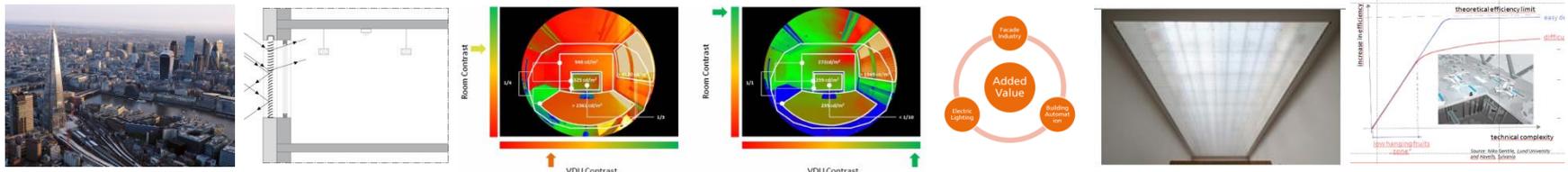


Bartenbach 
research & development

IEA SHC Task 61 / EBC Annex 77

Integrated Solutions for Daylight and Electric Lighting

From component to user centered system efficiency



AUSTRALIA · AUSTRIA · BELGIUM · BRAZIL · CHINA · DENMARK · GERMANY · JAPAN · NETHERLANDS · NORWAY · SINGAPORE · SLOVAKIA · SWEDEN · SWITZERLAND · UNITED KINGDOM · USA

IEA SHC Task 61 / EBC Annex 77

Integrated solutions for daylight and electric lighting

From component to user centered system efficiency

Operating Agent: J. de Boer, Germany

Subtask A

B. Matusiak, Norway
User Perspective,
Requirements

Subtask B

M. Fontoynt, Denmark
Integration and
optimization of
daylight and electric
lighting

Subtask C

D. Geisler-Moroder, Austria
Design support for
practioners
(Tools, Standards,
Guidelines)

Subtask D

N. Gentile, Sweden
W. Osterhaus, Denmark
Lab and field study
performance tracking

Joint Working Group

Evaluation method for integrated lighting solutions

Virtual reality (VR) based Decision Guide

Belgien, Brasilien, China, Dänemark, Deutschland, Italien, Japan, Niederlande,
Norwegen, Österreich, Schweden, Schweiz, Singapur, Slowakei, USA



Subtask A: User Perspective, Requirements

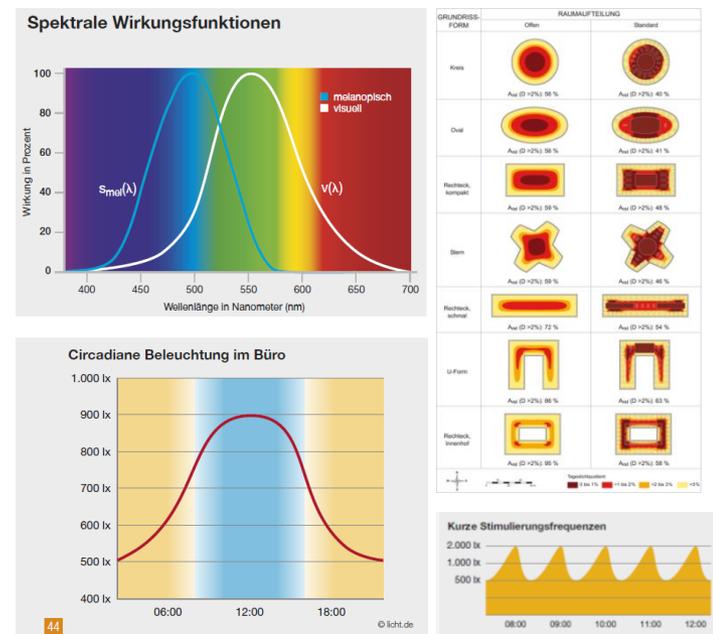
Coordination: Barbara Matusiak, NTNU, Norway

Objective: Consolidation of available knowledge on user-, activity- and time-dependent visual and non-visual *requirements* including cultural and climatic dependencies. Set up *use cases* in specific applications, reflecting typical temporal changes in the usage of these interior spaces. Aggregation in so called *personas* as representations of the behaviour of a hypothesized group of users in the defined applications.

