

TASK 50

ADVANCED LIGHTING SOLUTIONS FOR RETROFITTING BUILDINGS

Draft ANNEX

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This Annex text was prepared by Jan de Boer of Fraunhofer IBP, Germany

DRAFT

Annex Outline

Advanced lighting solutions for retrofitting buildings

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1. Definitions

(a) Description of technical sector

Lighting accounts for approximately 19%, i.e. 2900 TWH, of the global electric energy consumption. Research and developments in the field of energy efficient lighting techniques encompassing daylighting, artificial lighting and lighting controls combined with activities employing and bringing these techniques to the market can contribute significantly to reduce worldwide electricity consumptions and CO₂ emissions.

With a small volume of new building constructions in the developed countries, major lighting energy savings potentials can only be realized by retrofitting the building stock. However lighting retrofits are still way behind what is economically as well as technically possible and feasible. Reasons for this shortfall include: Lack of awareness of potentials, a confusing variety of retrofit solutions for lighting systems; missing proven evidence on the saving potential of sound design solutions using new emerging technologies, partly lacking technical and constructive solutions, missing of integrated rating methods on lighting energy and operational costs, and a lack of incentives.

(b) Definitions

The scope of the Task is on general lighting systems for indoor environments. The focus is laid on lighting appliances in non-domestic buildings. Technically the task deals with

- daylight utilization by better facade technologies and architectural solutions,
- electric Lighting schemes addressing technology and design strategies,
- lighting control systems and strategies

alike. The task targets building owners (investors), authorities, industry and consultants by providing strategic, technical and economic information and with this helping these stakeholders overcome barriers in retrofitting of lighting installations.

2. Purpose and Objectives

The overall objective of this activity is to accelerate retrofitting of daylighting and electric lighting solutions in the non-domestic sector using cost - effective, best practice – approaches,

which can be used on a wide range of typical existing buildings. This can be subdivided into the following specific objectives:

- Develop a sound view of the lighting retrofit market.
- Trigger discussion, initiate revision and enhancement of local and national regulations, certifications and loan programs.
- Increase robustness of daylight and electric lighting retrofit approaches technically, ecologically and economically.
- Increase understanding of lighting retrofit processes by providing adequate tools for different stakeholders.
- Demonstrate state of the art lighting retrofits.
- Develop as a joint activity an electronic interactive source book including design inspirations, design advice, decision tools and design tools relying on the results of the different task activities.

3. Activities

(a) Main activities

To accomplish the objectives of the Task, the Participants will carry out research and developments in the framework of the following four Subtasks and one joint working group:

- Subtask A: Market and Policies,
- Subtask B: Daylighting and Electric Lighting Solutions,
- Subtask C: Methods and Tools,
- Subtask D: Case Studies,
- Joint Working Group: "Lighting Retrofit Adviser".

(b) Sub-activities

The activities performed in the subtasks and joint working group and their specific projects are:

Subtask A: Market and Policies

This subtask will identify the various possible approaches of retrofitting daylighting systems and lighting installations in buildings. It proposes to provide key figures concerning costs (Total Cost of Ownership) and identify barriers and opportunities concerning lighting retrofit actions. Beyond costs, barriers could be related to inertia of stakeholders, poor habits or lack of knowledge. Opportunities may go beyond reduction of costs, reduction of energy requirements

and may relate to added benefits for investors, building owners, building managers and occupants. The work of Subtask A will be structured into four projects:

- A.1 Global economic models
- A.2 Barriers and benefits
- A.3 Building Energy regulation and certification
- A.4 Proposal of action concerning value chain

Subtask B: Daylighting and Electric Lighting solutions

This Subtask will deal with the assessment of existing and new technical solutions in the field of façade and daylighting technology, artificial lighting and lighting controls. For replacement solutions the subtask will identify and structure existing and develop new lighting system technologies. The work of Subtask B will be structured into six projects:

- B.1. Definition - system characterisation
- B.2. Definition of (regional) baseline conditions
- B.3. Review of state of the art technology and architectural solutions
- B.4. New technical developments
- B.5. Measurements of selected state of the art and new technologies
- B.6. Source book

