Summary of the REHVA Annual Conference April 2012 in Timisoara

Olli Seppänen
Professor
oseppanen@rehva.eu

Important topics and the main conclusions of the conference

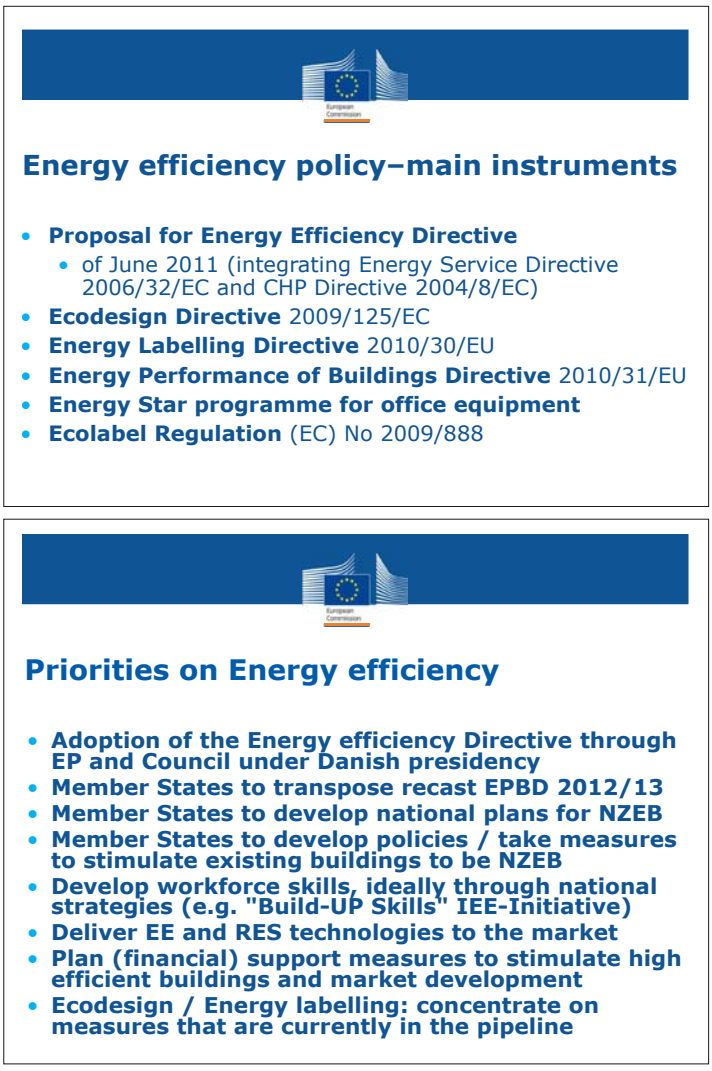
The main conclusion of the conference was that the low energy retrofitting of building is a huge challenge to the whole Europe, and the HVAC systems are a key contributor towards energy savings when the EU is to reach its target of reducing 20% the energy use by 2020.

The main topics of the conference were: how to improve the energy efficiency of the existing buildings, how to select the most cost effective methods to do it and how to motivate the building owners to implement the renovation of buildings.

Several presentations were focusing on the recast Energy Performance of Buildings Directive (EPBD) which is the most important piece of legislation to help to achieve this goal of energy efficiency in the EU. Specifically, the introduction of "nearly zero-energy buildings" by 2021/2019 will create major changes in the building industry and construction practice during the next decade. All member states will have to develop minimum energy performance requirements to all buildings. Even there is no obligation to renovate the existing buildings the regulations for the new buildings will speed up also the refurbishment rate of the existing building stock.

The strengthening of Energy Performance Certificates and Inspections is required also in EPBD. This will require new legislation in many countries. The requirement for guidance of the energy improvement measures as a part of energy certificate requires qualified well trained inspectors. The training of the inspectors is a huge challenge for the engineering community.

