



The Second U.S.-China Energy Efficiency Forum



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Industrial Energy Efficiency Assessments

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Industrial Energy Efficiency Assessments

- Definition and overview of key components
- International experience
- Chinese situation and recommendations
- US-China collaboration





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Industrial Energy Efficiency Assessments

- Analysis of the use of energy and potential for energy efficiency in an industrial facility
 - Current situation
 - Recommendations for improving energy efficiency
 - Cost-benefit analysis of recommended options
 - An action plan for realizing potential savings

Types of Industrial Energy Efficiency Assessments

- Preliminary or walk-through
- Detailed or diagnostic



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**Industrial Energy Audit Guidebook:
Guidelines for Conducting an
Energy Audit in Industrial Facilities**

Ali Hasanbeigi, Lynn Price

China Energy Group
Energy Analysis Department
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October 2010

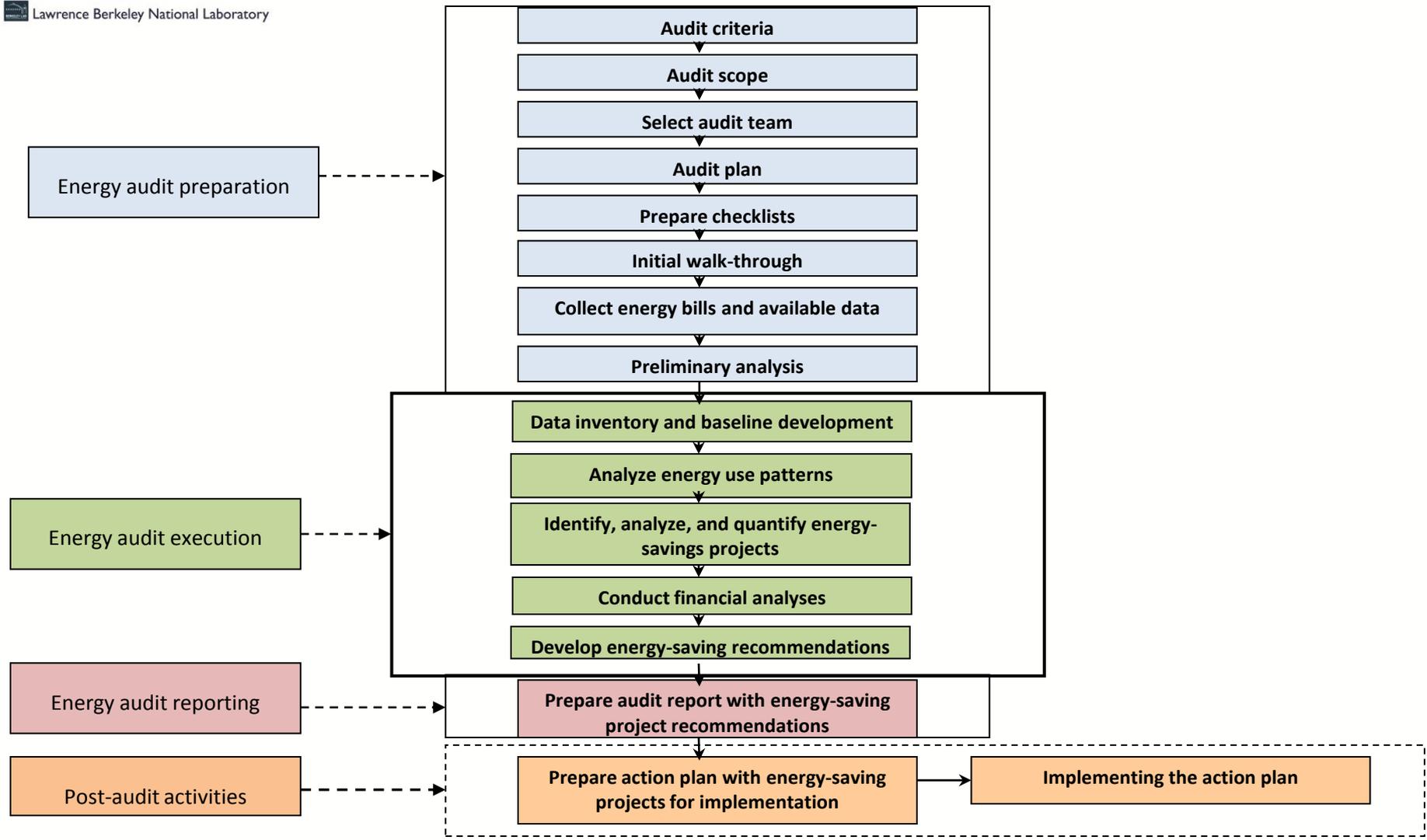
This work was supported by the China Sustainable Energy Program of the Energy Foundation through the U.S. Department of Energy under Contract No. DE-AC02-09-OR21400. The U.S. Government retains, and the publisher, by accepting the article for publication, acknowledges, that the U.S. Government retains certain copyright, reproduction, and/or other rights to publish or reproduce the published form of this manuscript, or allow others to do so, for U.S. Government purposes.



