ENERGY EFFICIENCY IN PUBLIC BUILDINGS AND MUNICIPAL ENERGY PLANNING

The Experience of Bulgaria
THE LEGISLATION SUPPORT OF THE ENERGY EFFICIENCY IN BULGARIA

- EU Directives for Energy Efficiency (EE)
- Related Regulation, Norms and Standards
- Buildings’ Energy Certificate/Labels
- National Programs for EE in the Building Sector
THE FINANCIAL SUPPORT FOR ENERGY EFFICIENCY IN BUILDING SECTOR

• Fuels and energy prices policy/tariffs
• EU Programs for the New Member States
• State Subsidies for Public and Private Buildings
• Funds for EE and RES supported by WB, EBRD, others
• Local Bank Loans for EE
• UN and EU International Projects for Sustainable Development
• Public-Private Partnership Financing Schemes
ENERGY EFFICIENCY IN BUILDING SECTOR
Example (1): Price Wise Policy Approach:
The Biomass and the Natural Gas energy sources are the most attractive way for heating in the country

Current Fuel Prices Comparison, Bulgaria, July 2007

<table>
<thead>
<tr>
<th>Fuel/Energy Type</th>
<th>Energy content kWh</th>
<th>Unit</th>
<th>Average Heating System Efficiency %</th>
<th>Fuel Price, euro/unit</th>
<th>Unit</th>
<th>Heat Production Cost, euro/kWh</th>
<th>Monthly Heating Cost, euro</th>
<th>Rate %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>4.1</td>
<td>kWh/kg</td>
<td>80</td>
<td>80</td>
<td>eur/ton</td>
<td>0.025</td>
<td>58.5</td>
<td></td>
</tr>
<tr>
<td>Wood</td>
<td>3.1</td>
<td>kWh/kg</td>
<td>85</td>
<td>32</td>
<td>eur/m3</td>
<td>0.026</td>
<td>51</td>
<td>62.2</td>
</tr>
<tr>
<td>Wooden chops</td>
<td>2.6</td>
<td>kWh/kg</td>
<td>85</td>
<td>60</td>
<td>eur/ton</td>
<td>0.028</td>
<td>55</td>
<td>67.1</td>
</tr>
<tr>
<td>Cherry/plum pits</td>
<td>3.4</td>
<td>kWh/kg</td>
<td>85</td>
<td>102</td>
<td>eur/ton</td>
<td>0.035</td>
<td>70</td>
<td>85.4</td>
</tr>
<tr>
<td>Wooden pellets</td>
<td>4.8</td>
<td>kWh/kg</td>
<td>85</td>
<td>166</td>
<td>eur/ton</td>
<td>0.041</td>
<td>81</td>
<td>96.8</td>
</tr>
<tr>
<td>Natural gas</td>
<td>9</td>
<td>kWh/m3</td>
<td>90</td>
<td>336</td>
<td>eur/kilo m3</td>
<td>0.042</td>
<td>82</td>
<td>100.0</td>
</tr>
<tr>
<td>Propane Gas (LPG)</td>
<td>12.8</td>
<td>kWh/kg</td>
<td>93</td>
<td>795</td>
<td>eur/ton</td>
<td>0.062</td>
<td>123</td>
<td>150.0</td>
</tr>
<tr>
<td>Electricity</td>
<td>1</td>
<td>kWh</td>
<td>98</td>
<td>0.075</td>
<td>eur/kWh</td>
<td>0.076</td>
<td>152</td>
<td>185.4</td>
</tr>
<tr>
<td>Light Fuel Oil</td>
<td>11.6</td>
<td>kWh/kg</td>
<td>90</td>
<td>953</td>
<td>eur/ton</td>
<td>0.091</td>
<td>181</td>
<td>220.7</td>
</tr>
</tbody>
</table>
The purchase price of power produced from Renewable Energy Sources as photovoltaic, wind and biomass is attractive for the producers.

