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Training for Renovated Energy Efficient Social housing

Intelligent Energy -Europe programme, contract n° EIE/05/110/SI2.420021

Intelligent Energy Europe

Section 3 Case Studies
3.3 Kruitberg, Amsterdam

Chiel BOONSTRA, Loes JOOSTEN
DHV

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General info

The Kruitberg project is part of a large area (Bijlmermeer) where the total renewal is running from 1992 through 2007 and which has ambitious aims. At the start of the renewal operation several main goals have been set:

- **Improving the position of Bijlmermeer on housing market (spatial renewal)**
- **Enhancing the labour participation of the population (social-economical renewal)**
- **Enforcing the urban life in the Bijlmermeer through more employment and cultural facilities (liveable and management renewal).**
- **In the second phase for renewal goals for urban renewal have been sharpened further in sub goals:**
  - **Improving satisfaction of residents about living in high-rise buildings**
  - **Higher appreciation for the quarter, showed by lower exchange rates**
  - **More people who want to live in the area**

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Building and renovation measures

- Glazed balconies
- New ventilation in upper windows, pressure controlled constant volume and individual controllable outlet kitchen
- PV at end façade
- Solar thermal collector
- Heat exchanger (air to water) with heat pump

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Results and conclusions

- Technical conclusions
  - Thermal insulation measures and LE-glazing: neither design nor practical problems and gives major savings and increase of comfort
  - Improvement of ventilation system (inlets, outlets, mechanical ventilation and air tightness) are rather easy and common practise with hardly any over cost.
  - Reducing tap demand at the apartments and the individual metering of space heating and cold and hot tap water will mean an important saving on energy.
  - The heat pump is a promising experimental technique but experience has to be gained with the energy and maintenance performance.
- Economical conclusions
  - The effective price reduction of solar thermal plant is 38% compared to former Thermie-project.
  - The integration of PV in existing constructions is expensive with some 12.5 €/Wp due to plan team and process, unforeseen complexity of adding PV to the end façade and small scale (custom made) for the parapets of glazed balconies.
  - The simple payback time of the full energy project is 19 years.

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Introduction

- **Bijlmermeer revitalisation**
- **Aim of project: improve/ implement most feasible measures**
- **Strategy: energy demand reduction, efficient supply and renewable supply**

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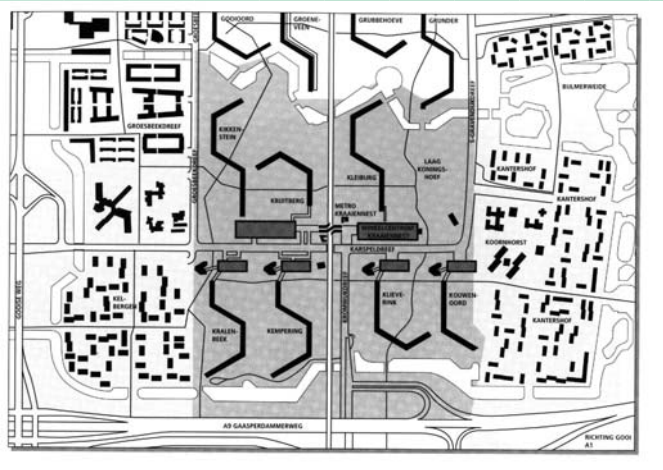
Kruitberg: high rise building in Bijlmermeer

- **Kruitberg is a typical large-scale high-rise building in the south-eastern part of Amsterdam built during the 1960-70's. The demonstration project includes the second phase of a large renewal operation and consists of 363 apartments out of a total of 9000, which are in need of renovation.**



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Bijlmermeer revitalisation

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Case Study: Kruitberg Amsterdam

- **Patrimonium is an organisation which owns and manages about 40,000 dwellings in and around Amsterdam. Patrimonium recently merged with Nieuw Amsterdam and Rochdale. Technical activities are carried out on behalf of other corporations from the region.**
- **Patrimonium is one of the largest organisations of its kind in The Netherlands.**
- **Energy consultancy Kruitberg: W/E consultants**

Energy objectives

- **The aim of the Kruitberg project is to improve and implement the most feasible measures previously demonstrated in a THERMIE project as well as using the experiences form IEA Task 20 'Solar Energy in Building Renovation' from the Solar Heating and Cooling Programme (SHCP) from the International Energy Agency (IEA).**

- **Kruitberg was one of the eight demonstration projects in REGEN-LINK:**

  An EU supported ENERGIE-demonstration project from 2000 – 2003.