A.1 User requirements

A.2 Use Cases

A.3 Representation of user behaviour - personas





Subtask B: Integration and optimization of day- and electric lighting

Coordination: Marc Fontoynt, SBI, Denmark

Objective: Identify the promising technical solutions to offer optimal control of lighting and daylighting components, with respect to minimum use of lighting electricity, maximum satisfaction of users, most attractive user interface (users and facility managers)

B.1 Interview of professionals: opportunities and barriers

B.2 Critical review of existing control systems and their functionalities

B.3 Critical review of new approaches under development

B.4 Review of other important aspects affecting performance of controls

B.5 Critical analysis of interfaces

B.6 Link with standardization activities

New technology	Benefits / interest
Miniaturisation of sensors, integrated sensors	Ability to read more relevant information locally, to offer a better fit with the demand of the users and facility managers
Use of LED in DC power supply	Ability to control each luminaire individually, and dim power progressively Ability to vary spectrum of light according to time of day and specific requirement of users (for example elderly, of people with specific visual handicap)
Wireless controls	Reduction of costs of installations Possibility to keep installation future proof (allowing modification of indoor space management)
Internet of Things	Link to internet can facilitate management of lighting sources with data flow upstream and downstream Management can also integrate external information (climatic conditions, variable cost of electricity, etc.) (Security issues have to be addressed)
Interface on tablets and smart phones	User friendly, mobile interface which could be used anywhere High quality graphics and possibility to ease operation: make the system fully understood.
Electrochromic glazing	Possibility to control freely daylight penetration, glare control, under various sections of the facade glazing.
Silent electric motors	Can operate blinds systems and any active daylighting systems more continuously and silently, to increase satisfaction by users
PoE (Power over Ethernet), DC-nets, driver-less/central hub solutions etc	New power technologies may call for new definitions of system components etc.
Built-in light sources	LED light sources can be integrated in other building components such as ceiling or wall modules.



Subtask C: Design Support for practitioners

Coordination: David Geisler-Moroder, Bartenbach, Austria

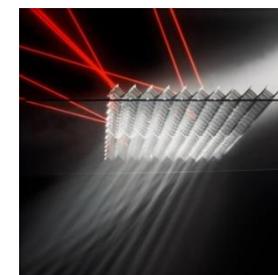
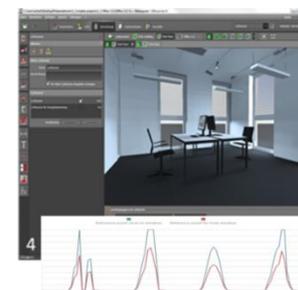
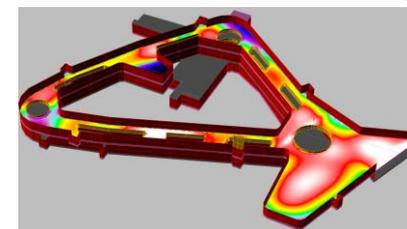
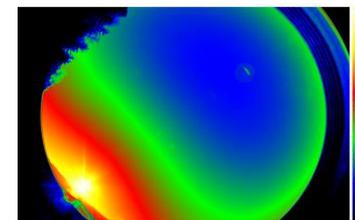
Objective: Focus on the application of technical innovations in the field of integrated lighting solutions in practitioners' workflows. Bring findings onto the desktops of designers by integration into widely used software tools, standards and codes, and design guidelines.

C.1 Review of state of the art design workflows

C.2 Standardization of BSDF daylight system characterization

C.3 Spectral sky models for advanced daylight simulations

C.4 Hourly rating method for integrated solutions





Subtask D: Lab and Field Study Performance Tracking

Coordination: Niko Gentile, Lund University, Sweden; Werner Osterhaus, Aarhus University, Denmark

Objective: Demonstrate and assess typically applied concepts for integrated daylighting and electric lighting design by medium-term experiments in live-labs, supplemented by short-term investigations in controlled research laboratory environments, as well as performance tracking in “real” field studies.