International studies (like IEA Annex 53) showed how important the occupant behavior is when evaluating the total energy use in buildings. The energy use of similar apartments or houses may vary in the ratio 1:4 due to occupants´ behavior. This needs much more attention in the future. It was also evident that office appliances have become major component in the energy balance of office buildings.



Clemens Haury from the European Commission focused in his presentation on the main instruments of Energy efficiency policy and the priorities of future actions.

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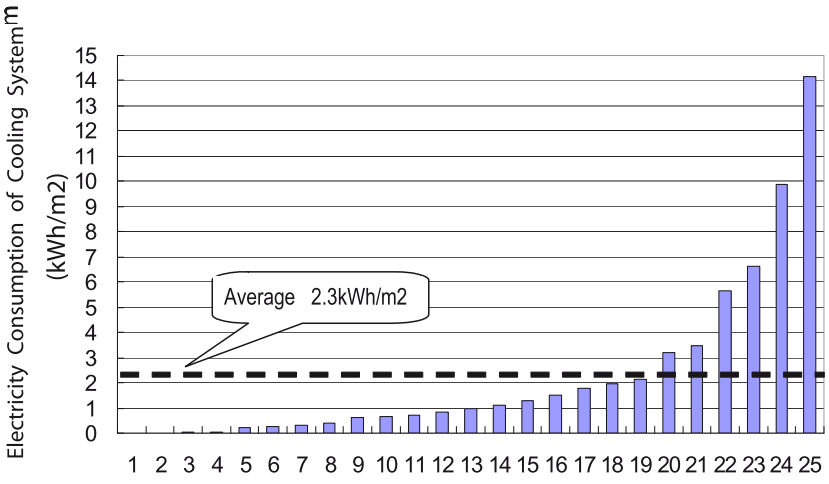
Technical session 2: Energy use of buildings and systems

- Significant discrepancy between each apartment



The statistics energy consumption of cooling system in different apartments of one residential building in Beijing,2006

Energy use of buildings - Measured energy use in buildings and its break down 1

Professor **Hiroshi Yoshino** from Tohoku University, Japan, presented the summary of the IEA´s working group Annex 53 "Measured energy use in buildings and its break down" and pointed out how large variation in energy use can be due to the user. In the figure the variation electricity use of air conditioning in Chinese apartments.

