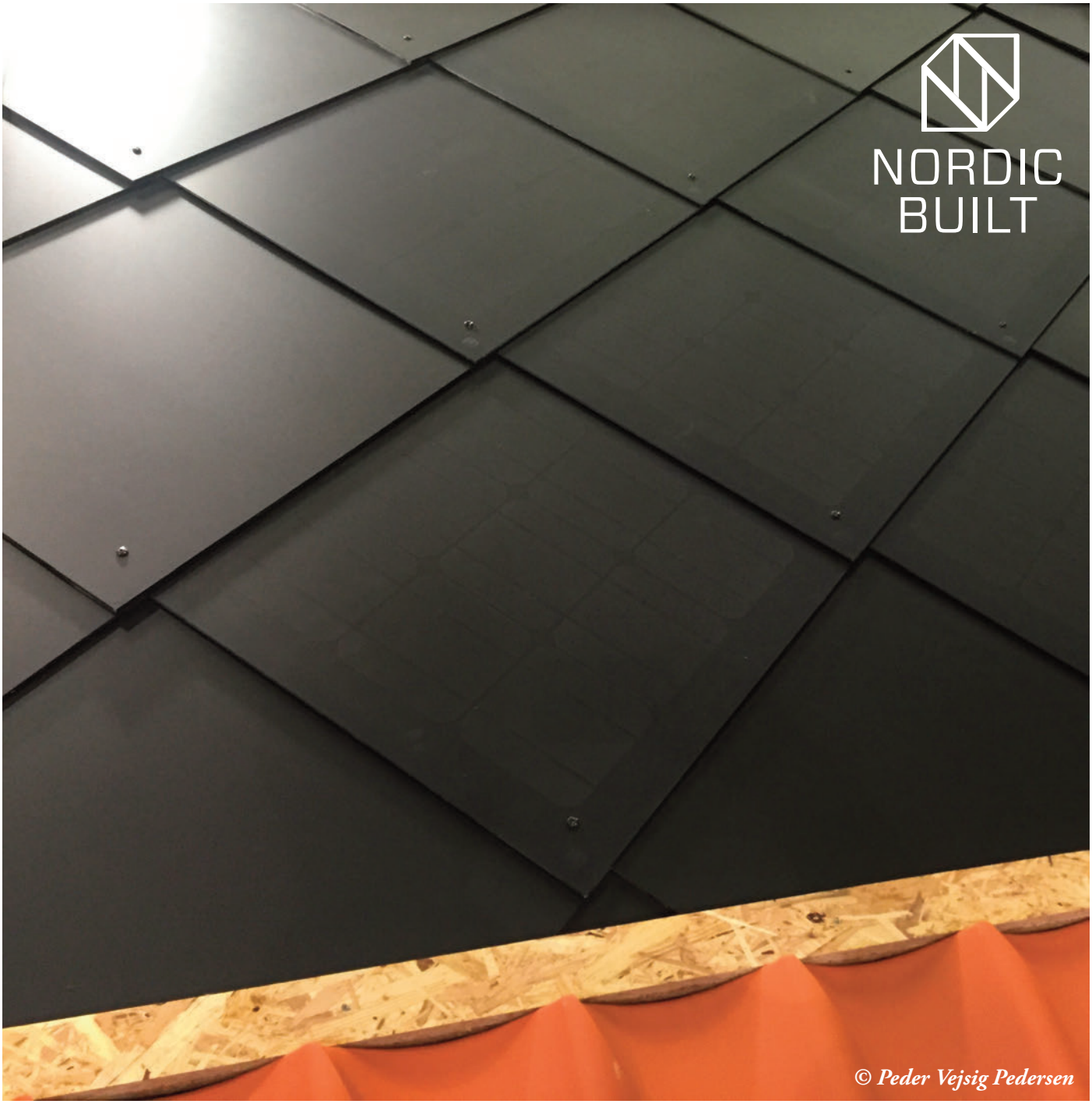


NEARLY ZERO ENERGY BUILDING SOLUTIONS

Photo: Bjørn Grubbe Rasmussen © Gaia Solar

Steni durable facade and roof plates combined with Gaia Solar matching PV modules

The Nordic Built "Active Roofs and Facades" project, coordinated by Cenergia, has received support from Nordic Innovation, EUDP (DK), Energimyndigheten (SE) and Rannis (IS) allowing strong development of leading Nordic competences in the area of building renovation.

This is achieved by the creation of transnational Public Private Partnership models to support the development of nearly zero energy building solutions and associated performance documentation – which is required in the EU building directive.

The proposed cooperation with the building industry on developing models and the demonstration of "Active House" based sustainable renovation is creating a strong Nordic alliance.

