Renovating the building stock in Germany

Andreas Koch
Lioba Markl-Hummel
koch@eifer.org, markl@eifer.org

A – Energy Efficiency in the building sector
1. Structure of the residential building stock
2. Classification of buildings according to energy needs
3. Actual conditions of buildings and localisation

B – Policies targeting the building sector
1. German Energy Saving Ordinance 2009
2. Energy Modernisation Programme (KfW)
Identifying target sectors for energy efficiency (NEEAP)


Projected Energy Efficiency Measures (%), mean value

- Private Households
- Trade, commerce, services
- Industry
- Transport
- Cross-sectoral

Source: German NEEAP, BMWi 2007
The Implementation of Energy Efficient Buildings Policies in Europe
24 February 2010

Source: GENESIS-Online, Statistisches Bundesamt, Wiesbaden 2010
The Implementation of Energy Efficient Buildings Policies in Europe
24 February 2010

Final Energy Use in Households (2004)

- Lighting
- Mechanical Energy
- Add. Process Heat
- Domestic Hot Water
- Space Heating

Final Energy Use in Households (Accounting for conversion losses)

- Lighting
- Mechanical Energy
- Add. Process Heat
- Domestic Hot Water
- Space Heating

EIFER, Koch A., Markl-Hummel L.

Source: Schoer et al. 2006

Development of the Energy Use of Private Households 1995-2004

- Total
- Lighting
- Mechanical Energy
- Add. Process Heat
- Domestic Hot Water
- Space Heating

- Strong increase in the use of mechanical energy and additional process heat (mainly cooking)
- Efficiency gains in specific space heat demand (9%) while used surface increased by 13%

EIFER, Koch A., Markl-Hummel L.

Source: Schoer et al. 2006
Specific energy demand of single family buildings by year of construction

EIFER, Koch A., Markl-Hummel L.  
Source: EIFER 2009, calculation based on the German typology, IWU 2003

*Requirements of the building regulation

Specific energy demand of multi family buildings by year of construction

EIFER, Koch A., Markl-Hummel L.  
Source: EIFER 2009, calculation based on the German typology, IWU 2003

*Requirements of the building regulation
Actual conditions of the building stock with a focus on multi-family buildings

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B - Policies targeting the building stock

*Sticks*

- German Energy Saving Ordinance (EnEV 2009) 1.10.2009
- The Renewable Energies Heat Act, (EEWärmeG), EWärmeG (BW)

*Carrots*

- KfW* Programmes (“CO2-Gebäudemodernisierung”)

*Tambourine*

- Energy Performance Certificate
- Voluntary Energy Audits

EIFER, Koch A., Markl-Hummel L. (Promotional bank under the ownership of the Federal Republic and the Länder (federal states))
## The Integrated Energy and Climate Programme 2007

<table>
<thead>
<tr>
<th>IECP measure</th>
<th>Title of the measure</th>
<th>Annual saved fossil energy (Pj)</th>
<th>Annual saved fossil energy (billion Euro)</th>
<th>Specific (net) CO2 reduction (kg CO2/ha)</th>
<th>Annually saved CO2 (Mt)</th>
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<tbody>
<tr>
<td>1</td>
<td>Combined Heat and Power Act (c)</td>
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<td>2</td>
<td>Modernization of existing buildings</td>
<td>120</td>
<td>6.2</td>
<td>2</td>
<td>18.9</td>
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<td>6-7</td>
<td>Energy management systems, Support programmes for climate protection and energy efficiency</td>
<td>120</td>
<td>6.2</td>
<td>2</td>
<td>18.9</td>
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<td>Energy-efficient products (e.g. households and industry)</td>
<td>112</td>
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<td>209</td>
<td>15.1</td>
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<td>10A</td>
<td>Energy Saving Ordinance</td>
<td>67.3</td>
<td>10.3</td>
<td>51</td>
<td>28.8</td>
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<tr>
<td>10B</td>
<td>Substitution of electric grid storage heating in households</td>
<td>-6</td>
<td>0.9</td>
<td>122</td>
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<td>12</td>
<td>Implementation programme to reduce CO2 emissions from buildings</td>
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<td>Energy-efficient modernization of social infrastructure</td>
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<td>0.33</td>
<td>110</td>
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<td>CO2 strategy for passenger cars</td>
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<td>Programme of buildings (P)</td>
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<td>180</td>
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<td>Improved energy efficiency of the tail on heavy goods vehicles (HDV)</td>
<td>1.2</td>
<td>0.04</td>
<td>-29</td>
<td>0.1</td>
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</tbody>
</table>