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U.S. DEPARTMENT OF ENERGY National Development and Reform Commission (NDRC)

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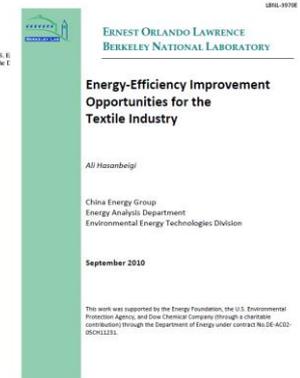
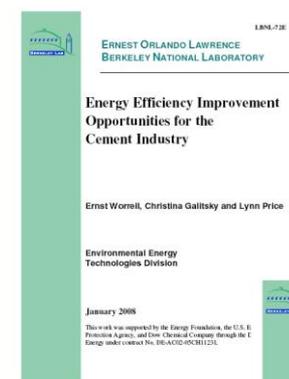
Identifying Energy Efficiency and Energy Cost Reduction Opportunities

— Cross-cutting

- Steam systems
- Process heating systems
- Compressed air systems
- Electric motor systems
- Fan and pumping systems
- Lighting systems

— Sector-specific

- US EPA ENERGY STAR energy efficiency guidebooks
- LBNL energy efficiency guidebooks
- US DOE Industrial Technologies Program resources
- EU Best Available Technology reference documents





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Cost-Benefit Analysis of Energy-Efficiency Opportunities

- Cash-Flow Diagram
- Life-Cycle Cost Analysis (LCCA)
- Net Present Value (NPV) Analysis
- Internal Rate of Return (IRR) Analysis
- Simple Payback Period (SPP) Analysis



Prepare an Energy Assessment Report

- Document current situation (energy baseline)
- Provide detailed recommendations for energy-efficiency and carbon dioxide emissions mitigation opportunities
- Provide detailed cost-benefit calculations



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Industrial Energy Audit/Assessment Programs: International Experience

- Various models used around the world
- Reviewed 22 programs in 15 countries, plus the EU
- Identified common elements for successful energy audit programs
 - Organization and coordination
 - Establishing program goals, scope, size
 - Types of audits offered
 - Supporting measures
 - Subsidies for assessments
 - Investment incentives
 - Technical assistance
 - Publicity





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U.S. DOE Industrial Energy Assessments

Targeted Companies	Implementing Entities	Duration	Services	Subsidies/ Financing
Large energy - intensive plants (≥500 Billion BTU/year in primary energy)	Energy Experts - BestPractices Qualified Specialists	3-day system assessment	Apply DOE’s software tools and technical assistance to a specific area	Free and cost-shared for LEADER companies
			Provide hands-on learning to plant personnel	
Small and medium enterprises (> 26 Billion Btu/year, but <500 billion Btu/year in primary energy)	University-based Industrial Assessment Centers (IACs)	1-day assessment	Highly trained IAC faculty and students apply DOE software and technical assistance	Free of charge to SMEs if eligible
			Identify energy-saving opportunities	
All plants	Information Center of Energy Efficiency & Renewable Energy at DOE	N/A	Technical assistance and guidance to all sizes of plants	Free of charge
			Customized energy efficiency consultation to SMEs	
			Providing information on energy management and financial support	