D.1 Literature Survey: Quantifying Potential Energy Savings

D.2 Monitoring protocol

D.3 Case Studies: Living Laboratories and Real Buildings

D.4 Lessons Learned – Guidance to Decision Makers



Joint Working Group: Evaluation tool & VR Decision Guide

Coordination:

Marc Fontoynt, Aalborg University, Denmark; Jan de Boer, Fraunhofer Institute of Building Physics, Germany

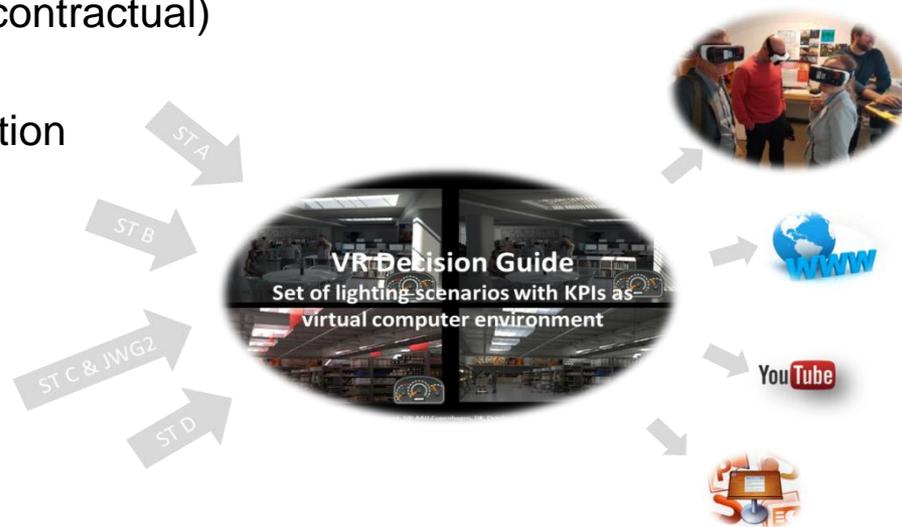
Objective:

The joint working group shall integrate and focus main results of the subtasks and look for an appropriate implementation

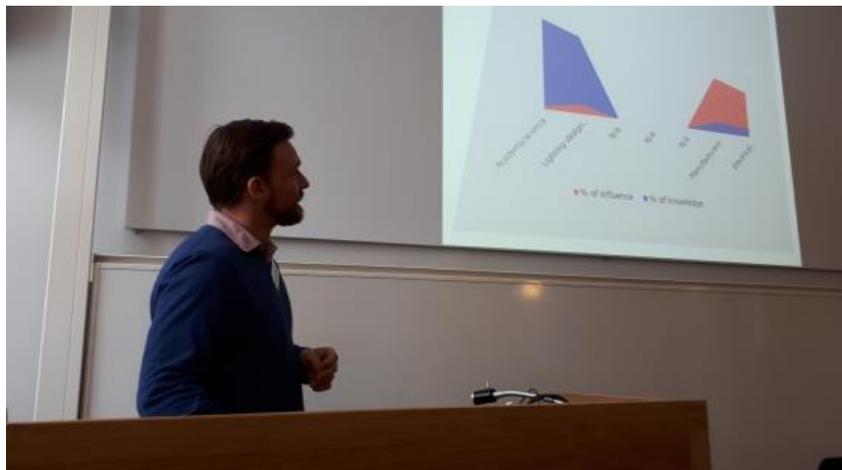
1. Evaluation / rating tool (hourly based) for integrated lighting solutions for implementation in standards and tools.

2. VR Decision guide (technical, architectural, contractual)

Management aspect: common goal, dissemination



Projektpartner



35 participants · 27 universities / institutes / companies · 16 countries

Erste Outputs

IEA SHC Task 61 / EBC Annex 77
Integrated Solutions for Daylight and Electric Lighting
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Operating Agent: IEA SHC

Subtask A 8 Members, 167 User perspective requirements	Subtask B 12 Members, 128 Integration and optimization of daylight and electric lighting	Subtask C 12 Members, 128 Design support for practitioners (Tools, Standards, Guidelines)	Subtask D 12 Members, 128 Lab and field study performance tracking
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Joint Working Group

Evaluation method for integrated lighting solutions
 Virtual Reality (VR) based Decision Guide

COORDINATION

Subtask A: User perspective and requirements
 Barbara Sjöstrand Matusiak, Norwegian University of Science and Technology (NTNU), Trondheim, Norway

Subtask B: Integration and optimization of daylight and electric lighting
 Marc Fontijn-Tekamp, Danish Building Research Institute (SBI), Copenhagen, Denmark

Subtask C: Design support for practitioners (Tools, Standards, Guidelines)
 David Geisler-Moroder, Bartenbach, Aldrans / Tyrol, Austria

Subtask D: Lab and field study performance tracking
 Jukka Gentile, Lund University, Sweden and Werner Osterhaus, Aarhus University, Denmark

Operating Agent:

FURTHER INFORMATION CONTACT DETAILS



Website: <http://task61.iea-shc.org/>
Email: task61.info@iea-shc.org

The deliverables will be available on the website. In addition, workshops and newsletters will keep interested parties informed about task progress and disseminate important outcomes.

