schneider will provide a quote to perform the integration as follows:
  - » Communication between the meters and ION Enterprise will be configured and tested.
  - » ION Enterprise will be configured to read selected historic and/or real-time parameters.
  - » If logging is required at the ION Enterprise level, it will be configured.
  - » The source hierarchy in ION EEM will be updated to include the new sources (meters)
  - » ION EEM will be configured to import data from ION Enterprise or from other source (flat file) as required.

Actions – Regional Short List

- Prioritized goal tracked inventory – regional level
- Each Region developed list of priority bldgs including need for advanced meter installation plus connection or just connection to IONEEM
- Developed regional funding request format to organize funding needs
  - Funding – detail whether budget estimate or proposal generated

Metering Status

- Closing in on 100 bldgs with advanced meters nationwide
- Southwest Region – Tridium System with 67 bldgs included
- Remaining are scattered across other regions
- Currently 11 bldgs connected to IONEEM with another 10 sites anticipated by end of year.
- Funding for additional 30 bldgs to have advanced metering in place by end of year

Actions – Various approaches

- Ongoing Projects – working in advanced metering capability into scope as well as tie-in capability (meeting communication requirements)
- Investigating programs offered through local utilities
- GSA Advantage for meter purchases
- Other systems being considered at regional level, data will still be brought in to IONEEM

Actions – Headquarters level

- Identified Ordering officials in each region for connection to IONEEM
  - Tie-in for existing advanced meters
- Training via web based conferencing
- Incorporating language into PBS Design Guide, P-100
- Sharing our successes in testimony

GSA, PBS A/E Design Guide (P-100)

- EPAct 2005 Advanced Metering

- *All projects shall include installation of advanced meters which will better enable GSA to track and continuously optimize performance. In order to take advantage of demand response programs, and to enable the GSA to respond effectively during a power curtailment event, facilities must be prepared to reduce demand quickly and effectively. New construction and modernization projects must include intelligent electric meters capable of bi-directional monitoring of: phase voltages, phase currents, power consumption (demand), power factor, kVAR, and availability. These meters must be capable of communicating via MODBUS/TCP/IP. Meters must meet at a minimum the definition stated in the Guidance for Electric Metering in Federal Buildings issued pursuant to Energy Policy Act of 2005. New construction and modernization projects must also include demand reduction logic in the building automation system that is capable of activation upon input from the building operator or the intelligent meters. Ideally the logic would be capable of three tiers of demand reduction – low/no occupant impact, minor occupant impact, some impact. The equipment curtailed or set-points changed during each level must be identified by the A/E and agreed to by the Project Manager*

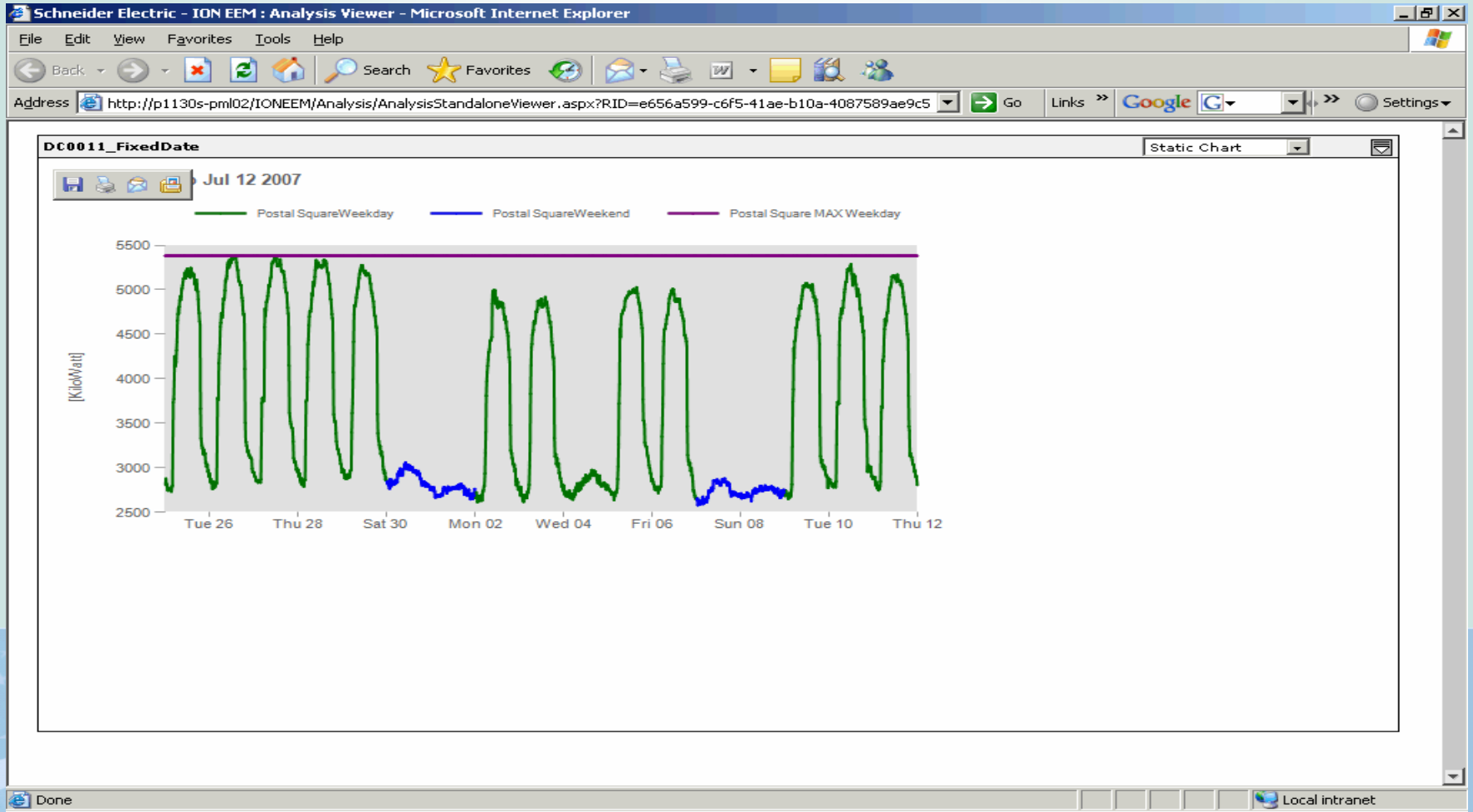
Early Uses/Plans for Data –Demand Response Participation