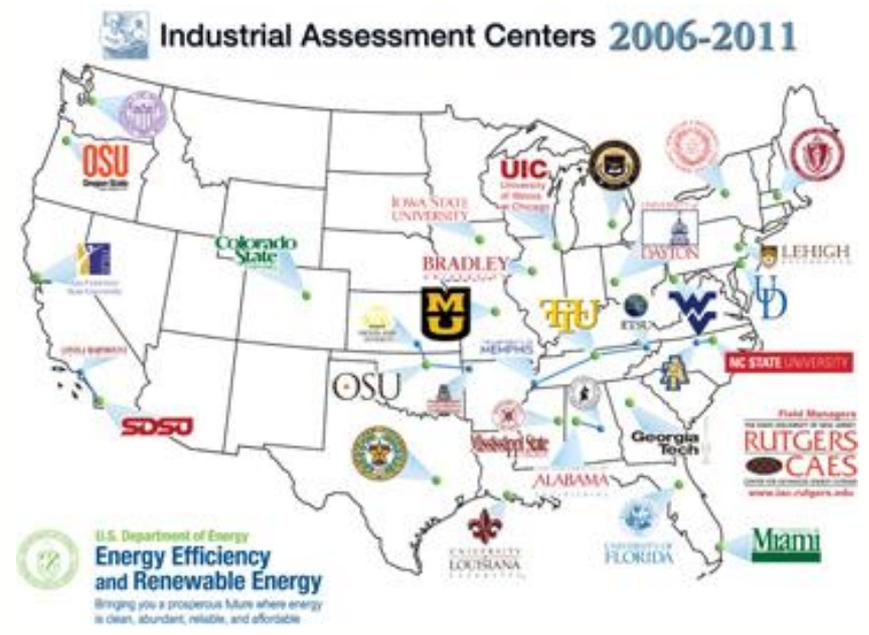
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U.S. DOE Energy Assessment Program: Industrial Assessment Centers (IACs)

- Focus on small and medium sized manufacturing facilities
- 26 university-based IACs train engineering students for careers in industrial energy efficiency
- Provide 1-day assessments, assessment reports with recommendations, follow-up
- IACs serve 300+ plants per year
- Typically Identifies \$175,000 to \$200,000 in potential annual energy savings per plant
- Average implementation rate of 35% to 45%





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U.S. DOE Save Energy Now LEADERS Program

- Corporate Commitment
 - Voluntary pledge to reduce energy intensity by 25% or more over 10 years
 - Designate an energy manager, develop an energy intensity baseline and energy management plan
 - Take steps to reduce energy intensity and carbon emissions
 - Report results annually to the U.S. DOE
- Benefits to Participating Companies
 - Gain enhanced access to enabling resources
 - Tailored technical assistance
 - Training
 - Assessments
 - Receive high-level recognition for achievements and enhance corporate image
- Results since 2006
 - 105 LEADER companies – including 7 of the top 50 U.S. industrial energy consumers - have signed the LEADER Pledge
 - LEADER companies represent over 1,000 plants



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U.S. DOE Save Energy Now LEADERS Program

- Thus far, 47 LEADER Companies have submitted Annual Pledge Reports representing 845 plants
 - These companies have improved their energy intensity by over 3%—exceeding the LEADER goal of 2.5% annually
 - Nissan, 3M, and UTC hosted Showcases to encourage replication of best practices by others
- By 2015, the Save Energy Now LEADER initiative will cover 25% of the total U.S. industrial energy footprint

LEADER Achievements

- ✓ **PPG Industries** invested nearly \$100K in energy projects recommended by two ESAs; 65% of identified projects have been implemented or are underway; realized >\$1.1M in annual energy cost savings.
- ✓ **OMNOVA Solutions Inc.** plans to roll out ITP's baselining process and energy metrics tracking worldwide.
- ✓ **Alcoa** hosted a Global Energy Summit in April 2011, featuring the company's ITP partnership and results; plant managers from around the world attended.



