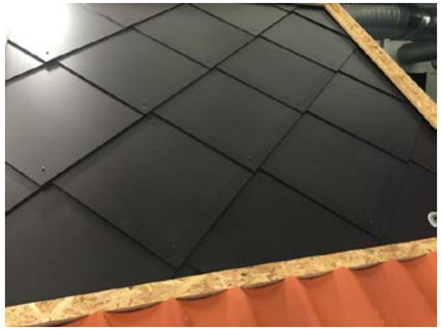
Active House Symposium 2017
#AHsymp17 #ActiveHouse

- TOWARDS A 2025 Standard

Speakers slide



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  - Partner in Cenergia and involved in solar energy / low energy demonstration and RTD for 30 years.
  - Chairman of Active House Denmark
  - Board member of Danish Association of Sustainable Cities and Buildings since 2005

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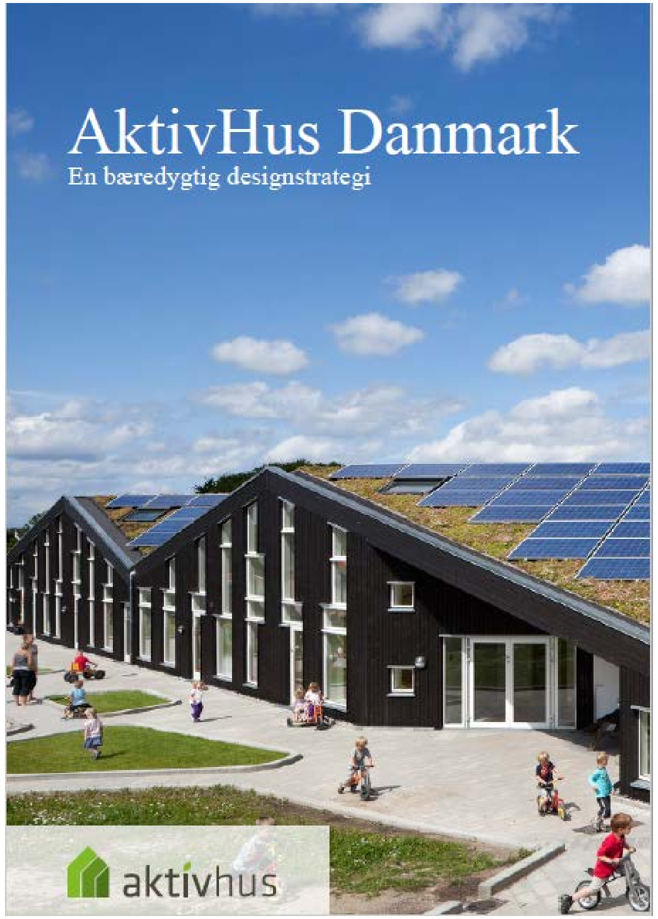
- The Active House standard concerning energy comfort and sustainability can be used in a strong way to communicate the important task of integrating renewable energy in buildings of the future
- In Denmark there does not exist an energy vision for 2025 at present. A possibility could suggest , like stated by the Nordic Built Charter, “That buildings should be CO_2 neutral over its lifetime”, and to use the Active House standard and prosumer levels 1 – 4 to document this in practice.



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- Cenergia – now a part of Kuben Management – has worked on an aim to document "low cost BIPV solutions" as part of an Active House standard. Several example projects has been developed incl. the small Active House test house, "Living in Light Box"

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- Building integrated PV
  Based on the huge reductions in costs of PV panels, there are now many examples of electricity producing building skins, which only have very marginal extra costs compared to normal building skins.
- Energy visions for 2025
  The passive house standard has documented in practice, that you can actually realise buildings with a very limited heating demand.
  A vision for the ActiveHouse standard can be to include a standard for different levels of zero energy building by help of renewable energy (by different prosumer levels)

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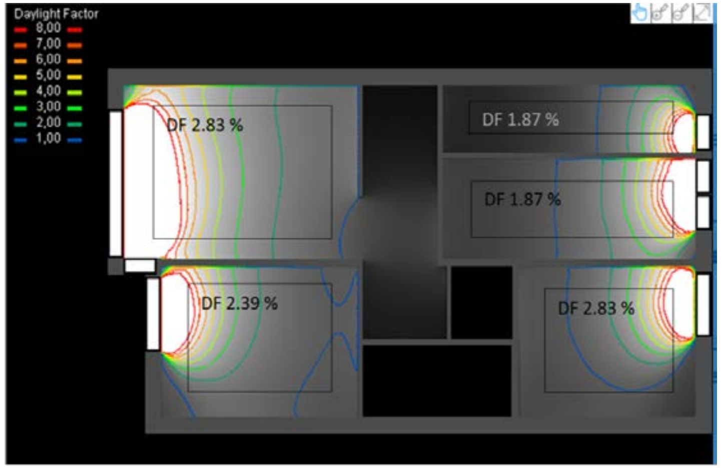

Daylight factor evaluation in the apartment of the 3. floor

- In Denmark we have the low energy class 2020 as an option for an improved low energy standard, you can use already today compared to the existing building standard from 2015.

- Here is introduced new factors for district heating, where you can multiply the demands with a factor 0,6, and for electricity with a factor 1,8, (normal building regulation factors here is today 0,8 and 2,5).
This makes it possible to reach an energy use of only 20 kWh/m²,year, perhaps with a small contribution from PV panels as well.

