



Effective Energy Audits

Value, Type, Qualifications, Road Maps
and Hurdles

Keith McBrien

GDS Associates

Bill Smith

Building Diagnostics



www.buildingdiagnosticsnh.com



GDS Associates, Inc.
Engineers and Consultants

Value of Energy Audits

- **Road Map to Energy Liberation**
 - Prioritized list of actionable energy saving measures
- **Master Energy Plan (MEP) implementation piece**
 - A piece of the puzzle that saves money on its own merit
- **The proof is in the pudding**
 - Experience, metering, and past performance
- **Case Studies**



Benefits of Energy Audits

- **Operating cost reduction**
- **Justify new capital expenditures**
- **Carbon reduction**
- **Reduced maintenance costs**
- **Increased reliability**
- **Increased comfort**
- **Increased productivity**



Typical Energy Audit Process Flow Diagram



Audit Types

- **Level I-Walk-Through Assessment**
- **Level II-Energy Survey and Analysis**
- **Level III-Detailed Analysis of Capital-Intensive Modifications**
- **General – The level of energy audits do not have sharp boundaries between them.**
- **What is an “investment grade audit”?**

Reference 1995 ASHRAE Application
Handbook p 32.10



Choosing What Best Fits The Need

- **Accreditations, licenses, certifications**
- **Skills**
- **Size**
- **Experience**
- **Equipment**
- **Location**
- **Outcome**



Tools of the Trade

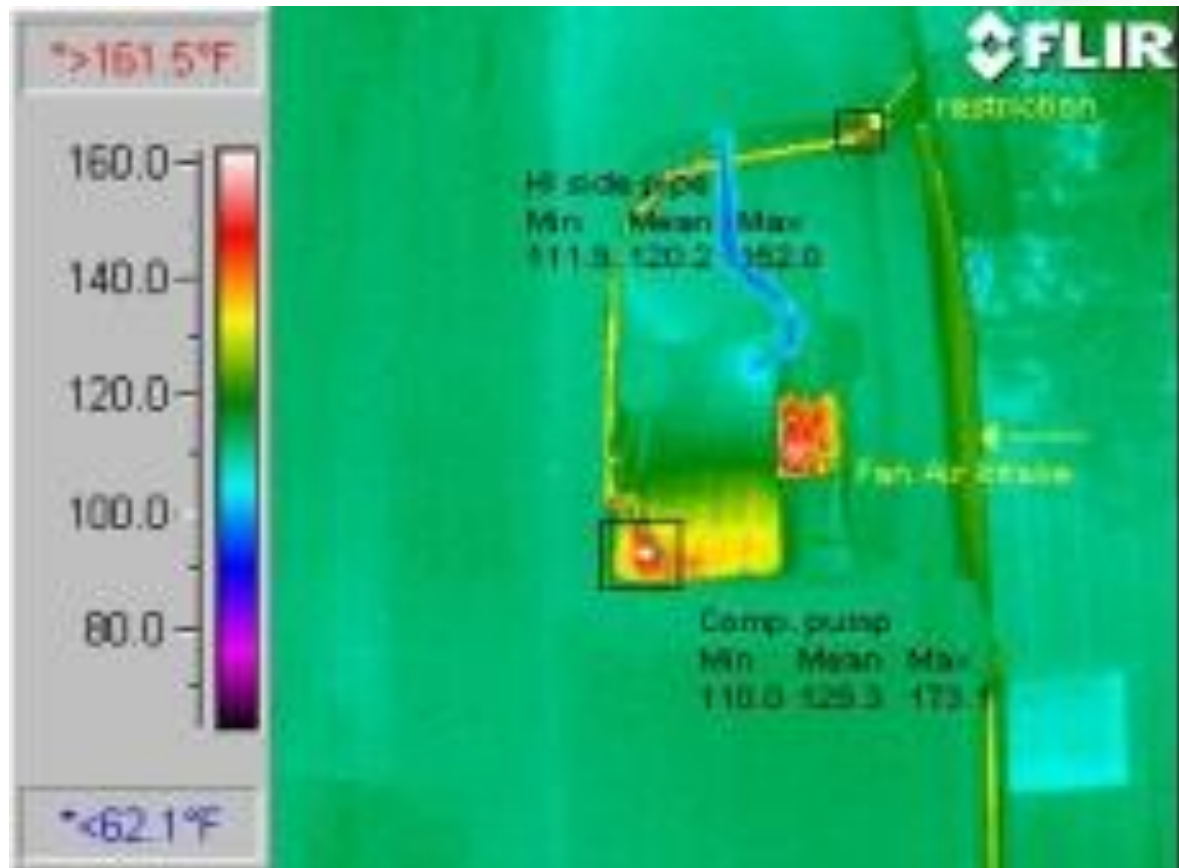
- **IR Camera**
 - Sample IR photo of County Court House
- **Data Logger**
 - Electrical usage data, Temperature, Humidity, Lighting, CO2 Monitoring
- **Blower Door Test Equipment**
- **Combustion Gas Analyzer**



