



**ISWG**

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**432 Compliant Facility Audits**

# Audit Background

- Federal requirement: EISA Section 432
  - Quadrennial comprehensive energy and water evaluation of covered facilities
  - “identify and assess recommissioning measures ... for each such facility”
- Non-Federal: ASHRAE Guidelines
  - Describes audit levels and outcomes:
    - Level I – Site Assessment or Preliminary Audits
    - Level II – Energy Survey and Engineering Analysis Audits
    - Level III – Detailed Analysis of Capital-Intensive Audits (a.k.a. investment grade audits)
  - Proposed Standard 211 – Procedures for Commercial Building Energy Audits
- EO13693: Section 3(a)(i)(A)
  - ... promote energy conservation, efficiency, and management by ... using remote building energy performance assessment auditing technology

# Federal Facility Audits

- Currently energy audits are performed by federal agencies in an ad hoc fashion, with varying levels of success ranging from full compliance to very low EISA compliance. \$\$\$
- The quality and usefulness of energy audits also varies greatly from agency to agency and audit to audit.
- Is there an interest in adopting a standardized approach, to include remote audits, that will work across many different agencies?

# Assessments/Audits - The Rest of the Story

- EISA 432 – “comprehensive energy and water evaluation” per 42 USC 8253
- Renewable Energy
  - “ensure that, to the extent economically feasible and technically practicable, of the total amount of electric energy the Federal Government consumes” per 42 USC 15852, and
  - “(c) ensure that the percentage of the total amount of building electric energy consumed by the agency that is renewable electric energy is” per EO 13693
- Guiding Principles – “Each agency is responsible for evaluating the agency’s buildings portfolio for compliance with the *Guiding Principles.*” (Source EO 13693)

# Audit Approaches Today

- Audits are conducted by agency staff, federal contractors, ESCOs\* and utilities.
- Generally 432 compliant audits are based on ASHRAE Level II.
- Audit formats vary greatly.
- Audit results are not readily available for use.
- Remote audits are not defined by EO (or ASHRAE).
- Desk audits are not defined.
- EISA, RE and GP audits done with little coordination. \$\$\$\$

\*Energy service companies

# An Audit Tool Evaluation Example

- Audit tools: See EISA 432 Energy Audit Best Practices: Software Tools (November 2014) at <https://inldigitallibrary.inl.gov/sti/6270875.pdf> . Description and review of available whole building energy analysis software tools:
  - EnergyIQ by LBNL
  - Laboratory Energy Efficiency Profiler (LEEP) by LBNL
  - Facility Energy Decision System (FEDS) by PNNL
  - eQUEST by LBNL
  - simuwatt™ Energy Auditor by NREL – not yet available

# INL Tool Report Summary

Software	EnergyIQ™	LEEP	FEDS	eQuest®	simuwatt™
Software developer	Lawrence Berkeley National Lab	Lawrence Berkeley National Lab	Pacific Northwest National Lab	James J Hirsch/ Lawrence Berkeley National Lab	concept3D/ National Renewable Energy Lab
Website	<a href="http://energyiq.lbl.gov/">http://energyiq.lbl.gov/</a>	<a href="http://leep.lbl.gov/">http://leep.lbl.gov/</a>	<a href="http://www.pnl.gov/feds/">http://www.pnl.gov/feds/</a>	<a href="http://www.doe2.com/equest/">http://www.doe2.com/equest/</a>	<a href="http://simuwatt.com/">http://simuwatt.com/</a>
Description summary from software literature	“Action-oriented” benchmarking tool for non-residential buildings— bridges a gap by providing a standardized opportunity assessment based on benchmarking results, along with decision-support information to help refine action plans.	Helps users to quickly identify and prioritize potential energy efficiency actions in laboratory facilities. It does not require users to have any specialized knowledge of energy audits or analysis.	Windows-based program requires only minimal user experience and input to perform energy efficiency assessment screenings as well as detailed energy retrofit project analyses across a wide variety of building types, from single buildings to large multi-building campuses and installations.	A sophisticated, yet easy to use building energy use analysis tool, which provides professional-level results with an affordable level of effort. This freeware tool was designed to allow you to perform building energy use simulation.	Replaces the clipboard-and-pencil approach of most building audits with a package that uses sophisticated, comprehensive computer modeling to find more potential energy savings. Tablet-based front-end working with EnergyPlus energy simulation modeling software and OpenStudio.

