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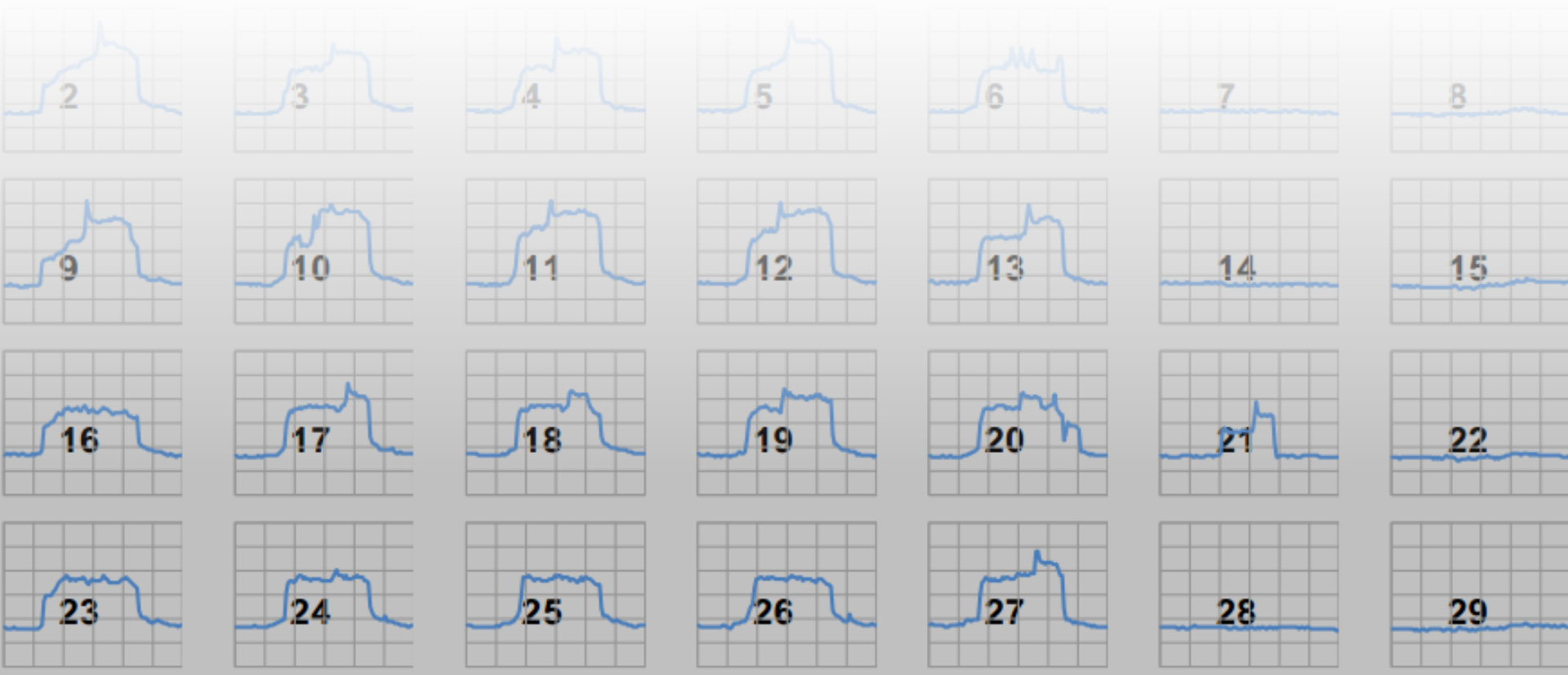

EnMS (energy management systems) Package for Small Commercial Buildings

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Purpose & Objectives

Problem Statement:

Small commercial buildings present two challenges for implementing energy efficiency strategies

1) high transaction cost relative to total savings
2) lack of personnel time or skill available for energy management

Objective: Develop packaged, highly 'commoditized' energy management systems (EnMS) for small commercial buildings that can be delivered with sufficiently low transaction costs, for 5-10% site energy savings

Purpose & Objectives

Impact of Project:

- Based on CBECS data, small buildings targeted (office, retail, food) comprise 24% of commercial energy use representing 1570 TBtu
- Assuming just 5% market penetration within several years of the first pilot, and 5-10% site savings, 4-8 TBtu savings could be generated

Project Focus:

- Supports midterm BTO goal of 40% savings in energy to operate existing commercial buildings, at less than the cost of energy saved
- Aligns with CBI strategies: accelerate advanced solutions into existing buildings, energy mgt and continuous improvement
- Aligns with CBI program role/priority: voluntary activities for increased efficiency, emphasizing market-viable yet under-utilized resources

Approach

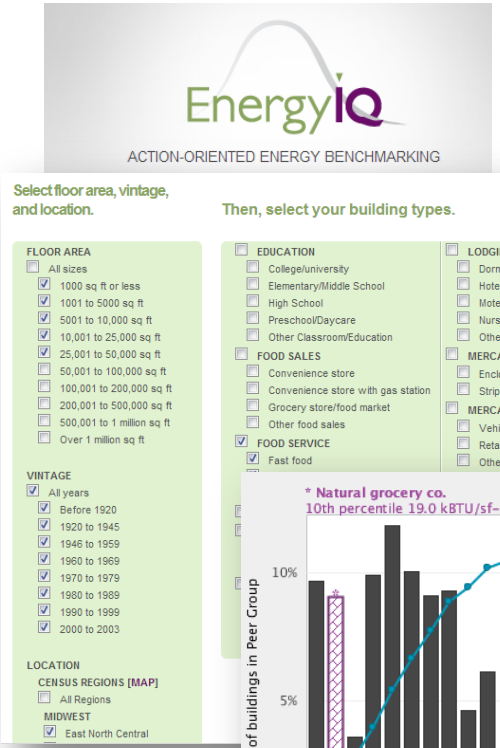
Approach: Combine *existing approaches*, e.g., meter data analysis, incentive matching, into a single low-cost solution delivered by HVAC contractors

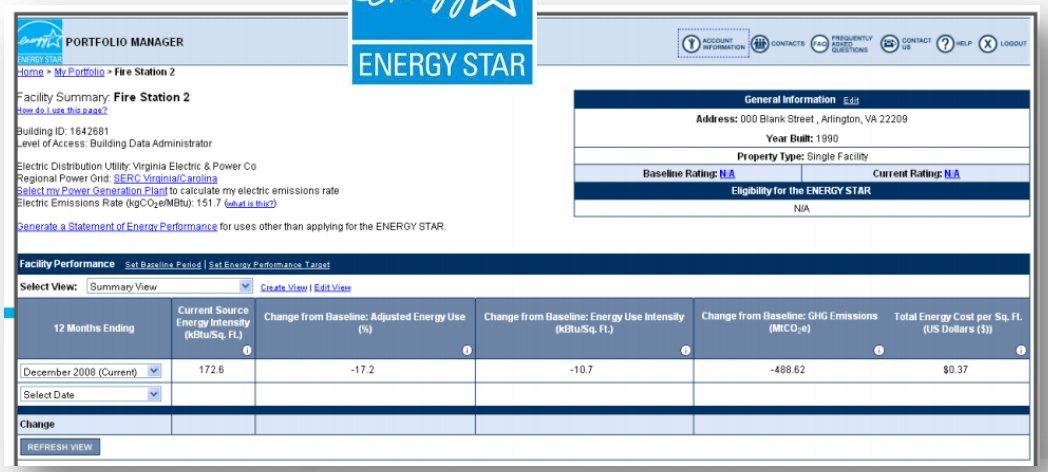
Key Issues: Very low level of effort (~4 hours); business model development; identification of deployment channels for scaled dissemination; demonstration design to generate necessary 'proof points' for adoption

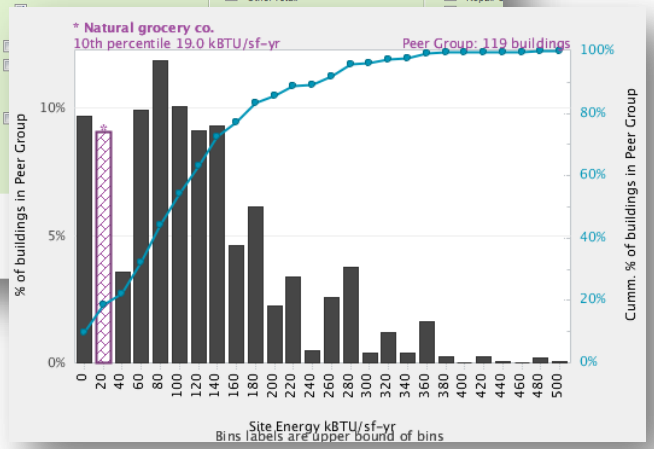
Distinctive Characteristics: Utilizes contractors who already serve small commercial market; creates new business value proposition for contractors and owners