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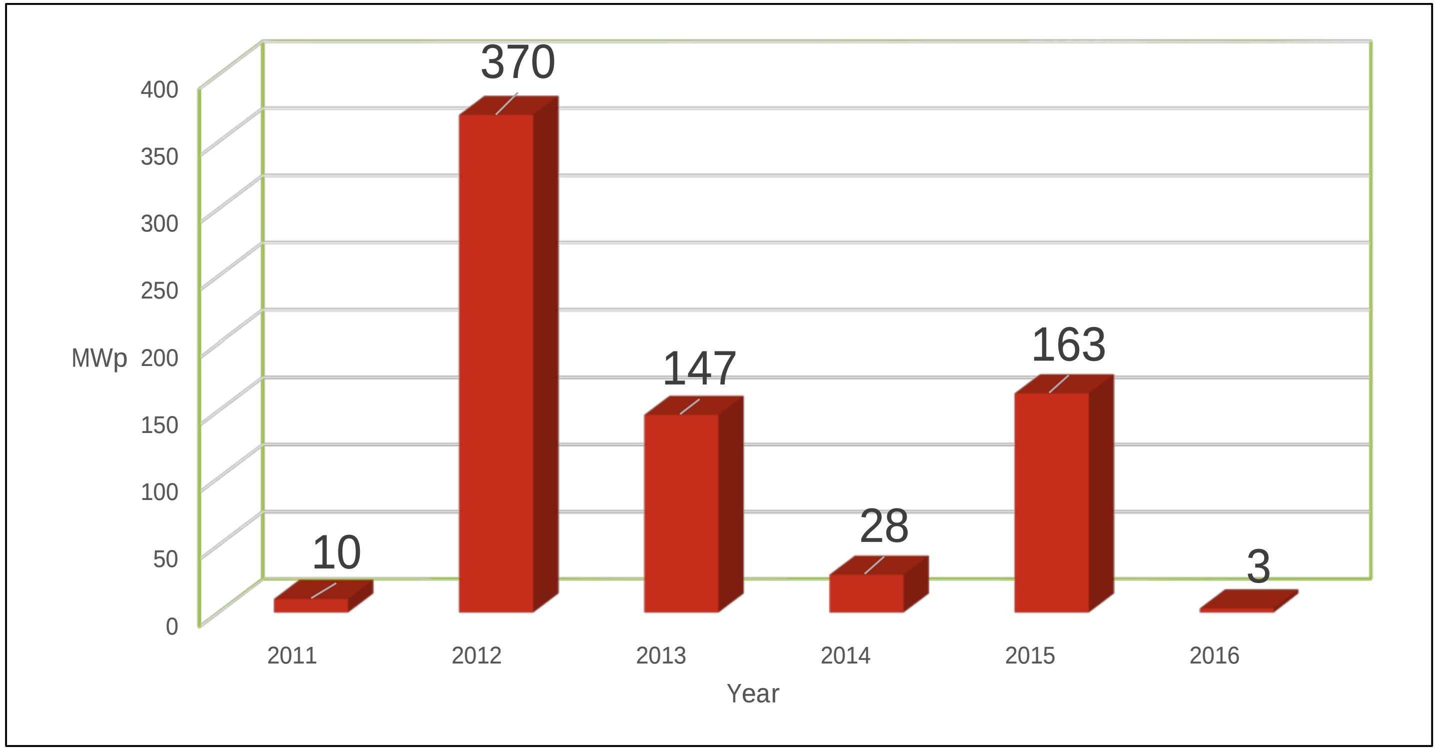
- Overview of fragmented PV installations in Denmark from 2011 to 2017 (721 MWp in total)



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Active House Denmark, Building Green, Copenhagen 2015

- AAU-IDA 2050 plan suggest 200 MWp per year to be implemented until 2050 reaching 5.000 MWp (covering around 5% of electricity use)

- Active House building combining Low Energy Class 2020, with prosumer level 1, 2, 3 and 4 for new building, larger renovations and new city areas, could help secure a stable BIPV market, which would not be stopped by regulation.

- Can help secure good architecture, a stable BIPV market and Active House quality

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- Illustration of how a low energy class 2020 building can look like with respect to windows to avoid overheating (new housing example from Aarhus)

Only limited window area towards south to avoid overheating

Large window areas towards north will not give problems with overheating and secures good daylight.

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- It has been argued that it could be beneficial to avoid the renewable energy contribution in building standards towards 2025. In that case you would need another way to highlight , how you try to reach an almost zero energy building standard

- A solution here could as mentioned be to introduce different “prosumer” levels, e.g. 1-4 the same way as the Active House Radar works. And to have prosumer level 1 as the best equal to a 100% zero energy or CO_2 neutral level

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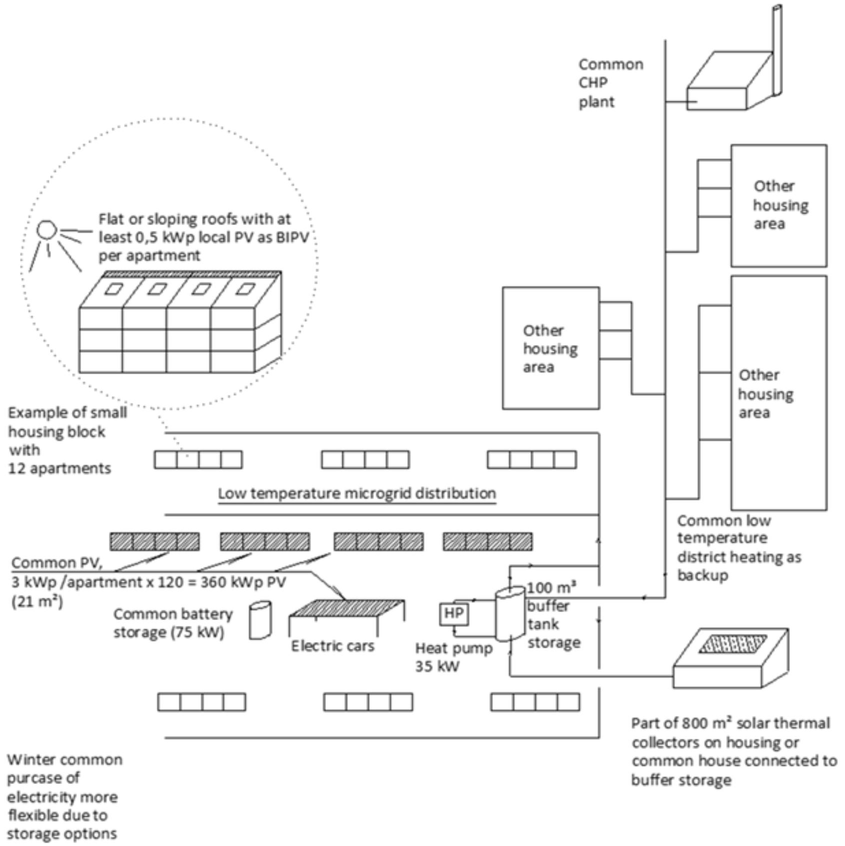
- The proposed prosumer levels 1-4 could be promoted towards e.g. cities and housing organisations, which wants to realise an ambitious energy standard towards 2025.
- An extra benefit in Denmark would also be that it would make it much easier for cities to implement use of e.g. building integrated PV, if they are part of an official energy standard.
- Besides it could be combined with the Active House standard in a really god way.



