

# IEA SHC Task 50:

# Advanced lighting solutions for retrofitting buildings



Daylighting

Electric Lighting

Lighting Controls

January 2013 – December 2015



# Task Structure

The objective 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.

## ***IEA SHC Task 50***

### **Advanced lighting solutions for retrofitting buildings**

*Operating Agent: J. de Boer, DE*

#### **Subtask A**

*M. Fontoynt,  
DK*

**Market  
and  
Policies**

#### **Subtask B**

*M. Knoop, DE*

**Daylighting  
and Electric  
Lighting  
Solutions**

#### **Subtask C**

*J. Kaempf &  
B. Paule, CH*

**Methods  
and  
Tools**

#### **Subtask D**

*M.-C. Dubois, SE*

**Case  
Studies**

**Joint Working Group: "Lighting Retrofit Adviser"**

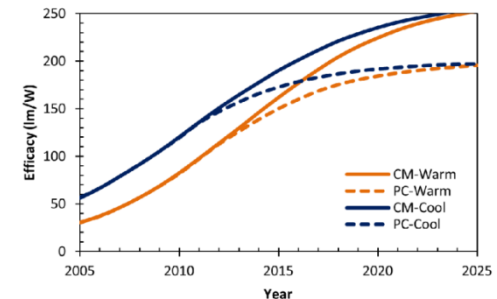
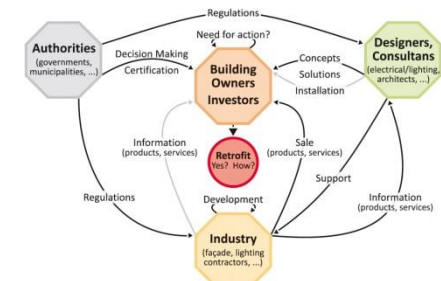
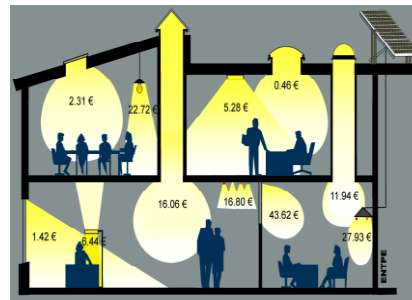
# Subtask A: Market and Policies

[Coordination: M. Fontoyont, SBI, Denmark]



**Objective:** To understand and model the financial and energy impact associated to retrofitting daylighting and electric lighting of buildings.

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



	Typology / best solutions	TCO of lighting	Value benefit	Energy benefit	Function benefit	Human benefit	Other benefit
1.	Offices New blind system and blind control Ambient task lighting Task lighting Daylight harvesting	€/m <sup>2</sup>	2000 €/m <sup>2</sup> (value) [ref] €/m <sup>2</sup>	2 €/m <sup>2</sup> .yr (lighting) 4€/m <sup>2</sup> .yr (cooling & lighting)	Higher productivity €/m <sup>2</sup>	less stress extra hours of comfortable work €/m <sup>2</sup>	€/m <sup>2</sup>

# Subtask B: Daylighting and Electric Lighting Solutions

[Coordination: M. Knoop, TU Berlin, Germany]



**Objective:** To assess quality of existing and new solutions in the field of façade and daylighting technology, artificial lighting and lighting controls. To identify and structure existing and develop new lighting system technologies.

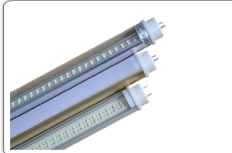
- B.1 Definition - system characterization
- B.2 Definition of (regional) baseline conditions
- B.3 Review of state of the art technology and architectural solutions
- B.4 New technical developments
- B.5 Measurements of selected state of the art and new technologies
- B.6 Source book

Building intervention level

PROJEKT TAGESLICHTNUTZUNG IN GEBÄUDEN IV

Home Projekt Technologien Kontakt

### LED Retrofit for T8 / T5 lamps



**LED Retrofit for T8 / T5 lamps**  
are applied to replace fluorescent lighting solutions, to reduce energy consumption and to increase lifetime of the lighting solution. LED retrofit lamps have the size of the conventional light source and typically include a ballast.

