


**Cost-effective Commissioning
IEA Annex 47**





International Energy Agency
Energy Conservation in
Buildings and Community
Systems Programme

International Commissioning Research

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Overview

Background


- What is an IEA annex?
- Why is enhanced building operation of international interest?
- Annex 40 Objectives & Results

International State of Commissioning

Annex 47


- Objectives
- Results (to date)

Conclusions



What is an IEA Annex?


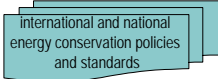
IEA provides a framework for over 40 international collaborative energy research, development and demonstration projects known as Implementing Agreements.



Energy Conservation In Buildings And Community Systems

IEA Annex- an international research group

- focused on specific energy saving technologies and activities to facilitate their implementation
- designed to enable international cooperation and leverage research \$\$
- approved by ECBCS members (DOE)


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Why is enhanced building operation of international interest ?



- In developed countries it is a greater challenge to operate buildings than it is build new ones
- Users request more comfort and IAQ
- Global warming puts added pressure on reducing energy consumption



- Cost effective actions applicable to existing buildings are needed
- Companies want to develop new services



- New techniques can be used to enhance operation
 - BEMS can be a key tool to help
 - Advanced computer models are available from design and can be used for operation

Annex 40

The Annex was focused on HVAC systems

- To develop, validate and document tools for commissioning buildings and building services
- To produce a set of tools to facilitate commissioning internationally (documentation, checklists, software, simulation models, ..etc.)

The Annex conducted research in 5 areas:


- The Commissioning Process
- Manual Commissioning Procedures
- BEMS Assisted Commissioning Tools
- Use of Models in Commissioning
- Commissioning Projects



Annex 40 Results


- Final report provides a well defined, international view of the process
- Numerous tools were developed and tested, CD provides data and models, examples
 - Process tools (task lists, documentation)
 - On-line glossary tool
 - Standard models of commissioning plans
 - Model for quality control matrix
 - Automated commissioning tools
 - prototypes
 - System/component models
- Real-building commissioning projects
 - Documented lessons learned





Annex 40 Conclusions

- The Annex 40 research group collected a tremendous amount of information. The final report & CD , available at www.commissioning-hvac.org
- The annex provided a means for international technology transfer
- Increased momentum internationally
 - Comprehensive information on commissioning to countries just starting to adopt the process
 - An exchange of relevant tools & techniques (e.g. visualization methods, FDD methods)



International State of Commissioning

Canada

- National program on Retro-commissioning involving Gov't agencies and Utilities
- Promoting optimization process, implementing DABO in 20 demonstration sites (including 1st early LEED buildings)

France

- New certification program (HQE-idem)
- Commissioning process is being implemented in operation phase
- National Commissioning Guideline under development

Germany

- National Guideline (EnEV 2006) sets energy efficiency requirements for New construction and major retrofits, requires that public buildings display energy certificate
- Research program- 20 demonstration sites, results outperform energy consumption standards by 50% with no added costs



International State of Commissioning

Japan

- Building Services Commissioning Association (2004)
- SHASE technical committee on commissioning
- 1st version of national commissioning guideline published
- Energy Conservation Law mandates performance testing for major HVAC components (April 2006)

Finland

- Promoting "ToVa", extending Energy Auditing activities
- Building services technology program aims to develop methods and tools for a "Commissioning Guidebook" and to implement in building sites

Norway

- National program aims to develop and implement tools for life-long commissioning



International State of Commissioning

The Netherlands


- Commissioning only implemented in handover, strong interest in functional testing, working to promote whole commissioning process
- Developing tools for fault detection and diagnosis

Czech Republic, Korea, Hong Kong/ China


- Research aimed at development of EMCS-based tools

USA

- Commissioning Penetration is less than 5% in new construction, approximately 0.03% for existing buildings
- Awareness increased through certification programs, large-owner mandates, state and local initiatives, professional organizations, and conferences
- High demand for tools and training