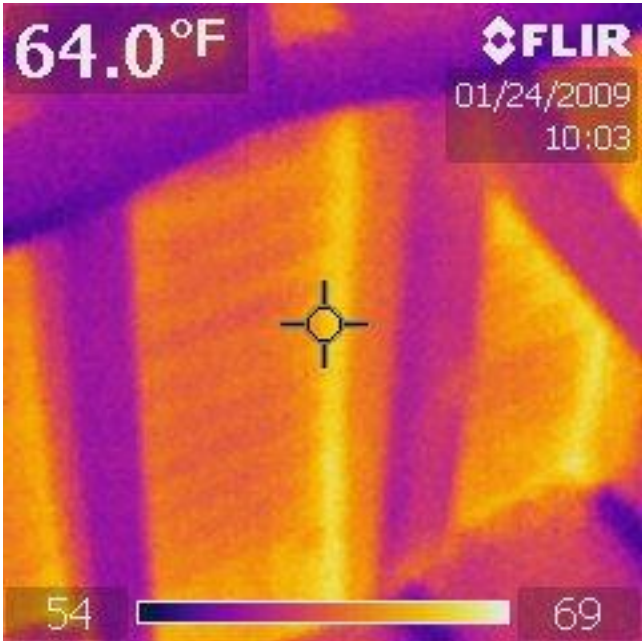
IR Camera



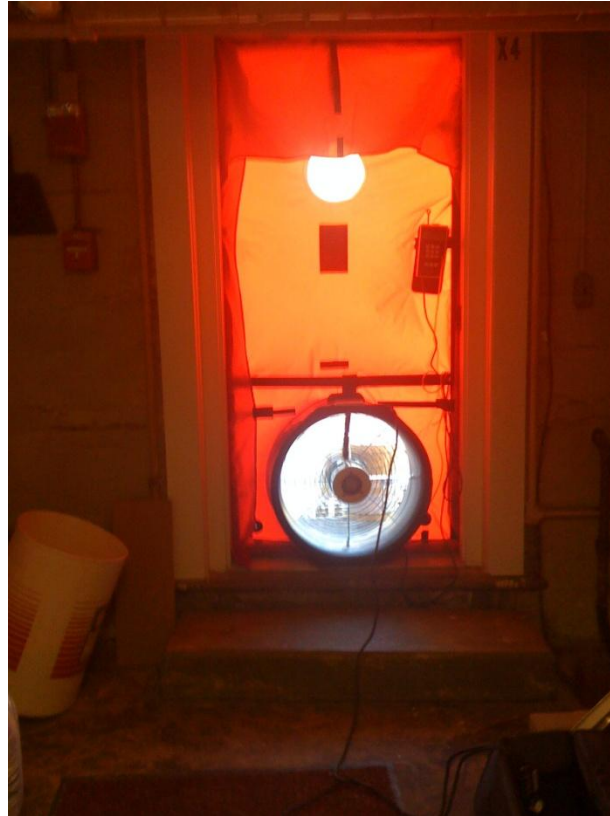
AC Unit Problem



1895 Court House Air Leakage



Blower Door Test Equipment



Combustion Gas Analyzer



Electrical Data Loggers



Hurdles

- **Staff – skills, time**
- **Culture**
- **Finances**
- **Future is unknown**
- **Understanding of technology**
- **Perceived value** (granite counter vs. upgraded heating system)



What's Wrong with this picture



Common Trends

- **Often times areas that are out of sight are out-of-mind from an energy perspective.**



Incentives

- **Rebates**
- **Tax Deductions (if applicable)**
- **RGGi**
- **Economic Recovery Act 2009**
- **Smart Start (NHEC and PSNH only)**



CASE STUDIES

- **Plymouth State University**
- **Belknap County Complex**
- **Somersworth School**



PSU EEM Highlights

- **Kitchen hoods \$30,000/yr. savings**
- **Solar thermal water heating competing with CHP.**
- **Trayless water use and water heating reduction only a small part of the picture.**
- **Air sealing and shell improvements over \$10,000/yr. savings.**



