Introducing retrofitting measures and combining EE and RE in public and residential buildings

Martin Mooij

Seminar: “Energy efficiency, demand-side management, and renewable energy - The sustainable way”

15-16 April 2008 – Brussels
Agenda

• Introduction Ecofys

• Renewable energy and sustainable energy in retrofit
  – Potential
  – Introduction of the EPBD

• Approach for improvement of the existing stock
  – Policy planning
    • Housing associations (IEE project RESHAPE)
  – Demonstration project
    • FP6-Concerto (Staccato project)
    • Living++ (approach to the individual consumer)
Ecofys

- Energy efficiency and sustainable energy consultancy

- Four fields of expertise (clusters)
  - ES: Energy Strategy
  - EBE: Energy in the Built Environment
  - SPF: Sustainable Power and Fuels
  - IES: Innovation in Energy Systems

- Solution provider: from concept to realisation

- Part of the Econcern holding
  - Established in The Netherlands 1984
  - 19 countries, more than 900 people
  - Rapid growth
Sister companies within Econcern

- **Evelop**: project developer
  - Wind (largest in off-shore), biomass
  - Real estate
- **Ecostream**: B2C and B2B sales
  - PV and PV farms, solar thermal systems, Living ++
- **Ecoventures**
  - Closed Greenhouse, Silicon and PV module industry
Experiences in retrofit
Large energy savings potential in existing buildings

- Ecofys Eurima studies
- Building sector is the largest end energy user in EU-15 – 40%, 735 Mt/a
- Savings by insulation up to 400 Mt/a
- www.eurima.com
## Market Potential for CO₂-Savings

### CO₂-Saving Potential [Mt/a]

<table>
<thead>
<tr>
<th>Country</th>
<th>CO₂-Saving Potential [Mt/a]</th>
<th>% CO₂-Saving Potential</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estonia</td>
<td>0.75</td>
<td>65.0%</td>
</tr>
<tr>
<td>Latvia</td>
<td>0.54</td>
<td>60.0%</td>
</tr>
<tr>
<td>Lithuania</td>
<td>1.17</td>
<td>68.9%</td>
</tr>
<tr>
<td>Poland</td>
<td>18.68</td>
<td>68.4%</td>
</tr>
<tr>
<td>Germany</td>
<td>19.51</td>
<td>50.0%</td>
</tr>
</tbody>
</table>

**Legend:**
- **[Mt/a]**
- **[%]**
EPBD

- Introduced 2006

1. Method for calculation energy performance of buildings
2. Minimum requirements energy performance new buildings
3. Minimum requirements on energy performance of large existing buildings subject to major renovation
4. Energy certification of buildings
5. Periodic inspection of boilers and air conditioning
Use of the EU energy label

**Liesbethstraat 33 's-Heer Arendskerke**

**Total costs € 511,=**

- **Referentie nr:** 5966
- **Type:** Eengezinswoning
- **Adres:** Liesbethstraat 33
- **Plaats:** 's-Heer Arendskerke
- **Huurprijs:** € 394,11
- **Servicekosten:** € 2,55
- **Energielabel:** D
- **Gem. energiekosten:** € 115,00
- **Slaapkamers:** 3
- **Installaties:** CV
- **Beschikbaar per:** 15 maart 2005
- **Bijzonderheden:** Tussenwoning
- **Inkomen:** Maximaal €2500,00
- **Leeftijd:** Vanaf 23 jaar
- **Punten vanaf:** 10

**Insulation**
- HE boiler
- Solar water heater
- Ventilation

**Total costs € 497,=**

- **Referentie nr:** 5966
- **Type:** Eengezinswoning
- **Adres:** Liesbethstraat 33
- **Plaats:** 's-Heer Arendskerke
- **Huurprijs:** € 426,39
- **Servicekosten:** € 2,55
- **Energielabel:** A
- **Gem. energiekosten:** € 71,00
- **Slaapkamers:** 3
- **Installaties:** CV
- **Beschikbaar per:** 15 maart 2005
- **Bijzonderheden:** Tussenwoning
- **Inkomen:** Maximaal €2500,00
- **Leeftijd:** Vanaf 23 jaar
- **Punten vanaf:** 10
Approach for improvement of the existing building stock

- Implementation of the EPBD in policy plans
  - National government
  - Local authorities
  - Housing associations
  - Example: IEE project RESHAPE

- Demonstration projects
  - Reproducible projects
  - Technical and non-technical lessons
  - Example: EU Concerto

- Awareness and action by the end-user
  - Example: Dutch Living++ campaigns
RESHAPE: Objective

- Improving energy Performance Assessment and Certification schemes by Tests

- Provide practical tools, guidelines, best-practice examples and training for the implementation of the EPBD by social housing actors in Europe
  - Increase the awareness and change the attitude of social housing actors towards solutions for refurbishments
  - Contribute substantially to EU policies and Kyoto commitments regarding the CO₂ reduction and energy consumption in the building sector

- 6 housing associations, 3 Eastern European
Rent and energy costs Dutch households

Index (1996=100)