Example of CO_2 neutral Active House Building areas

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- The possibility of also using the new Danish “sustainable building” database of FBBB outside Denmark has been investigated. Now it is aimed that also different Nordic best practice examples can be introduced in the database www.bæredygtigebygninger.dk

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Foreningen Bæredygtige Byer og Bygninger

- A number of good BIPV solutions can be found at

  www.bæredygtigebygninger.dk

  the database managed by Foreningen Bæredygtige Byer og Bygninger, FBBB / European Green Cities

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- Best practice demonstration at the new database www.bæredygtigebygninger.dk, which will be expanded to cover Norway and Sweden as well. Includes Copenhagen International School, where all facades (1.860 m²) are BIPV, the largest BIPV installation in Europe (May 2017)

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Possibility for performance documentation

Foreningen Bæredygtige Byer og Bygninger

Klimaskærm

LCA

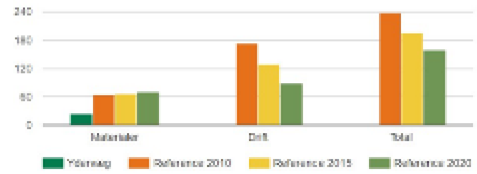
Beskrivelse af konstruktionen

Ydervæggens samlede miljøbelastning fremgår af graferne til venstre. Miljøbelastningen er beregnet for en periode på 50 år ud fra ydervæggens opbygning og U-værdi.

Ydervæggen er udført som fletmurværk med en U-værdi på ca. 0,22 W/m²K og en samlet tykkelse på ca. 265 mm.

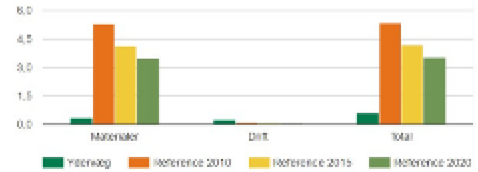
Global opvarmning (GWP)
(Kg CO2-ækv./m2 ydervæg)

	Materialer	Drift	Total
Beregnet	23,6	-418	-394,4
Reference 2010	65,4	173	238,4
Reference 2015	67,2	129,1	196,3
Reference 2020	70,6	88,1	158,7



Nedbrydning af ozonlaget (ODP)
(E-06 kg R11-ækv./m2 ydervæg)

	Materialer	Drift	Total
Beregnet	0,828	0,268	0,096
Reference 2010	5,28	0,0786	5,3586
Reference 2015	4,11	0,0587	4,1687
Reference 2020	3,47	0,0401	3,5101



Ydervæggen består af følgende materialer:

25 mm træbeklædning af thuja, 25 mm afstandsliste af træ, 200 mm papiruldsisolering inkl. træskelet, 15 mm gipsplade

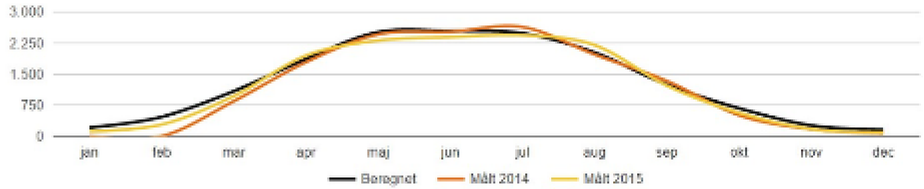
Energiproduktion, deltaljeret

Solceller

Beskrivelse:
Solcellerne bliver fjernaflæst og koblet op på Furesø Kommunes interne overvågningssystem, hvorfra det følgende monitoreringsdata stammer fra.

Producent: Gaia Solar
Solfangertype: Krystallinske solceller
Orientering: Syd/øst
Anlæggets størrelse: 140 m²
Hældning: 15 °
Anlæggets størrelse: 18,24 kWp

Anlæggets ydeevne i kWh:



Erfaringer:
Der er i tilbudslisten fra leverandøren givet en gennemsnitlig produktion for første år på 15.518 kWh. Solcelleanlægget producerede fra marts 2014 til december 2014 14.314 kWh. I 2015 producerede solcelleanlægget 14.719 kWh, hvilket er 5,2 % under den angivet gennemsnitlige produktion. Der har ikke været installeret nogen separat solskinsmåler i forbindelse med installeringen af solcelleanlægget og deraf ikke muligt at evaluere solcelleanlæggets ydelse med korrigeret vejrdata.

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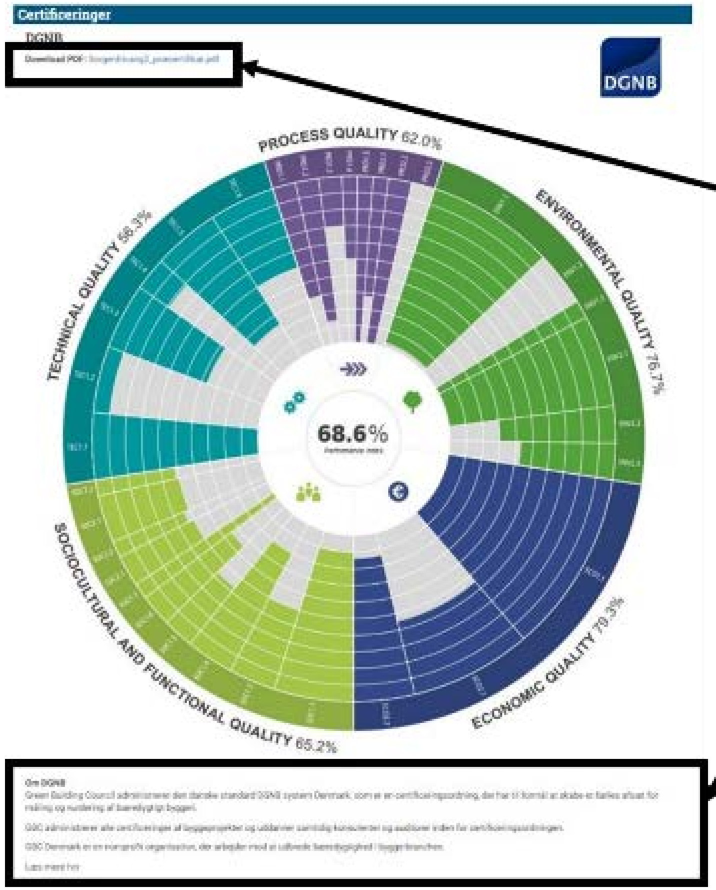

Mulighed for fremvisning af certificering

Mulighed for rapport om certificiering som pdf

Beskrivelse af valgt certificering

Example of DGNB certification

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Results from Nordic Built projects
- Active Roofs and Facades in Sustainable Renovation, see: www.activehouseroofsandfacades.com
- Living in Light, see: livinginlightbuildings.com

