Positive Energy Building Upgrade Plan Intro newly built social housing - Kortessem

The project **Hachent** presents a newly built social housing area located in the municipality of Kortessem in the province of Limburg, Belgium. The plot is heated by a central heating system that combines a gas-fired boiler with heat interface units in each of the 16 dwellings.

The social housing company WIL (Wonen In Limburg) is building owner and responsible for managing the site. This includes technical operations, user administration, social services and support for their tenants.

While the Flemish Society for Social Housing provides guidelines for new construction and renovation projects, support on technical aspects such as renewable energy technologies and PEB concepts is not included. As a result, the social housing company is responsible for knowledge and capacity building in these areas. Therefore, WIL considers the PEB concept as a good practice example of how to use energy technology optimally.

WIL emphasizes the importance of incorporating PEB replication in renovation projects. The number of prospective tenants has been steadily increasing in recent years, and there simply aren't enough dwellings available to meet the demand. While in some cases, it may be more effective to demolish and rebuild, renovation is often chosen instead due to the shorter lead time.

An important driver for rebuilding older dwellings is the trend to build more compact. Older dwellings are often large in terms of available floor surface compared to modern standards. More dwellings can be created on existing building plots, which in terms of energy efficiency,

is also the preferred option. This highlights the tension between the growing demand for social housing and the need for energy efficiency. Here, the replication plans intend to support building owners in their decision-making.

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1 Baseline assessment of the implementation environment

1.1 Building description

Project Hachent in Kortessem, Belgium is a social housing area with 16 apartments. The buildings were constructed in 2020. Currently central gas-fired boilers are used to heat the apartments via a small-scale heating network. The architecture of the heating system is very similar to the Excess demosite. The floor surface area of the apartments varies between 77m² and 125m². The total annual heat load projected by the EPBD calculation method is 48MWh.

Figure 1 Front and rear view on project Hachent in Kortessem (image courtesy: Cordium - WIL)

Figure 2 District heating satellite and ventilation system inside apartment

1.2 Regulatory aspects and public support schemes

Local regulatory aspects

The municipality of Kortessem evaluated the building permit for the project according to the Flemish building code. There are no further legal or regulatory aspects to consider when converting the building to PEB, however, there is a reporting obligation for PV installations to the DSO. More technical requirements on the installation of large PV systems can be found in the Kuringen replication plan or on the DSO website (www.fluvius.be). There is no permit required for the installation of geothermal probes if the depth criterion is respected on the project location. For this location a depth of 100m is sufficient for the technology considered in the replication plans – well within the 150m depth criterion.

National and regional law

In Belgium and more specific Flanders, only fire resistance and energy performance are regulated. The clearest is the national legislation for fire safety, which is arranged in terms of risk classes related to fire-fighting equipment. The general objectives of the legislation determines the minimum conditions to be met by the design, construction and layout of buildings. Fire behavior in case of fire of a construction element is appreciated according to its resistance to fire but also to the fire reaction of its constituent materials.

In Belgium no sustainability regulations apply to existing buildings and to renovation of existing buildings.

Contracts for the delivery of work, including the delivery of building works, are, together with the rules of general contract law primarily governed by Articles 1787 and the subsequent articles of the Belgian Civil Code.

The applicable energy performance requirements are set for primary energy consumption, insulation level, ventilation rate, overheating, technical installation, etc. These requirements are different for new or renovated buildings and units depending on the function (residential, office, educational, other non-residential). The requirements are updated on a regular basis according to the EPBD.

EU level

At EU level, new constructions must ensure the building meets high energy performance standards, in accordance with the EPBD. The directive also mandates optimizing health, indoor air quality, and comfort levels in building energy calculations, and highlights the IEQ impacts on health, productivity, and overall well-being of building occupants.

1.3 Social Dimension

Converting buildings to Positive Energy Buildings involves more than upgrading the technical infrastructure. Social aspects should also be considered to improve the wellbeing of residents and the local community. In the three Belgian replication plans, the targeted buildings house socially vulnerable populations. Rather than focusing solely on one specific demographic, a diverse range of socially vulnerable groups in considered, ensuring inclusivity, and addressing various social challenges. In this context, the following wishes or requirements - relevant for the development of PEBs - were identified amongst social tenants: (REF: https://www.hogent.be/sites/hogent/assets/File/24-01-15_WISHES_ONLINE.pdf).

- Proper insulation levels of the dwellings both in relation to thermal and acoustic comfort
- The facilities of the dwelling should match with the user target group
- Operational costs should be calculated and communicated in a transparent way
- Sufficient storage space and visual comfort

The buildings considered within the replication plans and the Excess demosite are designed to comply with these user wishes. The central basements at the different sites both offer sufficient storage space and host the technical building

installations. This delivers additional space in the dwellings and improves visual comfort. The buildings have proper insulation levels and the advanced monitoring infrastructure facilitates transparent operational cost calculation. In addition, the PEB technology packages will result in lower overall heating costs for the tenants in the longer term.

Another important aspect related to the social dimension is creating user awareness on energy consumption and thereby targeting energy poverty. WIL observes major differences in energy consumption between similar or identical dwellings. Therefore, the tenants should be advised on the rational use of energy. This role is picked up by the social services within WIL.

