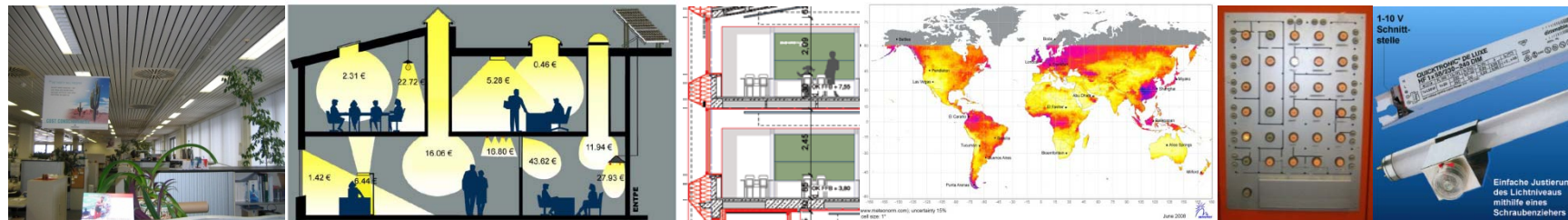


# IEA SHC Task 50: Advanced lighting solutions for retrofitting buildings



## Objectives of IEA SHC Task 50

Jan de Boer, Fraunhofer Institute of Building Physics, Stuttgart, Germany  
Industry Workshop, Copenhagen, 22.9.2013



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



# Lighting and Energy: Potentials in Retrofitting

**Only small volume of new building constructions**



Geo-reisecommunity

**~3%** retrofit rate

(estimation facade and lighting industry)

