Reviewing the Audit Results

David Birr

Synchronous Energy Solutions

Defining a Quality Base Year is Key to Maximizing Project Value

- Base year is the mutually agreed upon pre-retrofit *annual* utility consumption and cost for your building or a specific energy end use
- It provides the basis for the technical and economic analysis of potential energy conservation measures (i.e., investment-grade audit)
- It also provides the basis for measuring and/or calculating the value of future energy savings (i.e., monitoring project performance)

Factors to Consider When Establishing the Base Year

- Changes in building equipment, structures, schedule, occupancy, or control setpoints
- Recent operations and maintenance work impacts on energy consumption
- Mild or severe weather conditions
- Changes in utility rates
- Adequate, accurate documentation or measurement of current equipment operating conditions, sizes, loads, and schedules
- Existing lighting levels, ventilation rates, temperature, and humidity

Challenges to Calculating an Accurate Base Year

- Data analysis fails to account for periods during which equipment was broken or malfunctioning
- Base year consumption data reflect atypical schedule or operating conditions
- Consumption data are inaccurate or missing due to utility metering, billing, or data entry errors
- Run hours of equipment ≠ operating hours of building
- Run hours of equipment ≠ facility staff estimates
- Thermal loads may not be simply proportional to weather due to occupant load
- Actual annual equipment loads ≠ full load rating nameplate (e.g., average motor operates at 60% of full load rating)

Review of Audit Draft

- Request draft copy of audit report (70–80% complete).
- Review draft with HA Performance Contract team.
- Develop list of questions for ESCO.
- Meet with ESCO to resolve questions and/or reiterate expectations.

Energy Conservation Measures (ECMs) to Consider

Building Envelope Improvements

1. Replacement windows/doors
2. Window repair/sealing
3. Window films or screens
4. Storm windows/doors
5. Attic/roof insulation
6. Wall insulation
7. Air sealing

Energy Conservation Measures (ECMs) to Consider (cont.)

Mechanical Systems Improvements

8. Space temperature control (setpoint, setback)
9. Space heating O&M (leak repair, steam trap repair, tune-up, clean HX surfaces, calibrate controls)
10. Zone control
11. Boiler flue dampers
12. Boiler flue gas heat recovery (economizer)
13. Electric ignition (replace gas or oil pilot lights)
14. Energy management control system (new or upgrade)
15. Boiler or furnace replacement (heating plant)

Energy Conservation Measures (ECMs) to Consider (cont.)

Mechanical Systems Improvements (cont.)

16. Boiler plant decentralization
17. Steam to hot water conversion
18. Insulate piping
19. High-efficiency motors
20. Variable frequency drives
21. Heat recovery (ventilation air)
22. Ventilation O&M (belt maintenance, bearing lubrication, clean fans and HX, dampers, design)

Energy Conservation Measures (ECMs) to Consider (cont.)

Mechanical Systems Improvements (cont.)

23. Chiller or air-conditioner replacement (cooling plant)
24. Electric heat replacements
25. Electric/gas conversions
26. Equipment tune-ups
27. Air distribution systems
28. Heat pumps (air-to-air or ground-coupled)
29. Energy metering
30. Electric demand controllers

Energy Conservation Measures (ECMs) to Consider (cont.)

Lighting Systems Improvements

31. Lighting O&M (relamp, delamp, clean fixtures)
32. Lighting controls (occupancy sensors, daylighting)
33. Incandescent to fluorescent conversion
34. Fluorescent lamp upgrade
35. Ballast upgrade
36. Exterior lighting upgrade (incandescent and MV lamps to HPS, MH, or LPS)
37. Exterior lighting controls (timers, photosensors)

Energy Conservation Measures (ECMs) to Consider (cont.)

Water Services Improvements

38. Showerheads (convert to low-flow)
39. Toilets (convert to low-flow)
40. Faucets (convert to low-flow)
41. Insulate DHW tanks and piping
42. Repair damaged underground water lines
43. Cooling tower sewer credit
44. Detect and repair pipe leaks
45. Water metering

Accurate Technical Analysis

- Are the data used for energy rates and equipment costs accurate?
- Does it provide a comprehensive analysis of technical options?
- Are the calculations based on reasonable input estimates?
- Are the calculations reproducible and free from math errors?
- Have interactive effects between technical options been evaluated?

Accurate Technical Analysis (cont.)

- Poor data collection practices can create significant errors in the analysis (check the ESCO's standardized data collection format)
- Use technical assistance to review the calculations and proposed technical schedules
- Does the audit properly quantify environmental costs and benefits? (e.g., value of recycled CFCs, disposal costs, avoided air emissions)
- Do the proposed measures maximize net project benefits?

Accurate Economic Calculations

- Utility bill reconstruction should be used to value savings
- Materials and maintenance savings should be clearly documented and calculated
- Utility price escalation rates used for cash flow analysis or future savings valuation should be reasonable
- Economic impacts of performance guarantee provisions on HA annual budget should be evaluated