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Integrated Solutions for Daylighting and Electric Lighting

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Daylighting of Non-Residential Buildings

IEA SHC Position Paper

January 2019



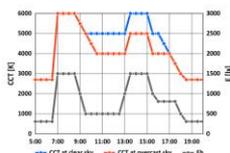
The task will work on integrating different building sectors involved (left). Example of a new integrated layout component, measuring daylight while at the same time emitting electric light (right).

Large Potential for Saving Electricity

Lighting accounts for approximately 19 %, i.e. 2900 TWh, of the global electric energy consumption. Projections by the IEA show that if governments only rely on current policies, global electricity use for lighting will grow to around 4250 TWh by 2030. Due to the world's growing population and the increasing demand for electrically driven services in emerging economies, the increase will occur despite constant improvements in energy efficiency of lighting systems.

During the last years the focus has shifted towards digitalized lighting. This offers the chance to overcome problems in the integration of daylight and electric lighting. (Ibex) technologies equipped with sensors, "intelligent" software and wireless data communication introduced large possibilities to bring the separate market sectors of electric lighting and facade technology closer together.

Research and developments in the field of energy efficient lighting techniques encompassing daylighting, electric lighting and lighting controls, combined with activities employing and bringing these techniques to the market, can contribute significantly to reduce worldwide electricity consumption and CO₂ emissions.



Outcomes for different Target Groups

Task 61 will generate diverse outcomes for different stakeholders:

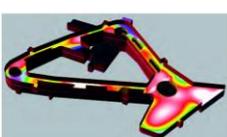
- Designers:** New integrated tools, system overviews, design guidelines, system performance information.
- Standardization bodies:** Integrated daylighting and electric lighting hourly energy rating method, spectral modelling including new material databases.
- Industry:** Better integration of electric lighting and daylighting facade.
- Building managers:** More effective guidance on the calibration, ongoing adjustment and maintenance of integrated lighting systems.
- Policy makers:** Advice to stimulate deployment of successful, energy efficient lighting schemes with added benefits to the citizens.
- Building users:** Improved indoor conditions, to support health, comfort and energy efficiency.

Activities to Get There

- The overall objective is to foster the integration of daylight and electric lighting solutions to the benefit of higher user satisfaction and at the same time energy savings. This includes the following activities:
- Reveal relation between user perspective and energy in the age of "smart and connected lighting".
 - Consolidate findings in use cases and "personas" reflecting the behaviour of typical users.



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 June 2018



Example of integrated daylighting and electric lighting design.

- Provide recommendations for energy regulations and building performance certificates, based on a review of specifications concerning lighting quality, non-visual effects, installation and use.
- Assess and increase robustness of integrated daylight and electric lighting approaches.
- Demonstrate and verify or reject concepts in lab studies and real use cases.
- Develop integral photometric, user comfort and energy rating models (spectral, hourly) as pre-normative work linked to relevant bodies.
- Provide decision and design guidelines incorporating virtual reality sessions.

Deliverables

- The following main deliverables are anticipated:
- Reports: e.g. "Personas for user centered integrated lighting solutions", "Integration and optimization of daylight and electric lighting", "Guidelines for the use of simulations in the design process of integrated lighting solutions", "Integrated solutions for daylighting and electric lighting in practice: results from case studies".
 - Standardization: Initialization of new work items in standardization bodies. Proposal of methods for draft standards (IESD system characterization, hourly lighting energy demand rating method).
 - Virtual Reality Decision Guide as a joint effort of the task.
 - Web-based tool of hourly lighting energy demand rating method as a joint effort of the task.

Erste Outputs (coming soon)



ISO/TC 274/JWG 1 N 223

[ISO/TC 274/JWG 1](#)
Energy performance of lighting in buildings (joint working group with CIE-JTC 6)
E-mail of Secretary: janine.winkler@din.de
Secretariat: DIN

Call for experts for ISO/TC 274/JWG 1 task force "Revision of ISO 10916"

Date of document 2019-08-09

Vielen Dank für Ihre Aufmerksamkeit!

Fragen?