**40-50%** of turnover of facade and lighting industry in retrofitting

**75 %** of appliances outdated (older than **25 a**)



Marquardt



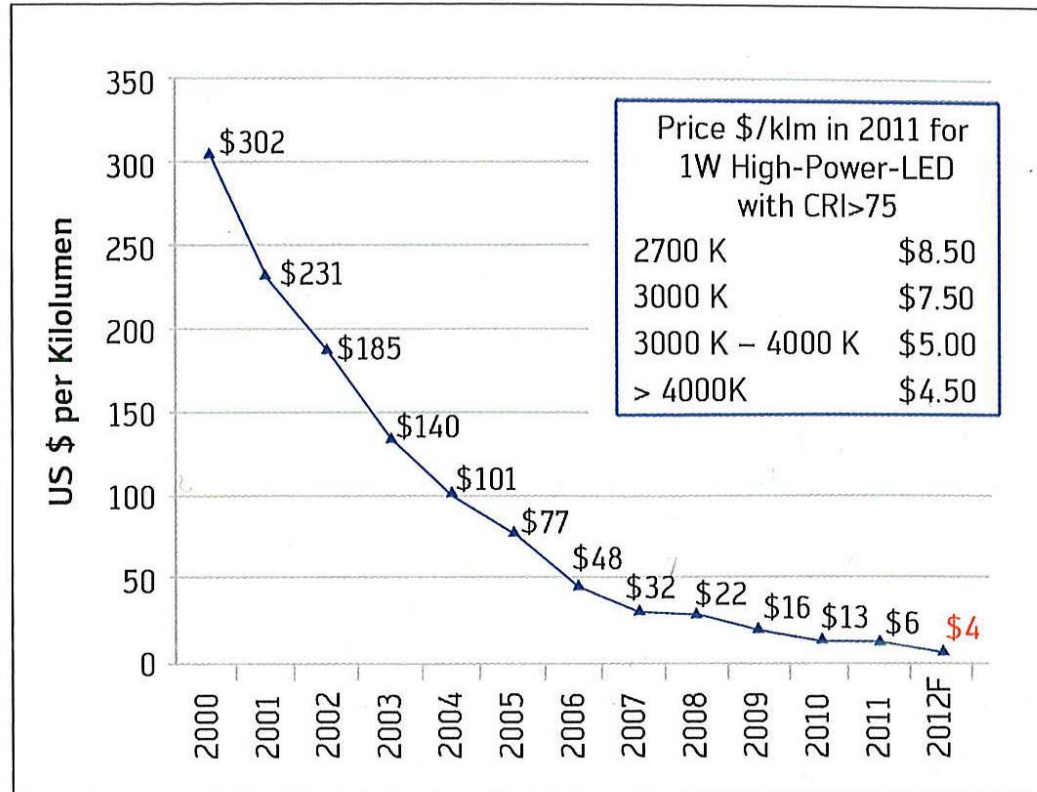
Wikipedia, Apfel3748

**“Lighting retrofits can save significant amounts of energy costeffectively”**

LIGHT'SLABOUR'S LOST, Policies for Energy-efficient Lighting, IEA, 2006