Subtask C: Methods and Tools

Whether an intended retrofit is technically, energetic and economically meaningful is at the moment not self-evident for the majority of stakeholders and building designers. This subtask will focus on simple computer design tools and analysis methods in order to improve the understanding of retrofit processes. This will incorporate energy and visual comfort analysis as well as the financial aspects of lighting retrofit solutions. It will also encompass advanced and future calculation methods aiming at the optimization of lighting solutions, as well as energy auditing and inspection procedures, including lighting and energy performance assessments. The work of Subtask C will be structured into five projects:

- C.1. Analysis of workflow and needs
- C.2. State of the art review
- C.3. Development of a simple integrated rating model
- C.4. Energy Audit and Inspection Procedures
- C.5. Advanced and future Simulation Tools

Subtask D: Case Studies

Case studies are essential to communicate lighting retrofit concepts to decision makers and designers. Therefore, the main aim of Subtask D is to demonstrate sound lighting retrofit solutions in a selection of representative, typical Case Studies. The selection of Case Studies will be based on a general building stock analysis, including the distribution of building typology in relation to lighting retrofit potential. These case studies will deliver proven and robust evidence of achievable savings and show integrated retrofit strategies. Measurements and assessments will include monitoring of energy savings, lighting quality and operational costs. In addition, Subtask D will provide updated information from an analysis of previously documented Case Studies in the literature and on websites. The work of Subtask D will be structured into to six projects:

- D.1 Building stock/typology

- D.2 State-of-the-art
- D.3 Assessment and monitoring procedure
- D.4 Case study assessment
- D.5 Overall conclusions, lessons learned
- D.6 Case study book / e-documentation

Joint Working Group "Lighting Retrofit Adviser" (LRA)

All Subtasks will provide major parts of their results, as input to this joint activity. Based on these results, the joint working group will develop an electronic interactive source book (Lighting Retrofit Adviser). A central data base will include all task results and will allow the users to obtain extensive information, according to their individual focus of interest: design inspirations, design advice, decision tools and design tools. Thus, the user will be able to increase quickly and reliably his knowledge in the respective field of interest. Users will have the choice of analysing retrofit (design) scenarios themselves and/or using the pool of experience gained in the case studies projects (electronic version of case study book) to access information on energy saving potentials and economic approaches. The Lighting Retrofit Adviser will address specific needs of different target groups and audiences. The joint working group will be structured into 4 project tasks:

- JWG.1. Architecture and software design
- JWG.2. Concept evaluation and proof
- JWG.3. Implementation
- JWG.4. Validation, quality assurance and national adaptations

(c) *Workshops and Seminars*

Industry workshops, during the Task duration, in conjunction with every Task meeting, will be organised in the host country of the meeting. All relevant target groups will be invited.

National industry workshops will be organised by Task participants using the information gathered during Task workshops and the material produced by the Task.

(d) *Publications/Newsletters*

The overall scope and objectives of the Task and the different Subtasks will be described on a public website, possibly the IEA-Task Website. Apart from publications of scientific results in conferences, journals and magazines printed leaflets will be distributed to describe the scope of the Task.

A Newsletter will be produced at the end of Year 2 and 3. The Newsletter will be distributed through national channels (for instance, included in a solar industry or lighting association or lighting journal)

4. Expected Results/Deliverables

All Subtasks will provide material for the final Task product, the Lighting Retrofit Adviser. The main results of this Task shall be:

4.1 Subtask A Market and Policies

- Collection of data on costs (TCO) of various lighting scenarios
- Proposal of models for comparison of retrofit schemes
- Analysis of barriers and opportunities as well as budget issues for retrofits
- Collection of information on the way lighting retrofit is integrated in documents used for regulation and certification.
- Proposal to improve integration in regulations and certifications
- Proposal of actions for stakeholders concerning the value chain
- Report "Lighting retrofit market. Including policy issues and proposals of action"

4.2 Subtask B Daylighting and Electric Lighting solutions

- Catalogue of criteria to describe lighting retrofit technologies
- Regional baselines of existing lighting installations
- Review on state of the art lighting technology and architectural solutions
- Investigation on new technologies of interest for retrofitting buildings, including technology roadmaps.
- Development and evaluation of specific new lighting technologies
- Measurements and evaluation of selected state of the art technologies and new technologies
- Source book (electronic) "Daylighting and electric Lighting retrofit technologies. From low budget to new advanced retrofit solutions"

4.3 Subtask C Methods and Tools

- Survey of workflows and needs for tools
- State of the art review of methods and tools including benchmarking specific tools on case studies
- Calculation engine for "Lighting retrofit adviser"
- Review on energy monitoring and inspection methods and benchmarking thereof in case studies
- Review and case study based testing of advanced simulation tools
- Webbased Survey & toolbox "Set of (simple) energetic and economic rating and calculation methods and tools",

4.4 Subtask D Case Studies

- Report about analysis of building stock and typology in relation to energy and electricity use
- State-of-the-art review of lessons learned from previous Case Studies
- Report about previous assessment protocols and procedure.

