


## Green Solution House

by [Stephanie Miller](#) / 2015-07-07 13:10:20 / International / 13738 / EN



Extension + refurbishment

Primary energy need :

36 kWhpe/m<sup>2</sup>.year

(Calculation method : Other )

**ENERGY CONSUMPTION**

*Economical building* *Building*

< 50	A
51 à 90	B
91 à 150	C
151 à 230	D
231 à 330	E
331 à 450	F
> 450	G

*Energy-intensive building*

**Building Type** : Hotel, boarding house  
**Construction Year** : 2015  
**Delivery year** : 2015  
**Address 1 - street** : 3700 RøNNE, Denmark  
**Climate zone** : [Cfc] Marine Cool Winter & summer- Mild with no dry season.

**Net Floor Area** : 4 500 m<sup>2</sup>  
**Construction/refurbishment cost** : 8 700 000 €  
**Number of Bedroom** : 92 Bedroom  
**Cost/m2** : 1933.33 €/m<sup>2</sup>

**Certifications :**



**Proposed by :**



### General information

GXN teamed with the owners of the Green Solution House to build both a successful business and a demonstration of **circular sustainability**. The renovation and expansion of this 4,500m<sup>2</sup> hotel and conference center on the Danish island of Bornholm supports a positive, healthy footprint and aspires to **eliminate the concept of waste** by applying 75 sustainable solutions across all aspects of the project, from building materials and systems to energy generation and monitoring.

GXN and our client designed the Green Solution House to evolve and improve over time. **All products and technologies are, in principle, replaceable with their more sustainable counterparts throughout the life of the building.**

[See more details about this project](#)

<http://gxn.3xn.com/#/projects/by-year/26-green-solution-house>

<https://stateofgreen.com/en/profiles/green-solution-house>

<http://www.greensolutionhouse.dk/>

## Stakeholders

### Stakeholders

Function : Contractor

Green Solution House

CEO Mrs. Trine Richter

[HTTPS://greensolutionhouse.dk](https://greensolutionhouse.dk)

Function : Designer

GXN

Design Architect and Sustainability Consultant

### Contracting method

General Contractor

### Type of market

Table 'c21\_maroc.rex\_market\_type' doesn't exist

<https://www.construction21.org/data/sources/users/15011/partners-green-solution-house.pptx>

### If you had to do it again?

One big learning from the project - my very first buildingproject - is that the building industry in general is not very innovative, and there is a huge communication gap between the different partners. To say it short: Architects have no respect of engineers, architects and engineers have no respect of the contractor and none of them listens to the investor/owner. In general everybody wants to do it there way, and to make money they turn to "copy and paste" eventhough the owner wants to be innovative - simply because the incentive structure in the building industry is based on "fast in fast out". 90% of my time has been used on communication trying to get people to work together, to create momentum and "translate" the differenc language each partner uses. My buildings are 1. generations. The money I earn on operating the hotel will be reinvested to create 2.nd generation of the building with new materials and solutions. The buildings will never stop changing. Next time - I will work together with smaller companies when I choose advisors - especially the engineers - I rather be a big customer in a small company, than a small one in a big company.

### Building users opinion

The delegates at conferences in our new conferencefacilities say: Because the indoor climate is so wonderfull and there are so much daylight we feel fresh even after a long day of plenty slideshows.

## Energy

### Energy consumption

Primary energy need : 36,00 kWhpe/m<sup>2</sup>.year

Primary energy need for standard building : 42,00 kWhpe/m<sup>2</sup>.year

Calculation method : Other

Initial consumption : 36,00 kWhpe/m<sup>2</sup>.year

### Envelope performance

Envelope U-Value : 0,60 W.m<sup>-2</sup>.K<sup>-1</sup>

More information :

See the attached calculations

Indicator :

Air Tightness Value : 0,95

### Systems

#### Heating system :

- Heat pump
- Others
- Solar thermal

#### Hot water system :

- Solar Thermal
- Other hot water system

#### Cooling system :

- Others

#### Ventilation system :

- Natural ventilation

#### Renewable systems :

- Solar photovoltaic
- Solar Thermal
- Heat pump (geothermal)
- Energy recovery from waste

### Smart Building

**Users' opinion on the Smart Building functions :** The building has been in use for a couple of months so we do not have all figures now and we do not have much feedback yet.

## Environment

### Urban environment

The urban planning has been developed together with the neighbours and the municipality.

**Land plot area :** 65 000,00 m<sup>2</sup>

**Built-up area :** 8 000,00 %

**Green space :** 55 000,00

## Products

### Product

Velux Modular Skylight

Velux Group

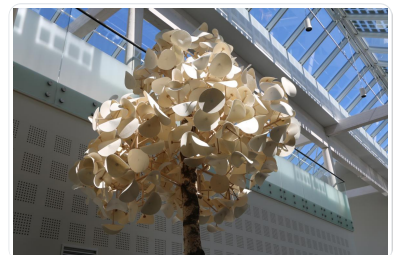
Mr. Brian Wendin

<https://velux.com>

**Product category :** Gros œuvre / Structure, maçonnerie, façade

SKylight with solarpanels

Its a innovative way of combining a roof with producing electricity

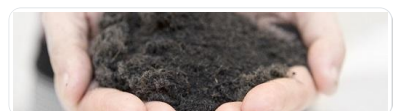


Pyrolysis Plant

<https://stateofgreen.com/en/profiles/green-solution-house/solutions/energy-from-waste>