**Source:** IECP measures after MURE / ODYSSEE, see BMU 2007

### German Energy Saving Ordinance 2009

**Construction of new residential or non-residential buildings**
- Maximum values for the annual primary energy demand decreased by 30% in 2009 (another 30% foreseen in 2012)
- Maximum values for the specific heat transmission losses decreased by 15% in 2009

**Renovation of existing buildings**
- Requirements for building parts have been increased by 30%
- When an energy balance is calculated the requirements follow 140% of the values for new construction

**Calculation procedure**
- Standard procedure provided by DIN 18599 for all buildings, residential buildings can alternatively be calculated along DIN 4108
- Requirements are calculated using a reference building with an identical geometry and specified properties

**EIFER, Koch A., Markl-Hummel L.**
Minimum requirements when changing external building parts §9

Pitched Roofs:
- EnEV 2009: U= 0.24 W/(m²K)
- EnEV 2007: U= 0.30 W/(m²K)

Flat Roofs:
- EnEV 2009: U= 0.20 W/(m²K)
- EnEV 2007: U= 0.25 W/(m²K)

External Walls:
- EnEV 2009: U= 0.24 W/(m²K)
- EnEV 2007: U= 0.34 W/(m²K)

Ceilings and Walls adjacent to basement:
- EnEV 2009: U= 0.30 W/(m²K)
- EnEV 2007: U= 0.40 W/(m²K)

Windows:
- EnEV 2009: U= 1.30 W/(m²K)
- EnEV 2007: U= 1.70 W/(m²K)

All measures have to be declared to meet the requirements after completion by the company ("Unternehmererklärung")

KfW Programme: Energy Efficient Renovation (Energieeffizientes Sanieren)

Renovation standard is directly linked to the Energy Savings Ordinance
- E.g. "KfW Effizienzhaus 85" will have a calculated primary energy demand of max. 85% of the current Energy Saving ordinance
- Interest rate and subsidy are specified according to standard
- Programme is available in form of credit or direct subsidy
- New construction allows for 85, 70 and 55 percent

<table>
<thead>
<tr>
<th>Reference to EnEV 2009</th>
<th>Interest rate*</th>
<th>Subsidy ( % of credit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>KfW Effizienzhaus 130</td>
<td>1.41 %</td>
<td>9%</td>
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<tr>
<td>KfW Effizienzhaus 115</td>
<td>1.41 %</td>
<td>7.5%</td>
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<tr>
<td>KfW Effizienzhaus 100</td>
<td>1.41 %</td>
<td>12.5%</td>
</tr>
<tr>
<td>KfW Effizienzhaus 85</td>
<td>1.41 %</td>
<td>15%</td>
</tr>
<tr>
<td>Individual measures</td>
<td>2.47 %</td>
<td></td>
</tr>
</tbody>
</table>

*up to a maximum of 75,000€ per unit for a "KfW Effizienzhaus" and 50,000€ for individual measures, 10 years

Source: KfW Group, as of 1.2.2010

EIFER, Koch A., Markl-Hummel L.
The Implementation of Energy Efficient Buildings Policies in Europe
24 February 2010

**CO2 Building Renovation programmes of the KfW**

- **Number of cases**
- **Number of residential units**
- **Subsidies**

*sum of loans and grants introduced in 2007*

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Source: own illustration after information provided by KfW Group

**Percentage of insulated building parts in the renovation measures supported by the KfW CO2 Programme**

- 2004-values (Source: eza 2004)
  - Heating System: 70%
  - Insulation of Roof: 43%
  - Insulation of External Walls: 44%

EIFER, Koch A., Markl-Hummel L.  
Source: Clausnitzer et al. 2008
Evolution of the Quality of Measures - Insulation

- Roof
- Upper Ceiling
- External Wall
- Floor

Source: Clausnitzer et al. 2008

Drivers
- High budget for incentive programmes
- Consciousness / Energy prices
- Sector specific approaches

and barriers
- User-investor dilemma
- Still too complicated procedures / multitude of legislation?
- High initial investment costs
- In trade, commerce and services relatively low importance of energy costs in an undertakings’ overall costs

Source: partly referring to the final remarks of the German NEEAP
References and further sources


German Government (2007). Report on implementation of the key elements of an integrated energy and climate programme adopted in the closed meeting of the Cabinet on 23/24 August 2007 in Meseberg


Thank you for your attention!

Andreas Koch - koch@eifer.org,
Lioba Markl-Hummel - markl@eifer.org