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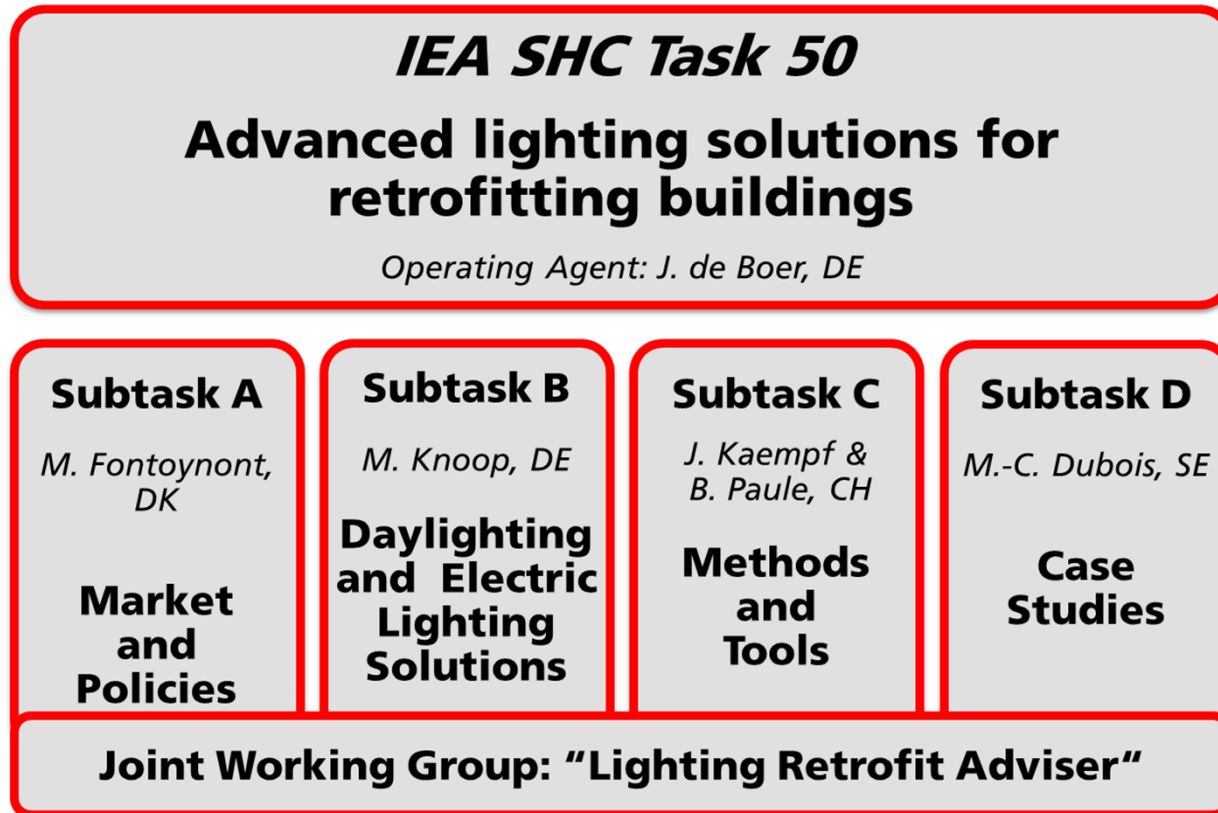
## Lighting and Energy: Major changes & chances in the market



LED prices over time (Source Strategies unlimited)

# 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.



# Objective

**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.**

This can be subdivided into the following specific objectives:

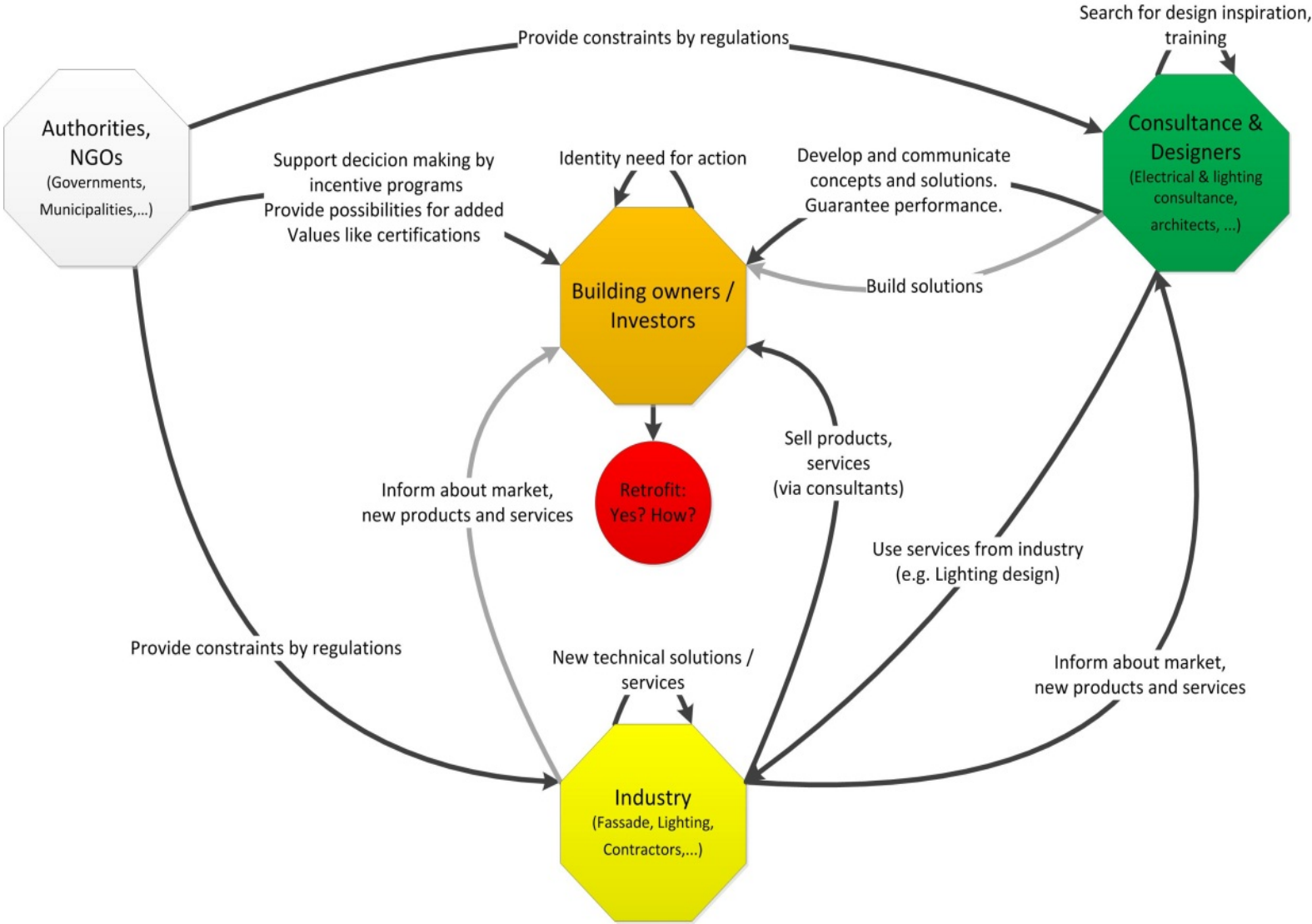
- Develop a sound view of the lighting retrofit market.
- Trigger discussion, initiate revision and enhancement of local and national regulations, certifications and loan programs.
- Increase robustness of daylighting and electric lighting retrofit approaches.
- Increase understanding of lighting retrofit 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.