**Product category :** Aménagement extérieurs / Déchets : collecte & valorisation

At Green Solution House we produce energy from food leftovers. All food scraps and organic material from the main building is fed into our own stationary pyrolysis plant, that takes all carbon based waste. The material is first dried and ground, then all the oxygen is removed. The pyrolysis process heats the waste, breaks it down, and then produces natural gas and char. A cyclone separates the gas, producing biochar, that sequesters carbon in a stable state. Biochar is valuable as an additive for the gardens as it improves soil health and water retention. The gas is combusted in a Combined Heat and Power (CHP) engine generating heat and electricity to be used in the building. Excess hot water is



stored onsite in a swimming pool, repurposed as an energy storage system. The pyrolysis plant is self-supporting, and only requires a small amount of energy to start up.

Green Solution House will release approximately 12.4 tons of dry material to the Pyrolysis Plant yearly. The plant has the capacity to process 1 ton of dry material over 6 hours which produces an output of 180 m<sup>3</sup> of gas, 360 kWh of electricity, and 100 kg of biochar.

## Costs

### Construction and exploitation costs

Total cost of the building : 12 €

Subsidies : 2 €

## Health and comfort

### Indoor Air quality

The score for the indoor air quality is 2,0. The score is a result of the function of the fresh air supply system. The air supply system contains a heat recovery unit. In addition to the mech. Ventilation, the room is equipped with a flat-roof window that makes it possible to use natural ventilation during the summer period. Taking the natural ventilation into account the score is 1,0 during wintertime and also 1,0 during summertime (with one person in the room). With two persons in the room, the score is 2,0 during the wintertime and 1,0 during the summertime (total score of 2). The simulation was performed with mechanical ventilation rates according to "byggeprogrammet". The score in the radar is based on two people present in the room. (Active House Report)

### Comfort

**Health & comfort :** We designed the Green Solution House with an intelligent indoor climate to benefit the health and comfort of guests.

Interactive energy visualization, via dedicated monitors in the lobby, displays on-site energy production and consumption correlated to building zones. In addition, two hotel rooms are designated 'Smart Rooms' and feature a custom designed app that tracks the impact of the guest's stay, monitoring water and energy consumption, daylight levels, air quality, temperature and humidity levels. Data from all energy resources is readily available, and therefore it becomes evident when low impact energy or heat is available for consumption. By correlating energy availability to day-to-day routine, the hotel room enables a subtle understanding of how our decisions influence the overall energy and resource profile for the site. When it comes to indoor comfort, the app helps guests correlate their own experience in the hotel room to the quality of the air and daylight levels.

At Green Solution House, we have been successful in balancing the thermal environment for optimal indoor comfort. We achieve comfort by balancing natural ventilation, mechanical ventilation and our heating strategy in response to the seasons. This strategy has resulted in the highest score possible in the Active House analysis of comfort in the building. Our diffuse ventilation strategy supplies fresh air through permeable acoustic panels in the conference center and restaurant ceiling and has two major advantages in terms of indoor climate. First, the even distribution lets us use cooler air without causing discomfort and drafts, and thus reduces supply air requirements and duct sizing. Second, by supplying cool air through the acoustic panels, they act as a chilled ceiling, further supporting comfort by radiative cooling. In floor heating and cooling is supported by our on-site thermal energy storage system. Thermal glazing in the conference center maximizes indoor comfort relative to solar exposure.

The cycle of natural light is fundamental to our wellbeing and ability to maintain a healthy circadian rhythm. Daylight improves productivity and ability to focus along with reducing energy consumption from artificial lighting. Daylight tunnels, redirecting light channels and skylights all bring light deep into the Green Solution House. Conference hall gables are large north-facing glass, which draw natural light into the new meeting areas to enhance attendee productivity.

Active materials create a healthy and pleasant environment: dust absorbing carpets, wall panels that neutralize formaldehyde, a green wall with local ferns that cleans the air and balances humidity levels, roof membrane that captures airborne particulate pollution from traffic by neutralizing nitric oxide particles. In addition, we prioritized certifications and environmental labels, recyclability, social responsibility, use of resources, safety of compounds and energy used in production when selecting materials for the interior.

We created the Third Climate Zone as a dynamic meeting space contemporary. This is a place for meetings, quiet reflection and inspiration. The east wing of the conference center is a unique spatial experience, connecting visitors with nature. As a transitional space, with extensive glazing, views of the site and generous daylighting, this space can be used throughout the seasons. The Third Climate Zone hosts algae generators as part of our on-site biological water purification system, which filters and purifies our wastewater. With the aid of plants and light, the water is recycled and used for irrigation. This water supports the green wall, a key feature of the space, which works to improve the indoor environment. The stone floors can be heated by hot water, generated from solar thermal energy, stored in a repurposed swimming pool.



Measured thermal comfort : 1.0

## Contest

### Reasons for participating in the competition(s)

At Green Solution House we want to inspire our visitors by offering a comfortable stay in a healthy and creative environment. The building and landscape show a holistic approach to sustainable design, emphasising regenerative solutions including healthy indoor climate, renewable energy sources, active materials and recyclability.

### Building candidate in the category

  
  
**Health & Comfort**

  
**Green Building Solutions Awards 2015**  
powered by  Construction21

