



TASK xx

Renovation of Non-Residential Buildings towards sustainable standards.

Work Plan

Prepared by:

Fritjof Salvesen (NO), Trond Haavik (NO), Doreen Kalz (DE), Sophie Trachte (BE)

DRAFT 26.10.2010

1. Background

More and more organizations agree to the recommendations from the IPCC that a 50% reduction of manmade CO₂ emission before 2050 is necessary to avoid severe problems from global warming. The IEA report "Energy Technology Perspective 2008" has presented the Blue Map scenario on how to achieve this emission reduction. A consequence for the building sector is that a widespread conversion of buildings to very low energy consumption and even zero energy buildings is necessary.

Buildings are responsible for up to 35 % of the total energy consumption in many of the IEA participating countries. The EU Parliament approved in April 2009 a recommendation that member states have to set intermediate goals for existing buildings to fix minimum percentage of buildings to be net zero energy by 2015 and 2020.

Also for the existing non-residential buildings a dramatic reduction in primary energy consumption is crucial to achieve the emission reduction targets. Together with energy savings measures, also increase of onsite energy production is needed.

A few exemplary renovation projects have demonstrated that total primary energy consumption can be drastically reduced together with improvements of the indoor climate. The experience gained from these projects has not been systematically analyzed to make it a reliable resource for planners. Because most property owners are not even aware that such savings are possible, they set energy targets too conservative. Buildings renovated to mediocre performance can be a lost opportunity for decades. It is therefore important that building owners be aware of such successes and set ambitious targets.

This Task will start by analyzing highly successful renovations and develop innovative concepts for the most important market segments.

Equally important, local authorities, companies and planners also need the knowledge how to achieve market penetration of such solutions. Success stories and planning knowledge will be communicated to target audiences to accelerate a market break-through of highly effective renovations in non residential buildings.

2. Objective

The objectives of this Task are:

- Develop a solid knowledge base on how to renovate non-residential buildings towards the NZEB standards (Near-Zero Energy Buildings) in a sustainable and cost efficient way.
- Identify the most important market and policy issues as well as marketing strategies for such renovations.

3. Scope

The task deals with several types of non-residential buildings, including protected and historic buildings:

- Office buildings
- Educational buildings
- Nursing homes
- Hotels
- Super markets and shopping centres

Depending on available projects among the participating countries, the following types may also be recognized; hospitals, industrial halls and indoor swimming pools.

A broad range of technologies will be included and solar energy will play a significant role in bringing the use of primary energy down to NZEB standard. (Near-Zero Energy Buildings)

4. Process

This will be a 3,5 years task starting 01.January 2011 and remain in force until 31.June 2014.

The Task will begin by collecting information from selected exemplary buildings in participating countries. The information gathered will be the basis for more detailed analysis in the task.

The building stock will be analyzed in order to identify building segments with the greatest multiplication and energy saving potential.

In parallel, exemplary renovation projects achieving substantial primary energy savings while creating superior living quality and indoor climate will be analyzed. Important aspects are both energy performance and the owner's motivations behind the renovation.

Drawing on this experience package of measures in combination with the most updated research front, new and innovative concepts and components will be developed. The research work will be accomplished in close contact with the end users (local authorities, housing industry and research institutions) to ensure a focus on their requirements. Insights from this international collaboration will be conveyed to target national end users in a deliberate strategy to increase the market penetration of advanced housing renovations.

The work will be carried out within the framework of four Subtasks and working groups. In order to increase the synergy between the subtasks, mutual inputs and possible interactions will be a checkpoint on the agenda at every expert meeting.

Experts will meet in two annual regular task meetings where their work in between the meetings will be discussed. It will be considered to extend some of the expert meetings with one extra day for more detailed work in a subtask. Intermediate web conferences will be organized if necessary for detailed discussions in a subtask in between the expert meetings.