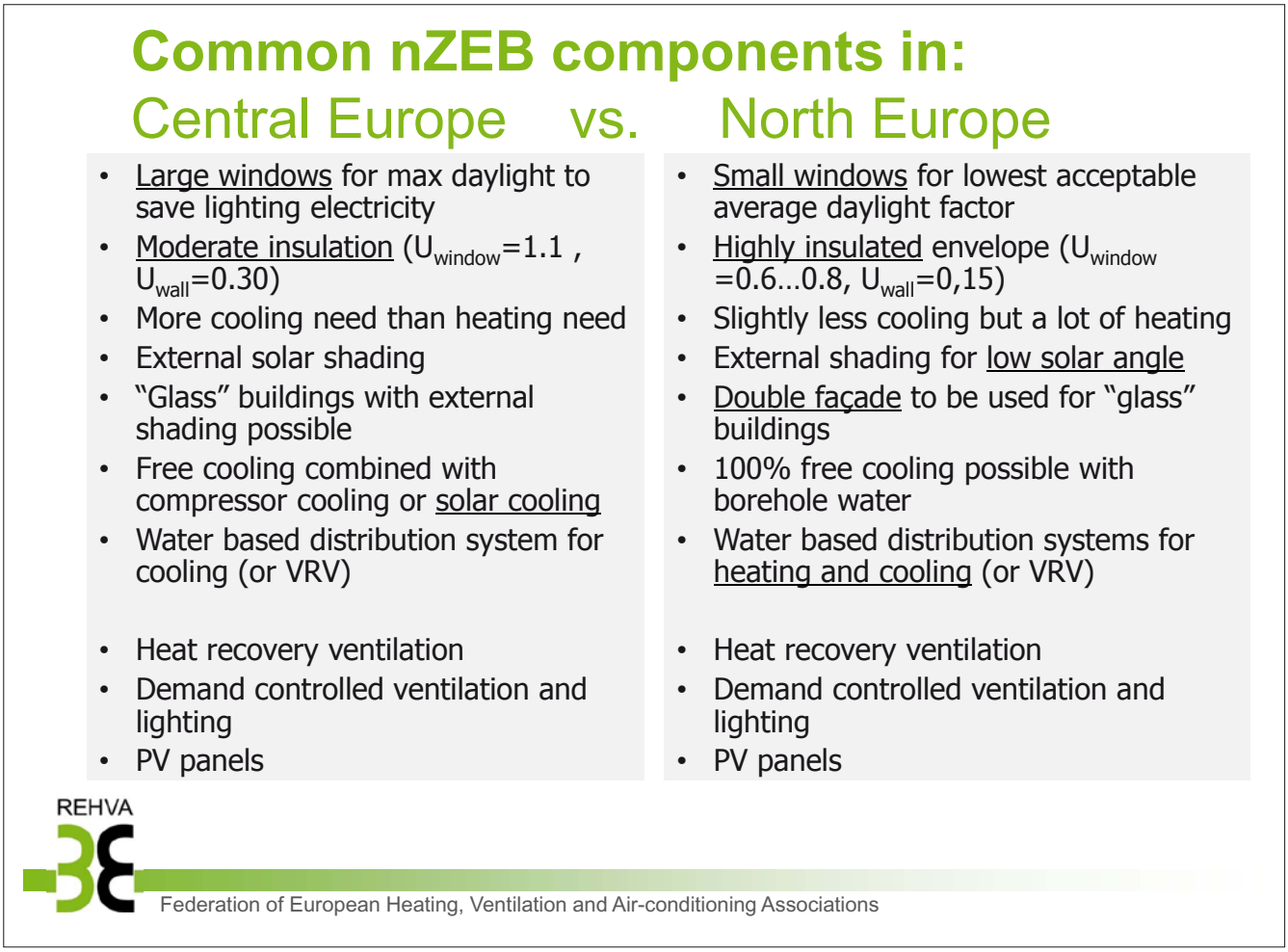
The European recast Energy Performance of Building Directive requires also the inspection of air-conditioning and heating systems. The presentation at the conference illustrated how the requirements in the directive can be implemented and how the good results can be achieved. Monitoring of the energy use of the building also revealed that the largest energy use in many office buildings is not due to HVAC but many other services in building like food and computer services.

Energy performance certificate (EPC) is required for all buildings. It is based on calculation of energy use with standardized operation schedules. However, buildings are never used exactly according to the predicted way.

The benefits of energy certificates based on measured energy use were widely discussed as they give also guidance to building owners regarding the need to take action for operational improvements. In UK, the measured energy use is used in the Display Energy Certificate (DEC) which is required parallel to EPC. DEC shows the actual energy use of the building compared to typical energy use of similar buildings of that type. It tells to building owner how effectively the building is managed. It is a measure of real operational energy use. It is based on energy use per unit area – quick and easy to measure and compared to an EPC. In the long run both calculated and measured certificates are needed.

The importance of HVAC technology in Energy retrofitting

Heating, ventilation and air condition systems play an important role when improving the energy performance of buildings. The studies have shown that in central system the balancing of the heating and improving the control system will bring significant saving in



Professor **Jarek Kurnitksi** presented overview of net and nearly zero energy buildings and summary of the common technical features of nearly zero energy office buildings in northern and southern European conditions.

