

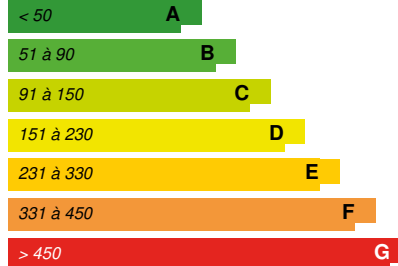
Lark Rise Passivhaus Plus house

Last modified by the author on 19/06/2018 - 12:31



New Construction

2



Building Type : Isolated or semi-detached house
Construction Year : 2014
Delivery year : 2015
Address 1 - street : HP17 0XS AYELSBURY, United Kingdom
Climate zone : [Cfb] Marine Mild Winter, warm summer, no dry season.

Net Floor Area : 175 m²
Construction/refurbishment cost : 1 200 000 €
Number of Dwelling : 1 Dwelling
Cost/m² : 6857.14 €/m²

General information

Lark Rise, the first Passivhaus Plus building in the UK, was rigorously designed and built by Bere Architects in 2015 to test the viability of the concept 'house as power station' in a north European climate and to establish the potential for a cluster of similar houses to draw down energy from the National Grid.

Lark Rise is an ultra-low-energy, all-electric, contemporary and healthy certified Passivhaus Plus home. It is a detached two-storey, two-bedroom dwelling of 175m² located on a North West facing slope on the edge of the Chiltern Hills in Buckinghamshire, England. It is partially prefabricated with heavyweight reinforced concrete retaining construction system to ground floor at garden level and prefabricated timber frame structure to first and floor at entrance level.

The main garden façade faces North West and is entirely glazed, with large windows and a terrace. Solar gains are limited because most of the glazing faces to the North West. Partially underground construction to reduce visual impact on a protected landscape area and northerly orientation certainly help to maintain stable and comfortable temperatures in Summer and Winter and help avoid summer overheating.

The house has been provided with a PV system on the roof designed to generate 12.4 kWp by means of 38 PV panels. The energy consumption and PV production data have been monitored and analysed for 1-year period between Oct-16 and Sep-17 and compared to a UK standard house and other Passivhaus projects achieving outstanding results.

Fully operational (with 13kWh battery storage), Lark Rise is expected to draw from the grid only 2% of the energy a similar sized standard UK house each year, while exporting 10 times this amount back to the grid each year.

See more details about this project

- <https://www.bere.co.uk/architecture/lark-rise/>
- http://passivhausprojekte.de/index.php?lang=en#d_5535
- <https://www.bere.co.uk/research/lark-rise-monitoring-report/>
- <https://www.bere.co.uk/research/lark-rise-self-consumption-study/>

Stakeholders

Contractor

Name : Sandwood Construction Ltd.
Contact : Richard Garland
<http://sandwood.co.uk/>

Construction Manager

Name : Bere Architects
Contact : Justin Bere (Justin.Bere@bere.co.uk)
<https://www.bere.co.uk/>

Stakeholders

Function : Certification company
MEAD: ENERGY & ARCHITECTURAL DESIGN

Kym Mead (kym@meadconsulting.co.uk)

<http://www.meadconsulting.co.uk/>
Passivhaus Plus Certification

Function : Environmental consultancy
Energelio

clement.castel@energelio.fr

<http://www.energelio.fr/>
Environmental Engineers that carried out the self-consumption analysis

Contracting method

General Contractor

Type of market

Realization

If you had to do it again?

We are doing it again for another client, using low-cost construction on a level site at 1/3rd of the cost.

Building users opinion

Very happy that the house is gaining so much interest around the world as a pioneering example that might one day be the norm.

Energy

Energy consumption

Primary energy need : 80,00 kWhpe/m².year
Primary energy need for standard building : 200,00 kWhpe/m².year
Calculation method : Other
CEEB : 0.0001
Breakdown for energy consumption : Heating: 22%
DHW: 10%
MVHR: 9%
Power sockets: 25%
Cooking: 5%
Miscellaneous: 9%
Lighting: 19%

Envelope performance

Envelope U-Value : 0,12 W.m⁻².K⁻¹

More information :