5. Outcome

The results of the Task will be brochures, technical reports and workshops describing:

- Design and performance of exemplary renovation projects, describing benefits, process and motivations [A]
- Building segments with the greatest multiplication and energy saving potentials [B].
- Decision making processes and the influence of barriers and non-energy-benefits [B]
- Key technologies for renovations and how to achieve NZEB standard for renovation with good indoor comfort.[C]
- A global approach for building renovation based on environmental, urban infrastructure, comfort and health impacts. [D]

6. Participants

Contributors and participants in this task will be:

- National and regional government planning authorities
- Market players (industry, institutions and others) in the building sector who are already planning/designing, producing, delivering, marketing and financing sustainable products/concepts or have ambitions to do so.
- Universities and research institutes active in the building sector

7. Subtasks

Subtask A: *Advanced Exemplary Projects - Information Collection & Brief Analysis*

Lead: Fritjof Salvesen, KanEnergi, Norway

Countries AT, AU, BE, DK, GE, IT, NL, NO, US

Objectives: This Subtask is planned to be a cross-Task activity to:

- Systematically analyze and document renovation projects meeting Task selection criteria in order to quantify which measures achieve the greatest energy savings or improvement in comfort and at what costs
- Identify the driving forces and barriers in the decision making processes for detailed analysis in subtask B.
- Identify innovative, promising concepts and technologies for detailed analysis in Subtask C.
- Identify environmental impacts and architectural quality for detailed analysis in subtask D.

Results: The following results will come out of this work:

- Data base describing main characteristics of renovation technologies
- Brochures describing exemplary renovation projects meeting the Task criteria among participating countries (4-6 pages including: energy characteristics, environmental impact, financing, health, process, architecture quality)
- Two dissemination seminars held in connection with expert meetings
- A summary report describing lessons learned from the exemplary projects.
- Survey of national renovation guidelines.

Approach: The following approach will be taken:

- Define project selection and evaluation criteria including energy, degree of innovation, degree of renovation, economy, environmental impact and market potential.
- Develop a template to describe the projects and to report what a project demonstrates, why it is important and how well it performs.
- Establish a database of good renovation projects. This work will be coordinated with the existing databases as the High Performance Buildings database of Task 40 and/or other relevant databases (i.e. EU PASS-NET and SHC Task41).
- Select a few projects per country meeting the task criteria to make brochures according to the agreed template. Some of those projects will be further analysed in sub-t. B, C and D.
- Interview demonstration project owners, property managers, planners and occupants to characterize the renovation process, their motivations, to quantify costs and benefits, identify opportunities for improvement, etc. Interviews will be based on questions arising from the other subtasks during to task.
- Identify which national guidelines are available and evaluate these to consider if a specific task guideline should be worked out.

Preliminary expected exemplary projects

Germany: 4-5 schools, Small office buildings/print shop, work shop, the German Embassy in Australia, 2 nursing homes

Austria: school projects, protected building monestry, offices in Salzburg

Belgium: one office buildings, 1-2 schools

The Netherlands: schools in Russia and Serbia, the renovated office building of one of the task participants

Norway: office buildings and schools

Time Plan and Milestones

	2011			2012			2013			2014		
1. Project selection criteria and documentation format	1											
2. Set up database on renovation projects (coordinate with others)	2											
3. Document exemplary renovation projects by means of brochures			3 5			6 7						
4. Workshop organized in connection with expert meeting			4								9	
5. Lessons learned summary									8			10

Milestones		
No	Milestone	Due
A1	Project selection criteria defined, documentation format decided.	May 2011
A2	Decide if to make a separate task database or link to others	May 2011
A3	First exemplary projects documented	Oct. 2011
A4	First workshop organized in connection with expert meeting	Oct. 2011
A5	First project brochures uploaded on public task web site.	Dec. 2011
A6	At least one project described from each participating country	April. 2012
A7	More brochures on public web site	Dec. 2012
A8	First draft lessons learned summary	Oct 2013
A9	Second workshop organized in connection with expert meeting	Oct. 2013
A10	Final "lessons learned summary" to be approved by participants	March. 2014

Subtask B: *Market and Policy issues and Marketing Strategies***Lead:** Trond Haavik, Segel, Norway**Countries** NO, BE, US, IT, AT?, GE?, AU?, NL?