**Performance of LED Retrofit for T8 / T5 lamps**

The majority of LED Retrofit for T8 lamps are slightly more energy efficient (up to 105 lm/W) than the T8 fluorescent lamps. The required luminous flux is typically lower, as the beam angle of the light source is smaller. Resulting, the lighting condition is more efficient in illuminating horizontal planes, positively affecting the energy consumption. In some cases, this can lead to a lower contribution to the vertical plane, which can affect lighting quality (darker walls and ceiling).  
The lifetime of the retrofit lamps is typically longer (30 000 – 50 000 h), which will reduce the maintenance costs.

Retrofit can be done by a quick replacement of the lamp. In most cases, the LED retrofit lamp includes a ballast. The ballast of the fluorescent lighting solution needs to be disconnected and the retrofit lamp can be placed directly in the lamp holder.

Most retrofit lamps have a colour rendering index above 80, additional information on the performance on red tones can give more insight into the lamp performance.  
A review of available LED retrofit lamps indicates that some products still have an insufficient luminous flux or colour rendering index.  
In general this retrofit solution will not increase lighting quality or address non-visual effects.

**Still missing:**  
Power factor information, lumen depreciation, flicker details, dimm characteristics, glare due to small light sources

[Link zur Fallstudie...](#)

**To be used when a simple retrofit is required and low maintenance and life time are important. Lighting quality is not enhanced.**

- Myer M.A., Paget, M.L., Lingard, R.D. (2009) CALiPer Benchmark Report - Performance of T12 and T8 Fluorescent Lamps and Troffers and LED Linear Replacement Lamps
- Ryckaert, W.R. et al. (2011): Performance of LED linear replacement lamps.
- Ryckaert, W.R.; Smet, K.A.G.; Roelands, I.A.A.; van Gils, M.; Hanselaer, P. (2012): Linear LED tubes versus fluorescent lamps: An evaluation.

← BACK

Fachgebiet Lichttechnik der Technischen Universität Berlin  
Impressum

# Subtask C: Methods and Tools

[Coordination: Jérôme Kaempf, EPFL, Bernard Paule, Estia, Switzerland]

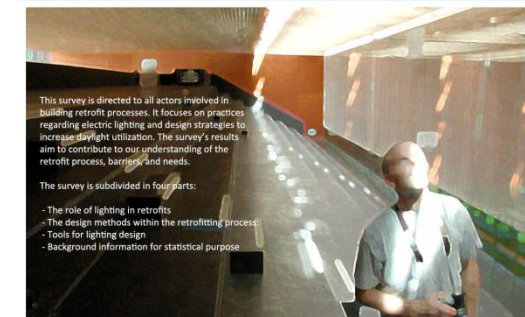


**Objective:** Provide methods and tools to make energy efficiency and economics of lighting retrofits transparent to stakeholders.

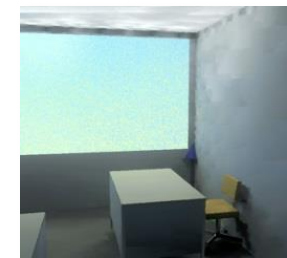
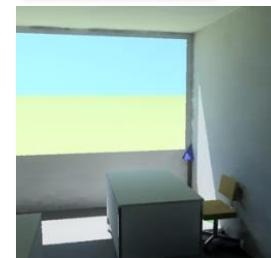
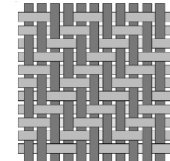
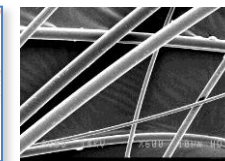
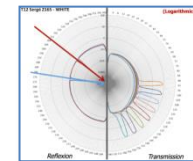
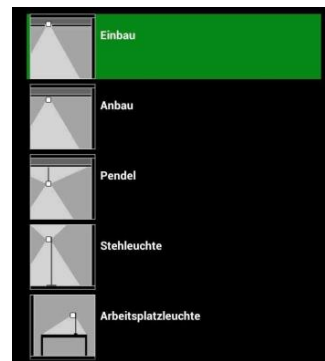
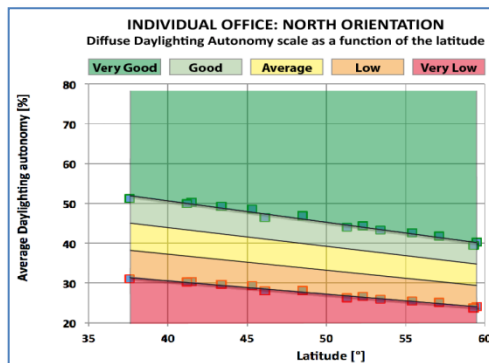
- C.1 Analysis of workflow and needs
- C.2 State of the art review
- C.3 Development of a simple integrated rating model
- C.4 Energy audit and inspection procedures
- C.5 Advanced and future simulation tools



