SOLAR HEATING & COOLING PROGRAMME
INTERNATIONAL ENERGY AGENCY

2015 HIGHLIGHTS

SHC Task 50
Advanced Lighting Solutions for Retrofitting Buildings

THE ISSUE

Lighting accounts for approximately 19% (~3000 TWh) of global electric energy consumption. Without essential changes in policies, markets and practical implementations, it is expected to continuously grow despite significant and rapid technical improvements like solid-state lighting, new façades and light management techniques. Major lighting energy savings can be realized by retrofitting existing out-of-date lighting installations, as new solutions allow a significant increase in efficiency along with highly interesting payback times. However, lighting refurbishments are still lagging behind compared to what is economically and technically possible and feasible.

OUR WORK

The overall objective of SHC Task 50 is to accelerate the retrofitting of daylighting and electric lighting solutions, using cost effective, best-practice approaches that can be applied in a wide range of existing buildings.

The Task work includes the following activities:

- Developing a sound overview of the lighting retrofit market.
- Triggering discussion and initiating revision of regulations and certifications.
- Increasing robustness of daylight and electric lighting retrofit approaches (technically, ecologically and economically).
- Increasing the understanding of lighting retrofit processes and stakeholders involved.
- Demonstrating state-of-the-art lighting retrofits
- Developing an electronic interactive source book, including design inspirations, design advice, decision tools and design tools.

Participating Countries

Austria
Belgium
Brazil
China
Denmark
Finland
Germany
Italy
Japan
Norway
Slovakia
Sweden
Switzerland

Industry
Philips

Task Date 2013-2015
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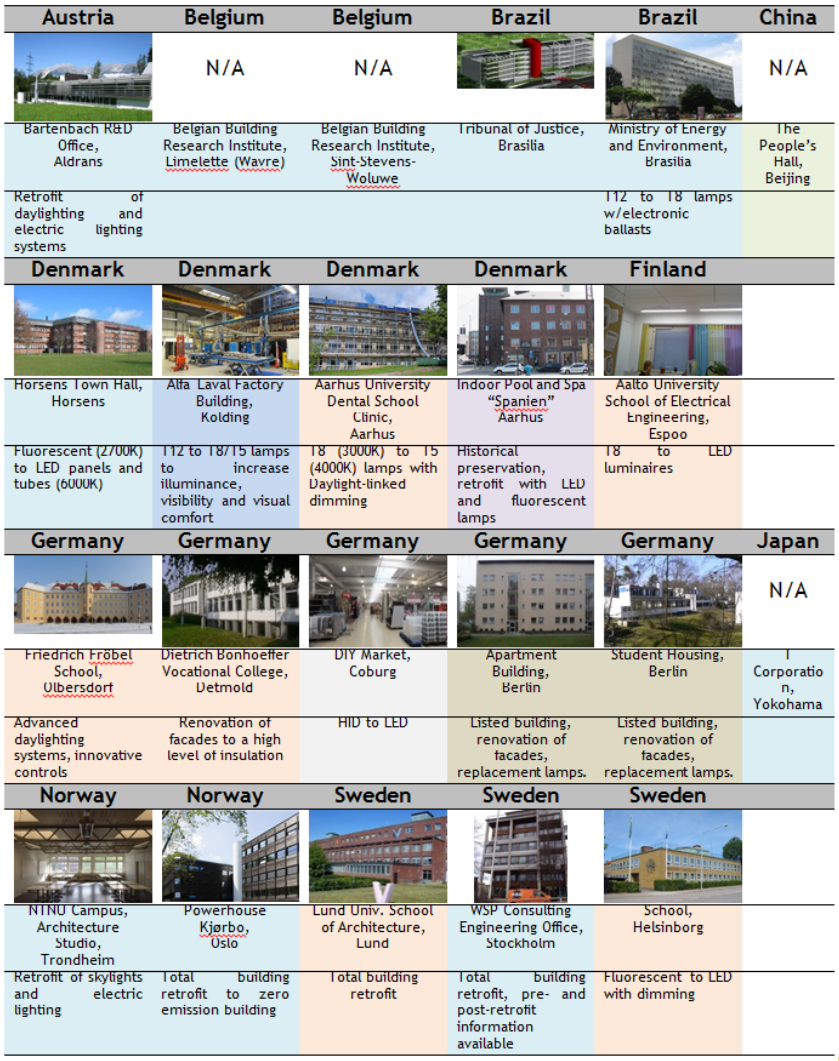
KEY RESULTS OF 2015

Experience with the Developed Monitoring Protocol: Lessons learned

Experts involved in Subtask D developed a monitoring protocol applicable to non-residential buildings retrofitted with electric lighting and/or daylighting technologies.