# Scope

**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

# Target audiences



# Benefits for target audiences

## The envisaged main results will enable

- **building owners** (public and private sector) to benchmark and compare their buildings, to get cost indications and hereby prepare and initiate retrofit decisions,
- **authorities** to initiate and / or improve regulations, incentive programs and certification procedures based on for instance detailed data on the building stock with its typical lighting configurations and related energy efficiency and monetary potentials,
- **designers and consultants** to get validated design solutions, to obtain energy efficiency and economic design parameters, to employ appropriate technologies and to benefit from tailored design tools,
- **lighting and façade industry** to adapt their products and services according to market figures, identified market barriers and opportunities, developed retrofit strategies, and evolving new technologies.



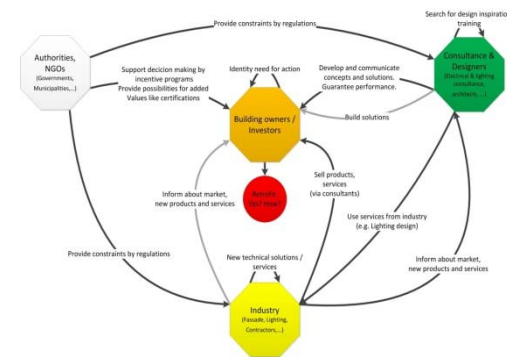
# Subtask A: Market and Policies

[Coordination: M. Fontoynt, SBI, DK]



**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



**Main Result**  
Report: "Lighting retrofit market. Including policy issues and proposals of action"



# Subtask B: Daylighting and Electric Lighting Solutions

[Coordination: M. Knoop, TUB, Ger]



**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

## **Main Result**

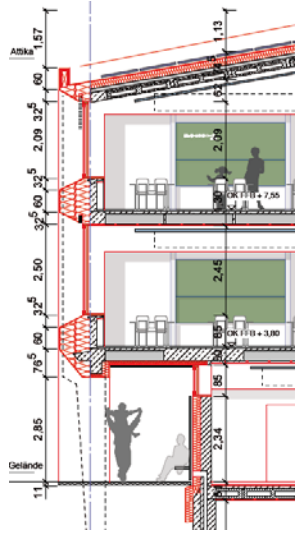



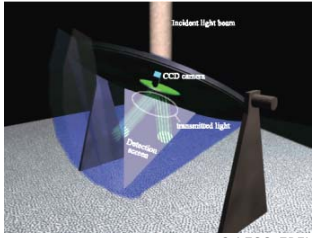








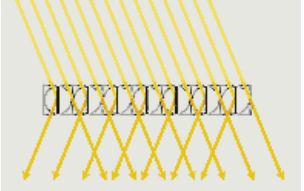
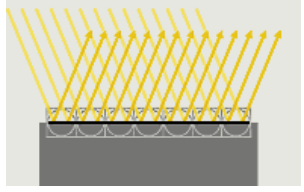

Source book: "*Daylighting and electric lighting retrofit technologies. From low budget to new advanced retrofit solutions*"

## B2: Rating the existing installations

Where is the baseline ? – Reference for analysis of energetic and economic potentials.



# B3-B5: State of the art & New Developments

Daylight		Electric Lighting		Lighting Controls
Architectural Solutions	Components	Retrofit Components	New Luminaires	
 <p>© Indulight</p>	 <p>© Uni Stuttgart IKB2</p>  <p>© LESO-EPFL</p>  <p>© EControl-Glas GmbH &amp; Co. KG</p>  <p>© LESO-EPFL</p>	 <p>© BEST-828.COM</p>   	  	 <p>1-10 V Schnittstelle</p> <p>QUICKTRONIC DE LUXE HF 14/80/230-240 DIM</p> <p>Einfache Justierung des Lichtniveaus mithilfe eines Schraubenziehers</p>    <p>© NRC</p>

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

## Subtask C: Methods and Tools

*[Coordination: Jérôme Kaempf, EPFL, Bernard Paule, Estia, CH]*



**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

**Main result:**

Webbased survey & toolbox:  
*"Set of (simple) energetic and economic rating and calculation methods and tools."*

## Subtask D: Case Studies

[*Coordination: Marie-Claude Dubois, LTH, 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 (selection, classification)
- D.2. State-of-the-art (literature, e-info)
- D.3. Assessment and Monitoring Procedure
- D.4. Case Study assessment
- D.5. Overall conclusions, lessons learned
- D.6. Case Study book / e-documentation