The project runs from 2014 to 2017 and involves companies which are represented in the Nordic countries and companies from the international Active House Alliance (www.activehouse.info). The development will use the best transnational competences and networks, creating greater possibilities to export technology.

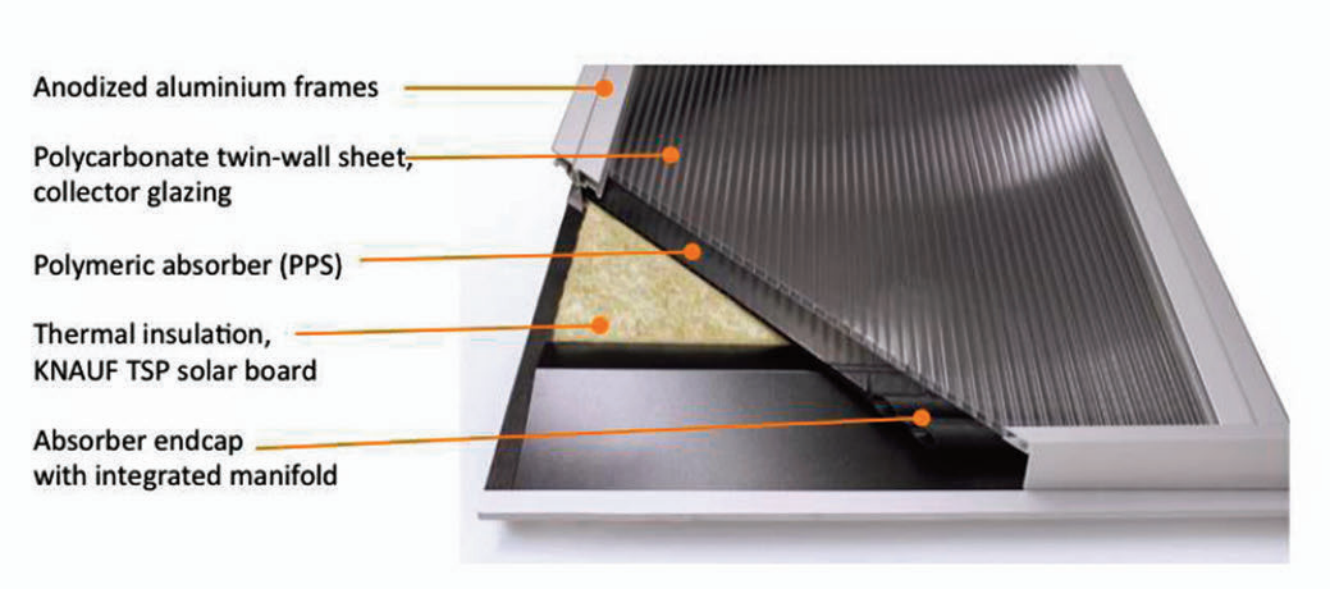
The Active House Radar

The Active House specifications and labelling system is very useful to communicate the Active House quality of a building project, with respect to energy, comfort and sustainability, and it can at the same time be used as a dialogue and performance verification tool. (see also www.activehouse.info)

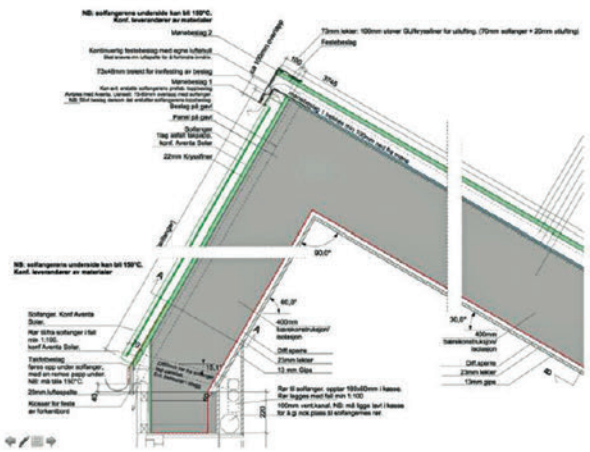
Building integrated PV both improves the assessment of CO_2 level, primary energy use and energy supply

JUST SOME OF BEST PRACTICE TECHNOLOGIES IN FOCUS IN THE NORDIC BUILT ACTIVE ROOFS AND FACADES PROJECT.