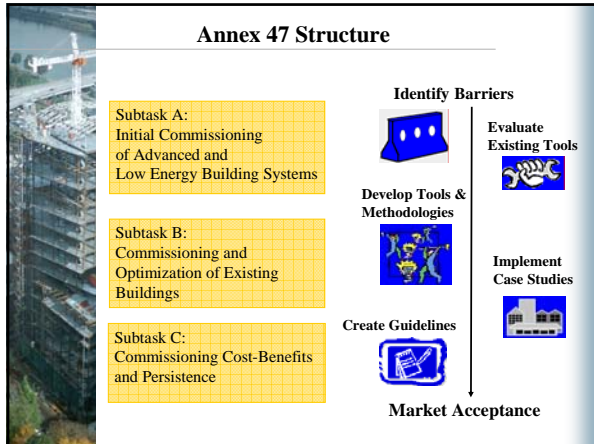


**IEA Annex 47:
Cost-Effective Commissioning of Existing and
Low Energy Buildings**



Annex 47 Objectives

- Extend previously developed methods and tools to address advanced systems in low energy buildings
- Quantify and improve the costs and benefits of commissioning, including the persistence of benefits and the role of automated tools in reducing costs and improving persistence
- Exchange information on commissioning practices in different countries and disseminate relevant information to U.S. practitioners



Annex 47 Participation

Country	Methods for Low Energy Buildings	Tools for Existing Buildings	Cost-Benefit and Persistence
Belgium	1	1	?
Canada	1	1	1
Czech Republic	1	1	2
Finland	1	1	3
France	1	1	3
Germany	1	1	3
HongKong/China	1	1	3
Hungary	2	1	2
Japan	3	1	2
Netherlands	2	1	2
Norway	2	1	2
South Korea	-	2	-
Sweden	1	2	?
USA	1	1	1

Funding Status

Funded

Pending

Unknown

Level of Involvement


1-primary

2-secondary

3-case studies


Annex 47 Schedule

Task	Propose		Plan		Work		Report	
	Oct-04	Apr-05	Oct-05	Apr-06	Oct-06	Apr-07	Oct-07	Apr-08
Preliminary state of the art review	●	●						
Identify collaborative projects	●	●						
Develop draft Cx procedures for ZEB			●	●				
Evaluate automated Cx tools					●	●	●	●
Develop cost-benefit protocol			●	●	●	●		
Develop persistence methodology			●	●	●	●		
Analyze cost-ben. & persistence data			●	●	●	●		
Develop methods/procedures for ZEB					●	●	●	●
Implement & validate with partners							●	●
Disseminate results							●	●
Final report/guidelines							●	●
Expert meeting	●	●	●	●	●	●	●	●



Early Results: State-of-the-Art Review

- Commissioning cost-benefit methodologies and data
- Persistence of commissioning measures in new and existing buildings
- Automated commissioning tools for buildings
- Needs and challenges in commissioning zero energy buildings
- New functional tests for use in commissioning zero and low energy buildings



Annex 47 Conclusions

- Commissioning has a key role to play in comprehensive quality assurance for the design, construction and operation of buildings.
- Quality assurance tools and procedures are necessary to ensure that the technical potential of building systems and components is realized in operation throughout the life of the building.
- Energy and non-energy benefits are significant, but standard cost-benefit data is needed to make the case for commissioning.
- The U.S. buildings industry can benefit from the technology transfer from countries that commonly implement 'advanced systems' for low energy buildings.

Annex 47 Website: www.iea-annex47.org



Cost-effective Commissioning
IEA Annex 47

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Meeting 1
Sub-task C
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Date	Document	Author
2006-01-19	Abbreviated commissioning cost-benefit methodology	Hannah Friedman, Marti Frank, Tud Haast, and Kristin Heeresmaier
2005-10-24	Preliminary state-of-the-art review for commissioning low energy buildings: existing cost-benefit and persistence methodologies and data, state of development of automated tools, and assessment of needs for commissioning ZEB	Marti Frank, Hannah Friedman, Kristin Heeresmaier, Cary Toole, David Clavidge, Nelaucha Castro, and Philip Hayes