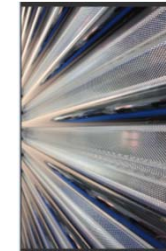
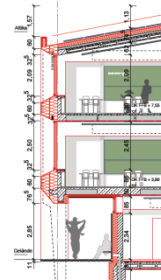
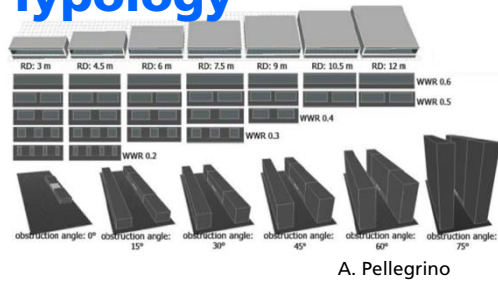
**Main result:**

Source book:  
"Applied  
(Advanced)  
lighting retrofits -  
realised projects  
and case studies  
for different  
building types "



# Subtask D: Case Studies

## Building stock, Typology



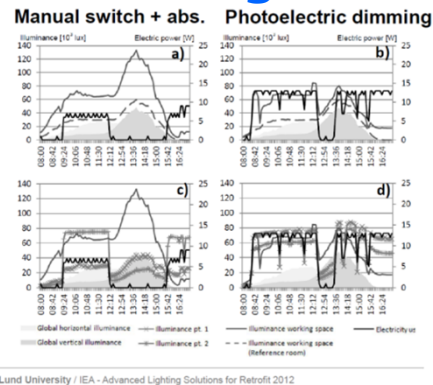
LESO-EPFL

## Facade components

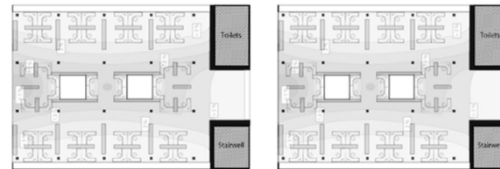
C. Fildhuth



## Monitoring



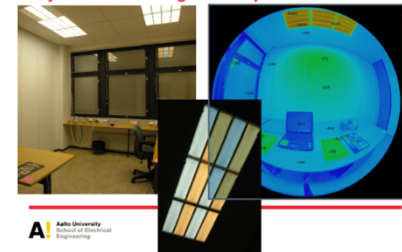
M.C. Dubois



## Architectural Solutions



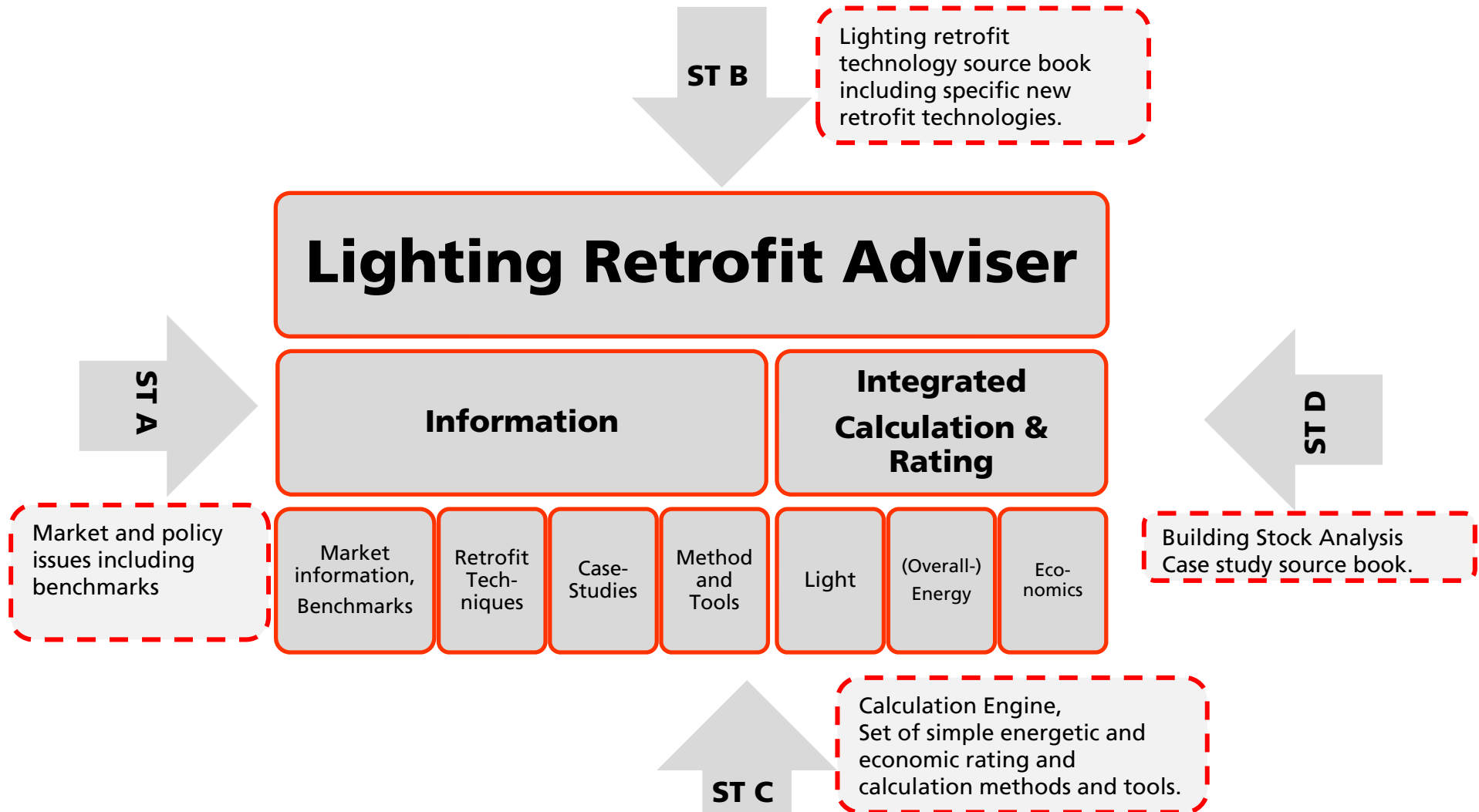
LED Lighting in which the light can be dimmed and the colour of the light can be adjusted according to user preferences



