Österreichische Beteiligung an gebäuderelevanten Projekten der IEA

Werner Weiss
Graz, 19. Juni 2011
The International Energy Agency (IEA) is an autonomous body within the framework of the Organisation for Economic Co-operation and Development (OECD).

It was established in 1974.
The primary mechanism for co-operation on technology matters are the co-operative Research-, Development- and Demonstration- (RD&D) programs carried out in the Implementing Agreements.

45 Implementing Agreements
Topics: Supply

FOSSIL FUELS
- Enhanced Oil Recovery
- Fluidized Bed Conversion
- IEA Clean Coal Centre
- Greenhouse Gas RD Programme
- Multiphase Flow Sciences

RENEWABLE ENERGY TECHNOLOGIES
- Bioenergy
- Geothermal
- Hydrogen
- Hydropower
- Ocean Energy Systems
- Photovoltaic Power Systems
- Renewable Technology Deployment
- Solar Heating and Cooling
- SolarPACES
- Wind Energy Systems

FUSION POWER
- Environmental, Safety, Economy
- Co-operation on Tokamak Programmes
- Fusion Materials
- Nuclear Technology of Fusion Reactors
- Plasma Wall Interaction
- Reversed Field Pinches
- Spherical Tori
- Stellarator-Heliotron Concept
Energy Efficiency

TRANSPORT
Advanced Fuel Cells
Advanced Materials for Transportation
Advanced Motor Fuels
Hybrid and Electric Vehicles

BUILDINGS
Buildings and Community Systems
District Heating and Cooling
Energy Efficient Electrical Equipment
Energy Storage
Heat Pumping Technologies

ELECTRICITY
Demand-Side Management
Electricity Networks
Energy Efficient Electrical Equipment

INDUSTRY
Emissions Reduction in Combustion
High-Temperature Superconductivity
Industrial Energy and Technologies

Cross-Cutting

INFORMATION AND MODELING
Climate Technology Initiative
Energy Technology Data Exchange
Energy Technology Systems Analysis
Energy Technology Co-operation

IEA Committee on Energy Research and Technology

Working Parties

Implementing Agreements (Examples)

- Fossil Fuels
- Renewable Energy
- End Use
- Fusion Power

- ... (Fossil Fuels)
- ... (Renewable Energy)
- ... (End Use)
- ... (Fusion Power)

- Solar Heat & Cool
- ECBCS
- PV Power Systems
- Process Integration
Österreichische Beteiligung an gebäuderelevanten Projekten
Österreichische Programme

HAUS
der Zukunft

ENERGIE
SYSTEME
der Zukunft

klima+energiefonds

www.iea-shc.org
Internationale Vernetzung

IEA

FORSCHUNGS
KOOPERATION

bm

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SHC - Member Countries

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Mexico
Netherlands
New Zealand
Norway
Portugal
Singapore
South Africa
Spain
Sweden
Switzerland
United States
<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>39</td>
<td>Polymeric Materials for Solar Thermal Applications (Germany)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>Net Zero Energy Solar Buildings (Canada)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41</td>
<td>Solar Energy and Architecture (Denmark, Norway, Sweden)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42</td>
<td>Compact Thermal Energy Storage (Netherlands)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>Rating and Certification Procedures (Denmark, US)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>Solar and Heat Pump Systems (Switzerland)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td>Large Solar Heating/Cooling Systems (Denmark)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>Solar Resource Assessment and Forecasting (United States)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>Solar Renovation of Non-Residential Buildings (Norway)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

www.iea-shc.org
# Completed Work

<table>
<thead>
<tr>
<th>Task</th>
<th>Description</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task 36</td>
<td>Solar Resource Knowledge Management (United States)</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
<td>⬤</td>
</tr>
<tr>
<td>Task 37</td>
<td>Advanced Housing Renovation with Solar &amp; Conservation (Norway)</td>
<td>⬤</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Task 38</td>
<td>Solar Air Conditioning and Refrigeration (Germany)</td>
<td></td>
<td></td>
<td>⬤</td>
<td>⬤</td>
</tr>
</tbody>
</table>
Task 37: Advanced Housing Renovation with Solar & Conservation

- To develop a solid knowledge base on how to renovate housings to a very high energy standard
- To develop strategies that support the market penetration of such renovations.
- Focuses on both technical R&D and market implementation
Task 37

60 brochures of exemplary buildings on web-site

Number of projects by country
- Germany: 13
- Austria: 12
- Switzerland: 12
- Belgium: 6
- Netherlands: 3
- Norway: 5
- Sweden: 2
- Denmark: 3
- Canada: 3
- Italy: 1
- Austria: 12

Number of projects by building type
- SFH: 15
- Historic: 10
- Row: 8
- Apartment: 27

Solar Thermal Systems
- No Solar: 20; 33%
- Solar Combi: 6; 10%
- Solar DHW: 34; 57%