2 Technical information / design specifications

Key technologies installed

- Gas-fired boiler (2 x 90 kWth) in combination with heat interface units in each apartment for space heating and domestic hot water production.

- Individual ventilation units without heat recovery (type C)

Energy balance

The energy demand for space heating is presented in Figure 14. The energy demand for the Excess demo-site is also given as a reference. Project Hachent in Kortessem is a more recent project and therefore the building requirements on insulation levels and energy consumption are stricter. While The Excess demo-site has a specific heat consumption (space heating) of +/- 44 kWh/m², the Hachent project has a specific consumption of +/- 27 kWh/m². The actual measured heat consumptions are significantly higher compared to the projected heat consumption by EPB.

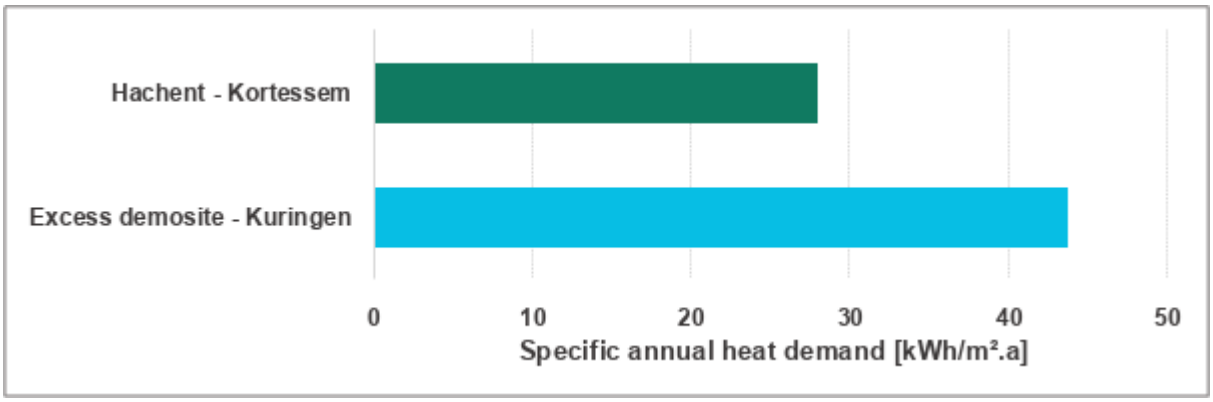


Figure 3: Specific heat demand for space heating according to EPB calculation method

PEB evaluation

The following technology packages are evaluated for project Hachent:

- Collective geothermal heat pump + District heating network + PVmin (HPgeo_DHN_PV_min)

- Collective geothermal heat pump + District heating network + PVmax (HPgeo_DHN_PV_max)
- Collective air source heat pump + District heating network + PVmin (HPair_DHN_PV_min)
- Collective air source heat pump + District heating network + PVmax (HPair_DHN_PV_max)

With:

- PVmin The minimal surface of PV is installed in order to reach PEB level (Net primary energy demand = 0)
- PVmax: All available roof surface area is used to install PV.

Individual heating systems are not considered due to the presence of the heating network and heat interface units in the apartments. Although air source heat pumps are not ideal to be used in a collective configuration (due to supply temperature limitations in winter), the technology is included in this assessment for completeness.

The results of the PEB technology assessment are presented in Figure 3.

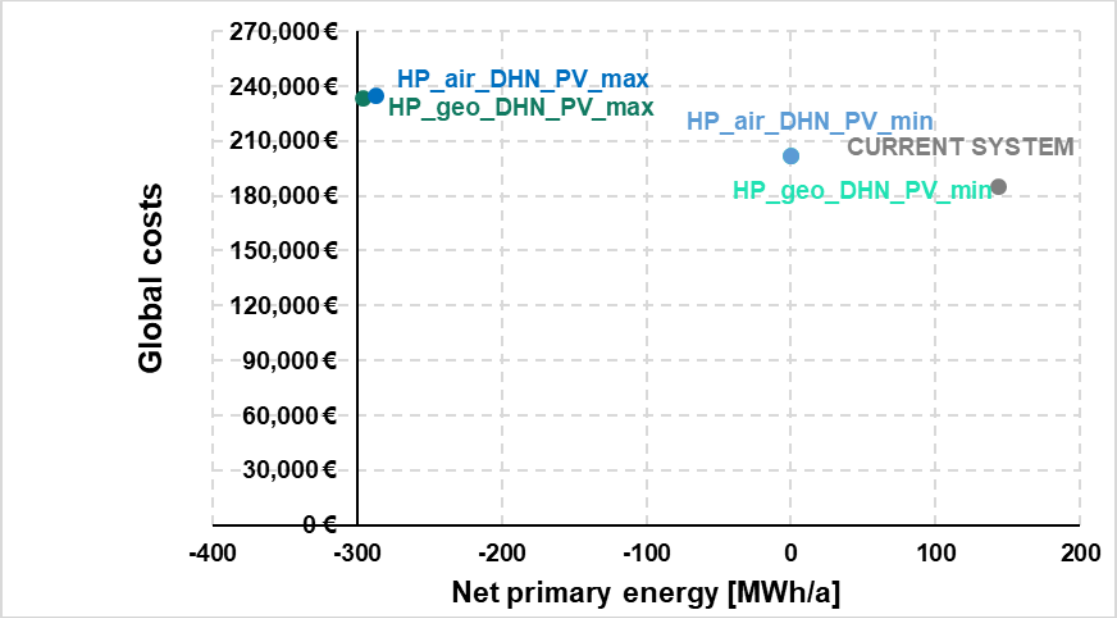


Figure 4 Global costs of PEB technology packages for project Hachent in Kortessem