TU-Berlin

## Electric Lighting

# Lighting Retrofit Adviser: Link with other subtasks



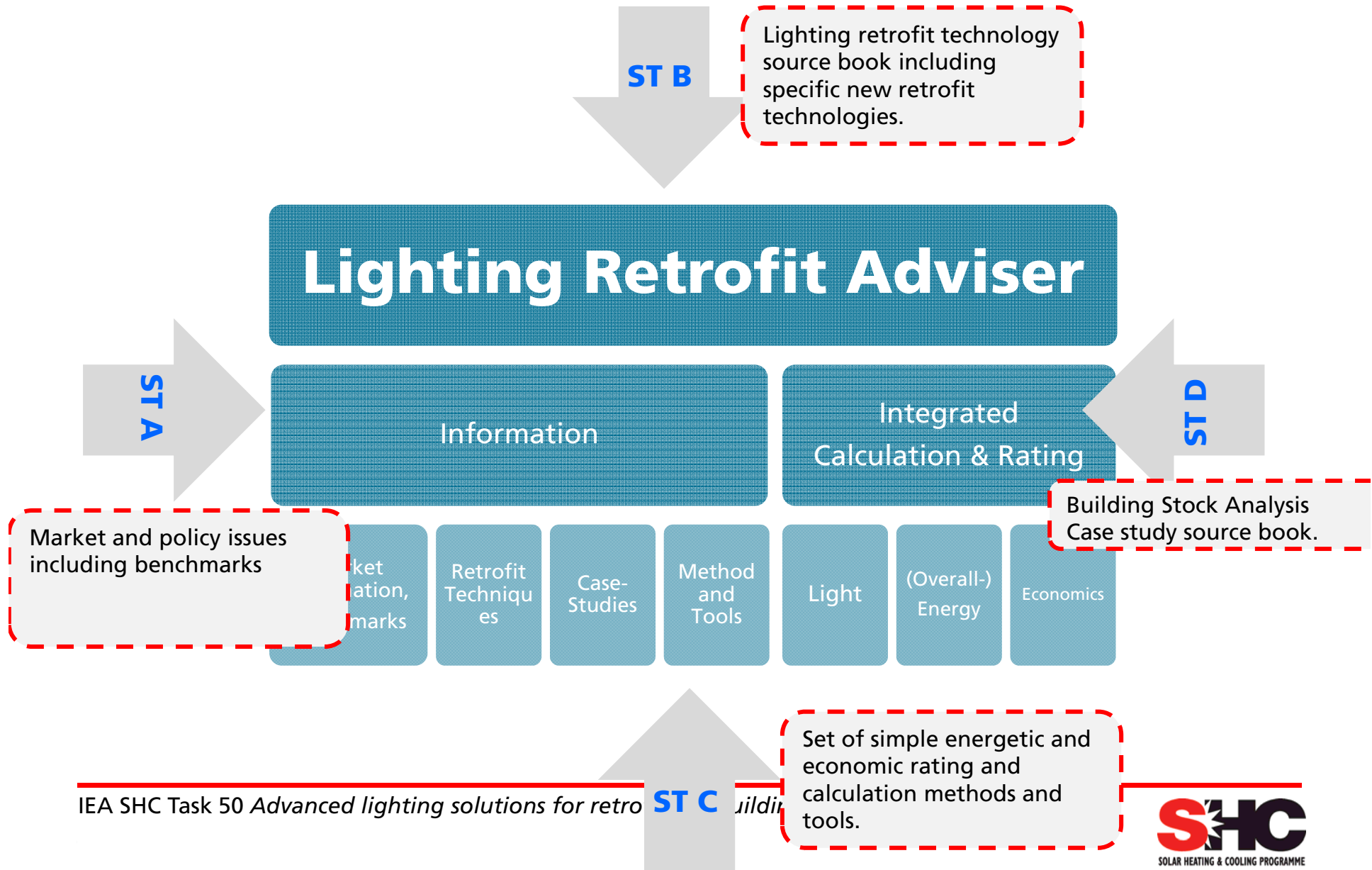


# Joint Working Group: **Lighting Retrofit Adviser**

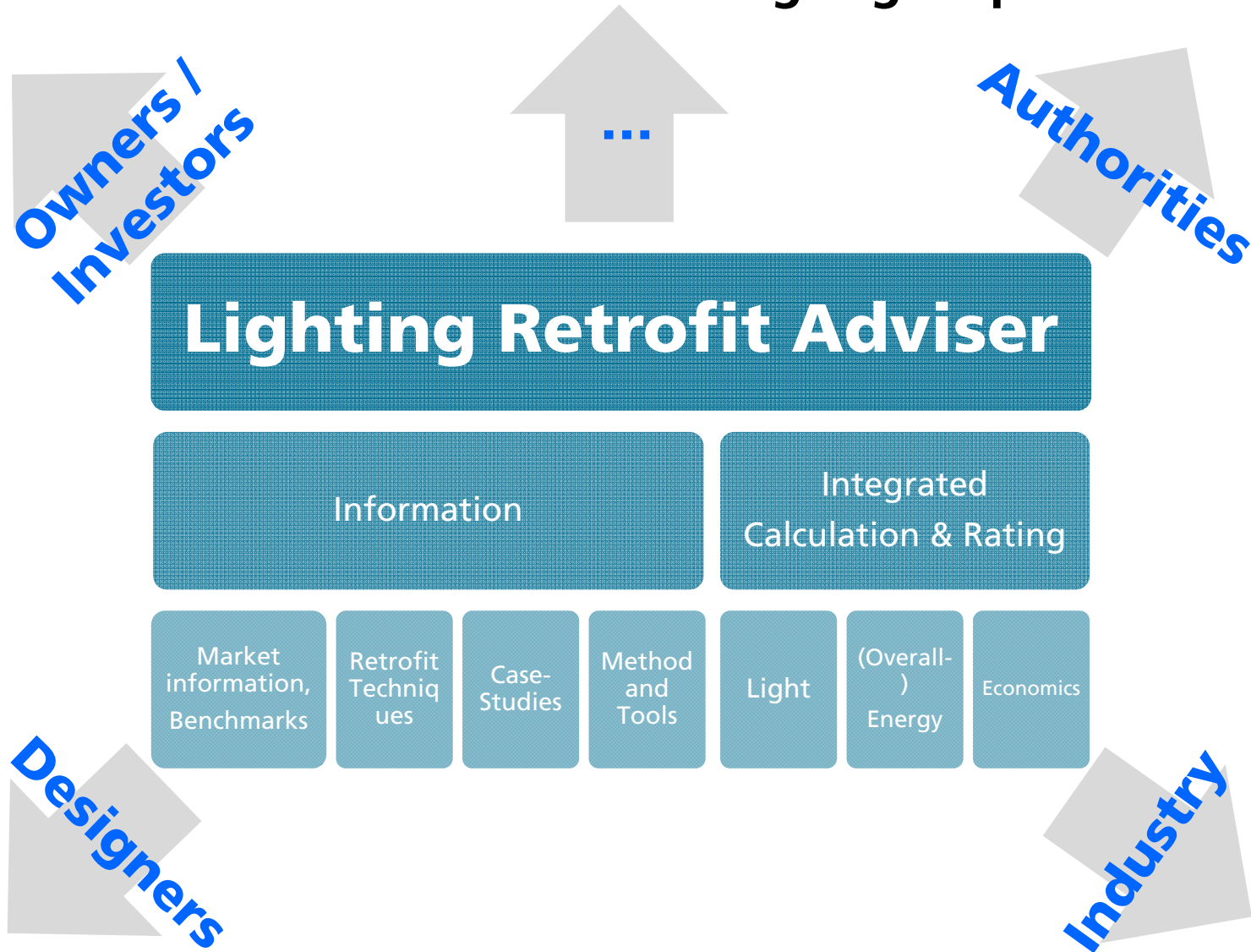
**Objective:** Develop as a joint activity an electronic interactive source book including design inspirations, design advice, decision tools and design tools

- Key role in Dissemination of Task results
- Adaptable international, multilingual framework
- Support of mobile computing: e.g. App (Android), HTML 5
- Compare to IEA-ECBCS Annex 36 "Concept Adviser", Annex-ECBCS 46 "IT-Toolkit"

# Lighting Retrofit Adviser: Link with other subtasks



# Provide tailored information to target groups



# Who is behind the activity ...



26 participants,  
18 universities/institutes/companies  
11 Countries

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



**We are at the beginning...**



**...and...**

# We are eager to hear your opinion

- Task experts will inform about general lighting retrofit issues and possible solutions