Energy produced from RES – Purchase Prices Comparison, Bulgaria, 2007

- Hydro power ...................... 41,03-43,59 eur/MWh
- Wind power ...................... 61,54 eur/MWh (up to 10 MW, before 2006)
- Wind power ...................... 80-89,74 eur/MWh (since 2006)
- Photo voltaic power .......... 368,21-401,03 eur/MWh (more/less than 5kW)
- Biomass power (1)..............10,77 eur/MWh (up to 5 MW, wood waste)
- Biomass power (2).............. 83,08 eur/MWh (up to 5 MW, agriculture residues)
- Biomass power (3).............. 94,36 eur/MWh (up to 5 MW, wild plants residues)

For comparison: Electricity average price = 75 eur/MWh
ENERGY EFFICIENCY IN BUILDING SECTOR
Example (3): Environment Protection Policy Approach:
The Electricity, the Coal and the Light Fuel used for heating are the worst CO2 polluters

Calculation of CO2 Emissions Reduction (ref.National Regulation)

<table>
<thead>
<tr>
<th>Type of fuel or power</th>
<th>Saved fuel or electricity kWh</th>
<th>Coefficient of losses %</th>
<th>Reference values of CO2 emissions gCO2/kWh</th>
<th>Reduced annual CO2 emissions kg/year</th>
<th>Rate of Eco Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel Oil</td>
<td>1 000</td>
<td>10</td>
<td>311</td>
<td>342</td>
<td>3</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>1 000</td>
<td>10</td>
<td>247</td>
<td>272</td>
<td>6</td>
</tr>
<tr>
<td>Propane Gas (LPG)</td>
<td>1 000</td>
<td>10</td>
<td>272</td>
<td>299</td>
<td>5</td>
</tr>
<tr>
<td>Black Coals</td>
<td>1 000</td>
<td>20</td>
<td>439</td>
<td>527</td>
<td>2</td>
</tr>
<tr>
<td>Brown Coals</td>
<td>1 000</td>
<td>20</td>
<td>452</td>
<td>542</td>
<td>2</td>
</tr>
<tr>
<td>Wood</td>
<td>1 000</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>Wood chips</td>
<td>1 000</td>
<td>5</td>
<td>32</td>
<td>34</td>
<td>8</td>
</tr>
<tr>
<td>Wood pellets</td>
<td>1 000</td>
<td>25</td>
<td>43</td>
<td>54</td>
<td>7</td>
</tr>
<tr>
<td>Electricity</td>
<td>1 000</td>
<td>300</td>
<td>683</td>
<td>2 732</td>
<td>1</td>
</tr>
<tr>
<td><strong>TOTAL =</strong></td>
<td><strong>9 000</strong></td>
<td></td>
<td><strong>-</strong></td>
<td><strong>4 808</strong></td>
<td><strong>-</strong></td>
</tr>
</tbody>
</table>
ENERGY EFFICIENCY IN BUILDING SECTOR

Example (4): Regulation and Standards Policy Approach:
The Current Bulgarian Standards partially complies to the severe EU standards versus building heat losses protection and well behind from the listed Low/Passive Energy Buildings thermal performance

Comparison of Thermal Performance of Building Envelope
(U-values) for some EU regions, ref. EU Green Buildings

<table>
<thead>
<tr>
<th>Building Components:</th>
<th>Low/Passive Energy Buildings</th>
<th>Severe Standards (North&amp;Mid EU)</th>
<th>Weak Standards (South EU)</th>
<th>Bulgaria, current standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>External Walls</td>
<td>U &lt; 0.15</td>
<td>0.15&lt;U&lt;0.40</td>
<td>0.40&lt;U&lt;0.65</td>
<td>U&lt;0.50</td>
</tr>
<tr>
<td>Windows/Doors</td>
<td>U &lt; 0.70*</td>
<td>1.25&lt;U&lt;2.50</td>
<td>2.50&lt;U&lt;3.25</td>
<td>U&lt;2.6</td>
</tr>
<tr>
<td>Roof/Ceiling</td>
<td>U &lt; 0.15</td>
<td>0.22&lt;U&lt;0.45</td>
<td>0.45&lt;U&lt;0.90</td>
<td>U&lt;0.30</td>
</tr>
<tr>
<td>Floor/Basement</td>
<td>U &lt; 0.15</td>
<td>0.15&lt;U&lt;0.40</td>
<td>0.40&lt;U&lt;0.65</td>
<td>U&lt;0.50</td>
</tr>
</tbody>
</table>

*For transparent elements (0.15 for opaque elements)
ENERGY EFFICIENCY IN PUBLIC BUILDINGS

(1) In general the public buildings are characterized by:

> intermittent demand for heating, therefore the building envelope and structure’s thermal inertia should be respected by the adopted heat insulation system