- GSA uses PLC Predictor service – South River Consulting
  - Email sent to bldg mgrs in PEPCO territory with notice of Gold day – curtailment actions taken
  - Follow progress of efforts live
- New England
  - Price Response program – voluntary curtailment
  - Demand Response program – penalized if you don't curtail amount agreed upon
- Similar participation in other regions.

Recent Successes

- GSA needed good example of real energy savings effort in response for Congressional Testimony
- Real time metering capabilities allowed GSA to verify our abilities to react to conditions using technology and pre-determined load shedding plans
- With level of metering installed as part of new BIPV roof in Waltham, demonstrate real time the actual production and savings of the project.

Real Life Example of Energy Savings!



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National Archive and Records Administration

SolarIntegrated

SOLAR POWER

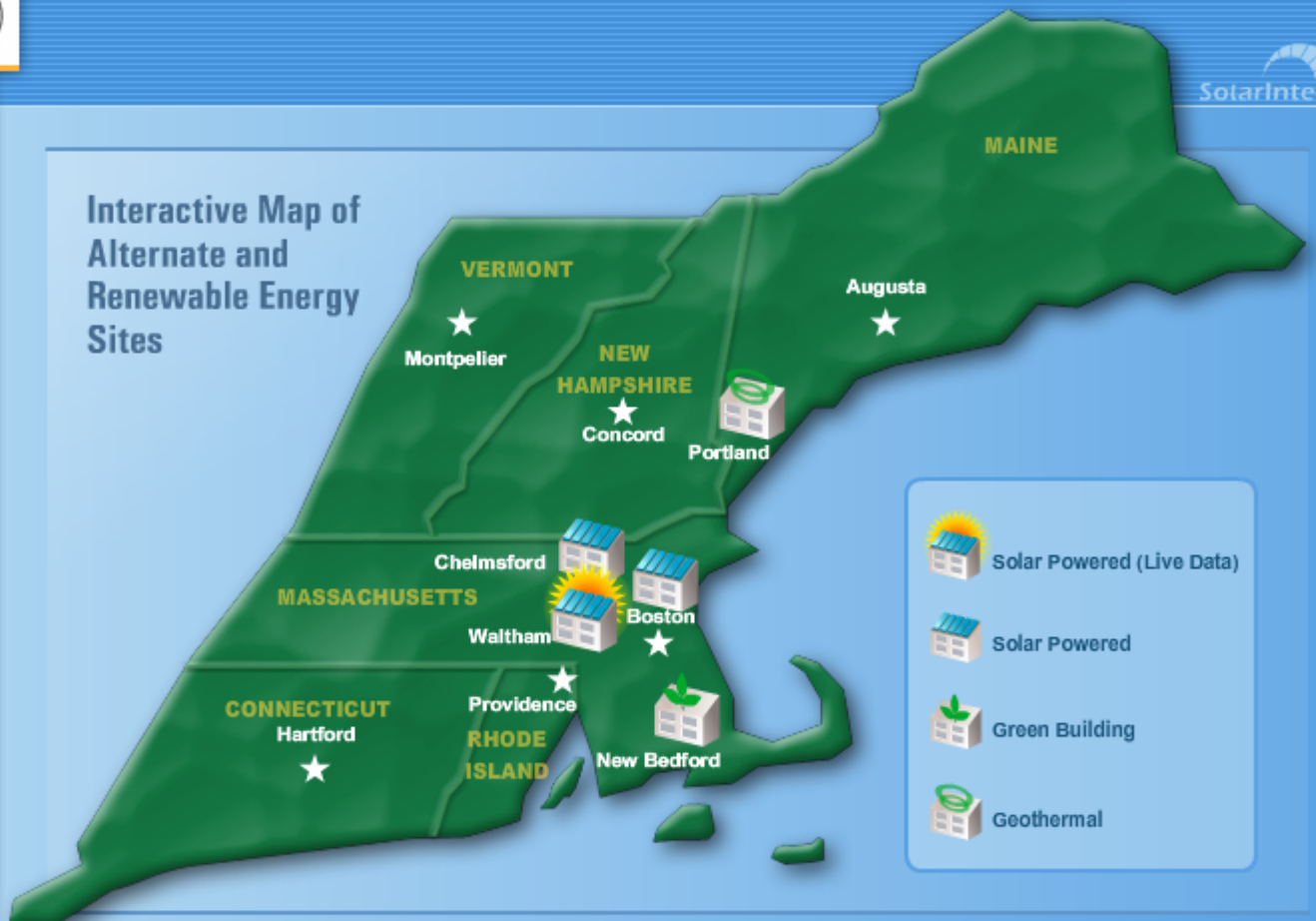
- What is solar power
- How a solar roof works
- Energy Production

BENEFITS

- Overview
- Global system savings
- Global warming

SELECT ADDITIONAL SITES

Waltham



Mouse over an installation to see Energy output or Click to go to the data screen.