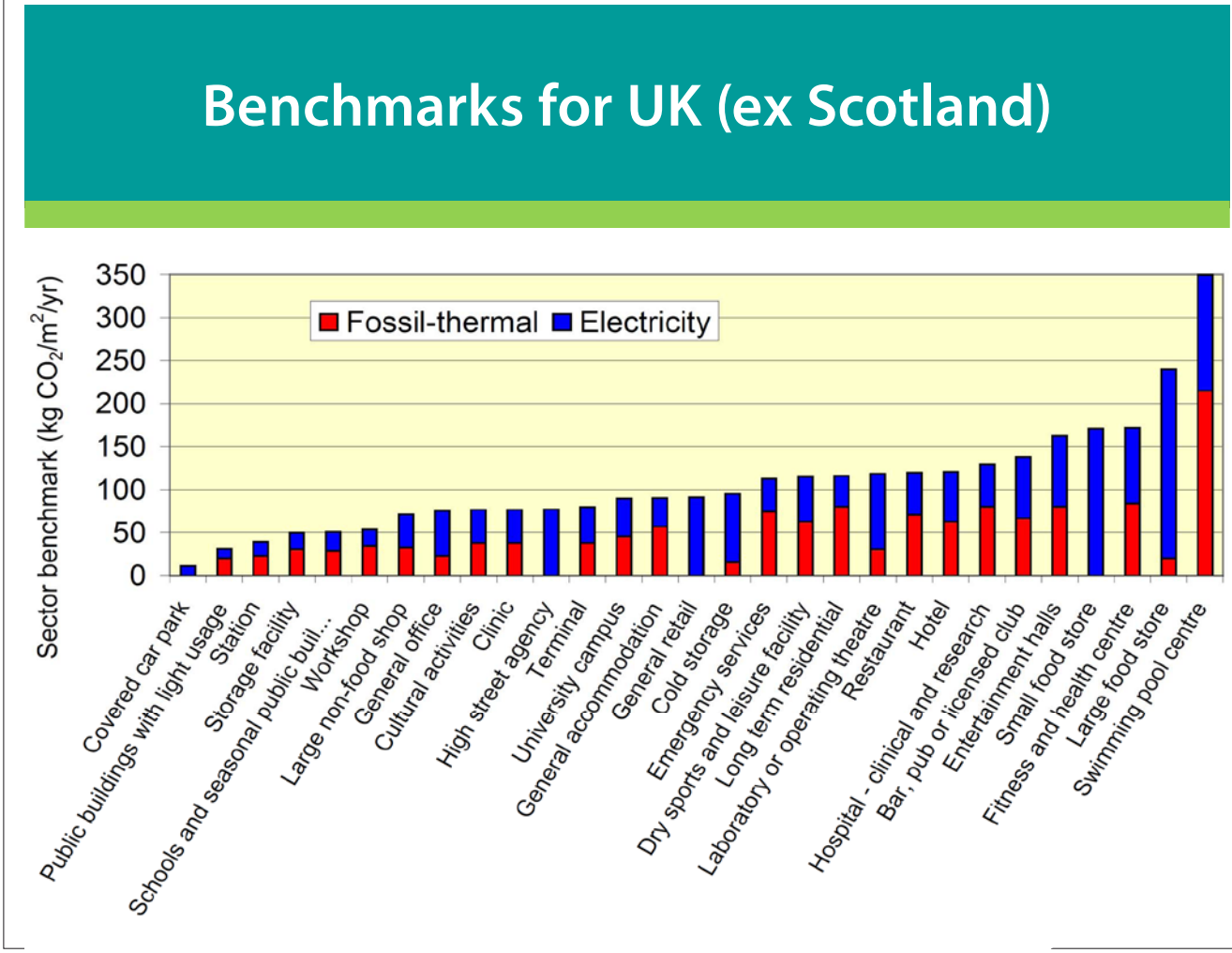
heating and at the same time improve the indoor environmental conditions. The following measures are particularly cost effective when improving the energy efficacy of heating system:

- Insulation of pipes of the heating and DHW distribution system
- Replacement of the heat generator with a more efficient one (i.e. with a condensing boiler or geothermal heat pump …)
- Introduction of technologies that employ renewable energy sources (solar system, biomass …)
- Connection of the heating system to district heating network (if available)
- High efficient distribution networks (pumps)
- Advanced control systems

Building and ductwork air leakage levels are reasonably well-known. It is also recognizes that a lot can be done to reduce to energy losses through building and duct leakage. Strict requirements for building and duct leakage should be imposed in all climates. Improvement of building air tightness is relative easy and cost effective, and professionals can rapidly integrate these issues in the construction practice. Testing is easy and can be rapidly integrated in a regulatory control schemes.