AventaSolar collector roof panels

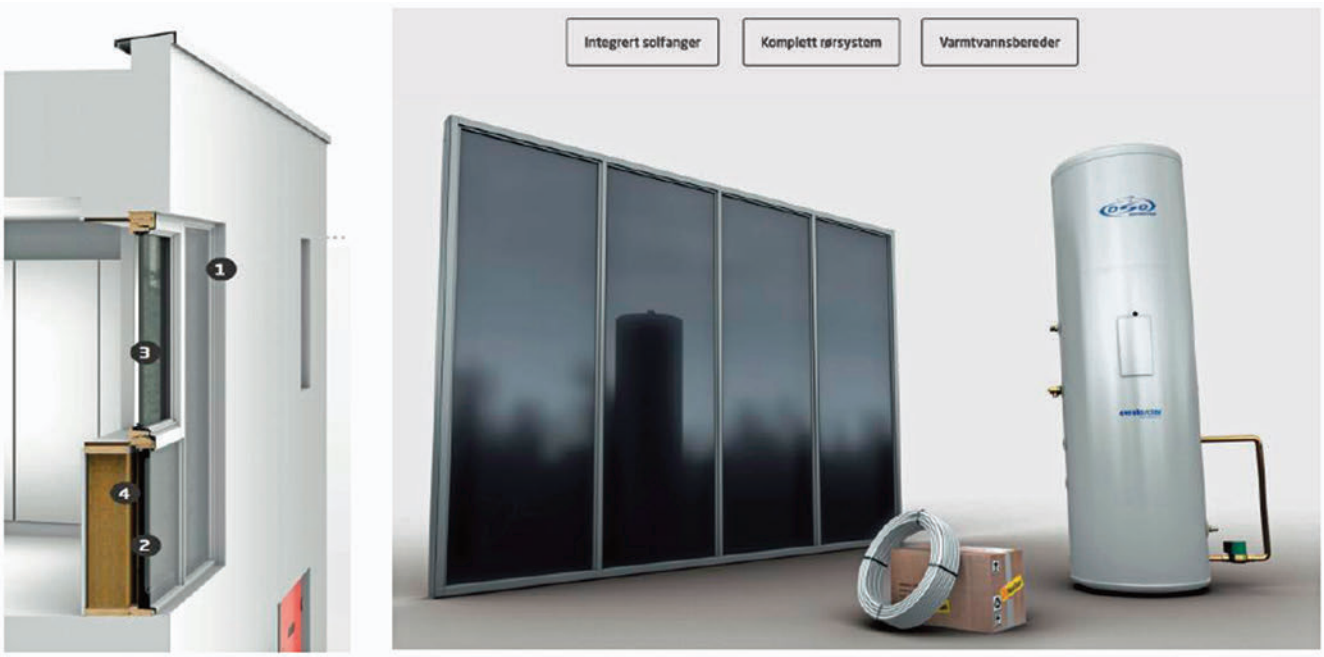


Cross section of the lower part of the AventaSolar collector showing individual components



AventaSolar collectors integrated in the tilted roof

The NorDan Solar concept



Left: Cross-section of the collector facade with 1) long and 2) short collector window, 3) standard window combined with collector window, 4) The wall behind a collector window is as thermally insulated as a standard wall.

Right: Standardised NorDan Solar delivery package: Collector window, 300 l AventaSolar OSO heat store, solar pump and controller, Uponor pipes with quick-and-easy connectors.

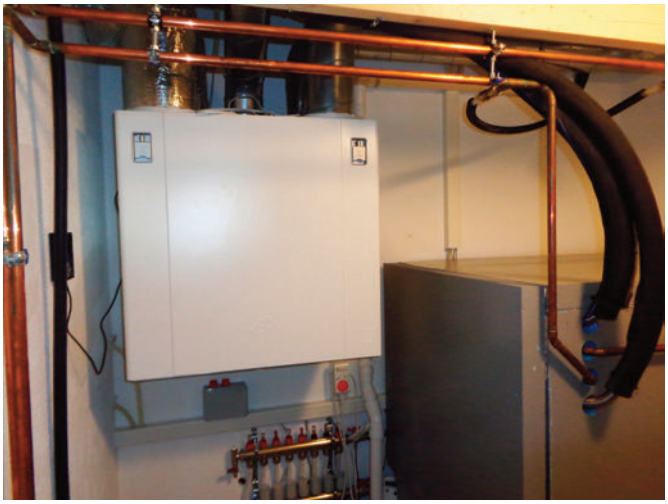
The NorDan Solar concept: First three installations of NorDan Solar in Norway

BUILDER:
OBOS
DEVELOPMENT:
STENBRÅTLIA, OSLO (NORWAY)

Roof terrace with approx. 14m² Aventa Solar Thermal collector. This technology has a far better yearly COP (coefficient of performance) than outdoor air heat pumps