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U.S. General Services Administration

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SolarIntegrated

SOLAR POWER

- What is solar power
- How a solar roof works
- Energy Production

BENEFITS

- Overview
- Global system savings
- Global warming

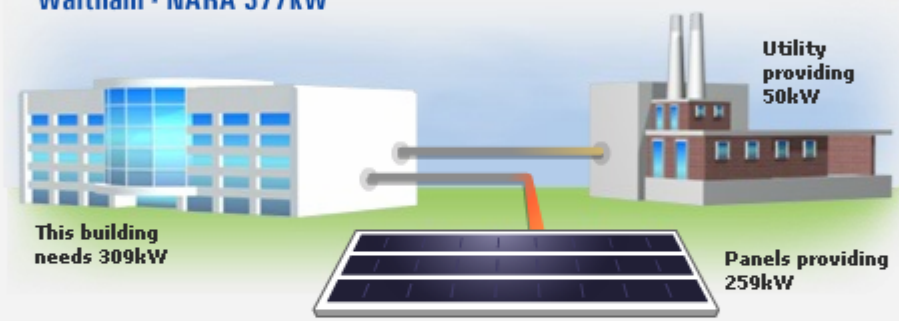
SELECT ADDITIONAL SITES

Waltham

HOME

SUMMARY | DATA VIEW | SYSTEM FACTS

Waltham - NARA 377kW

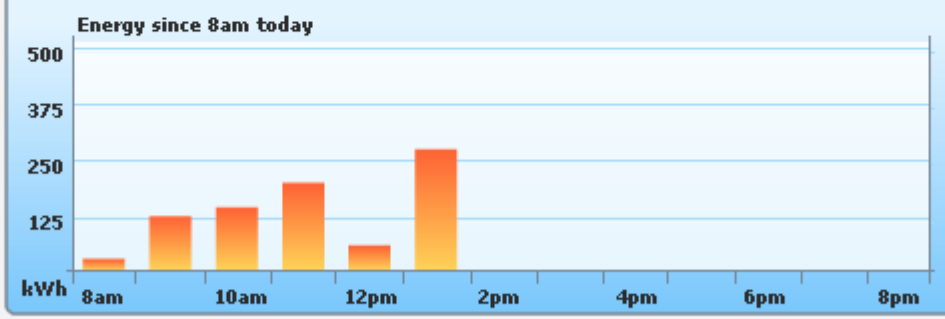


WIND SPEED 0 mph

Wind has a cooling affect on solar electric panels making them more efficient and thus improve performance.

	MAX	MIN	AVG
TODAY	0	0	0
THIS MONTH	12	0	1

TODAY | WEEK | MONTH | YEAR | ALL



POWER

This site has produced 804kW of power today

EMISSIONS

This site has reduced 745lbs of CO2 emissions today

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Internet

Lessons Learned – Advanced Metering System

- Need good handle on who your users and "Power Users" will be
- Organized Administration plan before rolling out and before training
- Focus on developing champions
- Dedicated staff to review information and develop agency specific needs that contractor can work to accommodate.

Lessons Learned – Agency view

- Who covers ongoing communication costs – headquarters or field level?
- Consistency across regional boundaries regarding allowing use of GSA network for data
- How sophisticated do we need to get with the meters?
  - Mandated to only meter electricity, but savings potential for all energy types
  - Great potential for better reporting for other areas such as renewable generation

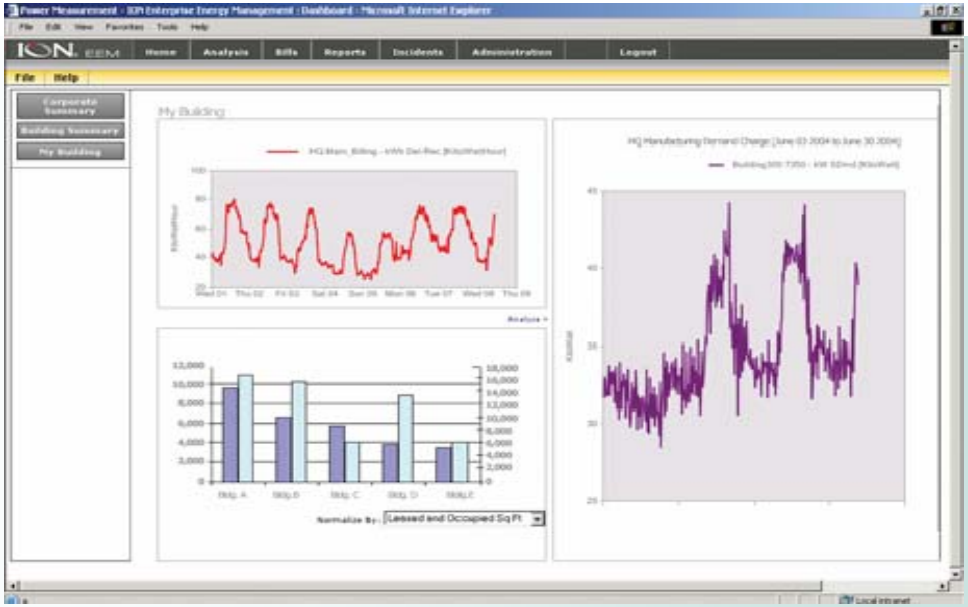
What are the Actual Costs?

- Advanced Metering System
  - Centralized system in place, as well as some regional systems in place
  - Ongoing support services from System vendor
  - Software upgrades
- IT Support – within agency, including server maintenance and upgrades
- Communication costs – initial and ongoing
- Actual Meters in the field
- Consultant – Additional expert in field for assistance in scope development, proposal review and long term planning
- Energy Tracking software upgrades to accommodate this data

Issues / Obstacles

- HSPD12 Clearances
- Funding – year end budgets
- Scopes / how detailed do we need to meet mandates vs. optimal benefit for our sites
- Funding and estimating costs
- Workload – Busy year….
  Manpower to analyze the data on continuous basis to maximize benefit

What is ION EEM?