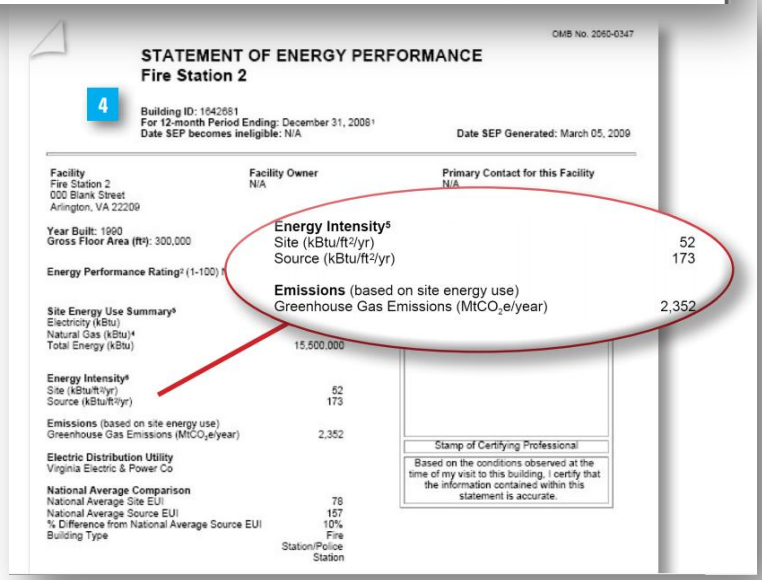
Approach

- Existing benchmarking tools (free)



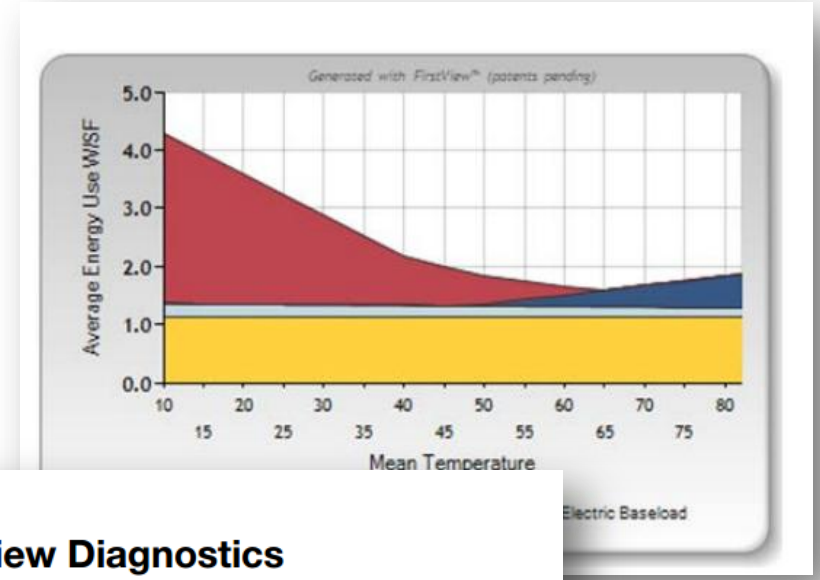






Approach

- Existing utility and interval data analysis tools (low/no cost)



FirstView Diagnostics

FirstView Category	*Status*
Occupant Load:	*Typical*
Heating and Ventilation	*Good*
Cooling Efficiency:	*Good*
Controls:	*Moderate Inefficiencies*
Reheat:	*Unlikely*
Gas Baseload:	*High*
Data Consistency:	*Orderly*

Shutdowns

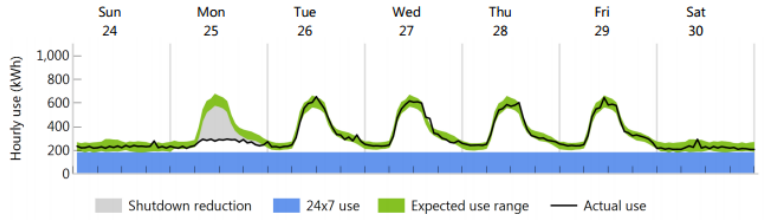
8 days Number of "shutdown" days in the analysis period - electricity use was much lower than expected, and was flat for most of the day.