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Technical: Reduced energy demand

- **Insulation at both end facades and parapets (U = 0.33 W/m²K)**
- **Insulation on the outside of staircases**
- **LE-glazing U = 1,1 W/m²K in 80 selected apartments with relatively large transmission losses**
- **Air supply through pressure controlled (natural) constant volume air inlets and individual controllable constant volume outlet devices in ‘wet’ spaces.**
- **Special attention to air tightness**

Glazed Balconies at Kruitberg

New ventilation in upper windows, pressure controlled constant volume (left) and individual controllable (2 modes) pressure controlled outlet kitchen

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Technical: Renewable energy supply

- **33 glazed balconies**
- **5 Crystalline PV in parapets**
- **1 end façade got crystalline and amorphous panels with 12 kWp**
- **Air heat is extracted from ventilation exhaust with an electrical compression heat pump (20 kW) to preheat DHW (using 10% of the air).**
- **720 m² thermal solar system with a performance of 1,74 GJ/m² primarily for DHW, and secondary for space heating.**

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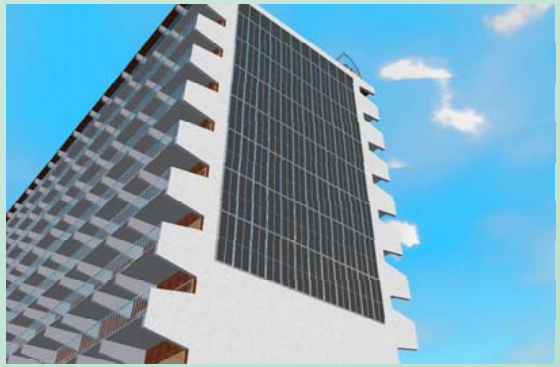

PV on end facades before and after renovation (artist impression)

construction 720 m2 collector (left) and framework (right)

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Getting solar storage into place and fixed

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Heat exchanger on roof (left) and heat pump (right)

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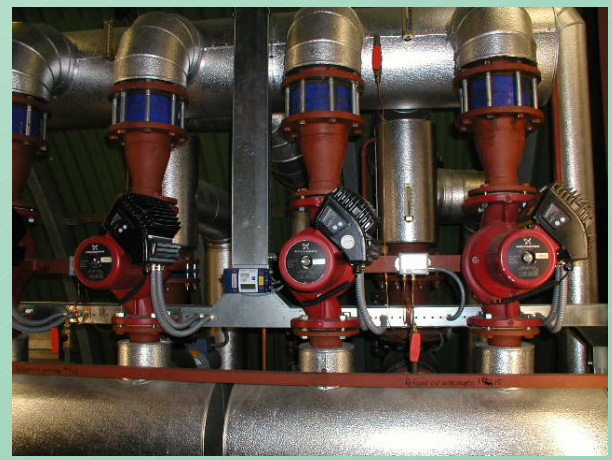
Technical: Efficient energy supply

- **Renovating and improving the existing collective installation with CHP**
- **Back up with new condensing boilers on the rooftop**
- **Mid term temperature distribution system (70^{o}C - 40^{o}C) replaced former level of (90^{o}C - 70^{o}C)**
- **Main distributing system was also taken from ground floor to the roof and well insulated.**
- **Individual metering of heat supply and the use of cold and hot domestic water**

Plant rooms on roof

Plant room solar thermal (left) Plant room gas, CHP and distribution (right)