- Innovative web-based software that answers the energy information needs of organizations that want to make better energy decisions
- Designed to support real-time monitoring within a data warehousing architecture
- Suitable for virtually any type of business: institutional, office and retail buildings, universities, industrial and research facilities, health centers, and utilities
- Offers a unique ability to provide a fully integrated look at all levels of your business

System Capabilities

- System provides individual users quick access to customized screens, delivering up-to-the-minute data consistent with their needs.
- System will utilize the existing wide area network (WAN) infrastructure to transmit data from field devices to the server(s).
- Data storage and warehousing will be handled by the National Capital Region's IT staff under an agreement with GSA's Energy Center of Expertise.

Communications Requirements

- ION EEM operates on historic data only, as opposed to real-time data.
- Data is typically time stamped in 15 minute intervals. The “front end” is provided by ION Enterprise. This system allows the presentation of real-time and historic data.
- A software module loads data from the ION Enterprise database into the ION EEM database for analysis in ION EEM.
- In order to get data into the system, meters will need to satisfy specific communications protocol and media.

Data Integration

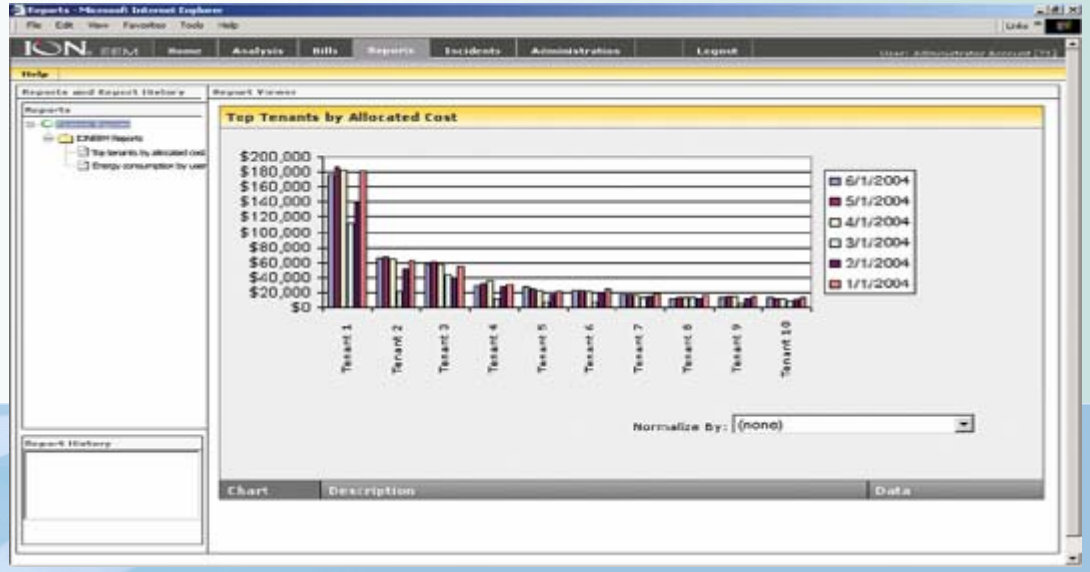
- *Historic Data for ION Meters*
  - ION meters feature on-board logging. This means that data is stored in a circular memory block in the meter. New data replaces the oldest data, so that one always has the most recent data stored on the meter e.g. the last 30 days. The effect of this is that any temporary loss of communications will not mean a loss of data in the ION Enterprise and ION EEM systems. As long as the communications downtime is not longer than the depth setting of the data recorder, data will not be lost.
- *Historic Data for 3rd Party Meters*
  - Although 3rd party meters might have similar on-board logging capability, ION Enterprise and ION EEM do not support the reading of these historic data logs. Data from 3rd Party meters must be logged using a software module of ION Enterprise, using a protocol other than ION protocol e.g. Modbus RTU. This means that in order to log data, continuous communications is required.
- *Historic Data from other sources*
  - Historic data can be loaded into the ION EEM database from e-mail, .xml and flat file formats. This means that historic data can also be sourced from 3rd party databases, ftp sites etc. A software module receives and transforms the data and loads it into the ION EEM database.

Key Benefits of ION EEM

- Translate real-time and historical data into actionable information
- Proactively reduce energy-related business risks
- Control energy costs
- Unite energy management and business strategies
- Gather, cleanses and integrate info from disparate systems
- Easily add capabilities as you need them