Questionnaire about methods & tools used for lighting retrofit of buildings



\* Options  
 Start  
 More info on IEA-SHC Task 50



IEA SHC Task 50 *Advanced lighting solutions for retrofitting buildings*

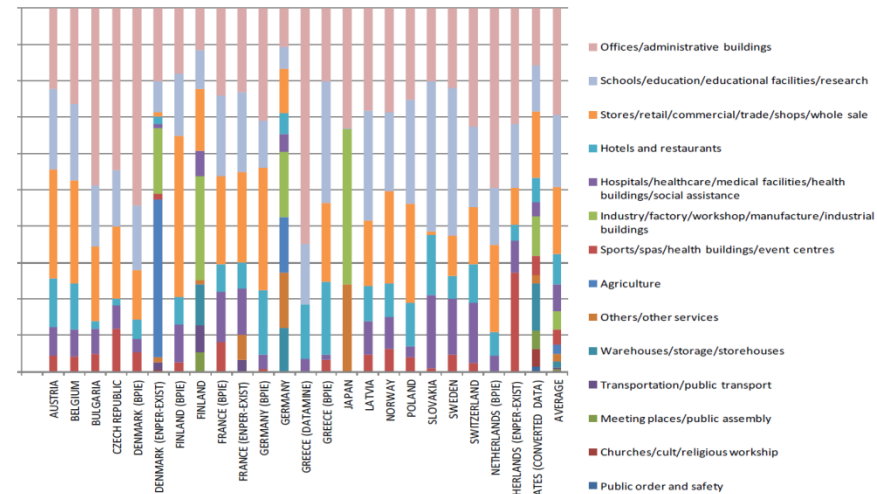
# Subtask D: Case Studies

[Coordination: Marie-Claude Dubois, Lund University, Sweden]



**Objective:** Perform building stock analysis including generation of a building typology for lighting retrofits. Based on this deliver proven and robust evidence on achievable savings and show integrated retrofit strategies for representative Case studies

- D.1 Building stock/typology
- D.2 State-of-the-art review
- D.3 Assessment and monitoring procedure
- D.4 Case study assessment
- D.5 Overall conclusions, lessons learned
- D.6 Case study book / e-documentation



# Lighting Retrofit Adviser

*design inspirations, design advice, decision and design tools for relighting*

Select your Country

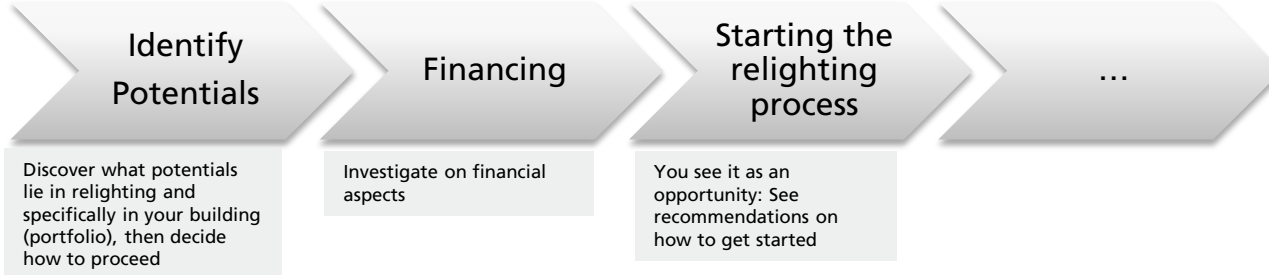


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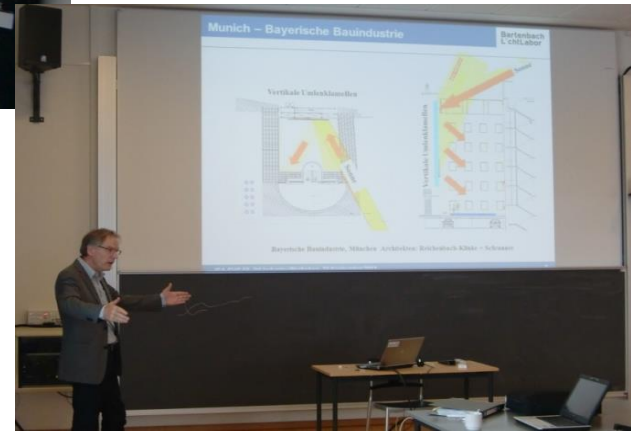