Roofs consisting of Aventa Solar Thermal collectors

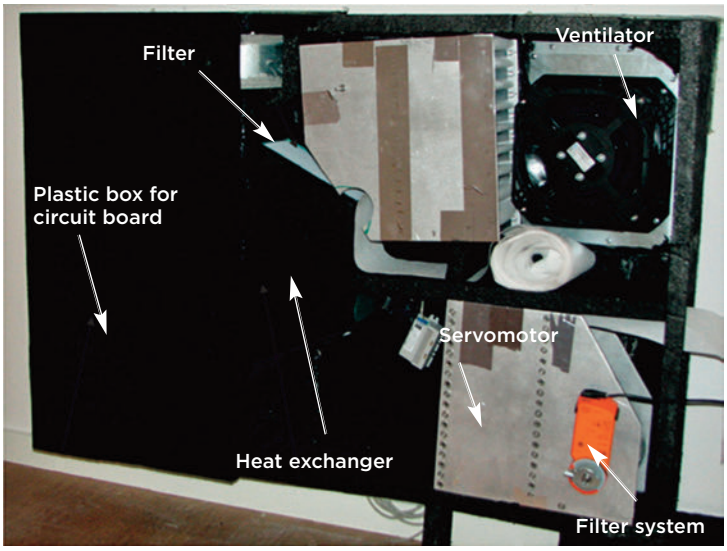
The Aventa Solar Thermal collector can be delivered in all chosen lengths, so it fits into a building



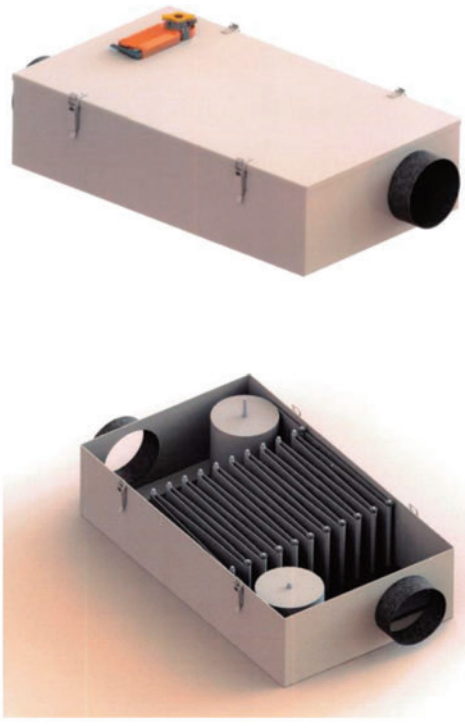
Heat recovery ventilation system

Innovative heat recovery ventilation design development including window integrated HRV units and integrated automatic filter exchange box.

Ecovent window or wall integrated HRV unit in situ

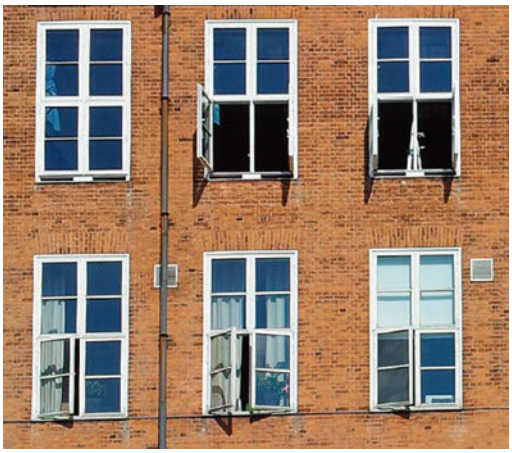


Inside the Ecovent HRV unit

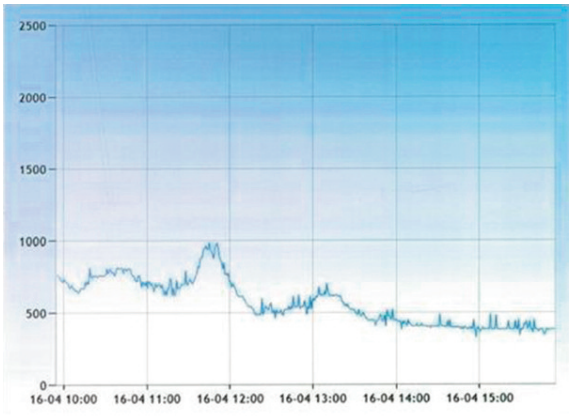


Example of seperate Unifilter box

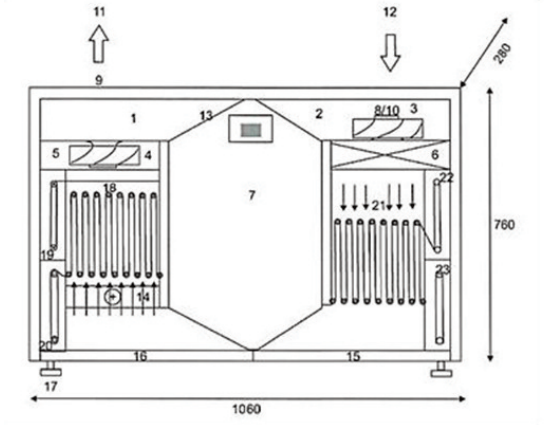
Ecovent HRV systems in test classroom at Grøndalsvænge School in Copenhagen