- New assessment protocol
- Comprehensive (large) electronic-database with retrofit cases
- Report summarizing general lessons learned
- Electronic Case Study book

4.5 Joint Working Group “Lighting Retrofit Adviser”

“Lighting retrofit adviser”, an electronic, interactive source book including design inspirations, design advice, decision tools and design tools for lighting retrofits. The adviser will work on desktops as well as mobile computing systems. It will be a joint effort of Task 50 and available at the end of the Task (Year 3).

5. Rights and Obligations of Participants

In addition to the obligations enumerated in Article 4 of this Agreement

(a) Reporting

Each participating institution/company shall provide the Operating Agent with detailed reports on the results of the work carried out for each Subtask;

(b) Data collection

Each participating institution/company shall collect, assess and report to the Operating Agent data on lighting retrofits for non-domestic buildings [like market, benchmarks, technologies, case studies etc.] in his country; and

(c) Editing and reviewing

Each participating institution/company shall participate in the editing and reviewing of draft reports of the Task and Subtasks.

(d) Operating Agent Meetings

Each country will bear the costs of its own participation in the Task, including necessary travel costs. The cost of organising meetings will be borne by the host country.

(e) Individual Financial Obligations

Aside from providing the resources required for performing the work of the Subtasks in which they are participating, all Participants are required to commit the resources necessary for activities which are specifically collaborative in nature and which would not be part of activities funded by national or international sources. Examples include the preparation for and participation in Task meetings, co-ordination with Subtask Participants, contribution to the documentation and dissemination work and Task related R&D work which exceeds the R&D work carried out in the framework of the national (or international) activity.

(f) Task-Sharing Requirements

The Participants agree on the following funding commitment:

- 1) Participation in this Task requires a minimum effort of 12 person-month per country. Each Participant’s country is required to participate in at least two

subtasks and in the Joint Working group “Lighting Retrofit Adviser” with a total minimum effort of 4 person month per year to the result of the task.

- 2) The Operating Agent will contribute with a minimum of 0.33-person year per year to the Task (i.e., a total of 1 person years for his/her work as Operating Agent).
- 3) The Subtask leader shall commit a minimum of 3 person-month per year for the work.
- 4) Participation may partly involve funding already allocated to a national (or international) activity that is substantially in agreement with the scope of work outlined in this Annex. Aside from providing the resources required for performing the work of the Subtasks in which they are participating, all Participants are required to commit the resources necessary for activities that are specifically collaborative in nature and that would not be part of activities funded by national or international sources. Examples include the preparation for and participation in Task meetings, co-ordination with Subtask Participants, contribution to the documentation and dissemination work and Task related R&D work which exceeds the R&D work carried out in the framework of the national (or international) activity.

6. Management

(a) The Federal Republic of Germany, represented by Jan de Boer, Fraunhofer Institute of Building Physics for the Project Management Center Jülich (PTJ) for the Federal Ministry of Economics and Technology, is designated as Operating Agent.

The Subtask leaders shall be from the following countries:

Subtask A: Denmark
Subtask B: Germany
Subtask C: Switzerland
Subtask D: Sweden

(b) The Operating Agent’s rights, obligations and responsibilities in addition to those indicated in the main body of the Implementing Agreement and the organisation of the work under this Annex enumerated in Articles 5 of this Agreement, the Operating Agent shall:

- 1) Prepare and distribute the results mentioned in paragraph 4 above;
- 2) Prepare joint assessments of research, development and demonstration priorities for advanced lighting solutions for retrofitting buildings;
- 3) At the request of the Executive Committee, organise workshops, seminars, conferences and other meetings;
- 4) Prepare the detailed Program of Work for the Task in consultation with the Subtask Leaders and the Participants and submit the Program of Work for approval to the Executive Committee of the Solar Heating and Cooling Programme;