In the area of energy efficient ventilation the following measures were agreed to be very important in improving the energy efficiency:

Control the ventilation and air-conditioning according to the use of the spaces and by installing demand controlled ventilation systems. In commercial buildings, in particular, ventilation rate should depend on level of occupancy. But also, in residential buildings operation of HVAC system should depend on the time of day (at home, outside), and room which are in actual use (living room, bedroom). Obvious need is for more representative sensors and better control concepts.



Donald Leeper from UK, emphasized in his presentation the importance of energy certificates based on measured energy use (Display Energy Certificate) widely used in UK. He also showed the benchmark values of CO2 emissions in different types of buildings developed by the REHVA British member CIBSE.

Commissioning of HVAC systems is important when reducing the energy use in buildings. The cost of commissioning is between 0,3 % and 0,7 % of the total development cost but the energy cost saving is between 5 % and 15 %. As the result of commission the system performs better and benefits can be seen such as: increased staff productivity lower maintenance costs and environmental protection.

Nearly zero energy buildings

The recast EPBD requires all new building to be nearly zero energy buildings by 2021. Such buildings have been already constructed. In general nearly zero energy building means:

Reduction of energy demand + **effective systems** + **on site renewables**

Common technical features in nearly zero energy office buildings were reported to be:

- Energy efficient energy sources and renewables to be used: heat pumps, DH, bio-CHP, solar PV and thermal
- Heat recovery ventilation; often demand controlled, by centralized or decentralized systems sometimes combined with natural stack effect ventilation for ventilative cooling purposes
- Free cooling solutions combined with mechanical cooling via boreholes, water to water HP, evaporative or ventilative cooling etc.
- Optimized building envelope and effective external solar protection
- Utilization of natural light + effective demand controlled lighting
- High efficiency heat recovery and low specific fan power;
- CO_2, presence and temperature control systems

- Water based distribution systems and VRV heat pumps
- Utilization of thermal mass and other passive measures

A common opinion of the conference participants was that in many cases the installation of heat pumps is a cost effective way to reduce primary energy use of buildings, particularly if the building has direct electrical heating.

REHVA activities for better buildings

REHVA – the Federation of European HVAC Associations has the improvement of energy efficiency of building in its agenda, and as an important part of its strategy. REHVA has several activities to help the members in implementing energy efficiency of buildings.

REHVA published two new guidebooks at its annual meeting, both helping building owner to make the building more energy efficient. These are:

- REHVA Guidebook 16: HVAC in Sustainable Office Buildings - A bridge between owners and engineers was created for building a bridge between the real estate community and the engineering community.
- REHVA Guidebook 17: The Design of energy efficient ventilation and air-conditioning systems.

REHVA has also several Task Forces developing new Guidebooks related to the energy efficiency of buildings such as:

- A REHVA Task Force on NZEB lead by Prof. Jarek Kurnitski continues its work for better definition on nearly zero energy buildings.
- A Task Force lead by Prof. Marija Todorovic is planning to publish three REHVA Guidebooks on the Energy retrofitting of the building in the near future.
- A new Task Force on "Environmentally friendly refrigeration system in buildings" lead by Attila Zoltan from Hungary in cooperation with UNEP
- Cold climate design guide in cooperation with ASHRAE lead from REHVA side by Prof. Bjarne Olesen.

On the EU level REHVA has supported the Commission when new regulations and directives are being developed. REHVA supports the ideas in the original Energy Efficiency Directive from the Commission with its target renovation rates, and binding requirements for the reduction of energy use and the leading role of the public sector. REHVA has also emphasized the fact that buildings are for people, and the first objective is to maintain in buildings good, healthy indoor environment, and that this target cannot be sacrificed when implementing energy efficiency improvements.