Figure 8: The complex value chain



- Identify demands by simple question, who the user is
- Configure the contained information (components) into a suited workflows
- Leave access to other information (components) open
- Here a more target group oriented starting page.

# Who is behind the activity ...





30 participants  
18 universities/institutes/companies  
14 Countries



# Information & Dissemination

EA SHC HOME TASK HOME MEMBER LOGIN SEARCH

**SHC Task 50**  
Advanced Lighting for Retrofitting Buildings

- About Project
- Participants
- Meetings / Events
- News
- Publications
- Related Sites
- Member Area
- Contact

Home > Publications

## Project (Task) Publications

The following are publications developed under Task 50:

### Task 50 Brochure

*Advanced Lighting Solutions for Retrofitting Buildings*


Juli 2013 - PDF 1,45MB - Posted: 7.16.2013

The overall objective is to accelerate retrofitting of daylighting and electric lighting solutions non-residential sector using cost effective best practice approaches, which can be used on typical existing buildings.

Search:  Search

Advanced Search | Clear

Order by: Publication Date Descending Sort



*Example of a simple tool easy and quick to use*


**Deliverables**

Within the scope of Task 50, the following main deliverables are anticipated:

- Report on the lighting retrofit market, including policy issues and proposals of action
- Source book on daylighting and electric lighting retrofit technologies, covering low-budget and new advanced retrofit solutions
- Toolbox with (simple) methods and tools for energy and economic auditing, rating and performance simulation
- Documentation of realized projects and case studies of lighting retrofits for different building types
- "Lighting Retrofit Adviser"

An electronic, interactive source book including design advice and recommendations, decision-making tools and design tools for lighting retrofits

Most deliverables will be available on the Website. In addition, Workshops and Newsletters will inform about progress and disseminate important outcomes.



**IEA SHC Task 50**  
Advanced lighting solutions for retrofitting buildings  
*Operating Agent: J. de Boer, DE*

<b>Subtask A</b> M. Fontoynt, DK <b>Market and Policies</b>	<b>Subtask B</b> M. Knoop, DE <b>Daylighting and Electric Lighting Solutions</b>	<b>Subtask C</b> J. Kaempfl, B, R. Paule, CH <b>Methods and Tools</b>	<b>Subtask D</b> M.-C. Dubois, SE <b>Case Studies</b>
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**Joint Working Group: "Lighting Retrofit Adviser"**

**Coordination**

**Subtask A: Market and Policies**  
Marc Fontoynt, Danish Building Research Institute (SBI), Copenhagen, Denmark

**Subtask B: Daylighting and Electric Lighting Solutions**  
Martine Knoop, Technische Universität (TU) Berlin, Germany

**Subtask C: Methods and Tools**  
Jérôme Kaempfl<sup>1</sup> and Bernard Paule<sup>2</sup>, Switzerland  
<sup>1</sup> Ecole Polytechnique Fédérale de Lausanne (EPFL)  
<sup>2</sup> Estia SA, Lausanne


**Subtask D: Case Studies**  
Marie-Claude Dubois, Lund University, Sweden

**Operating Agent:**  
Jan de Boer, Fraunhofer Institute for Building Physics, Stuttgart, Germany

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**Task Duration:** January 2013 – December 2015

**Daylighting Electric Lighting Lighting Controls**



*The "New Gallery" (Kassel, Germany) before and after refurbishment*

**PARTICIPATING COUNTRIES:** AUSTRIA · BELGIUM · CHINA · DENMARK · FINLAND · GERMANY · ITALY · JAPAN · NETHERLANDS · NORWAY · SOUTH AFRICA · SWEDEN · SWITZERLAND

<http://task50.iea-shc.org/>

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# „Low hanging fruits“