Projects with PV-Systems
- No PV: 42; 70%
- PV: 18; 30%
Task 37 Advanced Housing Renovation

Extreme renovation in Ludwigshaven DE
Task 37 Advanced Housing Renovation

Strategies Ludwigshafen:

Insulation:
- walls, roof, cellar:
  - 200, 240, 120 mm

PH windows

New balconies without thermal bridges

Mech. ventilation with 80% HR

18 kW PV (140 m²)

94% energy savings for heat!
(250 to 15 kWh/m²)
Information available from web-site  www.iea-shc.org/task37

- Housing Renovation film clips
- 60 Brochures describing exemplary renovation projects
- Lessons from Exemplary Housing Renovations
- Advanced and Sustainable Housing Renovation, guide for designers and planners
- From Demonstration Projects to Volume Market
- Advances in Housing Renovation – processes, concepts and technologies
- Passive House Renovation in Cold Regions
Net Zero Energy Solar Buildings

- **Aim:** To provide a clear definition and international agreement on the measures of building performance that could inform “zero energy” building policies, programs and industry adoption

  **Scope:** Residential, non-residential, clusters, different climates.

  **Period:** Oct. 2008 – Sept 2013
Net Zero Energy Buildings (NZEBs) Status

• Presently, a prominent vision proposes so called “net zero energy”, “net zero carbon” or “EQuilibrium”, or “very high performance buildings”.

• A maze of definitions
  • Low energy house
  • High performance buildings
  • Energy saving house
  • Ultra low energy house
  • Zero energy house
  • Zero energy buildings
  • Passive house
  • Zero heating energy house
  • Plus energy house
  • Zero carbon house
  • Emission free house
  • Carbon free house
  • Energy self sufficient
  • BREEAM building
  • EQuilibrium house
  • Green building
  • Very low energy house
  • Climatic active house
Definitions (Draft)

**ZEB**
A ZEB is a non grid connected, energy efficient building fully matching its annual energy needs by on-site generation fully based on renewables.

**Net ZEB**
A Net ZEB is a grid connected, energy efficient building that balances its total annual energy needs by on-site generation.

**Net ZEC**
A Net ZEC is a cluster of buildings fulfilling the net zero balance as a whole using the identical, local energy infrastructure. The cluster uses benefits from the economy of scale and levelling out the load and generation profiles of each building.
Examples from Europe: Zero Energy or Plus

Low energy buildings – 15 kWh = 4.75 kBtu per ft² per year.
Large solar PV systems.
Feed in tariffs guaranteed by German government.
These building produce much more than they use!
Zero Carbon Buildings BedZED, London, UK

Zero Carbon Buildings have been on agenda in UK since 2005.

How to ensure CO$_2$ neutral in future?

1. Avoid need for energy use passive heating, cooling and ventilation
2. Improve energy efficiency
3. Incorporate renewable energy and green power
4. Purchase carbon offsets
Passive House Technology, PV and HP, Austria
Energy balance

9.900 kWh/a (energy gains)
- 8.700 kWh/a (energy consumption)
+ 1200 kWh/a (electric power overage)

- (+) Heat energy
  - (by air-to-air heat pump)
  - 7%  
- (+) Electric power
  - (by photovoltaics)
  - 19%
- (-) Ventilation
- (-) Lighting
- (-) El. Appliances
- (-) Heat pump (COP 3)
- (-) Space heating
- (-) Domestic hot water
Task 41: Solar Energy & Architecture

Objectives:

- To support the development of high quality solar architecture
- Focus on the architectural profession
Architectural integration of solar systems

Guidelines for architects

1. INTRODUCTION

2. ARCHITECTURAL INTEGRATION QUALITY

3. APPLICATION TO TECHNOLOGIES

PART A: SOLAR THERMAL TECHNOLOGIES
A.1. Available technologies
A.2. Integration possibilities in the envelope
A.3. System sizing and positioning
A.4. Formal flexibility of existing products
A.5. Examples of good integration

PART B: PHOTOVOLTAICS
B.1. Available technologies
B.2. Integration possibilities in the envelope
B.3. System sizing and positioning
B.4. Formal flexibility of existing products
B.5. Examples of good integration

PART C: HYBRID TECHNOLOGIES

4. DIFFERENCES AND SIMILARITIES BETWEEN SOLAR THERMAL AND PV HIGHLIGHTS

5. CONCLUSIONS
Evacuated tubes collectors

Sunny Wood, multiple family house, 2002
Architect Beat Kämpfen, 8049 Zürich, Switzerland

Building facts
Continental microthermal climate
building size: 6 flats - 300m² each - Minergie and passive label
Active solar energy use by means of vacuum-tube collectors to balcony parapets for hot water and heating.