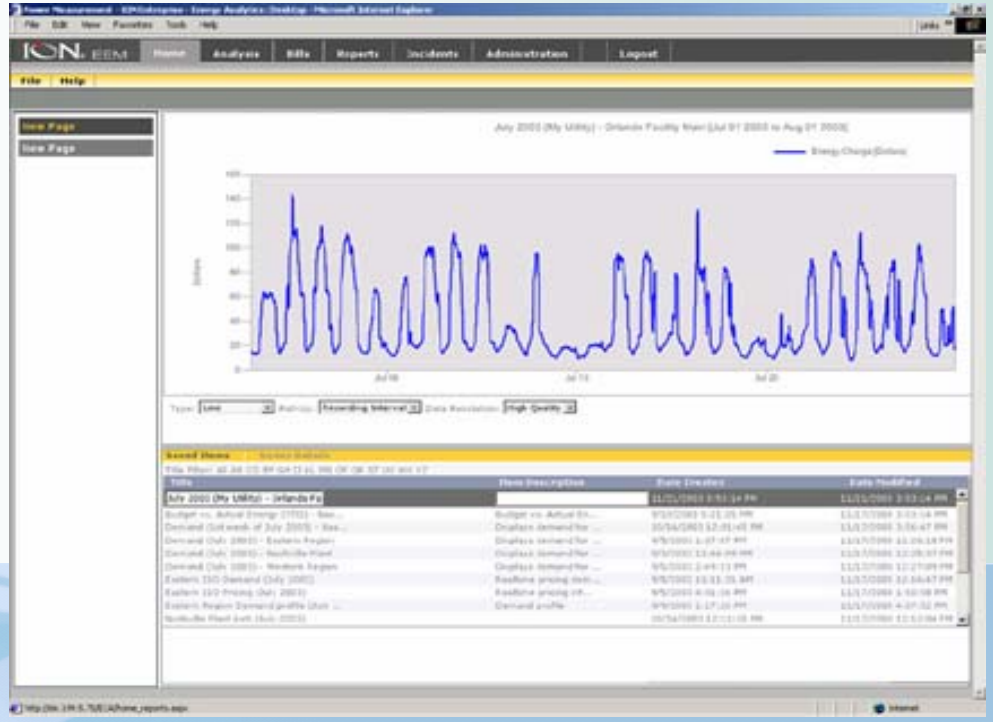
Application - Energy Cost Analysis

- Monitor and evaluate energy consumption and costs
- View data in whatever format best suits your needs
- Normalize energy usage data for variables such as weather and square footage
- Use easy drill-down analysis functions to present increasing levels of detail
- Process system data to prepare budgets for individual departments or processes, track budget projections with actuals, and use historical data to identify production, usage and cost trends

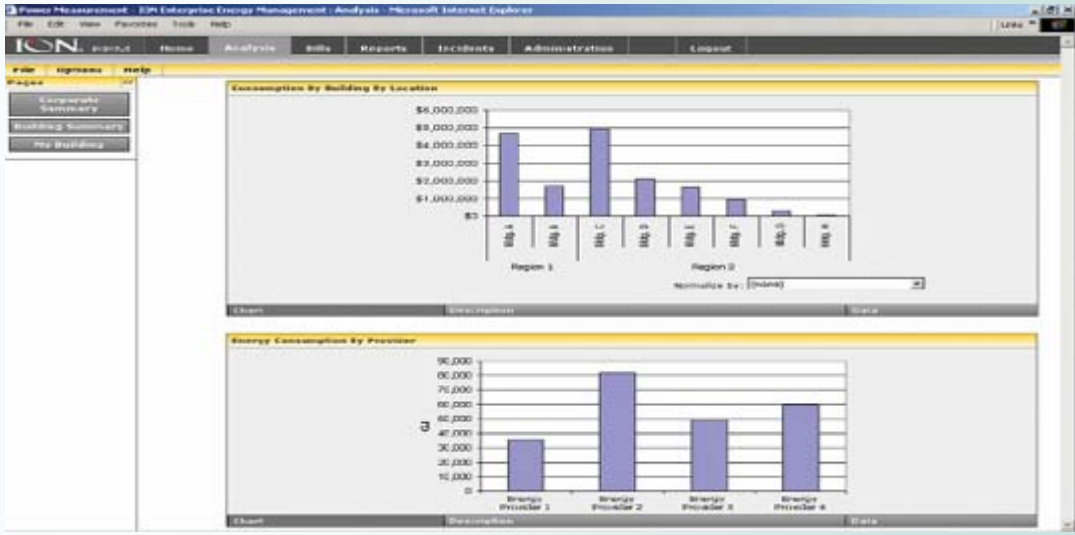


Application - Energy Cost Control

- Implement a comprehensive demand control scheme, with automatic load shedding, peak shaving, base loading and on-site generation
- Maximize ROI and simplify data collection by interfacing legacy systems with ION EEM
- Reduce business risks with information and analyses that can be used to produce cost and risk reduction strategies
- Create reports that can be distributed in paper, email or HTML format



Application - Benchmarking, Base-lining and Forecasting

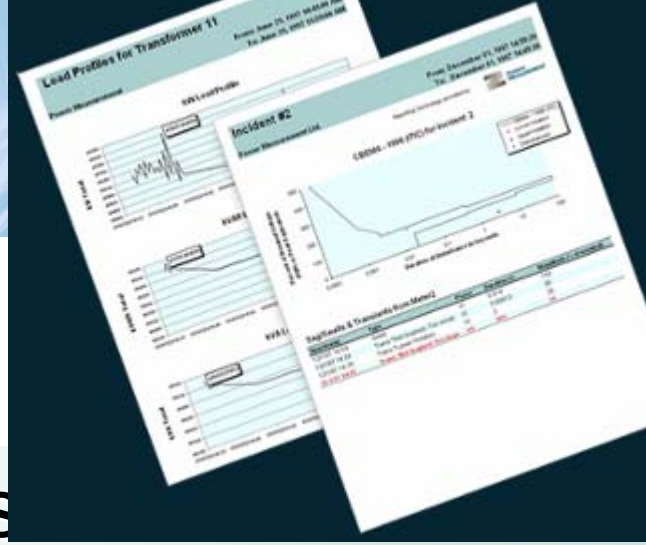


- Benchmark facility conditions
- Carry out comparisons between locations to identify best practices
- Create baselines to track conditions within a single facility
- Compare results over time to measure the effectiveness of retrofits, upgrades, etc.
- Use normalization routines to remove independent variables to ensure accuracy
- Model future results, then alter variables to gauge dependencies and see possible outcomes of different scenarios