Plymouth State University

Plymouth State University - Prospect Hall EEM Table

Energy Efficiency Measure	Savings				Installed cost (\$)
	Electricity (kWh/yr)	Steam (MMlbs/yr)	Water use reduction (Gallons/yr)	Cost reduction (\$/yr)	
Air Sealing & Infiltration upgrades	15,760	301	-	\$8,389	\$13,179
Windows (replacement and shading)	14,740	0	-	\$2,211	\$12,500
Kitchen Exhaust Hood Makeup Air	-	1,451	-	\$29,020	\$34,898
Solar thermal	-	218	-	\$4,360	\$85,000
Trayless water reduction	-	397	592,328	\$16,706	\$0
Misc. Common Area Controls	27,103	-	-	\$4,065	\$5,593
Upgrade Walk-In Cooler	18,000	-	-	\$2,700	\$21,000
Energy star or high efficiency cooking and cooling equipment	96,467	239	252,780	\$22,986	\$32,142
Total - All Utilities	172,070	2,606	845,108	\$90,438	\$204,312
Overall Percent Savings by Utility	29%	58%	14%		



Belknap County

- **EEM highlights**
- **9 efficiency measures identified**
- **Nearly \$100,000 saving per year**
- **Focused on HVAC system only**
- **Identified over 40,000 gallons per year of oil savings.**



Belknap County

ID	Energy Efficiency Measure	Electricity (kWh/yr)	Oil (Gal/yr)	Savings (\$/yr)
County Court House				
CCH1	Install Programmable Controller on Boiler		1,096	\$2,453
CCH2	Steam Trap Replacement		1,664	\$3,725
CCH3	Replace RTU	3,017		\$362
County Jail				
CJ1	Install New Gas Fired Boilers in the New Jail Wing and serve the Old Jail Wing Heating System from the New Jail Wing Boilers		8,933	\$20,000
CJ2	Refurbishment of Pneumatic HVAC Controls		2,671	\$5,981
Nursing Home, Other Campus Offices				
NH1	Demand Ventilation on Kitchen Hood Exhaust		1,563	\$3,500
NH2	Install Two (2) Condensing Boilers in the Nursing Home		21,674	\$48,527
NH3	Thermostatically Controlled Radiator Valves w/Set-Back Capability		4,822	\$10,796
NH4	Refurbish the Controls on the AHU Serving Sheriff's Office Area		0	\$0
Total Savings		3,017	41,326	\$95,344



Somersworth High School

EEM highlights

- **Nearly \$25,000 annual savings identified.**
- **Total installed costs for all measures \$142,000.**
- **55,000 kWh savings per year**
- **14,000 therm savings per year**



Next Steps

- **Develop goals**
- **Develop Committees – possibly involve community**
- **Develop an Action Plan with deliverables and timelines (e.g. 10% cost reduction by 2011, X% of buildings to have comprehensive energy assessment by end of 2011 etc.)**
- **Prioritize and budget for energy efficient upgrades.**
- **Track progress and report progress. Remember that energy savings is cumulative over the expected life of the upgrade.**



Costs and Funding Options

- **ESCO's**
- **EPC**
- **PPA**



Web Links

- GDS Associates Inc. – Energy Efficiency Services
 - <http://www.gdsassociates.com/services/energyefficiency.html>
- U.S. Department of Energy - Building
 - <http://www.energy.gov/energyefficiency/buildings.htm>
- U.S. Environmental Protection Agency – U.S. Department of Energy
 - <http://www.energystar.gov/>
- Energy Star Portfolio Manager Overview
 - http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager
- Missouri IAC Energy Audit Guide
 - <http://iac.missouri.edu/tools/Flowchart/flowchart.html>
- U.S. Department of Energy – Industrial Technologies Program
 - <http://www1.eere.energy.gov/industry/bestpractices/software.html>
- Database of State Incentives for Renewable Energy & Energy Efficiency
 - <http://www.dsireusa.org/index.cfm?EE=1&RE=1>

Web Links

- OGE Commercial Energy Calculator
 - <http://www.oge.com/business-customers/save-energy-and-money/Pages/CommEnergyCalc.aspx>
- U.S. Department of Energy – Federal Energy Management Program
 - http://www1.eere.energy.gov/femp/procurement/eep_eccalculators.html
- Pump Systems Matter
 - <http://www.pumpsystemsmatter.org/default.aspx>
- Rite Height Industrial Doors – Interior Commercial Door Solutions
 - <http://www.ritehite.com/ark/rhweb/rhprod.nsf/vProdCategories/Interior+Doors!OpenDocument>
- The Engineering Toolbox – Internal Rate of Return
 - http://www.engineeringtoolbox.com/internal-rate-of-return-irr-d_1235.html
- Energy Efficiency Unit Conversions
 - <http://www.tagdmedia.net/convert/>

Contact Information

**Keith McBrien, A.I., LEED AP, CEM, CEA,
Project Manager
GDS Associates**

Manchester NH, 1181 Elm Street – (603) 656-0336,
keith.mcbrien@gdsassociates.com,
www.gdsassociates.com

**Bill Smith
Building Diagnostics**

603-753-6725

wsmith@buildingdiagnosticsnh.com
www.buildingdiagnosticsnh.com