16,700 kWh Reduced electricity use during the shutdown days. If use had been in the "expected range" for these days, this is how much additional electricity would have been used.

$2,250 Estimated cost savings from the reduced electricity use.

A "shutdown day" occurs when equipment which can be turned off is shut down for most hours of the day. This is a day when the load is expected to rise and fall, but instead is flat and near the 24x7 demand. Shutdown days often occur around holidays.

For example, the week beginning Sunday, 24 May 2009 has one shutdown day:

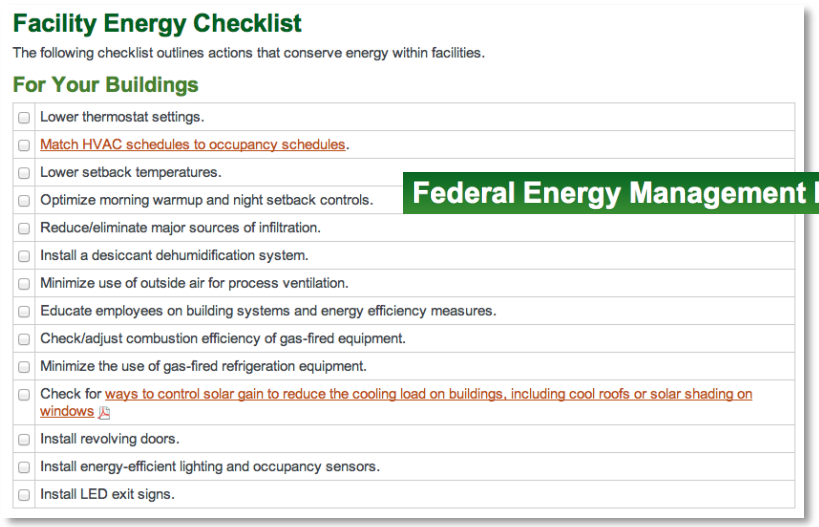


The 8 shutdown days occurred in 5 periods:

Shutdown Period	Reduced use (kWh)	Reduced cost ($)	Holidays
Mon, 25 May 2009	2,180	294	Memorial Day
Mon, 7 Sep 2009	2,620	405	Labor Day
Sat, 10 Oct - Mon, 12 Oct 2009	5,060	704	Columbus Day
Wed, 11 Nov 2009	2,050	250	Veterans Day
Thu, 26 Nov - Fri, 27 Nov 2009	4,830	592	Thanksgiving Day

Approach

- Existing walk-through checklists and guides



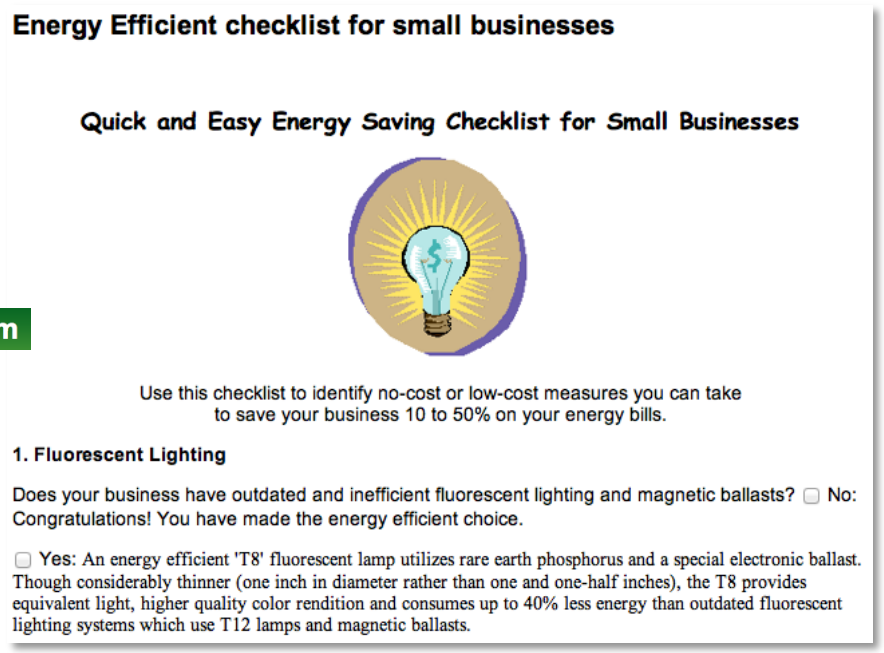
Facility Energy Checklist

The following checklist outlines actions that conserve energy within facilities.