Objectives: This Subtask's objectives are to:

- Identify segments in the non residential building stock with high potential for energy efficiency savings and which type of owners are most likely to go for major renovation projects.
- Identify the most important barriers and driving forces in decision making processes for high ambition renovation in the non residential sector and how to overcome them.
- Develop knowledge about which boundary conditions are important to make renovations attractive/affordable/cost effective and more available.
- Increase the understanding of how improved non energy benefits (including outcome subtask D) as a result of substantial renovation, increase the value of the building and thereby makes the investments profitable.

Results:

- Gathering building stock analyses for the countries actively participating in the subtask for further analysing of interesting segments. Together with an analysis of the ownership structure this will form the information foundation for identifying segments with high potential.
- In depth descriptions of decision making processes in case studies (positive and negative experiences) in the participating countries (minimum 2 case studies from the participating countries in the subtask). This will include in depth interviews with building owners, occupants etc. These reports will also describe how non energy benefits of the investments have influenced the process, and how attitudes change among decision makers during the process. The report will also include a description of their strategic choices and what happened during the process issues related to occupants in the building.
- Based on [B2] and project descriptions delivered by subtask A, a discussion with conclusions regarding barriers and driving forces in decision making processes will be summarized. This report should be of great interest for building owners and actors in the building industry.
- Based on the other deliverables and through an analysis of effects of existing regulations and incentives, it will be discussed how authorities may increase the number of ambitious energy efficiency projects in the non residential sector.
- A selection of the different sub deliveries will be gathered in a final report. This report will also sum up potential strategies for different actors.

Audience: Actors in the building industry focusing on renovation projects, local and national authorities, owners.

Approach: The following approach will be taken:

- Analyze national statistics on the existing non residential building stock, survey owners' motivations for renovations to identify building types and concepts with the greatest multiplication and energy saving potential.
- Investigate national regulations and building codes together with the middle and long-term targets for the non residential building stock to put Task targets for research and demonstration work in perspective.
- Analyze the effect of various subsidies and financial models
- Collect feedback from non residential building owners, real estate managers, planners, occupants on costs, benefits, motivations and the process of renovation through case studies.
- Develop targeting communication strategies to accelerate the growth of non residential renovations with substantial reductions in primary energy use.
- Two workshops held in conjunction with expert meetings.
 - 1: Discussion of which segments have the greatest potential
 - 2: Discussion of the decision making process

Time Plan and Milestones

	2011	2012	2013	2014
1. Simplified building stock analysis		1		
2. Case studies		2		3
3. Analysis of barriers and drivers			4	
4. Evaluation of regulations and incentives			5	
5. Strategies				6
6. Workshops				

Milestones		
No	Milestone	Due
B1	Building stock analysis completed	Jan 2012
B2	Template for case studies finished	Nov 2011
B3	In depth description of decision making processes and chosen strategies in case studies	Dec 2013
B4	Report on barriers and driving forces in decision making processes	June 2013
B5	Evaluation of regulations and incentives	Oct 2013
B6	Possible policies and market strategies for actors in the market	Jun 2014

Subtask C: Assessment of Technical Solutions and Operational Management**Lead:** Doreen Kalz, Fraunhofer Institute Solar Energy Systems, Germany**Countries** GE, NO, NL, AT, BE ++?**Objectives:** The subtask's objectives are to:

- Describe the HVAC and control systems of the recommended retrofit concept. This includes information about the building shell, the HVAC system, the daylighting and artificial lighting concepts as well as available measurement or energy consumption data. The documentation of the data is an important contribution to subtask A.
- Identify required measuring points for a basic monitoring of building and HVAC system.
- Develop a methodology for evaluating the different building and plant concepts.
- Identify and develop successful NZEB concepts considering the building envelope as well as the heating, cooling, ventilation and lighting concept.
- Evaluate the building and plant performance on basis of energy monitoring or monthly energy bills (if measurements are made available by participants).
- Analyze the fault detection and identify optimization potential due to smart building and plant control.