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U.S. DOE Energy Assessment Program: Save Energy Now Energy Savings Assessments (ESAs)

- System-specific assessments focus on steam, process heating, compressed air, pumping, or fan systems
- Assessment conducted by DOE Energy Experts
- Plant personnel and affiliates are exposed to the application of DOE software tools in their facility





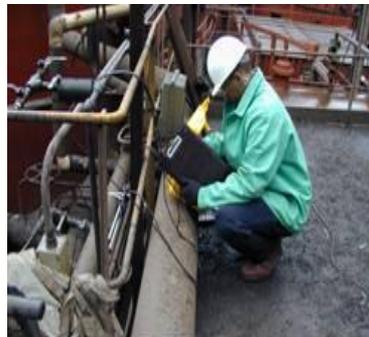
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U.S. DOE Energy Assessment Program: Qualified Energy Experts

- U.S. DOE Industrial Technologies Program conducts a qualification training program to provide qualified energy experts by system area
- Qualification workshops include classroom and hands-on instruction by highly experienced energy professions, written exams, and certificates
- Energy Experts are available for system-specific areas (e.g., compressed air, pumping, process heating, steam, and fan systems)
- Full list of qualified DOE Energy Experts is posted on DOE's website, with a searchable database





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U.S. DOE Energy Assessment Program: Software Tools

Scope	Tools
Plant-wide	Industrial Facilities Scorecard Quick Plant Energy Profiler/Integrated Tool Suite (QuickPEP) IAC Database
Steam	Steam System Scoping Tool Steam System Assessment Tool 3E Plus
Process-heating	Combined Heat and Power Application Tool NOx and Energy Assessment Tool Process Heating and Survey Assessment Tool (PHAST)
Motor-Driven	AirMaster+ Fan System Assessment Tool MotorMaster+ Chilled Water System Analysis Tool Pumping System Assessment Tool
Data Centers	DC Pro Software Tool Suite



Process Heating Assessment and Survey Tool (PHAST)

U.S. Department of Energy
Energy Efficiency and Renewable Energy *Bringing you a prosperous future where energy is clean, abundant, reliable and affordable.*

Calculators

Plant/Equipment Information

Furnace Analysis - Heat Balance

Reports

Import Plant Information

Export Plant Information

Click on the appropriate button for further information

[Exit Application](#)

This Application is developed by E3M Inc. with support from the Department of Energy and Oak Ridge National Laboratory in cooperation with Industrial Heating Equipment Association (IHEA). A subcommittee consisting of members from major industries and equipment suppliers acted as advisor for the application development.



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LBNL-4159E



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Energy Audit Practices in China:
National and Local Experiences and
Issues

Bo Shen, Lynn Price, and Hongyou Lu

China Energy Group
Energy Analysis Department
Environmental Energy Technologies Division

December 2010

This work was supported by the China Sustainable Energy Program of the Energy Foundation, the Regulatory Assistance Project, Dow Chemical Company (through a charitable contribution) and the Partnership for Climate Action Program of the U.S. Agency for International Development through the Institute for Sustainable Communities through the U.S. Department of Energy under Contract No. DE-AC02-05CH11231.

Industrial Energy Efficiency Auditing in China

- LBNL assessment of current situation in China
- Many good energy audits being undertaken
 - Detailed Audits
 - Regular audits to meet government mandate
 - Special audits for quality assurance
 - Verification audits for processing incentive
 - Comprehensive audits for Identifying integrated solutions
 - Targeted Audits (focus on subsystem or equipment)
 - Walk-through Audits
 - Investment-grade Audits
- Many organizations/institutions involved



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Industrial Energy Efficiency Auditing in China: Recommendations

- Continuing policy push from the central government for energy audits
- Designate a national-level entity to lead the effort in organizing and coordinating energy audit activities
- Focus on assessing cost-effective saving opportunities rather than on energy accounting audit
- Create specific funding to support energy audits
- Develop standards and tools to effectively support energy audits
- Build strong capacity for energy audits
- Strengthen international cooperation in energy auditing



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US-China Industrial Energy Efficiency Assessment Activities