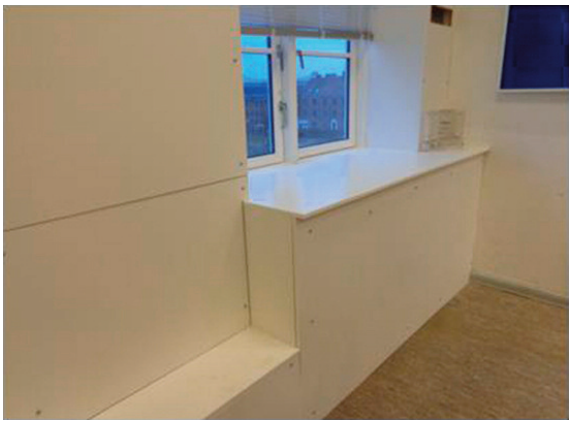
New windows with integrated fresh air intakes and exhaust outlet in window frame



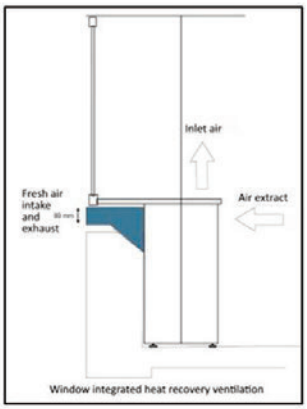
CO_2 level below 1000 ppm



3. **Fresh air fan**
4. **Exhaust fan**
7. **Air to air heat exchanger**
13. **Control**
14. **Heating element**
18. **Automatic filter system (inlet)**
21. **Automatic filter system (exhaust)**
22. **Clean filter material**
23. **Used filter material**



Window integrated HRV system



Experiences from “Trianon” renovation in Lindängen in Malmø, Sweden

Trianon Vårsången, Malmö

- Halvera Mera
  - •Feasibility Study to show how to cut the energy use in half, 2013.
- Trianon ZenN
  - •EU-project Zero Energy Neighbourhoods
- Nordic Built Active Roofs & Facades
  - •Nordic Collaboration
- Innovation splattform Sydost
  - •Local collaboration for research, property owners and municipalities to make sustainable and attractive renovated neighbourhoods
- Bygga-Om Dialogen
  - •Focus on social issues, employment and community involvement.

WSP

Energy Performance after Renovation

Before:
Specifik energianvändning 166 kWh/m²

Basår 2012

- Värme 110 kWh/m²
  - • **After Renovation: 28 kWh/m²**
- Varmvatten 30 kWh/m²
  - • **After Renovation: 24 kWh/m²**
- Fastighetsel 26 kWh/m²
  - • **After Renovation 20 kWh/m²**

After:
Specifik energianvändning 72 kWh/m²

WSP

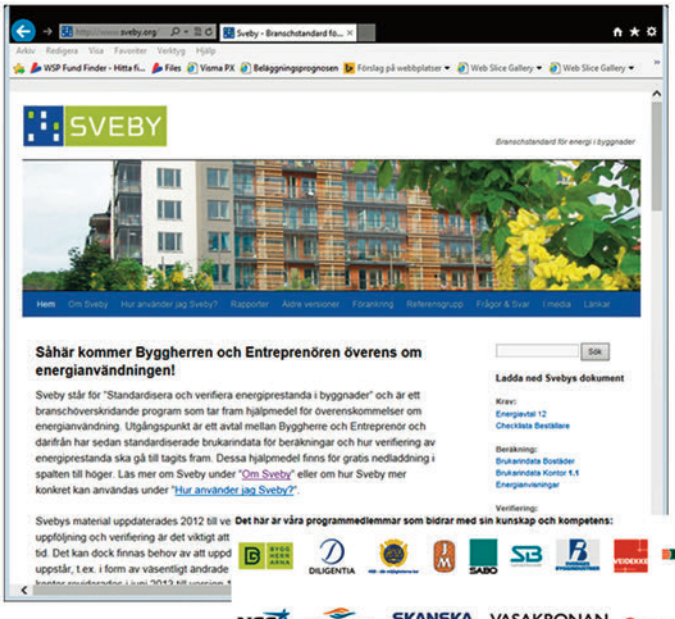
Energy Efficiency Directive Article 9 – Metering