Nordic Sustainable Buildings database
Developed from www.bæredygtigebygninger.dk

International Active House Labelling – standard (www.activehouse.info)
- Energy
- Comfort
- Sustainability

Introduction of Methodology for:

Zero Emission City Areas

Zero Emission Buildings

- in different levels

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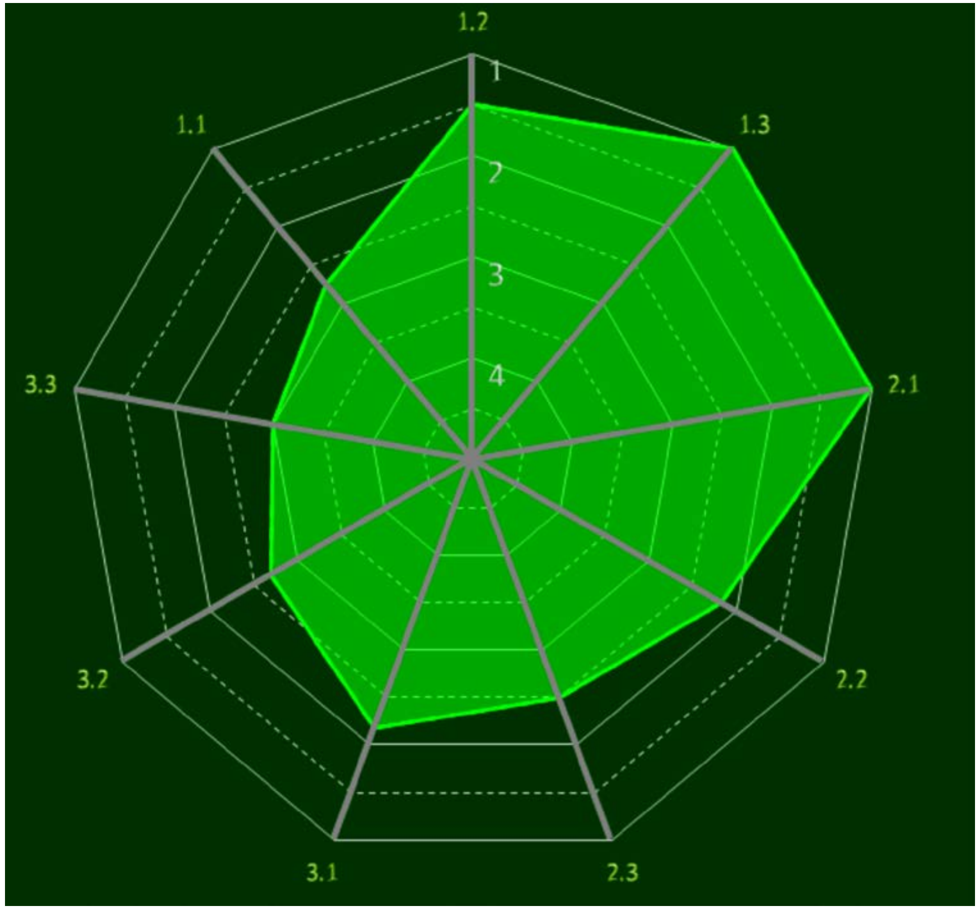
- Active House Radar for Nordic Built challenge winner, Ellebo Garden Room housing renovation in Ballerup with KAB housing association.



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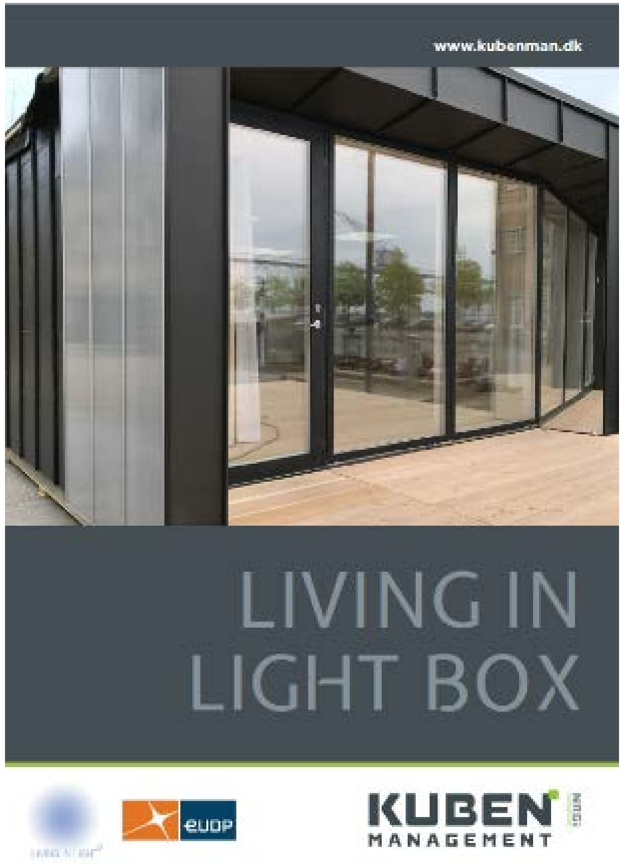
- Active House test house

Living in Light Box



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- The construction at Husfabrikken in Assens

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- The transportation to The Architectural School of Copenhagen at Holmen

Facts

Supplier: Husfabrikken

Contact: Claus Valsøe, cv@husfabrikken.dk

Suppliers in cooperation with Husfabrikken

Lilleheden, Klaus Becker, Kb@lilleheden.dk

Golan Pipe Systems, Martin Have, mh@golan.dk

Build a House, Casper La Cour, casper@buildahouse.dk

Kroghs, Erling Johansen, ej@kroghs-as.dk

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- ”Summer Garden” at the Valby project

THE SUMMER GARDEN

In cooperation with Velfac and Torben Thyregod, the Living in Light Box will be testing the “Summer Garden” concept, BOLIGHAVEN, which is a new development of the traditional winter garden.

Here is utilised the much improved quality of window systems. And from 2017 these principles will be implemented in a new urban renewal housing renovation project at Gl. Jernbanevej in Valby, Copenhagen.

The idea with the “Summer Garden” is that in the summertime, part of the living room along the facade will be utilised as an exterior area. This is secured by help of two different window façades, which is used in summer periods and in winter periods. The winter façade is the glass façade which is the exterior. This has a u-value of 0.9 W/m²°C. The summer façade is the inner glass façade and has a higher u-value. There is in the Living in Light Box used another summer façade solution that there is going to be used in Gl. Jernbanevej project.