Results: The subtask's outputs are:

- A documentation of building information and data on a website (in cooperation with subtask A).
- A detailed description of two best case buildings (school and office building) considering the building (i) before and (ii) after retrofit. A third step is the description of the building performance (iii) with optimized control and operation algorithms applied.
- A technical report with recommendations for (i) the assessment of new technologies for retrofit and (ii) a description of successful path to "near-zero energy buildings" (NZEB) with good indoor comfort.

Approach: The following approach will be taken:

- Subtask C provides a template for a facts sheet in order to collect information of the building shell and the HVAC system.
- Secondly, a methodology is developed for the comparative analysis of the different building and energy concepts of the buildings before and after retrofit.
- A selected number of non-residential buildings will serve as case study for further investigation. The participants are responsible for collecting the information about the buildings according to the facts sheets. Further, monitoring data or/and energy bills of buildings are made available by the participants.
- Each participant evaluates the building and plant concepts of the buildings before and after retrofit according to the methodology developed. Promising concepts and technical solutions are identified and described.

- Subtask C carries out a comparative cross-analysis of all buildings considering energy use, efficiency, and interior comfort.
- Optimization potential of the concepts is identified and described in order to reach the target of a “near-zero energy building”.
- Identification of potential energy saving due to weather predictive control in highly insulated buildings.
- Identify and demonstrate the potential and technical possibility for grid relief and flexibility improvements of existing intelligent buildings in a smart grid.

Time Plan and Milestones

	2011			2012			2013			2014		
1. Collection of data/information	1			2								
2. Development of methodology and basic monitoring					3							
3. Evaluation of technologies of the building by participants												
4. Comparative analysis: range of performance, benchmark												4
5. Technical Report												5

Milestones		
No	Milestone	Due
B1	Draft for facts sheets for HVAC+L (contribution to ST A)	March 2011
B2	Collected information (facts sheets)	March 2012
B3	Methodology for evaluation concept	June 2012
B4	Evaluation of building and plant concepts, technical report	June 2013
B5	Final technical report	June 2014

Subtask D: Environmental and Health Impact Assessment**Lead:** Sophie Trachte; Belgium**Countries** BE, NL?, NO?, GE? ++**Objectives:**

- Develop an global (including local and global environment) approach for building renovation based on environmental, urban infrastructure, comfort and health impacts;
- Identify quantifiable and qualitative criteria and requirements for environmental impacts of renovation projects based on BREEAM assessment methodology;
- Identify indoor climate and indoor space issues with particular relevance to the topic of the user's health and user's comfort (visual, acoustical etc)
- Identify "quality of life" issues with particular relevance to the topic of the urban infrastructure, of the urban transportation network and of the collective or public spaces
- Identify the adaptability of building and flexibility issues with particular relevance to the acceptance of renovations without causing heavy impact on the environment

Results:

- Specific analysis of exemplary renovation projects (selected by Subtask A) based on BREEAM methodology
- Specific analysis of innovative concepts
- Booklet with guidelines for designers and planners (how to do...)

Approach: The work will focus on school buildings.

- Selection of criteria will address the following dimensions:
 - Impact on the environment : atmospheric pollution, production of waste, impact of solar supplies, flexibility and adaptability of the building
 - Impact on the energy and non energy resources: Fossil energy consumption, use of renewable energy (solar and others), use of raw material and building material, use of water, use of land and spaces etc.
 - Impact on quality of life: quality of outdoor and public spaces, links between the building and the urban network (services, transports, distance to, soft mobility,...) and accessibility of the building
 - Impact on user's health and comfort: visual comfort (use of daylight), thermal comfort (temperature, moisture etc), acoustical comfort and indoor air quality – IAQ (materials emissions, ventilation etc)
- Analysis of BREEAM methodology (to know which information is necessary –for analysis of exemplary projects), eventually extend this with additional criteria.
- Analysis of exemplary projects from subtask A (how projects respond to the selected subtask D criteria). Identify new innovative and relevant concepts or/of experiences (not all the building renovation but only concepts
- Define the table of content and the main chapters of the booklet

