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# Best Practices in Energy and Water Auditing and Existing Building Commissioning

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# Presentation Overview

1. Commercial Auditing Best Practices
2. Identifying Existing Building Cx Opportunities During an Audit
3. Case Study: Naval Station Great Lakes ESPC



# Goals of a Successful Energy Audit

- Identify types and cost of existing energy use
- Determine more cost-effective ways of using energy.
  - Operational techniques
  - New equipment and processes



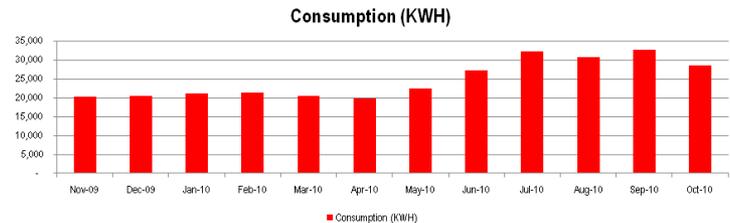
Source:  
<http://www.thepowercompany.net/business.html>

# Steps to Plan and Execute an Audit

- A successful audit incorporates the following steps:
  1. Pre-survey preparation and planning
  2. Logistical planning and coordination
  3. Technical support during and after the audit
  4. Performing the audit
  5. Completing the proposal

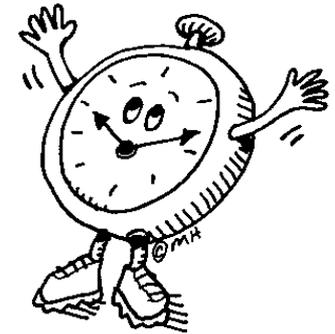
# Pre-survey Preparation

- Utility bills
  - 36 months of history is ideal
  - Understand rate schedules
  - Energy baseline analysis
- Degree day data for geographic location
- Equipment inventory
- Building use and operating schedules
- Remote access facility's EMS, if possible.



# Logistical Planning and Coordination

- Survey timing
- Site point of contact
- Try to secure a knowledgeable escort
- Access requirements
- Lodging and transportation



Source:  
<http://school.discoveryeducation.com>



Source: [graphicleftovers.com](http://graphicleftovers.com)

# Technical Support During and After

- Utility representatives
- Equipment vendors
- Governmental support agencies



Source:  
<http://northwest.inetgiant.co.uk/liverpool/home/building-surveying>

# Performing the Audit

1. Assess existing conditions
2. Determine customer criteria
3. Perform technical evaluation
4. Determine energy conservation measures



# Assess Existing Conditions

- Annual operating hours
- Nine Major Systems to Consider:
  1. HVAC system
  2. Building envelope
  3. Electrical supply system
  4. Lighting
  5. Boiler and steam system
  6. Domestic hot water system
  7. Compressed air system
  8. Motors
  9. Special purpose process equipment
- How the systems are controlled
- System maintenance
- Utility rate structure
- Existing energy consuming systems

# Determine Customer Criteria

- What are the customer's objectives?
  - Reduced operating/maintenance costs
  - Energy goals and mandates
  - Environmental compliance
  - Safety and security
- What are the economic restrictions?
  - Payback or availability of capital



Source:  
<http://www.pearcyblackman.co.uk>



Source:  
<http://sustainabledesigners.blogspot.com>

# Determine Customer Criteria Cont.

- What are the functional restrictions?
  - Night time setback of space temperatures
  - Turning off air compressors during downtime
- Are there time restrictions?
  - Release of funds
  - Cooling/heating season
  - Major renovation



Source: Pmptips.net

# Determine Energy Conservation Measures

- More efficient equipment
- Equipment scheduling
- Improved system control
- Enhanced maintenance procedures



Source: <http://lyricsdog.eu/s/save%20the%20energy>



Source: <http://wittywrite.wordpress.com>

# Completing the Proposal

- Depends on the contract and deliverable requirements
- Typically, the report should contain the following elements:
  - Site overview
  - Existing conditions and energy baseline
  - Proposed ECMs
  - Savings calculations, cut sheets, life cycle cost analyses, etc.



Source: <http://www.senukedetector.com>

# Case Study

## Naval Station Great Lakes

NSGL



# Background

- NSGL has approximately 280 buildings situated on roughly 1,600 acres.
- Slightly less than 100 buildings were identified as target buildings for audit and existing building commissioning. (selection based on cursory walk-through and buildings identified by NSGL Energy team.)

# First Step

- Identification and clear understanding of energy goals. EPA Act 2005, EO 13423
- Develop “real” energy baseline for 12 consecutive months using utility bills.
- Perform audit and review of drawings of building within scope to identify potential measures.
- Identification of multiple Energy Conservation Measures (ECMs) within building list, measures include:

# Next Step in the Audit Phase

- Performed detailed audit to identify specific scope for contractor pricing.
  - Audit identified items such as quantities, wattage, occupancy sensor locations, GPF ratings, motor horsepower ratings, etc.
- Retro- Commissioning effort discovered by full building HVAC audits including eQuest modeling, trend data from existing EMS systems.

# ECMs

- Water and Wastewater
  - Low flow fixtures
  - Low flow aerators
- Lighting Improvements
  - High efficient T8 lamps and ballasts
  - Occupancy sensors
  - HID hi-bay replacements
- Variable Frequency Drive (VFDs)
  - Audit focused on 15hp or greater motors
- Retro-Commissioning



# Fully Developed Scope

- Developed detailed SOW for Contractor fixed firm pricing.
- Identified M&V methodology appropriate to the size and complexity of each measure.
- Finalized savings and provided Energy team sufficient information to make the best fit decisions within the scope and Building list for a successful project.

# Implementation

- Closely monitored and managed subcontractors installation to ensure stated system performance was achieved.
- Deliver post installation M&V report with achieved savings information.



# Resources

- Handbook of Energy Audits
  - Authors: Albert Thumann, William J. Younger
- Guide to Energy Management
  - Authors: Barney Capehart, Wayne C. Turner, William J. Kennedy
- Energy Management Diploma – North Carolina State University
  - <http://continuingeducation.ncsu.edu/energymgt.html>

# Any Questions?

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