As Figure 4 shows, the PEB solution packages result in a higher global cost compared to the current system. The conversion to PEB is therefore not cost effective. The analysis was made taking into account the projected heat demand according to EPB. If the measured heat consumption is taken into account, the HP_geo_PV_min package has a slightly lower lobal cost compared to the reference (-23k€). It should be stated that the injection tariff for excess PV energy influences the results, where low injection tariffs increase the global costs of larger PV installations for negative net primary energy concepts.

3 Business model details & possible financing arrangements

The social housing company can rely on the Flemish climate fund or apply for specific subsidy schemes to implement energy efficiency schemes in social housing infrastructure. These schemes can be used for large and smaller renovation projects

(e.g., heating system replacement and building envelope thermal performance improvement). In July 2023, a total resource volume of 70 M€ was available within the climate fund.

Photovoltaic panels are also applied more frequently in social houses. The Aster project (supported by the European Commission and the European Investment Bank) is accelerated using an appropriate split-incentive financing model. The social housing company invests in PV panels while the tenants purchase PV energy from the social housing company at a reduced tariff. Excess electricity is sold to the market. This model can also be applied to other energy-efficient technologies.

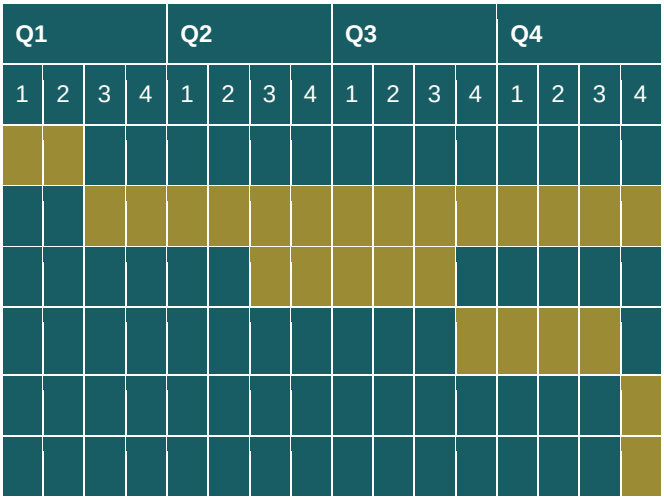
Under the incentive of the Energy Performance of Buildings Directive, heat pumps are also becoming more widespread for new building projects, such as the replication case in Kuringen. The social housing company invests in energy-efficient technology, and the users benefit from the savings on their energy consumption. The social housing company receives a reduction in the real estate tax for energy-efficient dwellings. WIL also recovers part of the additional investment for centralized sustainable heating systems via the heat tariff.

4 Possible PEB upgrade timeline

A high-level upgrade timeline is included in the replication plans. This timeline includes experiences from the demo partners gained during the roll-out of the PEB concepts during the Excess project. No permits are required for the installation of the technology packages considered. The installation of the roof PV installation is very straightforward and will only cause minimal disruptions in the heating system operations during the installation phase. The energy management system can be applied without hardware modifications to the existing building management control system. The total duration of the project is estimated to be approximately one year.

PEB Upgrade Activities in M01 to M06

- Activity A – Concept definition
- Activity B – Project planning
- Activity C – Project procurement
- Activity D – Installation process
- Activity E – Commissioning
- Activity F – System monitoring



5 Local Government Recommendations [200 words - ICLEI]

Local governments support the development of affordable housing, with social housing being a key component. Each municipality in Flanders has been assigned a binding objective, which sets the minimum number of social housing units that must be provided within their territory by 2025.

In an effort to accelerate the energy efficiency of these dwellings, local governments could support PEB retrofits in various ways:

First, local governments should establish support mechanisms to facilitate the access of energy efficiency to the market via energy communities. To encourage the building of PEBs, local planning should enable higher density and more compact buildings while energy efficiency goals can be incorporated in local zoning plans.

In addition, complementing regional and national grant or subsidy schemes, local governments could entertain the establishment of a special fund for PEB support and/or act as a guarantor for banks to offer low-interest loans for PEB projects. In the context of privately owned houses, LGs could also set up a fund to support low-income households and those at risk of energy poverty to implement energy renovations. When feasible, more flexible requirements should be introduced regarding energy performance systems in buildings.

Lastly, local governments should enhance technical advisory services (One-Stop Shops) so that building owners could approach public officers to support them with decision making on which measures, subsidies or grants to apply for in order to enhance energy performance of buildings.