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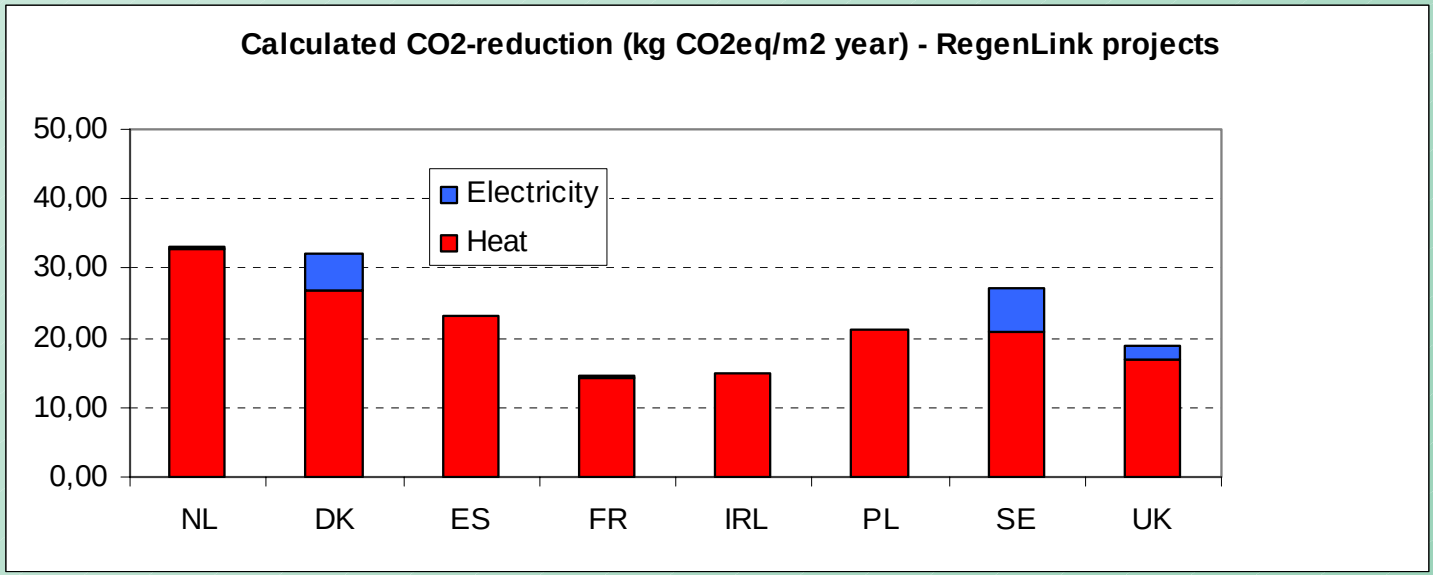
Calculated CO2-reduction (kg CO2eq/m2 year) - RegenLink projects
50,00
40,00
30,00
20,00
10,00
0,00
Electricity
Heat
NL
DK
ES
FR
IRL
PL
SE
UK

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Technical conclusions

- **Thermal insulation measures (R=3) and LE-glazing (U glazing=1.1) gave neither design nor practical problems and gives major savings and increase of comfort**
- **Glazed balconies are chosen as a separate add-on service instead of an integral part of the design.**
- **Important break through is the guarantee on high system performance of the solar thermal plant over the lifespan.**
- **Improvement of ventilation system (inlets, outlets, mechanical ventilation and air tightness) are rather easy and common practise with hardly any over cost. Attention has to be paid on construction, maintenance and users instruction.**
- **Reducing tap demand at the apartments and the individual metering of space heating and cold and hot tap water will mean an important saving on energy.**
- **An important environmental aspect is the increase of the indoor climate.**
- **The heat pump is a promising experimental technique but experience has to be gained with the energy and maintenance performance.**

Economical conclusions

- **The effective price reduction of the solar thermal plant is 38% compared to a former Thermie-project.**
- **The integration of PV in existing constructions is expensive with some 12.5 €/Wp due to plan team and process, unforeseen complexity of adding PV to the end façade and small scale (custom made) for the parapets of glazed balconies.**
- **The simple payback time of the full energy project is 19 years.**