# Proposed Standard 211-20XX - Procedures for Commercial Building Energy Audits

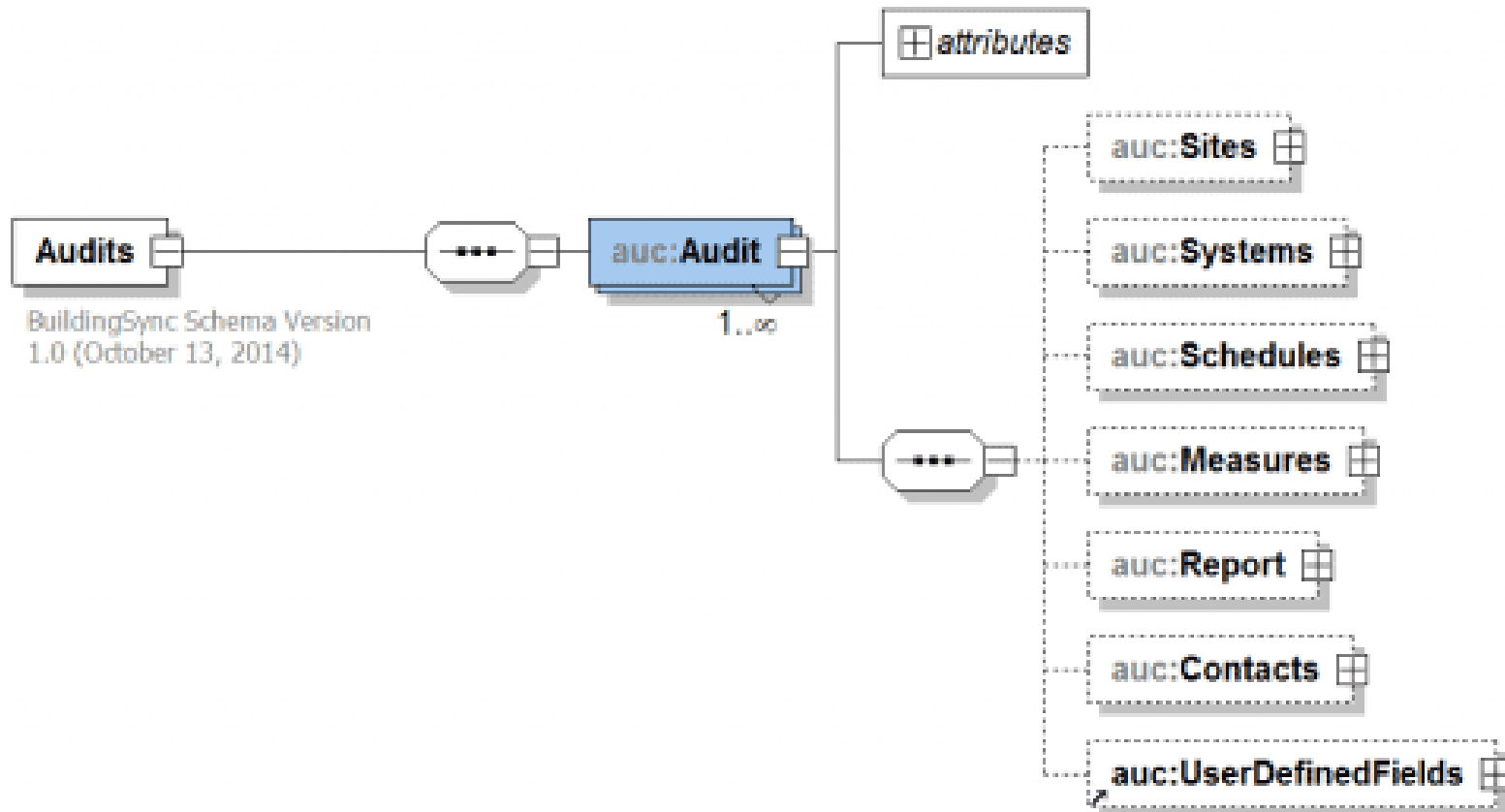
The purpose of this ASHRAE standard is to **establish consistent practices for conducting and reporting energy audits for commercial buildings**. This standard:

- Defines the procedures required to perform Energy Audits Levels 1, 2 and 3,
- Provides a common scope of work for these audit levels for use by building owners and others,
- Establishes standardized industry practices for conducting energy audits, and
- Establishes minimum reporting requirements for the results from energy audits.



# Using Audit Data

BuildingSync can facilitate a **consistent history** of energy audit data across the life of a building or a group of buildings. It can also allow easier **aggregation and analysis of audits** conducted by different companies using different software.



# Remote Audits – This is new.

- In general, use building interval data and building information as available:
  - Interval utility (electric) consumption data
  - User provided information on the building and its systems
  - Digital and aerial photos and satellite images
- Benefits – significantly reduced time and cost to complete \$
- Analyses
  - Completed: DoD Environmental Security Technology Certification Program's (ESTCP's) Rapid Building Assessment Project (ESTCP Project EW-201261) of May 2014: <https://www.serdp-estcp.org/Program-Areas/Energy-and-Water/Energy/Conservation-and-Efficiency/EW-201261>
  - Ongoing: PNNL analysis to compare results of remote audits with results of traditional audits done at four installations.
    - Target completion date of late March 2016
    - Analysis to look at ECMs with identified energy and cost savings estimates; types of projects identified (end uses, building controls, low-/no-cost, capital projects, etc.); cost to perform field audits and analysis (\$/building, \$/ft<sup>2</sup>); and more

