SOLAR HEATING & COOLING PROGRAMME
INTERNATIONAL ENERGY AGENCY

2020 HIGHLIGHTS

Task 61 - Integrated Solutions for Daylight and Electric Lighting

THE ISSUE

Lighting accounts for approximately 15% of the global electric energy consumption and 5% of greenhouse gas. Projections by the IEA show that if governments only rely on current policies, global electricity use for lighting will grow from around 2,900 TWh to around 4,250 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 the energy efficiency of lighting systems.

During the last years, there has been a shift towards digitalized lighting because of its ability to overcome problems in the integration of daylight and electric lighting. New technologies equipped with sensors, "intelligent software," and wireless data communication provide opportunities to bring the disconnected market sectors of electric lighting and façade technology closer together.

OUR WORK

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.

SHC Task 61 is generating diverse outcomes for different stakeholders:

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

SHC Task 61 is collaborating with the IEA Technology Collaboration Programme on Energy in Buildings and Communities (EBC TCP) in this project.

Participating Countries

Australia
Austria
Belgium
Brazil
China
Germany
Denmark
Italy
Japan
Netherlands
Norway
Poland
Slovakia
Sweden
Switzerland
USA

Task Period	2018 – 2021
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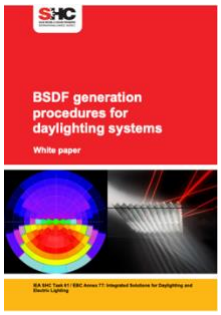
KEY RESULTS IN 2020

Report – Literature Review of User Needs, Toward User Requirements

During the last twenty years, the knowledge about light and lighting has significantly developed and at the same time the technological development has been immense. Today, we are able to get much more electrical lighting with less energy than ever before, but is the light of good quality? We need to develop evaluation methods that take all the qualitative aspects of illumination as well as the energy efficiency into account at the same time to be able to evaluate the lighting conditions. Reliable and valid measures of light, as well as valid and reliable measures of user's reactions are needed.

In this report, more than 100 articles were reviewed and analyzed, covering 1) Perception of light, 2) Visual comfort, 3) Psychological aspects of lighting (view out, perceived quality of space, privacy, etc.), and 4) Non-image forming aspects of light (ipRGCs action spectrum, hormones, etc.). Using these four basic aspects, we can define several lighting quality criteria, both image-forming and non-image-forming. We also can compare qualities of electric lighting and daylighting. For office work, the findings have been aggregated in an overview table of application related requirements.

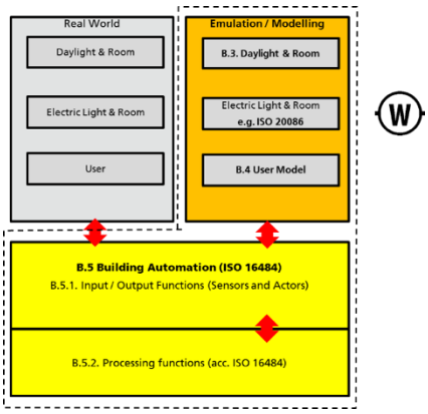
White Paper on BSDF Data



As preparatory work for standardization, a white paper on BSDF (bidirectional scattering distribution function) data generation for daylighting systems is now available. This white paper or parts could serve as input to or reference for an international standard. For the planned BSDF round robin test in different goniophotometers worldwide, one venetian blind system and one fabric screen were selected as test samples. Measurements have started in the participating labs and will be finished by November. The different results will then serve as input to different software processing the data, for instance, in annual lighting and energy calculations. Future work will include analyzing and documenting the impact of possible differences in the measurement data.

Standardization Initiative started from within SHC Task 61

In the scope of the Task (Subtask C and a joint working group), an hourly based evaluation and rating method for the energy demand of integrated lighting solutions are under development. The approach is based on a clear, logical segregation of emulating reality, i.e., daylight & room, electric lighting & room and occupancy behavior on the one hand side and description of sensors, actors and (network) functionality on the other side. The latter is kept in accordance with standard BACS description semantics. This approach allows an integrated workflow for lighting design and commissioning of lighting installations and avoids double modeling/specifications. This work is connected to ISO/TC 274/JWG 1 in revising ISO 10916 "xxx." In addition, the integration into the ISO EN 52000 series on building energy performance is under discussion.



Webinar

As no face-to-face industry workshops were possible in 2020, a SHC Solar Academy webinar on SHC Task 61 helped fill this absence. The five Subtask Leaders and the Operating Agent presented Task results to more than 225 participants. The webinar is available to watch on https://www.iea-shc.org/solar-academy/webinars.