> high internal gains (people, lighting, equipment), therefore more cooling is needed

> high glazing façade ratio (especially the newly constructed office buildings), therefore it needs less heating, but more cooling and also building orientation might be an important energy saving factor for the whole building life

> high quantity of treated fresh air, therefore they needs more energy;

> some consume more hot&cold water, therefore they needs more energy;
ENERGY EFFICIENCY IN PUBLIC BUILDINGS

(2) In general the public buildings are characterized by:

> most are frequently visited, therefore more energy is needed to protect the entrances to eliminate the stack effect (with high rise buildings)

> high level complexity of the building services equipment, therefore reliable building or energy management system is needed

> higher noise level (people, lighting, equipment), therefore they needs more energy and efficient equipment, materials, and special systems for noise reduction

> higher rate of fire and safety protection, therefore more energy is needed

> higher demand for façade cleaning, therefore more energy is needed
ENERGY EFFICIENCY IN PUBLIC BUILDINGS

and:
> most are bigger urban polluters, therefore special attention as buildings and energy consumers is required

Conclusion:
The energy efficient design of new and renovation of existing public buildings is a complex process, which requires interdisciplinary approach, specific knowledge, sophisticated tools, and widespread social awareness and support.
Municipal Energy Planning

Methodology

The Experience of Bulgaria
Why Municipal Energy Planning? (MEP)
Municipal Energy Planning -
Systematic approach for energy management at local/municipal level
Driving force and effective instrument to achieve the ambitious goals and objectives of common EU policy for sustainable development
Which are the main products of the MEP process?

Municipal Energy Strategy – MES (long-term)
Municipal Energy Programme – MEP (medium term)
Municipal Energy Action Plan – MEAP (short term)
Investment Programme - IP
What is Municipal Energy Programme?

Key component of the overall development strategy of the municipality

Political document outlining goals, objectives and frames of all local energy aspects
Energy programme or Energy Efficiency programme?
Tendency for energy sector decentralization and growing use of local renewable energy sources make Energy planning on local level possible.

MEP for municipal property or MEP for the municipal territory?
All energy end-users and energy producers on the municipal territory make sense for sustainable local development policy (After all, we have only one – our municipality environment!)
What is Municipal Energy Database?

MEDB is a key prerequisite for successful energy planning and management.

The establishment of MEDB is the first essential condition to ensure long term sustainable MEP process.

MEDB should consist of data about municipal property and also data about all energy producers and energy end-users on the municipal territory.
Which municipal functions are covered by the MEP?

Four basic municipalities’ functions:

Consumer - Producer - Regulator - Motivator
What the 4 functions lead to?

Energy Consumer & Producer – lead to: INVESTMENTS

Energy Regulator & Motivator – lead to NON INVESTMENT ACTIONS
United Nations Forum on Energy Efficiency

Seoul, 17-18th December

1. MEDB development
2. Capacity building
3. Scope, objectives, participants
4. Baseline determination
5. Financial framework
6. Selection of priorities
7. Organization of Implementation
8. Programme implementation
9. Monitoring

I. Political decision

II. Political decision

III. Political decision

Preparation
Development
Implementation
### United Nations Forum on Energy Efficiency

**Seoul, 17-18th December**

#### PLANNED ACTIVITIES BY FUNCTIONS OF MUNICIPALITIES

<table>
<thead>
<tr>
<th>Sector: ..................</th>
<th>INVESTMENT ACTIVITIES</th>
<th>NON-INVESTMENT ACTIVITIES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Municipality as energy consumer</td>
<td>Municipality as energy producer</td>
</tr>
<tr>
<td>Project A: ..................</td>
<td>Measure 1 / Euro</td>
<td>Measure 1 / Euro</td>
</tr>
<tr>
<td></td>
<td>Measure 2 / Euro</td>
<td></td>
</tr>
<tr>
<td>Project B: ..................</td>
<td>Measure 1 / Euro</td>
<td>Measure 1 / Euro</td>
</tr>
<tr>
<td></td>
<td>Measure 2 / Euro</td>
<td>Measure 2 / Euro</td>
</tr>
<tr>
<td></td>
<td>Measure 3 / Euro</td>
<td></td>
</tr>
</tbody>
</table>

---

**Center for Energy Efficiency**
Thank you very much for your kind attention!

United Nations Forum on Energy Efficiency
Seoul, 17-18th December