Electricity price
Gas price
Average rent

OUR MISSION: A SUSTAINABLE ENERGY SUPPLY FOR EVERYONE
RESHAPE: workpackages

• WP1  Project co-ordination

• WP2  Housing stock and processes
  - Task 1: Select reference dwellings
  - Task 2: Perform energy audits
  - Task 4: Describe building stock
  - Task 5: Plan for integration in operation

• WP3  Retrofitting strategies

• WP4  Tools and guidelines

• WP5  Dissemination
RESHAPE WP2: Pilot WoonWel Complex 2.06.3 Kerkwerve

<table>
<thead>
<tr>
<th>A</th>
<th>0,0%</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>0,0%</td>
</tr>
<tr>
<td>C</td>
<td>62,2%</td>
</tr>
<tr>
<td>D</td>
<td>37,8%</td>
</tr>
<tr>
<td>E</td>
<td>0,0%</td>
</tr>
<tr>
<td>F</td>
<td>0,0%</td>
</tr>
<tr>
<td>G</td>
<td>0,0%</td>
</tr>
</tbody>
</table>

Our Mission: A Sustainable Energy Supply for Everyone
RESHAPE WP2: Pilot WoonWel Complex 2.06.3 Kerkwerve, scen. 1

Our Mission: A Sustainable Energy Supply for Everyone
RESHAPE WP2: Pilot WoonWel Complex 4.02.1 Rochussenlaan

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0,0%</td>
<td>0,0%</td>
<td>0,0%</td>
<td>0,0%</td>
<td>24,1%</td>
<td>39,2%</td>
<td>36,7%</td>
</tr>
</tbody>
</table>

Our mission: A sustainable energy supply for everyone
RESHAPE WP2: Pilot WoonWel Complex 4.02.1 Rochussenlaan, scen. 1

3682 kg CO2

€ 694

€ 9993

OUR MISSION: A SUSTAINABLE ENERGY SUPPLY FOR EVERYONE
Building stock analysis (WoonWel)

<table>
<thead>
<tr>
<th>Noem</th>
<th>b</th>
<th>h</th>
<th>I</th>
<th>RU</th>
<th>Type constructie</th>
<th>U</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voorgevel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G1</td>
<td>0.00</td>
<td>0.00</td>
<td>25.15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G1-K1</td>
<td>1.40</td>
<td>2.20</td>
<td>3.08</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G1-K1-E1</td>
<td>0.60</td>
<td>0.00</td>
<td>3.08</td>
<td></td>
<td>HKEG01-hk.koz/glas</td>
<td></td>
</tr>
<tr>
<td>G1-K2</td>
<td>1.50</td>
<td>2.20</td>
<td>3.20</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G1-K2-K1</td>
<td>0.00</td>
<td>0.00</td>
<td>3.10</td>
<td></td>
<td>HKKG01-hk.koz/glas</td>
<td></td>
</tr>
<tr>
<td>G1-K3</td>
<td>0.50</td>
<td>0.50</td>
<td>0.25</td>
<td>0.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G1-K3-K1</td>
<td>0.00</td>
<td>0.00</td>
<td>0.25</td>
<td></td>
<td>HKKG01-hk.koz/glas</td>
<td></td>
</tr>
<tr>
<td>Door</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dichte gevel (net)</td>
<td>18.63</td>
<td></td>
<td>0.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G2</td>
<td>0.00</td>
<td>0.00</td>
<td>11.25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G2-K1</td>
<td>2.70</td>
<td>2.50</td>
<td>6.75</td>
<td>0.00</td>
<td>HKKG02-hk.koz/plek</td>
<td></td>
</tr>
<tr>
<td>G2-K1-E1</td>
<td>0.00</td>
<td>0.00</td>
<td>4.55</td>
<td></td>
<td>HKKG02-hk.koz/plek/2/glas</td>
<td></td>
</tr>
</tbody>
</table>
Building stock analysis (WoonWel)

energy labeling per building period

- ≤ 1969
- 1970 - 1980
- 1980 - 1992
- ≥ 1992

number of energy labels

OUR MISSION: A SUSTAINABLE ENERGY SUPPLY FOR EVERYONE
Demonstration project: EU FP6 Concerto program

• Typical Concerto project
  - 1-3 communities
  - 500-2000 dwellings each
  - Integrated demonstration project
    • Ecobuildings (low energy)
    • Sustainable energy supply
  - Reproducible
  - Better than national energy performance requirements
    • New developments: -30% national EP
    • Refurbishment: < national EP for new dwellings
  - Social aspects
Concerto 1 and 2 Communities

THE CONCERTO INITIATIVE

CONCERTO I COMMUNITIES

- BRUSSELS
  - Brussels

- CONCERTO II COMMUNITIES
  - Glass 1
  - Stenflees
  - CONCERTO Al Piano
  - Alessandria
  - Conception
  - Valbray
  - Salzburg

