The implementation of the EU Buildings Directive in Austria

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The Region of Upper Austria
Oberösterreich

- Capital: Linz
- Population: 1.4 million
- Area: 12,000 km²
- Gross inland cons: 300 PJ; 35% renewables
- Economic activities: industry, service sector, tourism, 25% of the Austrian industrial exports
Organisation
• energy agency of Upper Austria
• founded (in 1991) and mostly funded by the regional government
• promotes energy efficiency and renewable energy
• provides services to private households, public bodies & businesses

Services
• Energy advice (10,000 sessions/a)
• Building certification (>100,000 buildings rated since 1993)
• Training programmes
• Management of regional subsidy programmes
• Public awareness campaigns, events, publications
• Pilot projects
• Municipal energy strategies
• European cooperation
• World Sustainable Energy Days
• OEC network
Renewable energy & energy efficiency
Energy Action Plan of Upper Austria

• Share of renewable energy: 35 % of total primary energy demand
  (16 % biomass, 14 % hydro, 5 % solar & other renewables)

• Share of renewable energy: 50 % of total heating demand
  > 80 % of total electricity demand

• Avoided imports of fossil fuels: > 1 billion Euro per year

Energy Action Plan:
By 2030, all electricity and space heating will come from renewables!

→ reduction of heat demand by 39 %
→ reduction of electricity demand by 0.5 %/year
→ minus 65 % CO₂ emissions
Member States must draw up national plans for increasing the number of NZEBs which include - among others:

the definition of NZEBs, reflecting their national, regional or local conditions, and including a numerical indicator of primary energy use expressed in kWh/m² per year.

In Austria, joint implementation by the 9 regions, supported by the OIB (joint institutes of the regions).
Defined energy performance indicators in Austria
Why 4 indicators?

• Looking at the overall efficiency of buildings is complex!
• Different needs need to be satisfied

- **HWB** (heat demand): insulation levels (thermal quality of the building)
- **PEB** (primary energy demand): use of resources
- **CO₂**: climate protection
- **f_{GEE}** (total energy performance factor): energy performance (costs)
Primary energy -> final energy -> heating energy demand

**Diagram Description:**

- **HWB (Heat Working Body):** Represents the heat demand.
  - **Wärmeübergabe (Heat Transfer):** Shows the various energy losses such as heat losses from heating bodies and losses in the supply lines.
  - **Wärmeverteilung (Heat Distribution):** Indicates the distribution of heat.
  - **Wärmeerzeugung (Heat Production):** Represents the production of heat energy.

- **fGEE:** Represents the final energy.
- **PEB:** Represents the primary energy.
- **CO₂:** Indicates carbon dioxide emissions.

**Energy Flow:**

1. **Primary Energy (PEB) -> Final Energy (fGEE) -> Heating Energy Demand (HWB).**
2. **CO₂ emissions** are associated with both primary and final energy stages.
### Variations to achieve similar energy performance

<table>
<thead>
<tr>
<th>Variation</th>
<th>HWB</th>
<th>f&lt;sub&gt;GEE&lt;/sub&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Better insulation</td>
<td>36</td>
<td>0.78</td>
</tr>
<tr>
<td>Ventilation with heat recovery</td>
<td>36</td>
<td>0.78</td>
</tr>
<tr>
<td>8 m² thermal solar collectors</td>
<td>45</td>
<td>0.78</td>
</tr>
<tr>
<td>2 kW&lt;sub&gt;peak&lt;/sub&gt; PV</td>
<td>45</td>
<td>0.78</td>
</tr>
<tr>
<td>Low temperature heat distribution systems instead of high temperature distr. system</td>
<td>40</td>
<td>0.78</td>
</tr>
</tbody>
</table>
## National Plan – Austria
### Example new homes