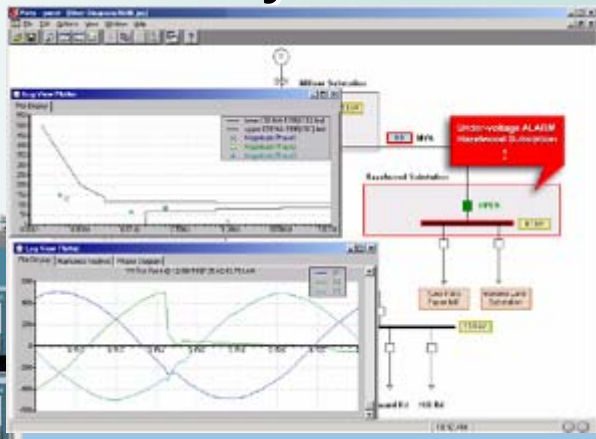
Application - Real-time Monitoring

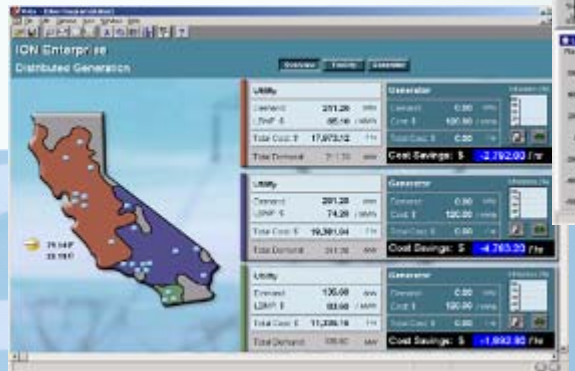
- Determine the condition of all your energy assets in real time
- Use instant data access to correlate ongoing activities with logged trends to help you better fulfill core needs
- Configure schedule- or event-driven alerts on any combination of trends, events or costs to ensure quick and efficient response to any condition

ION® Enterprise



- ION Enterprise™ – web-ready s
  - Enterprise-wide data acquisition and control capabilities
  - Comprehensive power quality and reliability analysis
  - Device configuration
  - Reporting





Moving Forward -

- Customize trend analysis to meet our needs for verifying demand response
  - Demand monitoring
  - General usage trends
  - Aggregation for energy procurements
- Share success stories
- More use of Rate Wizard tool
  - See real benefit potential here for forecasting impacts of new tariffs on current utility budgets
- Increase sharing of efforts at regional levels within agency

http://p1130s-pml02/ioneem/default.aspx?page=1

EEM | Dashboard | Trend Analysis | Bills | Reports | Administration | Alarms | Logout

Help

- ROB
- ekday Ops
- ekend Ops
- ekend Comp
- Hours kWh
- eral kWh
- d Monitoring
- Dashboard

Regional Office Building

GSA NCR Regional Office Building

Web page

GSA NCR Regional Office Building

Aggregated Demand

kW : 1385.5

Average Power Factor

PF : -88.8

GSA_ROB.14737	GSA_ROB.14738	GSA_ROB.14739
kW tot : 675.5	kW tot : 342	kW tot : 365.7
I avg : 32.6	I avg : 15.6	I avg : 17.7
PF sign tot : -87.2	PF sign tot : -92.3	PF sign tot : -87.2

nology by Schneider Electric ©2006

User: Administrator Accou

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Address http://p1130s-pml02/ioneem/default.aspx?page=7 Go

ION EEM | Dashboard | Trend Analysis | Bills | Reports | Administration | Alarms | Logout

File | Help

Pages

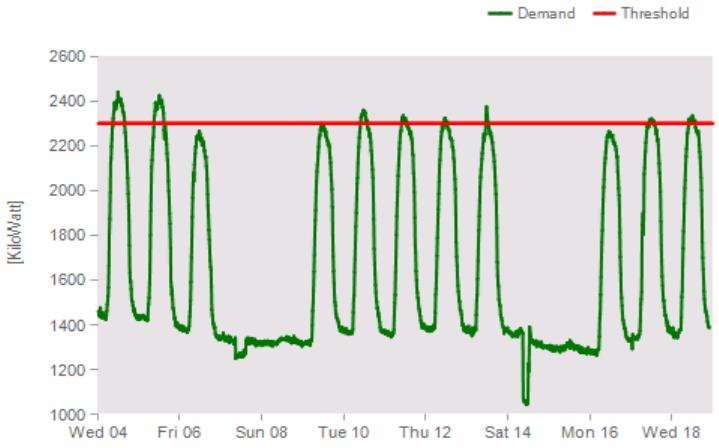
- GSA - ROB
- Weekday Ops
- Weekend Ops
- Weekend Comp
- Off Hours kWh
- General kWh
- Dmd Monitoring
- My Dashboard