- 5) Propose and maintain a methodology and a format for the submission of information on advanced lighting solutions for retrofitting buildings which is collected by the Participants as described in paragraphs 3 and 4 above;
 - 6) Provide reports semi-annually to the Executive Committees on the progress and the results of the work performed under the Programme of Work;
 - 7) Provide to the Executive Committees, within six months after completion of all work under the Task, a final report for its approval and transmittal to the Agency;
 - 8) In co-ordination with the Participants, use its best efforts to avoid duplication with activities of other related programmes and projects implemented by or under the auspices of the Agency or by other competent bodies;
 - 9) Provide the Participants with the necessary guidelines for the work they carry out with minimum duplication;
 - 10) Perform such additional services and actions as may be decided by the Executive Committees, acting by unanimity; and
 - 11) Gather documents from Subtask Leaders, organize the output of the Task either as a printed handbook, electronically or on a Web site.
 - 12) A Subtask Leader for each of the foregoing Subtasks will:
 - a. Co-ordinate the work performed under that Subtask;
 - b. Assist the Operating Agent in preparing the detailed Programme of Work;
 - c. Direct technical workshops and provide the Operating Agent with written summaries of workshops results and
 - d. Edit technical reports resulting from the Subtask and organise their publication.
 - e. Subtask leaders may arrange meetings in between or in association with Experts meetings of the Task.
 - 13) The Subtask Leader shall be a Participant that provides to the Subtask a high level of expertise and undertakes substantial research and development in the field of the Subtask. The Subtask Leaders shall be proposed by the Operating Agent and designated by the Executive Committee, acting by unanimity of the Participants. Changes in the Subtask Leaders may be agreed to by the Executive Committee, acting by unanimity of the Participants.
- (c) *Operating Agent's Meetings:* There will be Experts meetings of the Task at intervals of approximately 6 months. Subtask Leaders may arrange meetings in between or in association with Experts meetings of the Task. Attendance at the Experts Meetings of the Task will be mandatory.
- (d) It is intended to organize expert / industry workshops directly linked to the Task meetings. The overall scope and objectives of the Task and the different Subtasks will be described

on a public website, possibly the IEA-Task Website. The server should be able to process an automatically distributed electronic newsletter.

7. Admission, Participation and Withdrawal of Participants

In addition to the specific obligations, the Operating Agent will produce, promote and distribute the results of the Task. The Participants will support these activities by contributing respective papers and by dissemination activities financed by the individual Participants.

8. Information and Intellectual Property

(a) Executive Committee's Powers

The publication, distribution, handling, protection and ownership of information and intellectual property arising from this Task shall be determined by the Executive Committee, acting by unanimity, in conformity with the Agreement.

(b) Right to Publish

Subject only to copyright restrictions, the Participants shall have the right to publish all information provided to or arising from this Annex, except proprietary information.

(c) Proprietary Information

The Participants and the Operating Agent shall take all necessary measures in accordance with this paragraph, the laws of their respective countries and international law to protect proprietary information provided to or arising from this Annex. For the purposes of this Annex, proprietary information shall mean information of a confidential nature such as trade secrets and know-how (for example computer programs, design procedures and techniques, chemical composition of materials, or manufacturing methods, processes, or treatments) which is appropriately marked, provided such information:

- (a) Is not generally known or publicly available from other sources;
- (b) Has not previously been made available by the owner to others without obligation concerning its confidentiality;
- (c) Is not already in the possession of the recipient Participant without obligation concerning its confidentiality.

It shall be the responsibility of each Participant supplying proprietary information and of the Operating Agent for appraising proprietary information, to identify the information as such and to ensure that it is appropriately marked.

Arising Information

All information developed in connection with and during activities carried out under this Task (arising information) shall be provided to each Participant by the Operating Agent, subject only to the need to retain information concerning patentable inventions in confidence until appropriate action can be taken to protect such inventions.

For arising information regarding inventions the following rules shall apply:

(1) Arising information regarding inventions shall be owned in all countries by the inventing Participant. The inventing Participant shall promptly identify and report to the Executive Committee any such information along with an indication whether and in which countries the inventing Participant intends to file patent applications.