- Memoranda of Understanding that include training programs and workshops
 - LBNL, ORNL, and the University Alliance for Industrial Energy Efficiency (UAIEE) at 1st US-China Energy Efficiency Forum May 2010
 - LBNL, ORNL, and the National Energy Conservation Center (NECC) at 2nd US-China Energy Efficiency Forum May 2011
- China-U.S. Industrial Energy Efficiency University Partnership Symposium, October 2010
 - Hosted by the UAIEE
 - Presentations by US DOE, MIIT, ERI (of NDRC), ORNL, LBNL, IAC Directors and staff members
 - Presentations described the operation of IACs, tools and software developed by US DOE used by the IACs, database used for collecting and analyzing energy assessment results in the IACs, and US DOE industrial energy efficiency programs





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US-China Industrial Energy Efficiency Assessment Activities

- Translation and Localization of US DOE Software Assessment Tools
 - Quick Plant Energy Profiler (QuickPEP)
 - In collaboration with the Center for Industrial Energy Efficiency
 - Process Heating Assessment and Survey Tool (PHAST)
 - In collaboration with Shandong University and the UAIEE
- QuickPEP Training Workshop, October 2010

美国工业技术项目：
介绍快速能源档案工具 (QuickPEP)

Energy Efficiency & Renewable Energy | OAK RIDGE

中国工业节能减排大学联盟
合作研讨会暨联盟工作会
中国北京
2010年10月17-18日

詹姆斯·昆恩 (James Quinn)
美国能源部
源效率与可再生能源



培训课程
快速能源档案工具

Training Workshop
QuickPEP Tool

2010年10月19日
国家会议中心

October 19, 2010
China National Convention Center
Beijing

主办方 / Host:
中国工业能效大学联盟
University Alliance for Industrial Energy Efficiency of China

协办方 / Coordinator:
中国能源研究室, 劳伦斯伯克利国家实验室
China Energy Group, Lawrence Berkeley National Laboratory
— 中美气候行动伙伴计划合作伙伴
US-China Partnership for Climate Action Program partner

赞助方 / Funded by:



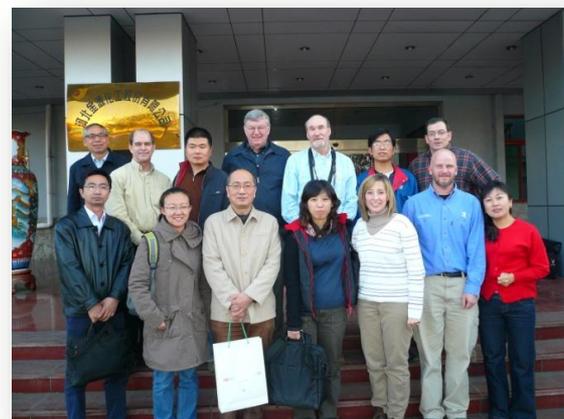


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US-China Industrial Energy Efficiency Assessment Activities

- National Energy Conservation Center, LBNL, and ORNL
 - Developing an English-Chinese energy efficiency dictionary
 - Exchanging study reports and publications related to industrial energy efficiency program design
 - Holding an industrial energy efficiency assessment workshop in June 2011
 - Hosted by the Xi'an Energy Conservation Center
 - Focused on the use of the PHAST tool in the steel industry





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Opportunities for Future Collaboration

- Continued assistance in localizing DOE industrial energy efficiency assessment tools
- Translation of IAC database with information on 15,000 industrial energy efficiency assessments and 112,000 recommendations (over 30 years of assessment activities)
- Additional workshops/training on:
 - DOE and IAC assessment procedures
 - Software tools
 - Assessment equipment
 - Qualification of energy auditors
 - Identification of efficiency measures
 - Financial analyses
 - Calculation of energy savings from implemented projects



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Further Information

U.S. DOE's Industrial Technologies Program

<http://www1.eere.energy.gov/industry/index.html>

U.S. DOE's Industrial Assessment Centers

<http://www1.eere.energy.gov/industry/bestpractices/iacs.html>

<http://iac.rutgers.edu/>

LBNL's China Energy Group

<http://china.lbl.gov/>

ORNL

<http://www.ornl.gov/>