- General experience exchange between industry and research
- Obtain feedback of industry and practitioner needs to further develop IEA Task 50
- Follow us:
  - <http://task50.iea-shc.org/>
  - <http://www.iea-shc.org/newsletters>
  - <https://twitter.com/ieashc>





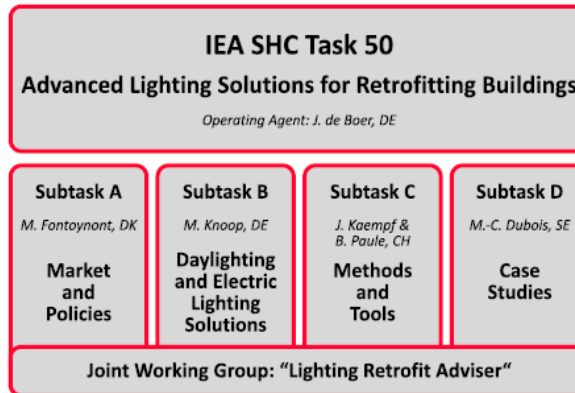
Example of a simple tool easy and quick to use

## 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.



Structure of IEA SHC Task 50

## Coordination

**Subtask A:** Market and Policies  
*Mark 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 Kaempf* <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

**Website:** <http://task50.iea-shc.org>  
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**Task duration:** January 2013 – December 2015



# IEA SHC Task 50

## Advanced Lighting Solutions for Retrofitting Buildings

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 • SLOVAKIA • SWEDEN • SWITZERLAND

# „Low hanging fruits“



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