In the summer, the exterior glass façade will be opened and the inner glass façade will function as an active facade. By help of this, the “Summer Garden” is introduced as a covered exterior outdoor space, where the cover also function as a horizontal solar shading system.

During winter, the outer façade is closed and the inner glass facade is opened. In this way, the whole space is useful as heated space area.

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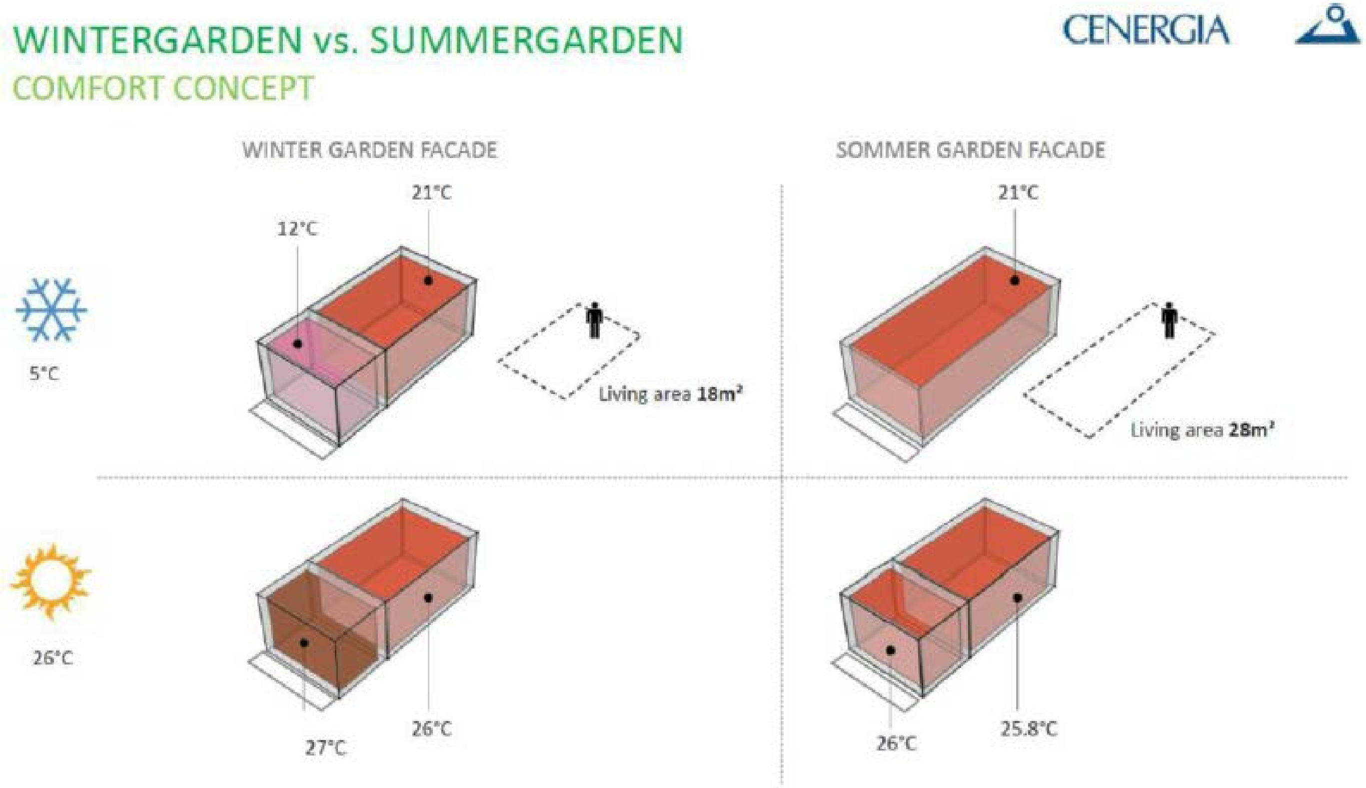

- The winter garden vs. the summer garden concept.

- The “Summer Garden” is depending on an active role from the tenants. They will feel, that it will be too hot in summer, if they do not open the outer glass façade, while it will be too cold, if it’s not closed in winter. The illustration here is without the roof windows from VELUX.

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- VELUX roof window.

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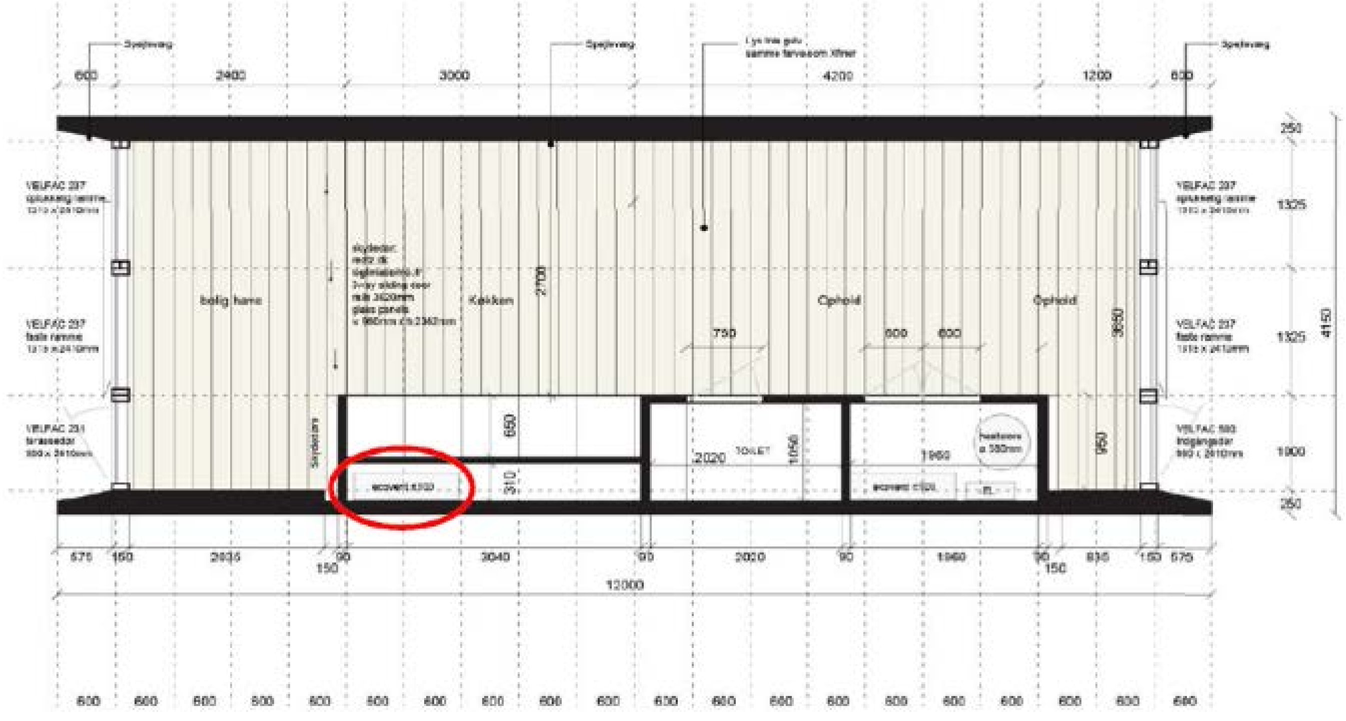
- **DECENTRAL VENTILATION**