- Boverket has investigated cost-effectiveness and technical feasibility for individual metering of heat and domestic hot water, for
  - New construction
  - Renovation projects
  - Unaltered projects

- **Boverkets investigation shows poor cost-effectiveness in relation to technical feasibility**

WSP

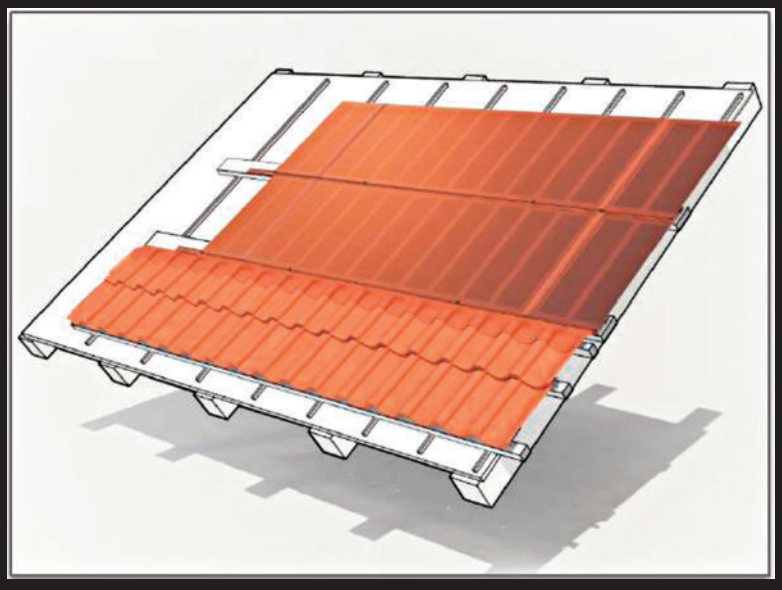
Measures to enhance Performance Documentation

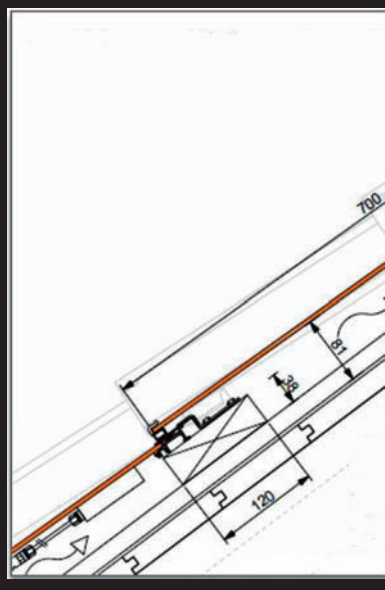


- **Common grounds for property owners and builders**
- **Standardized data for calculations**
- **Interpretations and clarifications of building regulations and requirements**
- **Measures to facilitate and coordinate energy management in construction stage**
- **Quality assurance, for both the builders, property owners and end users**

WSP

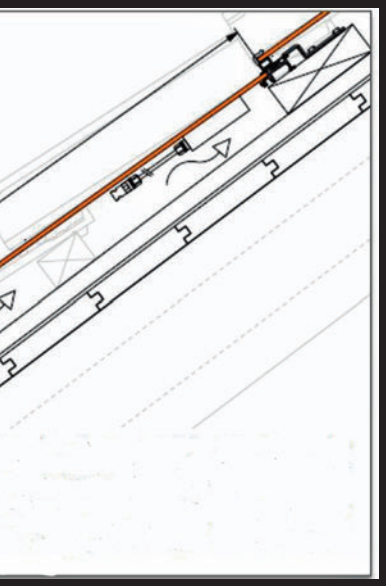
INNOVATIVE USE OF BUILDING INTEGRATED PV SYSTEMS BIPV