- Prepare a guideline for designers and planners, based on the selected criteria and innovative concepts analysis. The guideline will be illustrated by good exemplary projects

Time Plan and Milestones

	2011			2012			2013			2014	
1. Analysis of BREEAM methodology			1								
2. Analysis of exemplary projects from subtask A.					2						
3. Workshops / seminars					3			5			
4. Definition of the table of content of the guideline						4					
5. Compose and write the guideline									6	7	
6. Final presentation											8

Milestones		
No	Milestone	Due
D1	Definition of the criteria for sustainable renovation based on environment impacts, user's comfort impacts, health impacts and flexibility, adaptability to changes	Sept. 2011
D2	Analysis of exemplary projects from subtask A with BREEAM methodology. Identify new innovative and relevant concepts or/of experiences.	June 2012
D3	First Workshop : <ul style="list-style-type: none"> - presentation of BREEAM methodology and selected criteria throughout some good examples (subtask A) - presentation of innovative concepts - proposal of non energy concepts/advantages (comfort, health, quality of life) for subtask B - proposal of flexibility concepts (linked with subtask C, how to manage the future changes) 	March 2012
D4	Definition of the of the content of the guidelines (priorities in renovation, main chapters)	Dec. 2012
D5	Second Workshop, with the presentation of the table of content and main chapters	March 2013
D6	First draft of the guidelines illustrated by good examples (subtask A)	Oct. 2013
D6	Second draft of the guidelines to be approved by subtask participants	March 2014
D7	Final guidelines to be approved by task experts and ExCo	June 2014

8. Information plan:

In general the dissemination of the task results will take place at a national level. The publications listed below will be available from the task public web-site in pdf-format. The publications may be used as a basis for making national publications.

The following documents and information meetings are planned during the task:

1. The Task web site is publicly available by 31. January 2011 including secure sites for the task participants.
2. Database for renovation projects (could be a link to other relevant bases), public available by December 2011
3. First brochures of exemplary renovation projects available from the public web by December 2011. (4-6 pages with a standard template) For designers, planners and building owners
4. Two seminars in conjunction with expert meetings presenting exemplary projects from the participating countries (autumn 2011 expert meeting, spring 2014 expert meeting)
5. "Lessons learned summary" from the exemplary projects of subtask A.
6. Publication describing decision making processes, non energy benefits as well as barriers and driving forces from the case studies of subtask B.
7. Publication summarising renovation policies and strategies.
8. Use social media such as LinkedIn for publication and establish discussion groups and inviting of actors to join online discussions to gather more information.
9. Presentations at national and international conferences which have the building industry and/or the real estate sector as target group.
10. Technical report with recommendations and conclusions from subtask C
11. "Guideline for designers and planners" with recommendations from subtask D.

To be discussed with the ExCo:

- *Should the main output of the task be a glossy book by a commercial publisher instead of separate subtask reports in pdf-format.*
 - *The pro is to have all the important outcome from the task in one glossy and nice book which includes a potential for a wider distribution also outside the participating countries and the IEA.*
 - *The contra is that most of the participating countries have a mother tongue different from english, and a translation the native language is necessary for a wider distribution in the industry.*
- *If a glossy commercial book will be the choice,*
 - *it is important to use the first expert meeting to agree on the structure and content of the book for each subtasks.*
 - *The book needs an editor with sufficient fund*
 - *The book needs a publisher, could be a commercial publisher or maybe the IEA secretariat?*

9. Future meetings

The first ordinary task expert meeting will be hosted by the xxx and will take place in March 2011 in Austria/Norway??

The autumn meeting 2011 will take place in Norway/Belgium/the Netherlands??.