In the Living in Light Box there is installed a decentralised ventilation unit with heat recovery, which is integrated into the kitchen wall. The idea here is to demonstrate a low electricity consumption decentralised solution, which is useful for renovation projects, and where also the inlet air solution is building integrated, here utilising a normal building plate with holes in for introducing fresh air to the housing unit without draft or noise. To secure easy maintenance an innovative automatic filter system is used, which only need to be exchanged every 5 years.



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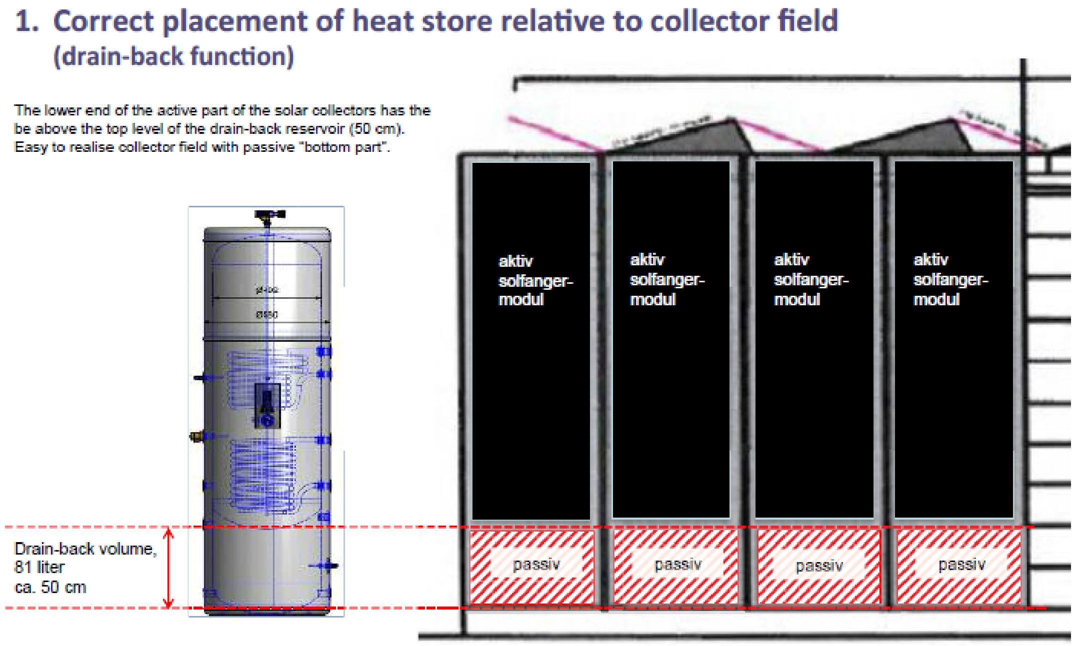

- Illustration of the solar collector solution

- **SOLAR THERMAL COLLECTOR SYSTEM**
- On the south façade of the Living in Light Box, 12 m² façade integrated solar thermal collectors from the Norwegian company Aventa are installed, which will take care of both room heating and the domestic hot water (DHW) demand, supplemented by an electrical heating supply. The experience from Norway is that it is possible to obtain a coefficient of performance (COP) of 3.0, which is just as good as heat pumps according to the Norwegian research institution SINTEF. And since it is aimed to obtain a CO_2 neutral operation on a yearly basis, it is the idea that as much of the electrical heat supply as possible will be secured from the PV modules and the connected battery used in the Living in Light Box.

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- **Calculations of Aventa Solar heating system in the Living in Light Box in Copenhagen**
- Here is illustrated that a yearly solar contribution of 68 % of the heating demand should be possible to obtain. Simulations performed with SolDat v. 1.2.

Simulation results		Month	Solar irradiation	Heat demand	Solar gain	Auxiliary heat	Solar Fraction
TESLA House, Copenhagen			(kWh/m² month)	(kWh/month)	(kWh/month)	(kWh/month)	(%)
		January	27.2	302.1	94	208.1	31
Input parameters for simulation:		February	58	274.6	167.9	106.7	61
Latitude (º)	55.7	March	72.5	240.3	152.7	87.6	64
Solar collector area (m²)	12	April	111.1	165.1	165.1	0	100
Tilt angle (º)	90	May	107.4	54.1	54.1	0	100
Azimuth angle (grader)	0	June	90.7	30.7	30.7	0	100
Active heat store volume (litres)	250	July	82.3	30.9	30.9	0	100
DHW consumption (litres/day)	0	August	89.8	32.9	32.9	0	100
DHW temperature (ºC)	55	September	92.3	54.2	54.2	0	100
Temperature heat distribution (ºC)	30	October	101.9	177.4	174.7	2.7	98
Base heat demand (kWh/day)	1	November	46.4	233.5	153	80.5	66
Heat loss coefficient (kWh/(K day))	0.5	December	51.3	303.6	181.5	122.1	60
Threshold temperature for heating (ºC)	16	**SUM**	**930.9**	**1899.4**	**1291.7**	**607.7**	**68**

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MEASUREMENT, INTEGRATED CONTROL AND FEEDBACK

A wide measurement setup is realized in the Living in Light Box. Inspired by the Active House specification, both comfort, energy and environmental parameters is measured and saved for later analyses, but also for realizing of a real-time Active House Radar, where the performance and the influence of the users behaviour is visualized. (See also: www.activehouse.info)

To realize this the following measurements will be made during next year by Visility:

- Electricity split into 9 groups;
- Energy used for heating;
- Energy used for hot water production;
- Amount of hot and cold water;
- Temperatures;
- Humidity, CO_2;
- Performance of ventilation.

