

# Energy Auditing Training Seminar Outline



## Welcome & Introductions

### Energy Auditing Overview

- Introduction to energy auditor skills
- Common audit shortcomings
- The need for Certified Energy Auditors

### Energy Fundamentals

- Energy and power
- Forms of energy
- Unit conversions
- Energy bill components
- Point of use cost

### Audit Process

- Energy balance
- Benchmarking analysis
- Level 0 - Preliminary energy use analysis
- ASHRAE level 1 audits
- ASHRAE level 2 audits
- ASHRAE level 3 audits
- Investment grade audit basics
- Investment grade audit contract
- Other type of audits
- Data collection forms

### Auditing Tools and Computer Software

- Safety considerations
- Energy audit instrumentation
- Metering and sub-metering
- Free and proprietary software tools (EZSim, HAP, Energy Plus, MotorMaster+, QuickCalc, RETScreen)

### Understanding Electrical Energy Systems

- DC, AC, Single & 3-phase power
- Star and Delta connections
- Resistive and inductive loads
- Power Factor and Power Factor Correction
- Electric motors
- Voltage imbalance
- Energy efficient motors
- Variable Speed Drives
- Harmonics
- Single phase motors
- Lighting
- Lighting quality and lighting quantity considerations
- Types of light sources
- Ballasts
- Lighting maintenance
- Lighting control

## Understanding Thermal Systems

- Heat transfer
- Heat flow calculations
- Degree-days
- Insulation
- The psychrometric chart
- Refrigeration
- The vapour compression cycle
- Pressure enthalpy diagram
- HVAC performance measures
- Absorption chillers
- Air conditioning system types
- Boilers and steam systems
- Boiler fuel types
- Boiler types
- Combustion efficiency
- Steam leaks
- Heat recovery

## Understanding Mechanical Energy Systems

- Affinity laws
- Pump systems
- Pump and system curves
- Gas-engine driven chillers
- Compressed air systems
- Components (after-coolers, receivers, dryers, distribution, condensate drain traps)
- Artificial demand
- Compressed air leakages
- Multiple compressor control
- Transport energy
- Transport energy improvement opportunities

## Economic Analysis and Economic Decisions for Energy Projects

- Economic analysis (simple payback, MARR, NPV, IRR, SIR, present worth)
- Life cycle costing
- Economic examples and problems
- Case studies

## Controls and Web-Based Energy Information Systems

- Types of controls
- Control technologies
- Control algorithms
- Building Management Systems
- DDC Control
- Building EIS
- Building Automation Systems
- Maintenance and commissioning

## Data Analysis

- Fixed versus variable energy use
- Regression analysis
- Drivers of energy use
- CUSUM

## Assessment of Performance

- Energy performance
- Energy Performance Indicator (EnPI)
- Current consumption, efficiency, and end use
- Significant Energy Use (SEU)

## Alternative Financing and Measurement and Verification (M&V)

- Energy Management Project financing options
- Energy Saving Performance Contracting (ESPC)
- M&V process
- IPMVP
- M&V measurement methods
- Baseline adjustments
- Routine and non-routine adjustments

## Management of the Audit Process

- Resources, competence, time management, communications

## Writing Successful Audit Reports

- Report structure
- Techniques for effective report-writing
- Presenting the report