(2) Information regarding inventions on which the inventing Participant intends to obtain a patent protection shall not be published or publicly disclosed by the Operating Agent or the other Participants until a patent has been filed, provided, however, that this restriction on publication or disclosure shall not extend beyond twelve months from the date of reporting of the invention. It shall be the responsibility of the inventing Participants to appropriately mark Task reports that disclose inventions that have not been appropriately protected by filing a patent application.

(3) The inventing Participant shall license proprietary information arising from the Task for non-exclusive use to participants in the Task:

(a) On the most favorable terms and conditions for use by the Participants in their own country

(b) On favorable terms and conditions for the purpose of sub-licensing others for use in their own country.

(c) Subject to sub-paragraph (1) above, to each Participant in the Task for use in all countries, on reasonable terms and conditions.

(d) To the government of any Agency Member country and nationals designated by it, for use in such country in order to meet its energy needs.

Royalties, if any, under licenses pursuant to this paragraph shall be the property of the inventing Participant.

(d) Production of Relevant Information by Governments

The Operating Agent should encourage the governments of all Agency Participating Countries to make available or to identify to the Operating Agent all published or otherwise freely available information known to them that is relevant to the Annex.

(e) Production of Available Information by Participants

Each Participant agrees to provide to a Subtask Leader or to the Operating Agent all previously existing information, and information developed independently of the Annex, which is needed by a Subtask Leader or by the Operating Agent to carry out its functions under this Annex and which is freely at the disposal of the Participant and the transmission of which is not subject to any contractual and/or legal limitations:

(1) If no substantial cost is incurred by the Participant in making such information available, at no charge to the Annex therefor;

(2) If substantial costs must be incurred by the Participant to make such information available, at such charges to the Annex as shall be agreed between the Operating Agent and the Participant with the approval of the Executive Committee.

(f) Use of Confidential Information

If a Participant has access to confidential information which would be useful to a Subtask Leader or to the Operating Agent in conducting studies, assessments, analyses, or evaluations, such information may be communicated to a Subtask Leader or to the Operating Agent but shall not become part of the reports, handbooks, or other documentation, nor be communicated to the other Participants, except as may be agreed, between the Subtask Leader or the Operating Agent and the Participant which supplies such information.

(g) Reports on Work Performed under the Annex

The Operating Agent shall, in accordance with paragraph 7 above, provide reports of all work performed under the Annex and the results thereof, including studies, assessments, analyses, evaluations and other documentation, but excluding proprietary information.

(h) Copyright

The Operating Agent may take appropriate measures to protect copyrightable material generated under this Annex. Copyrights obtained shall be the property of the Operating Agent for the benefit of the Participants provided, however, that the Participants may reproduce and distribute such material, but if it shall be published with a view to profit, permission should be obtained from the Executive Committee.

(i) Authors

Each Participant will, without prejudice to any rights of authors under its national laws, take necessary steps to provide the co-operation from its authors required to carry out the provisions of this paragraph. Each Participant will assume the responsibility to pay awards or compensation required to be paid to its employees according to the laws of its country.

9. Entry into Force, Term and Extension

This Annex shall enter into force on 1st January 2013 upon the date the IEA Executive Director received the second Notice of Participation, and shall remain in force for a period of 3 years/until 31st of December 2015. At the conclusion of that period, this Annex can be extended by at least two Participants, acting in the Executive Committee, for a period to be determined at that time, provided that in no event shall the Annex continue beyond the current term, or actual termination, of the Implementing Agreement.

10. Participants

The contracting parties which are intending to participate in this Task are the following (tentative 10/ 2012):

Austria:	AEE INTEC
Belgium:	Architecture et Climat Université Catholique de Louvain
China:	National Center for Quality Supervision and Testing of Solar Heating Systems (CABR)
Denmark:	The Ministry of Environment and Energy, Danish Energy Agency
Finnland:	TEKES, National Technology Agency Energy and Environment Employment & Economic
Germany:	Forschungszentrum Jülich - PTJ
Italy:	ENEA UTEE-ERT
Japan:	New Energy and Industrial Technology Development Organization (NEDO)
Slovakia (Observer):	TBD
South Africa:	SANEDI
Norway:	ENOVA
Sweden:	Swedish Energy Agency
Switzerland	Swiss Federal Office of Energy