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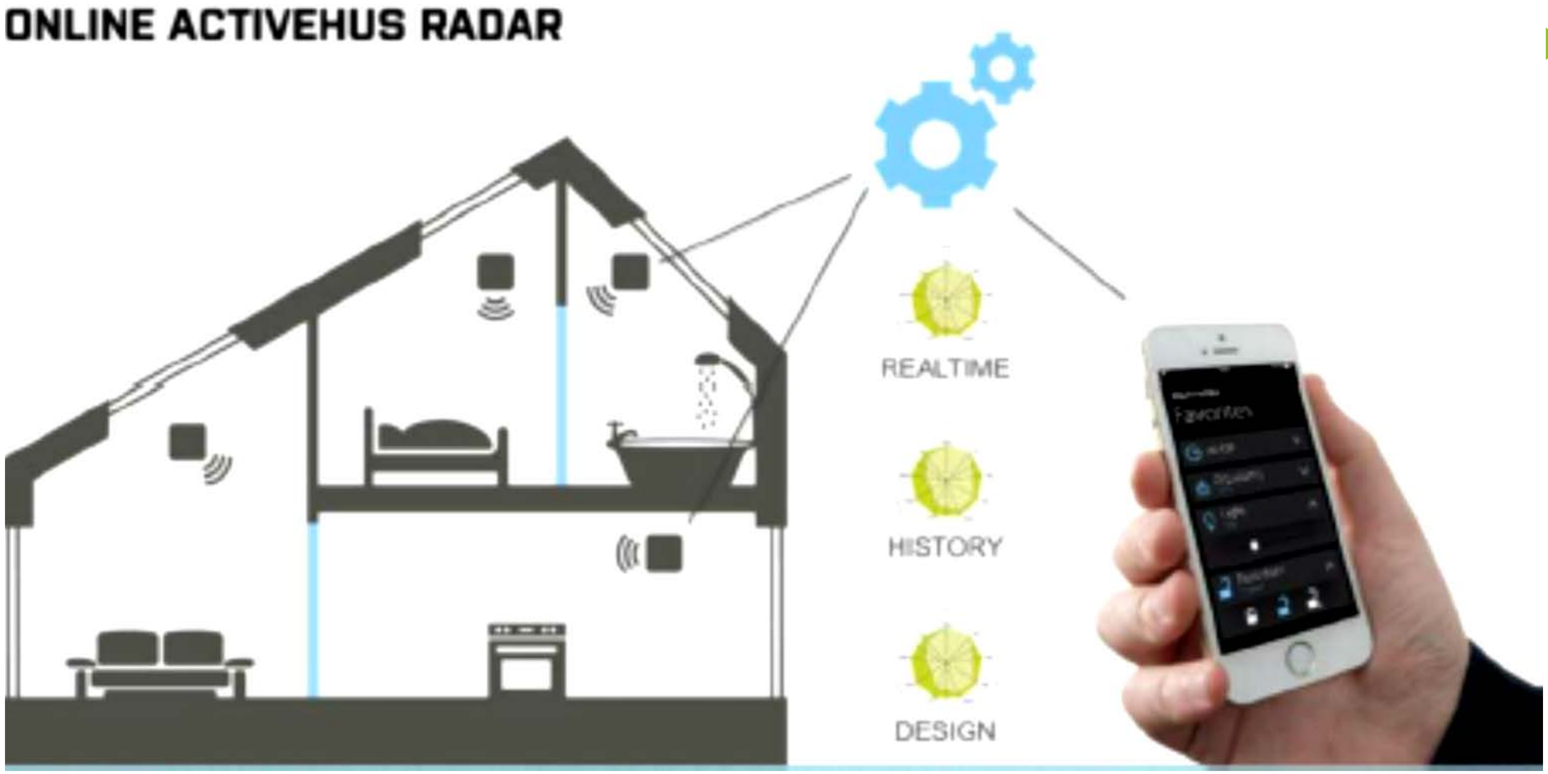

- In addition, Visility will demonstrate a natural ventilation solution, developed with AAU, Velux and Dovista, with the addition of integration with the Ecovent decentralized ventilation. With the integration, we combine the best from both natural ventilation and mechanical ventilation. The control strategies cover both indoor air quality and cooling.

- As part of the project an online Active House Radar will be demonstrated

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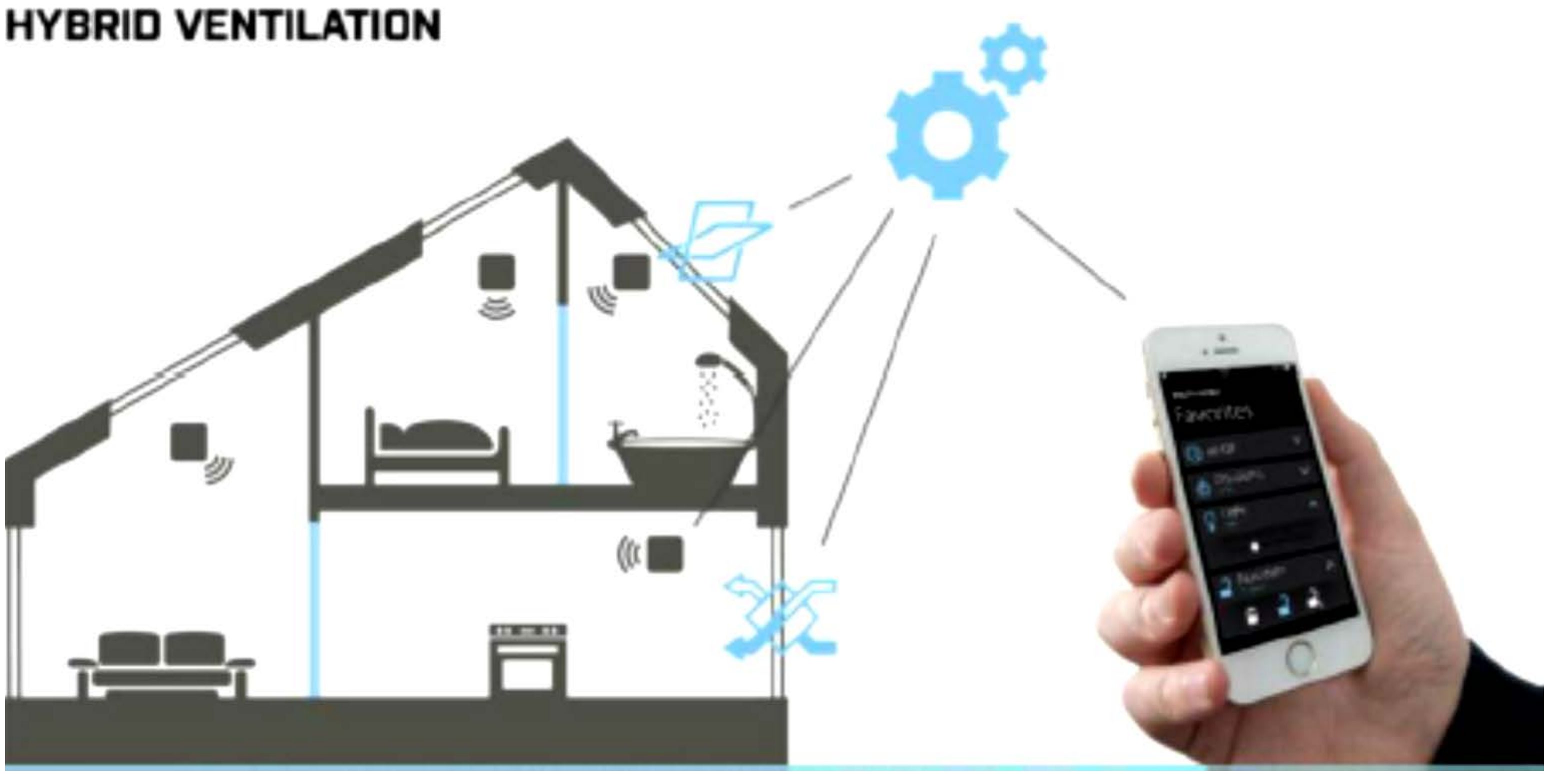