The Monitoring protocol was tested on 25 non-residential buildings in ten countries during 2015. Different building types were considered: Industry, retail, office, housing, assembly, sport/recreation and education.

Case studies of the experiences with the monitoring protocol, including the monitored data and the key conclusions, are presented in the "Lighting Retrofit Advisor". A few of the key lessons learned from the monitoring process are:

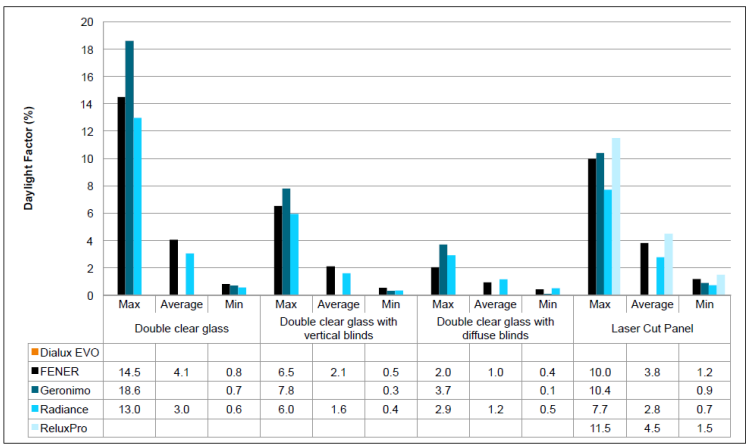


- Reducing energy use attributed to electric lighting was the main driver for the majority of the lighting retrofits monitored in this study.
- All retrofits monitored achieved improvements in either energy efficiency or lighting quality or both.
- The best overall results were achieved when the focus was on an effective integration of energy performance, daylight and electric lighting.
- Replacing older fluorescent lighting with appropriate LED lighting systems can lead to substantial energy savings for electric lighting. Lighting quality and user satisfaction can also be improved at the same time by providing better visual conditions in the spaces. It is, however, not recommended to just replace fluorescent tubes with LED tubes in existing luminaires other than those with diffusing panels, as it can lead to inappropriate light distribution patterns and significantly lower illuminance levels at the work plane.
- Control systems for electric lighting or solar shading devices are frequently found to be poorly implemented, calibrated or commissioned, or perhaps too complex, resulting in reduced energy savings, annoyance of users or even in complete deactivation of the control system. This highlights the need for better guidance on the installation, commissioning and operation of lighting control systems.

Advanced and Future Simulation Tools: Simulating Complex Fenestration Systems

To get an overview of the simulations tools that are available on the market the Task 50 experts reviewed advanced simulation tools for complex fenestration systems (CFS) and optical lighting fixtures for LED light sources. The following tools were examined: Dialux Evo, Fener, Geronimo, Radiance and Relux Pro.

The tools were applied on an additional case study with a clear sky condition that was set up and evaluated to show the light redirection properties of the different CFS. For different systems the daylight factor was simulated and the results of the described simulation tools were compared. Only three were suitable to calculate the daylight factor. The outcome of the clear sky conditions and the previous outcome for the overcast sky conditions will be included in the LRA.



	Double clear glass			Double clear glass with vertical blinds			Double clear glass with diffuse blinds			Laser Cut Panel		
	Max	Average	Min	Max	Average	Min	Max	Average	Min	Max	Average	Min
Dialux EVO												
FENER	14.5	4.1	0.8	6.5	2.1	0.5	2.0	1.0	0.4	10.0	3.8	1.2
Geronimo	18.6		0.7	7.8		0.3	3.7		0.1	10.4		0.9
Radiance	13.0	3.0	0.6	6.0	1.6	0.4	2.9	1.2	0.5	7.7	2.8	0.7
ReluxPro										11.5	4.5	1.5

Industry Workshops

In its third year, Task 50 has attracted huge interest by industry. The 6th industry workshop was organized during the Task meeting in Brazil. The industry workshops are deigned to continuously mirror the Task work with respect to the needs of the industry. The Brazilian workshop was very well attended with 190 participants.

Lighting Retrofit Advisor

The Lighting Retrofit Advisor consists of two main parts 1) Information and 2) Calculation & Rating. The technology viewer and the FAQ/Recommendation in the Information section is starting beta tests and the first available case study data has been added.

Within the Calculation section, the "LRA - CFS Express" 3 Phase Modell and the dynamic sky model have been implemented. The Benchmarking and the Portfolio Analyze, based on baseline data, are ready for beta testing. The plan is to translate the LRA into French and German.