Demand Monitoring at ROB

Example - Demand with One Threshold

Static Chart

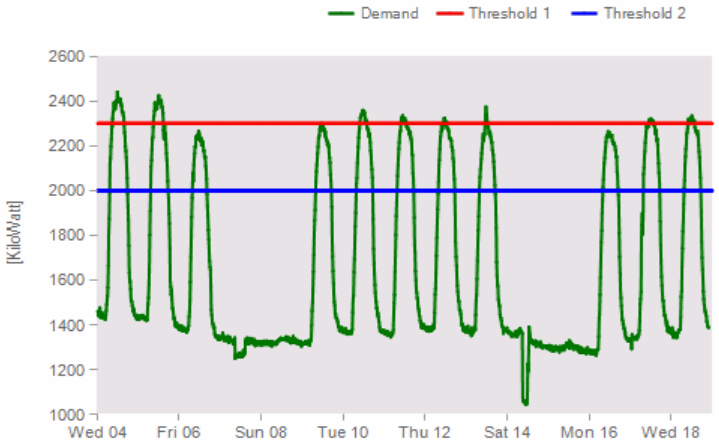
Apr 04 2007 to Apr 19 2007



Example - Demand with Two Thresholds

Static Chart

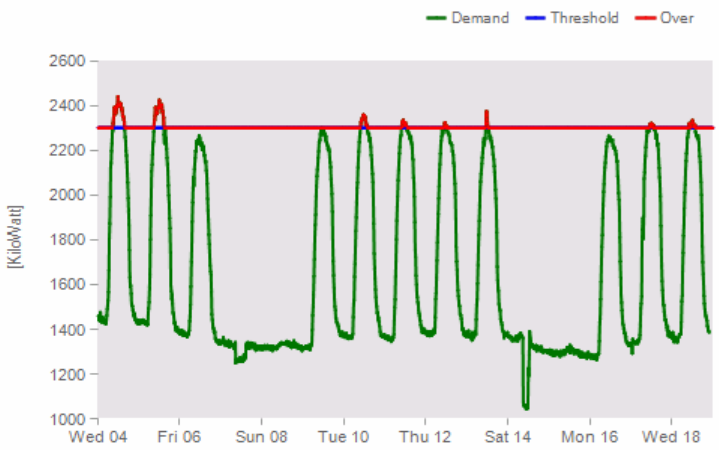
Apr 04 2007 to Apr 19 2007



Example - Demand Penalty with One Threshold

Static Chart

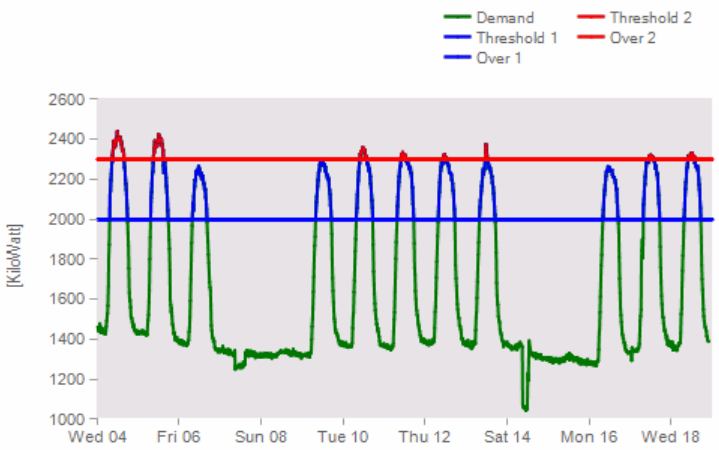
Apr 04 2007 to Apr 19 2007



Example - Demand Penalty with Two Thresholds

Static Chart

Apr 04 2007 to Apr 19 2007



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File | Help

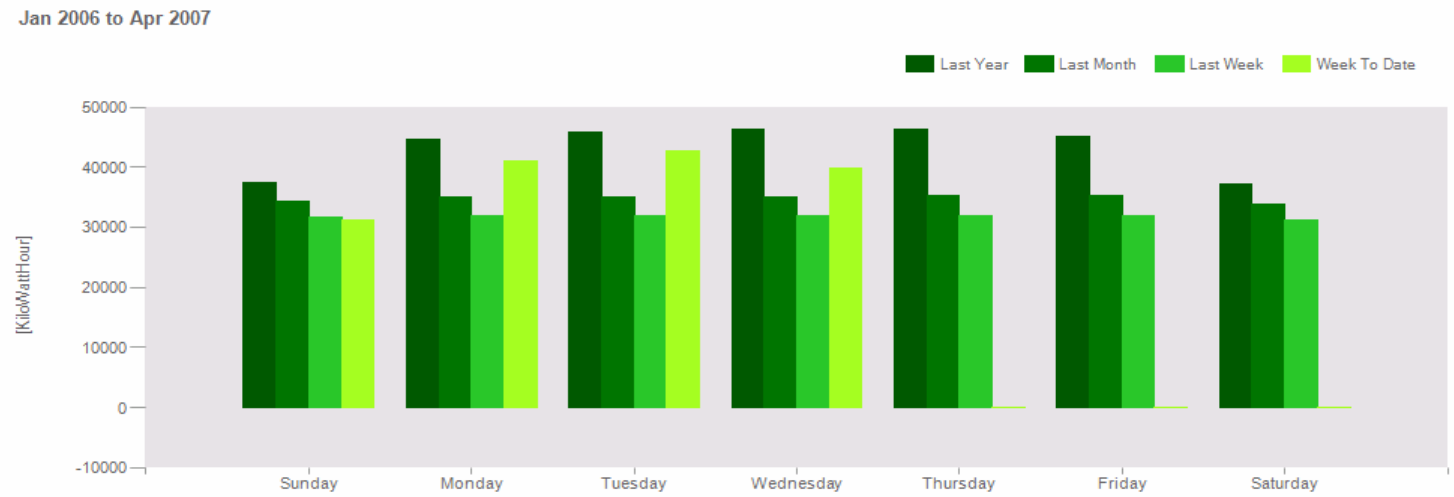
Pages

- GSA - ROB
- Weekday Ops
- Weekend Ops
- Weekend Comp
- Off Hours kWh
- General kWh
- Dmd Monitoring
- My Dashboard