Solar product
SWISSTIPPE Balkone by Schweizer energie AG im Chmielbrichli 30 / CH-6197 Refz / http://www.schweizer-energie.ch

The solar modules, composed of nine tubes each, are 90 cm height and ensure the double function of solar thermal heat producer and standard balcony parapet.
Thermal solar collectors 36.9 m²: 6 x 1430 l (tanks)
Solar fraction: 97% - floor heating and hot water

Integration achievements
- Collector used as multifunctional construction element
- Field position and dimension
- Visible materials
- Surface texture
- Surface colour
- Module shape & size
- Joining

Glazed flat plate collectors

School building in Geis, Switzerland, 1996
Architects Gsell und Tobler, Niederteufen Switzerland

Building facts
Continental microthermal climate
building size (m² / m³ / n. of persons) N.A.
The integration of solar thermal was clearly considered at a very early project phase, so that the design of the south façade, of the spaces behind it, and of the roof structure have all been influenced by both the size of the collectors field, and by the fixed modular dimensions of the collectors.

Solar product
Ernst Schweizer AG, Metallbau / Bahnhofplatz 11 / CH-8908 Hedingen / http://www.schweizer-metallbau.ch
Product characteristics: no flexibility
fixed module size of 2081x 1223 mm
The collector field (53m²) occupies the whole parapet area of the south façade
Production: 20'000 kWh / year

Integration achievements
- Collector used as multifunctional construction element
- Field position and dimension
- Visible materials
- Surface texture
- Surface colour
- Module shape & size
- Joining
Unglazed flat plate collectors

Swimming pool, Ilanz Switzerland, by P. Curschellas, 1996

Building facts
Mountain area
Uncovered swimming pool with 3 basins for a total of 1250 m²
Standard hot water supply in summer / heating help in winter
Situation: On roof
Other relevant facts

Solar product
Energie Solaire SA, CH - 3020 Sierra, www.energie-solaire.com
Unglazed stainless steel collectors, could be mounted on oblique or curved roof and facade.
Dimensions: 248 x 86 x 0.6 [cm] / solar effective: 1.93 m²
Installation size: 353 m² on curved roof and 100 m² on oblique roof
Solar fraction: 96% for DHW, for Space heating

Integration achievements
Collector used as multifunctional construction element
Field position and dimension
Visible materials
Surface texture
Surface colour
Module shape & size
Jointing

Unglazed solar thermal collector

Single-family house, Dresden (D), Arch. Schulze S., 2003

Building facts
Climate Type: Temperate
Building Size: 223 m² / 3 occupants
Energy Standard: Low energy house
Constructive aspects: Heavy-weight construction with roof structure in concrete and wood, plus thermal insulation on rooftop.
Zinc roofing integrates an invisible solar thermal system connected with a geothermal heat pump.

Solar product
Rhennzink Quick Step Solar Termie
Oblenhauerstrasse 101 - D-13403, Berlin
www.rhennzink.de
Product characteristics:
Integrated solar thermal system in zinc for rooftops with very simple installation.
System size and orientation: 250 mm x 400-600 mm

Integration achievements
Collector used as multifunctional construction element
Field position and dimension
Visible materials
Surface texture
Surface colour
Module shape & size
Jointing
Methods and Tools

- Identify important needs and criteria for tools to support architectural design and integration of solar components at early design stage.

- Provide clear guidelines for developers of methods and tools for architects designing solar buildings.

56 programs:
23 CAAD tools
13 visualization tools
20 simulation tools
Case studies, Buildings

Selected case studies from different countries will be presented

Selection based on:
- Architectural quality
- Energy performance

With a diversity of building type and location

Solar XXI, office building, Portugal. Architects: Pedro Cabrito, Isabel Diniz
Case Studies, Urban Areas

Master plan for The City Harbor in Sønderborg, Denmark
Architect: Frank Gehry Partners, LLP.
Illustration: Sønderborg Havneselskab A/S

Urban Plan, Santo António Houses, Portugal
Architects: PROGESTO - Maria Rosário Ribeiro and Rui Noël Vera Cruz
ECBCS - Participating Countries

24 Member Countries and the EC

- Austria
- Australia
- Belgium
- Canada
- CZECH Rep.
- Denmark
- Finland
- France
- Germany
- Greece
- Israel
- Italy
- Japan
- Netherlands
- New Zealand
- Norway
- Poland
- Portugal
- Norway
- Sweden
- Switzerland
- Turkey
- UK
- USA
Austrian Participation

Annex 44

Integrating Environmentally Responsive Elements in Buildings

Operating Agent:
Per Heiselberg, Aalborg University, DK

Austrian Participation:
AEE INTEC E. Blümel
A. Seerig
Austrian Participation

Annex 50
Prefabricated Systems for Low Energy - High Comfort Building Renewal

Operating Agent:
Mark Zimmermann, EMPA

Austrian Participation:
AEE INTEC  Dr. K. Höfler
SHC Website

www.iea-shc.org
Further Information

http://www.ecbcs.org
Thank You