# EISA 2007 Section 432 Compliant Desk Audits

- **Challenge: DOT's FY12 compliance rate: 12.2% (71 buildings)**
- **Result: DOT's current compliance rate: 45.8% (242 buildings)**
- **Keys to Success:**
  - 26 site visits
  - 236 desk audits (with verification from utility data and questionnaires)
  - Close coordination between FAA ATO, DOE HQ, NREL and contractor
- **Additional benefits**
  - Completed audits allowed for consideration in ESPC projects
  - Feeds Compliance Tracking System requirements.
  - Performing desk audits resulted in \$1 million in savings
  - Opportunity for FEMP to pilot a new resource for other agencies

# ECMs Found

	Lighting	Desktop to Laptop	CRT Monitors	HVAC efficiency improvement	Cogged V-belts	Enable Economizer	UPS Efficiency	HE Motors	HVAC Optimization	Zone Setpoint Reduction	**Other Improvements
<b>Times Encountered (# of sites)</b>	25	8	10	22	6	7	15	14	17	10	2 to 5
<b>Percentage</b>	96%	31%	38%	85%	23%	27%	58%	54%	65%	38%	8 to 19%

\*\*Other improvements include zone temperature, insulating ducts,

CV to VAV, indirect evaporative cooling and envelope improvements.

# Value of the Desk Audits

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## Value of Providing Audits

- Total cost for onsite and Desk audits ~ \$300,000
- Avoided cost ~ \$1.3 million

## Electricity Savings

- Potential savings for all ASRs and ARSRs of 14.8 million kWh/year (equivalent to about 1.3% of DOT's total electricity use)

## Potential Cost Savings through ECMs at all ASRs/ARSRs

- Annual cost savings: \$1,387,000/year (from utility bills)
- Implementation cost: \$3,978,000
- Payback period: 2.9 years

## Performance-Based Contract Consideration

- About 60 ASRs and ARSRs now being considered as a result of the desk audits.

# The Bigger Audit Question

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- Is there an interest in coordinating efforts and adopting a standardized approach, to include remote audits, that will work across many different agencies possibly including:
  - Qualification of auditors
  - Procurement tools, e.g. SOWs and GCEs
  - A portfolio of approved auditing tools
  - A data management standard
    - Including a feed into the Compliance Tracking System

# Why Now?

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- EO advocates remote building energy performance assessment auditing practices.
- Numerous studies on audit tools and approaches under way by Federal agencies and DOE laboratories.
- Audit standards under development by ASHRAE.
- Data management tools are under development by DOE.

Thank You

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# Backup Slides

# Industry Auditing Solutions

There are currently a large number of tools on the market that have been designed to streamline and improve the quality of energy audits and energy analysis. A subset are cataloged below.

EnergyIQ	Benchmarking, EE Screening	Lvl 1	Develops a benchmark based on user inputs and utility data, helps target EE categories. Does not do a full energy audit, but preliminary steps.	No
<i>LEEP</i>	<i>Laboratory Efficiency Screening</i>	<i>Lvl 1</i>	<i>Screens for EE opportunities in Laboratories for further investigation. Does not do an energy audit, but screens for targeted measures.</i>	<i>No</i>
FEDS	Single and Campus Auditing	Lvl 2	Uses building surveys to extrapolate EE over campuses, can be used as the analysis platform for energy audits.	No
eQUEST	Building Energy Modeling	Lvl 2, Lvl 3	Used in the analysis step of energy auditing. Can do pricing and LCCA. No data collection aspects or reporting for energy auditing.	No

# Industry Auditing Solutions

simuwatt	Commercial Energy Auditing	Lvl 1, Lvl 2, Lvl 3	Software guided workflow to streamline auditing and store data in the cloud. Supports auditor from data collection through report generation.	Yes
Retroficiency	Virtual and On Site Energy Audits	Lvl 1, Lvl 2, Lvl 3	Multiple steps of auditing offered, virtual, survey, in person, efficiency improvement tracking, very low cost. Geared towards data analytics.	Yes
FirstFuel	Virtual Energy Audits	Lvl 1	Virtual audits, very low cost, can detect operational issues. Geared towards data analytics and can be used to track efficiency gains.	Yes
ecoInsight	Tablet Audit Tool	Lvl 1, Lvl 2	Software guided workflow, geared towards selling EE measures	Yes
BPI	Data Collection Forms	Lvl 1, Lvl 2, Lvl 3	Developed data collection worksheets, modeled after ASHRAE resources. Geared towards self-employed auditors. No analysis platform is included in the sheets. Traditional type audit.	No
RMI	Data Collection Forms, Worksheets	Lvl 1, Lvl 2, Lvl 3	Developed data collection worksheets and calculation worksheets using industry best practices. Traditional pen and paper type audit.	No