General Usage Trends

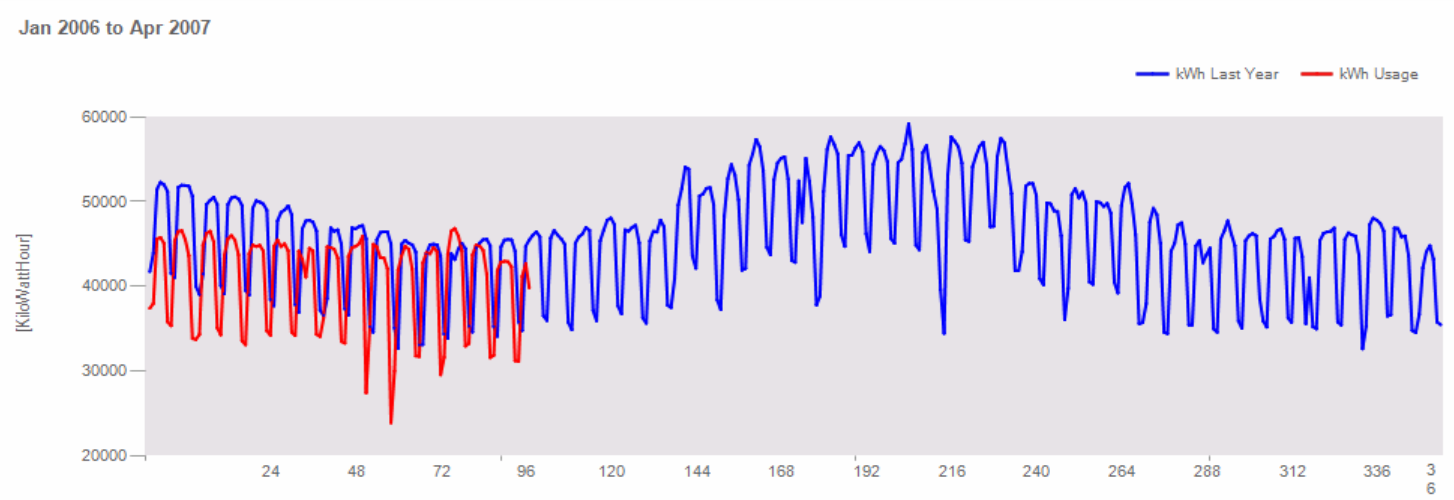
Example - Daily Usage Trend Check

Static Chart



Example Year To Date

Static Chart



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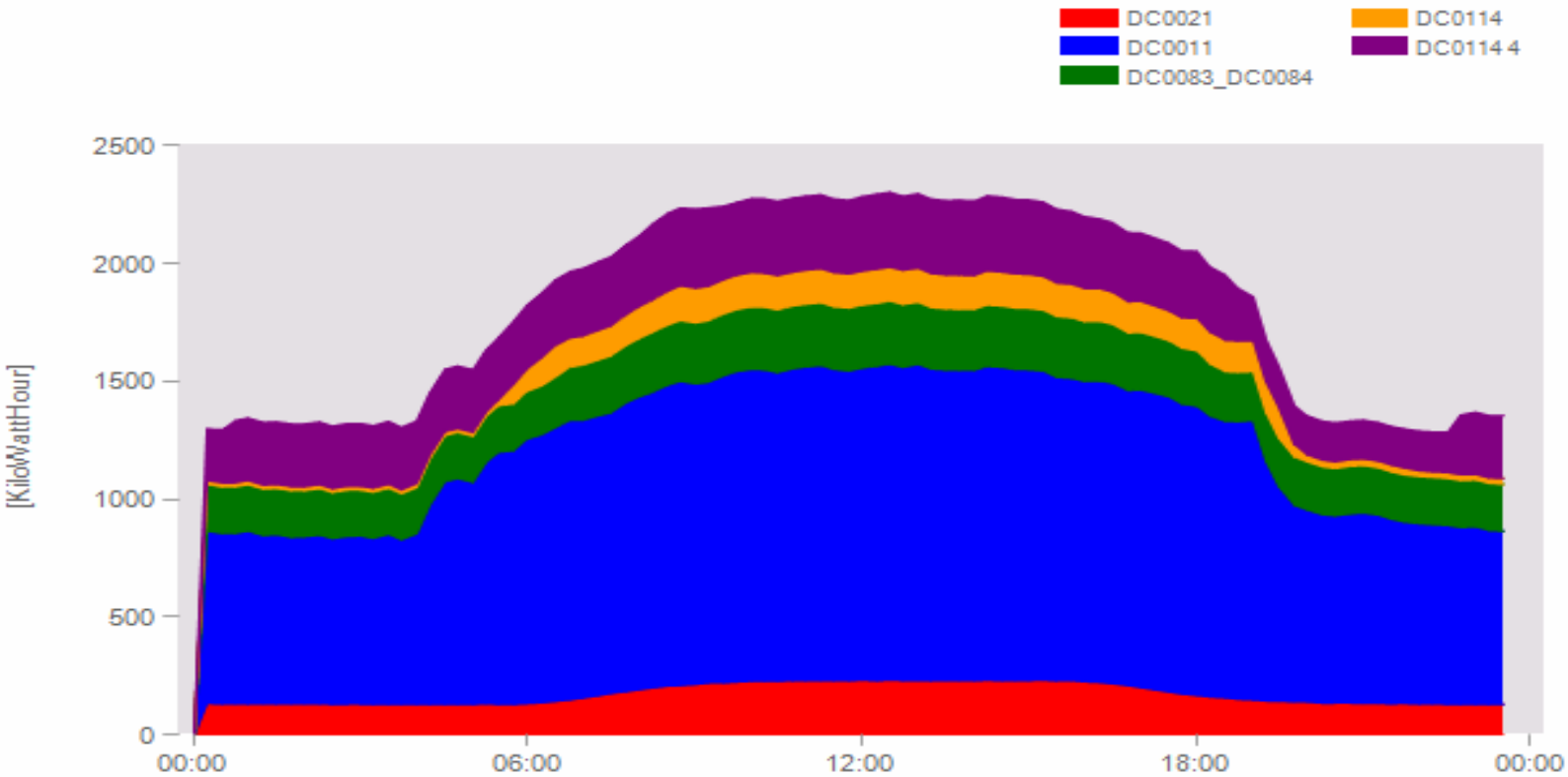
Untitled Static Chart

Tuesday Aug 07, 2007



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For More Information

- Would you like to know more about this session?
- Karen Curran
- GSA, Energy Center of Expertise
- Karen.curran@gsa.gov

Don’t forget to fill out and drop off your session evaluations!