<table>
<thead>
<tr>
<th>Jahr</th>
<th>$\text{HWB}_{\text{max}}$ [kWh/m²a]</th>
<th>$f_{\text{GEE, max}}$ [-]</th>
<th>$\text{PEB}_{\text{max}}$ [kWh/m²a]</th>
<th>$\text{CO}<em>2</em>{\text{max}}$ [kg/m²a]</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014</td>
<td>$16 \times (1 + 3,0 / \ell_c)$ 54</td>
<td>0,90</td>
<td>190</td>
<td>30</td>
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<tr>
<td>2016</td>
<td>$14 \times (1 + 3,0 / \ell_c)$ 48</td>
<td></td>
<td>180</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>oder</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>$16 \times (1 + 3,0 / \ell_c)$ 54</td>
<td>0,85</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>$12 \times (1 + 3,0 / \ell_c)$ 41</td>
<td></td>
<td>170</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td>oder</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>$16 \times (1 + 3,0 / \ell_c)$ 54</td>
<td>0,80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2020</td>
<td>$10 \times (1 + 3,0 / \ell_c)$ 34</td>
<td></td>
<td>160</td>
<td>24</td>
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<td>oder</td>
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</tr>
<tr>
<td></td>
<td>$16 \times (1 + 3,0 / \ell_c)$ 54</td>
<td>0,75</td>
<td></td>
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</tr>
</tbody>
</table>

Bei einem Eigenheim, $A/V = 0,8$
Cost-optimal levels of minimum energy performance requirements
NZEB combine energy efficiency and renewables

Many combinations possible: more efficiency - more renewables

Separation of "insulation" and "heating systems" has come to an end
Examples from Upper Austria (1):
Single-family home

- 8 m² solar thermal OR 2 kW PV
- AND
  - ≤ 45 kWh/m²,a
  - CO₂ ≤ 24 kg/m²,a
- Biomass heating OR Heat pump OR Gas condensing boiler OR District heating

- 25 – 40 cm insulation
- Triple glazed windows
- 25 – 35 cm insulation
Examples from Upper Austria (2): Single-family home

- ≤ 36 kWh/m²,a
- ≤ CO₂ 24 kg/m²,a

- biomass heating
  - OR
  - heat pump AND PV
  - OR
  - gas condensing boiler AND solar thermal
  - OR
  - district heating
Examples NZEB-buildings (1)

- Public building (school building), Altmünster, Upper Austria
- treated floor area: 13,000 m²
- heat demand: 15 kWh/m²a
- 400 kW wood chip boiler
- solar thermal collectors 90 m²
- 10 kW_{peak} PV
Examples NZEB-buildings (2)

- One-family house
- prefabricated elements
- heat demand: 5 kWh/m²a
- ventilation system with heat recovery
- 15 m² solar heating system,
  10 kW wood pellet stove
Examples NZEB-buildings (3)

• Multi-family building (social housing)
• 9 flats, low energy building standard
• heat demand : 21 kWh/m²,a
• 50 kW wood pellet heating system
• 22 m² solar thermal collectors
TAG DER OFFenen TÜR IN NIEDRIGSTENERGIEHÄUSERN
Der OÖ Energiesparverband lädt ein!

HEUTE SCHAUNEN – MORGEN Bauen:
Holen Sie sich Anregungen für effizientes Bauen & Sanieren, über 80 Gebäude öffnen ihre Türen!

Freitag, 15. 11. 2013 & Samstag, 16. 11. 2013 in ganz Oberösterreich

Anmeldung & Info: www.haeuserschauen.at

- more than 80 NZEBs opened their doors
- 1,090 visitors
What will change for the energy efficiency sector?

- **decreasing heat demands** per m² → with implications on the **choice** of heating systems
- higher requirements in the **overall system efficiency** of heating systems (including distribution systems) → requires **more interaction** with between building technologies
- **complexity** increases significantly!
- primary energy (and CO₂) becomes slowly a decision making reality on building owner level
What we see in the NZEB market in Upper Austria

- **energy performance certificate** has - step by step - fundamentally **changed the building market** (e.g. for young families thinking about their new single-family homes, energy efficiency and renewables are key elements in their planning process)

- **heating installers** were **quicker** in learning about efficient buildings, **architects** were **slower** in the uptake of renewables

- policy **leadership resulted** in numerous leading renewable energy companies (especially in the heating sector): number of **employees** in the Oekoennergie-Cluster grew from 1,600 to 8,900 in 12 years
Greenhouse gas emissions Austria - buildings

![Bar chart showing CO₂ emissions from 2003 to 2012 with source: UBA]

Source: UBA
Thank you!

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