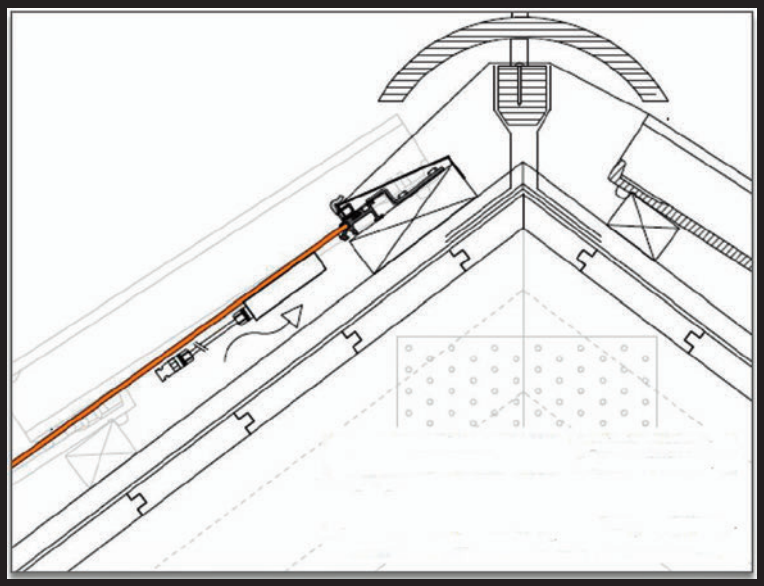




GAIA SOLAR

Technology by Gaia Solar. Visualisation by Architect Henning Larsen of PV integration in Copenhagen. Red tile roofs





Active Roofs and Facades of the future

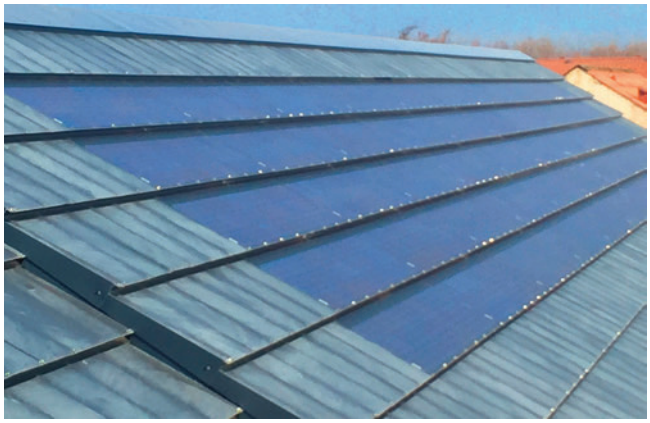
Building integrated PV (BIPV) has now been developed into useful substitutes for normal roof and facade materials, and due to continuous reductions of PV costs on a global scale, the extra costs for electricity producing roofs and facades are becoming more and more marginal.

In some cases, it is therefore possible to have almost similar m^2-costs of PV or BIPV to e.g. natural slate roof costs or costs of Steni facade or roof plates with an up to 60 years' durability.

The costs of PV panels have as a mean been reduced by 36% every year since 1991, and during the last 7-8 years it was reduced by a factor of 10, and a further 50% reduction can be expected before year 2020.

This illustrates the importance of ensuring an aggressive development and practical use of BIPV solutions in Europe so a basis for a future supply of Active Roofs and Facades can be secured.

Below is an example of a recently developed BIPV solution. The diagram on page 3 shows how it is possible for builders to support such a development with help from the international Active House standard.

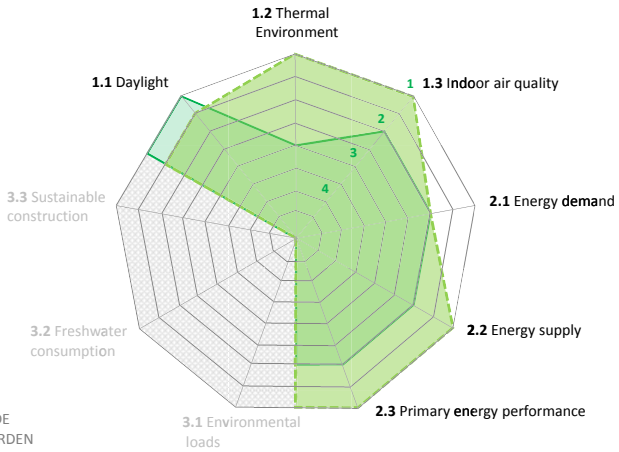


A new developed "Complete Cover" roof from Komproment in Denmark. It also includes a build-in possibility for placing exhaust air armatures, avoiding shadow problems from normal types of exhaust air armatures, and this is with a proven operation quality according to tests at Aalborg University in Denmark.