- HOLISTIC
  - Dundalk
  - Mlinha
  - Neuchatel

- SEMS
  - Weidenbach
  - Tulln
  - Hradec
  - Slabice

- SERVE
  - Serve Region

- SORGER
  - Vollrad
  - Apoldern

- STAGGAT
  - Amsterdam
  - Budapest
  - Sofia

- REMUNIC-LUWEK
  - Koenler
  - Zgorze

- POLICY
  - Cordovino de Vallès
  - Astfielden
  - Torino

- RENAISSANCE
  - Lyon
  - Zaragoza

- SESAG
  - Grenoble
  - Boln
  - Varš

- Totaer
  - Genova
  - San Sebastian

OUR MISSION: A SUSTAINABLE ENERGY SUPPLY FOR EVERYONE
Concerto 2 project: Staccato

- Large post war housing areas (50-ies to 70-ies)
  - Amsterdam: 1,200 apartments
  - Budapest (Obuda): 800 apartments
  - Sofia (Oborishte): 600 apartments
- Improvements in buildings (EE)
  - Insulation, thermal bridges, air tightness
  - Ventilation system
- Integration of renewable energy
  - Solar thermal
- Expected energy savings up to 50%
**Staccato: demonstration sites**

- Amsterdam
- Budapest/ Obuda
- Sofia/ Oborishte
Staccato: technical and non-technical research program

- Technical research
  - Ecobuilding design
  - Integration of renewable energy
- Non-technical research
  - Involvement of housing owners/renters
  - Financing schemes
  - Policy planning
- Monitoring
  - Energy systems
  - End user consumption
- Reports later on: www.concerto-plus.eu
Examples of measures and concepts
Approach to consumers: The Netherlands: Living++

- Local campaigns
  - Local authorities
  - Achieving climate targets
- Full-service approach
  - Proposal to housing owners
  - Advice (audit)
  - Proposal for retrofit
    - Insulation
    - HE boiler, solar
  - Realisation
  - Quality control
  - Financing (green mortgage)
**Living++: packages incl. financing**

<table>
<thead>
<tr>
<th><strong>Tussenwoning van voor 1946</strong></th>
<th><strong>Tussenwoning van 1966-1975</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vloer</strong></td>
<td>Ongesoliederd (R=0,15 m²K/W)</td>
</tr>
<tr>
<td><strong>Gevel</strong></td>
<td>Ongesoliederd (R=0,36 m²K/W)</td>
</tr>
<tr>
<td><strong>Dak</strong></td>
<td>Ongesoliederd (R=0,22 m²K/W)</td>
</tr>
<tr>
<td><strong>Beglazing</strong></td>
<td>Dubbel glas</td>
</tr>
<tr>
<td><strong>Ketel</strong></td>
<td>Hoog Rendement combiketel</td>
</tr>
<tr>
<td><strong>Tapwater</strong></td>
<td>Hoog Rendement combiketel</td>
</tr>
</tbody>
</table>
On a national Scale: ‘Less-is-more’

- National campaign
  - Participation of utilities, local authorities, national government, branch organisations (installers, housing associations, building contactors, banks)
  - Coordination: Energy-Central

- Ambition
  - 300,000 dwelling per year (7,000,000 in The Netherlands)
  - 30% CO₂ reduction (improvement of 2 label classes)

- Approach
  - Capacity building, education, quality control
  - Procedures
  - Financing scheme: green mortgage
‘Less-is-more’ campaign: parties involved

Promotie
- EnergieCentraal
- MilieuCentraal
- Gemeenten (VNG)
- Toeleverings-industrie
- Energieleveranciers
- Klantenorganisaties
- Milieuorganisaties
- Bouwend NL

Advisering (gecertificeerd)
- EnergieCentraal (generiek)
- Bouwend NL - aannemers
- Energieleveranciers
- UNETO-VNI - installateurs
- Avepa – adviseurs
- Particuliere verhuur - adviseurs
- VEH
- Banken
- Toeleveringsindustrie
- NVM makelaars
- MKB Nederland
- VastgoedBelang
- VvE belang
- IVBN

Rapportage
- EnergieCentraal voor mijlpalen en actualisering voortschrijdend actieplan
- Energieleveranciers
- Kadaster
- Overheid

Uitvoering (gecertificeerd)
- Bouwbedrijven
- Installateurs
- Energieleveranciers
- Netbeheerders
- Toeleveringsindustrie
- Gebouweigenaar

Flankerend beleid
- VROM
- EZ
- Financiën
- Politiek (CDA, PvdA, CU etc.)
- Vereniging NL Gemeenten (VNG)
Implementation

Utility: NUON

• Started ‘Energy saving shops’
  – Advice on retrofitting
  – Boilers, PV systems, insulation, light saving bulbs
• Took over an insulation company
• Cost neutral offer to clients
  – Lower energy consumption
  – Extra: loan for retrofit package
  – In the end same energy bill
Conclusions

- Large energy saving and renewable energy potential in the existing EU building stock
  - Insulation potential > 50%
- Acceleration of retrofitting is required
- Techniques and concepts are available
- Cost effective approaches are developed

- EPBD labeling helps to communicate in ‘total cost of ownership’
  - Action by housing associations/ investors
  - National and local authorities