Facts
Supplier: Visility ApS
Contact: Thøger Lyme, Tel: 31 792 792

- A hybrid ventilation solution will be demonstrated

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Active House evaluation

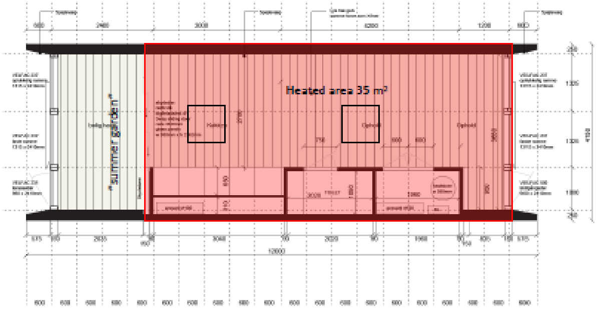
Figure 1. Living in light box placed on [illegible]

Active house evaluation and summer garden test

The living in light Box is a prefabricated active house full scale testing unit realized in connection to the Nordic Built projects "Living in Light" and "Active Roofs and Facade in Sustainable Renovation".
The "Living in Light" concept is applied to the renovation and urban renewal of a small housing block in Copenhagen.
The aim of this demonstration unit is to prove the benefits of a synergy between Energy, Comfort and Sustainability, like is known from the Active House Standard.
The main characteristic of the "Living in Light" concept is the summer garden space, which is a new developed idea of the traditional winter garden also known as a green house or a sunspace.
This is an enclosed area by two glass facades. The exterior glass facade and the inner sliding glass door. The concept has been created by closing the existing terrace of the apartment. This new space has different functions along the year:

1- Winter time: The outer glass façade is closed and the interior sliding door is open. Therefore, the " summer garden" is included in the living space , resulting in a larger heated space area.

2- Summer time: The outer glass façade is open and the inner sliding door is closed. In this case, the "summer garden" is introduced as a traditional covered exterior outdoor space and it is not included in the heated area. The cover also functions as a horizontal solar shading system. The cover reduces the risk of overheating of the main living area since the direct solar radiation is concentrated onto the "summer garden"



The role of the "summer garden" will be defined by the tenant. They may feel too hot in summer if they do not open the outer glass facade, while they may feel too cold if it is open in winter. Hence, both scenarios have been evaluated and reported in this paper. The combination of both results will give a final active house radar.

1. COMFORT
   1.1. DAYLIGHT

The daylight factor is evaluated by VELUX daylight visualizer 3. [1] The Building material have the following characteristics:

Tabel 1: Building envelop characteristics inputs for DF evaluation

Building envelop element	Reflectance factor	Light transmittance
Light wooden floor	0,842	
Light wooden ceiling	0,842	
Light wooden wall	0,842	
Skylight	0,920 (white frame)	0,72 [2]
Facade door	0 (black frame)	0,71 [3]

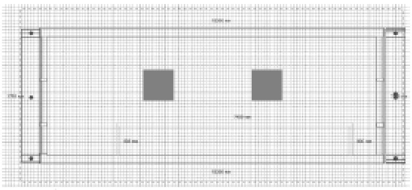


Figure 2. Box design

Figure 3. Indoor perspective

Winter scenario:

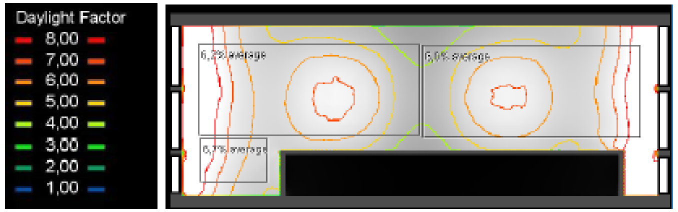


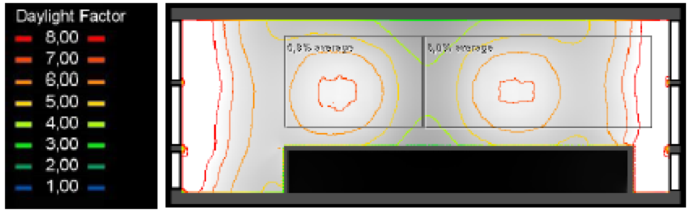
Figure 4. Daylight simulation in Living in light box

The DF is measured for the utilized area 500 mm of distance from the walls. The DF found is described in Tabel 2.

Tabel 2. DF evaluation of each activity and living zone

Area	DF	Areas	Occupancy
"Summer garden" (small)	6,7%	2,28	0,304
Kitchen with "summer garden"	6,2%	14,45	0,304
Bedroom	6,0%	14,14	0,304
Average	6,1 %		
Active house score	1 (DF >5% on average)		

Summer scenario:



Area	DF	Areas	Occupancy
Kitchen	5,8%	8,7	0,304
Bedroom	6 %	14,14	0,304
Average	5,9 %		
Active house score	1 (DF >5% on average)		

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- Combined results for winter and summer scenario