Nordic Built living in light urban renewal in Valby Copenhagen

Glazed extention with 3 layer Velfac windows according to Active House standard

OVERALL RESULTS
for VALBY PROJECT



TRADITIONAL GLASS FACADE
FACADE WITH SUMMERGARDEN
Environmental criteria / under development

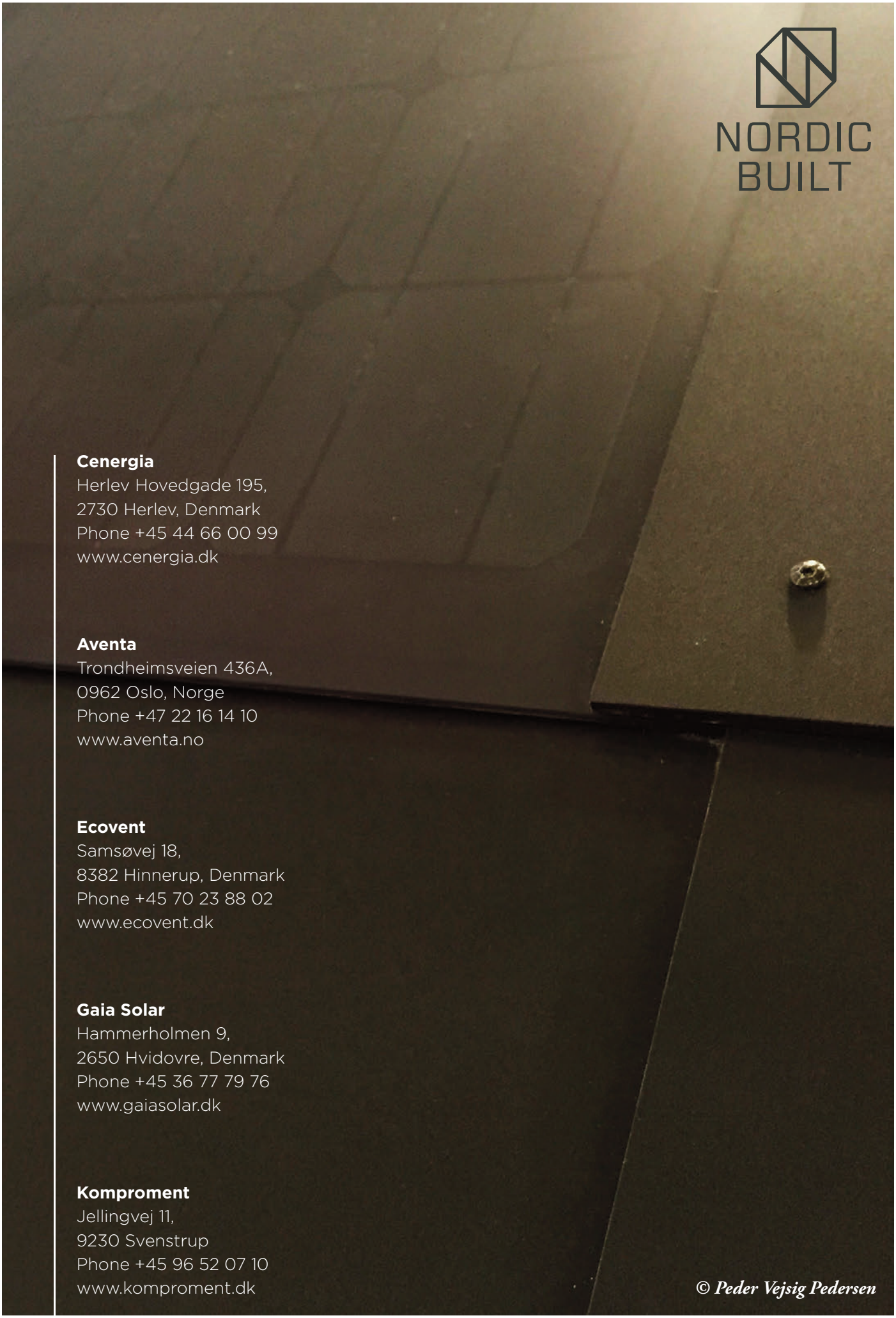
ACTIVE HOUSE EVALUATION of VALBY PROJECT
CONCLUSIONS

FACADE WITH SUMMERGARDEN

NO OVERHEATING ✓

BALANCED ENERGI DEMAND ✓

GOOD DAYLIGHT FACTOR ✓



NORDIC BUILT

Cenergia
Herlev Hovedgade 195,
2730 Herlev, Denmark
Phone +45 44 66 00 99
www.cenergia.dk

Aventa
Trondheimsveien 436A,
0962 Oslo, Norge
Phone +47 22 16 14 10
www.aventa.no

Ecovent
Samsøvej 18,
8382 Hinnerup, Denmark
Phone +45 70 23 88 02
www.ecovent.dk

Gaia Solar
Hammerholmen 9,
2650 Hvidovre, Denmark
Phone +45 36 77 79 76
www.gaiasolar.dk

Kompro ment
Jellingvej 11,
9230 Svenstrup
Phone +45 96 52 07 10
www.kompro ment.dk