For Your Buildings

- ☐ Lower thermostat settings.
- ☐ Match HVAC schedules to occupancy schedules.
- ☐ Lower setback temperatures.
- ☐ Optimize morning warmup and night setback controls.
- ☐ Reduce/eliminate major sources of infiltration.
- ☐ Install a desiccant dehumidification system.
- ☐ Minimize use of outside air for process ventilation.
- ☐ Educate employees on building systems and energy efficiency measures.
- ☐ Check/adjust combustion efficiency of gas-fired equipment.
- ☐ Minimize the use of gas-fired refrigeration equipment.
- ☐ Check for ways to control solar gain to reduce the cooling load on buildings, including cool roofs or solar shading on windows
- ☐ Install revolving doors.
- ☐ Install energy-efficient lighting and occupancy sensors.
- ☐ Install LED exit signs.

Federal Energy Management Program



Energy Efficient checklist for small businesses

Quick and Easy Energy Saving Checklist for Small Businesses

Use this checklist to identify no-cost or low-cost measures you can take to save your business 10 to 50% on your energy bills.

1. Fluorescent Lighting

Does your business have outdated and inefficient fluorescent lighting and magnetic ballasts? ☐ No: Congratulations! You have made the energy efficient choice.

☐ Yes: An energy efficient 'T8' fluorescent lamp utilizes rare earth phosphorus and a special electronic ballast. Though considerably thinner (one inch in diameter rather than one and one-half inches), the T8 provides equivalent light, higher quality color rendition and consumes up to 40% less energy than outdated fluorescent lighting systems which use T12 lamps and magnetic ballasts.

Accomplishments and Progress

Accomplishments: Concept vetting and confirmation of intended approach with ~20 stakeholders– contractors, tools vendors, utility reps w/ small commercial focus

Partner commitments for pilot demonstration- 2 contractors and 4 buildings

Progress on Goals: Project is progressing relative to goals, as planned– draft package by May, demos in May/June

Awards/Recognition: n/a

Project Plan & Schedule

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Task Overview

Task 1 Analyze market need and potential - completed

Task 2 Develop technical and business approach, obtain pilot partner commitments - completed

Task 3 Develop EnMS package and business model - in progress

Task 4 Demonstrate in pilot, track impacts, disseminate results to seed deployment – future task

Project Plan & Schedule

Project initiated October 2012

Planned completion September 2013

2 go/no-go decision points, both have occurred

Q1: *Evidence of necessity and value of DOE investment in proposed EnMS (scoping study, stakeholder feedback)*

Q2: *Commitment from providers and owners to participate in pilot demonstration*

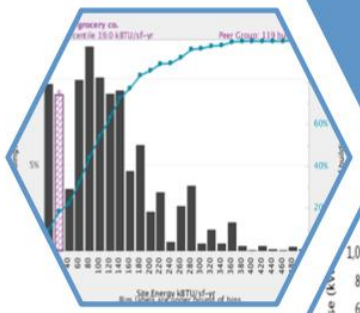
On schedule, no slips

EnMS Package Description

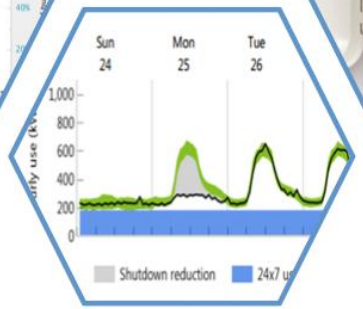
EnMS Activity	EnMS Package Contents
Peer benchmarking, monthly bill analysis	**Template and instructions for collecting data; Instructions on how to use existing tools, interpret and record results**
Electric interval meter data analysis	
Walkthrough to identify operational or modest capital improvements	**Audit checklists and guidelines; tracking sheet, and instructions on how to resolve issues**
Identify incentives to support capital improvements	Pointers to online tools and how to find local small commercial utility programs
Savings assessment and continuous tracking	Instructions on how to use existing tools; what to quantify
Communication of results	Guidelines on goal setting; template to compile results

EnMS Package Description

Analyze monthly data & benchmark



Analyze interval data



Walkthrough

Identify incentives

Assess savings

Communicate results

EnMS Activity Example: Interval meter data analysis

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Analysis of Interval Data

Plan to spend about 20-30 minutes reviewing a building's interval energy use data.

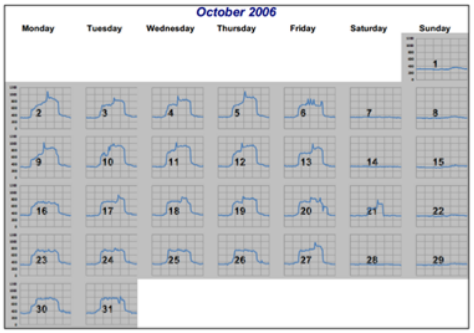
	When you see this icon, make sure to record the requested information in the 'Analysis of Interval Data Worksheet'
	When you see this icon, look for tips for actions to reduce energy consumption.

Step 1 Upload data

Load interval data into the program. You need at least one month (as much as 6-13 months for some tools) of electricity use data reported every hour (or every 30, 20, 15 minutes). See 'Obtaining Interval Data'.

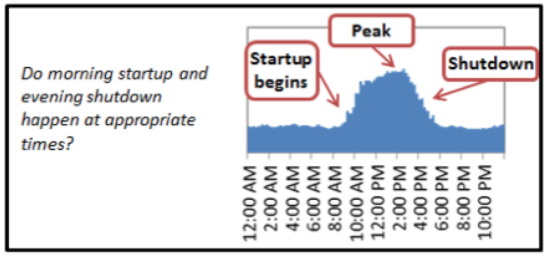
Step 2 Daily and weekly load schedule

Display electricity use data vs. time for a few weeks of interval energy use data.



Energy use for each day in the month of October 2006 using ECAM (from ECAM instruction manual). Note weekday vs. weekend schedule is typical, with abnormal activity on Saturday October 21.

Does the daily load profile have the same shape as you would expect? Specifically:



Interval Data Analysis Worksheet

Building:_____
Date:_____

Step 0: Obtain interval energy use data

Either: ☐ Get file from owner. File name: _____

☐ Download file from utility website. Utility: _____ Username:_____ Password: _____

Building floor area: _____ Building type: _____

Step 1: Tool used to display interval data: _____

Step 2 Daily and Weekly Scheduling:

[paste an image of a week or several weeks of daily loads here]

Weekly pattern (circle): Weekend load compared w/ typical: As owner expected?	all days similar weekday/weekend weekday/Sat/Sun irregular/other: _____ same slightly lower much lower base load level yes / no
Holiday loads compared w/ typical: Which holidays (circle): As owner expected?	same slightly lower much lower base load level 1/1 MLK Pres. Mem. July4 Labor Colum. Vet. ThnkGiv 12/24 12/25 other:_____ yes / no
Typical day scheduling: As owner expected?	Startup begins: _____ Startup ends: _____ Shutdown begins:_____ Shutdown ends:_____ yes / no
Notes on irregular activity: *Include times where equipment may be running unnecessarily.*	

Step 3 Base Load:

Base load level: _____ Typical daily maximum level _____
Base load to daily maximum ratio: _____ *Divide base load by typical daily max*
• *If ratio above is greater than 0.50, look for opportunities to deepen setbacks.*

Project Budget

Project Budget: $250K

Variances: None expected

Cost to Date: $70K, expected increase in spend rate to support pilot demonstration

Additional Funding: n/a

Budget History			
FY2013		FY2014	
DOE	Cost-share	DOE	Cost-share
$250K	n/a	TBD	TBD

Project Integration, Collaboration & Market Impact

Partners, Subcontractors, and Collaborators: Demonstration partners Marina Mechanical and RRR Heating and Air Conditioning

Technology Transfer, Deployment, Market Impact: 6 potential deployment pathways have been identified

1. **Contractor training venues**
2. **Contractor professional orgs**
3. Cities and states with energy use reporting requirements
4. Utility programs targeting small commercial
5. **Building Owners and Managers Association (BOMA)**
6. Environmental business certification bodies, e.g. Green Seal

Communications: n/a

Next Steps and Future Plans

Next Steps and Future Plans: Following FY13 development and demonstration, potential next steps concern

- dissemination of pilot results
- engagement of deployment partners via high-priority pathways
- scaling/testing in diverse US markets

BOMA INTERNATIONAL Building Owners and Managers Association International

ACCA Air Conditioning Contractors of America