- Below ground walls: concrete basement retaining structure (250mm), exterior Foamed glass insulation (360mm). U-value= 0.118 W/(m²K)
- Above ground walls: Prefabricated timber frame, with mineral wool insulation (300mm), and larch rain screen cladding. U-value = 0.137 W/(m²K)
- Prefabricated Glulam box-beam ceiling, PIR insulation (280mm) and multi-ply hot-melt membrane, extensive green multi-ply bituminous membrane roof. U-value= 0.074 W/(m²K)
- PUR insulation (50mm) and screed with UFH and floor finishes on top of concrete slab (300mm) and foamed glass insulation below-slab (410mm) U-value= 0.076 W/(m²K)
- Passive House certified, insulated triple-glazed timber-framed windows & doors. U_g= 0.60 W/(m²K), U_f= 0.72 W/(m²K), g-value= 62%
- Entrance door: Bayer Passive House insulated timber-framed door. U-value = 0.81 W/(m²K)

Building Compactness Coefficient : 0,21

Indicator : n50

Air Tightness Value : 0,41

Users' control system opinion : It's an incredibly simple and robust building in use.

More information

Lark Rise consumption was monitored during 2 tenancy periods, user preferences can cause variations in the floating demand seen in the cooking and lighting levels, however, we would expect the miscellaneous circuit to show a relatively constant demand between tenancies because the circuits which are fed by the 'miscellaneous' submeter shouldn't be greatly affected by user preference, however there was an unexpected consumption on the 'miscellaneous' circuit (pumps etc) during the second tenancy period. At present the cause of the variation in miscellaneous power demand is not known. However, the pump within the septic tank burnt out in November 2017, and it is possible that the increased consumption could be due to this.

Real final energy consumption

Final Energy : 42,00 kWhfe/m².year

Real final energy consumption/m² : 42,00 kWhfe/m².year

Real final energy consumption/functional unit : 42,00 kWhfe/m².year

Year of the real energy consumption : 2 016

Renewables & systems

Systems

Heating system :

- Heat pump

Hot water system :

- Heat pump

Cooling system :

- No cooling system

Ventilation system :

- Natural ventilation
- Nocturnal Over ventilation
- Double flow heat exchanger

Renewable systems :

- Solar photovoltaic
- Heat pump

Renewable energy production : 200,00 %

Other information on HVAC :

Zehnder, Paul Novus 300

eff. specif. HRE: 91%

Maximum flow rate [m³/h] 300

Electric power input [W] 90

Sound power level [dB(A)] 43

Reference flow rate [m³/h] 210

Reference pressure difference [Pa] 50

SPI [W/(m³/h)] 0,22

heat exchanger

12kWp PV installation on the roof with a 13kWh battery store

Solutions enhancing nature free gains :

Since most of the glazing is sub-optimally oriented to face North West, it needed to be made from super-clear glass with a high g-value in order to maximise winter heat gains

Smart Building

BMS :

Very simply that the heat pump will heat the hot water to a few degrees above set temperature if there is excess sun.

The building use, PV production, battery storage and import or export can be seen in real time via the Tesla application on a mobile phone. This information is being used to tune the building and to decide what the next steps might be (e.g demand shifting or change of user habits eg switching off lights and IT and gaming equipment on standby.)

Smartgrid :
not yet applicable, but may follow

Users' opinion on the Smart Building functions : Interested in viewing the information provided by the Tesla app.

Environment

Urban environment

n/a

Products

Product

LIGNO TREND Roof system

Klimaholzhaus

Ralf Harder (R.Harder@lignotrend.de)

<https://www.klimaholzhaus.com/construction/>

Product category : Table 'c21_china.innov_category' doesn't exist SELECT one.innov_category AS current,two.innov_category AS parentFROM innov_category AS oneINNER JOIN innov_category AS two ON one.parent_id = two.idWHERE one.state=1AND one.id = '7'

Load-bearing insulated CLT ceiling component

Good



Kaufmann Zimmerei und Tischlerei, Reuthe, Austria - first floor timber frame structure and finishes.

Shoock Isolators for balcony connections

Costs

Health and comfort

Life Cycle Analysis

This is a very interesting topic, but not yet assessed for this building. On another similar project, but with 1/4 the generating capacity, we found that the embodied energy from the building's construction could be paid back in 60 years. This building is

Eco-design material : N/A

Water management

All waste water is processed on site using a low energy septic tank and zero energy natural water polishing system based on natural bacteria in a peat store.

Indoor Air quality

Other similar projects of ours have been independently monitored, tested and assessed with the conclusion that they provide optimal conditions with optimal RH generally around 40% with any peaks being flushed away within an hour by the heat recovery ventilation system. CO2 levels have been found to be optimal, generally between ambient external conditions and an upper level on occasions no greater than 1000ppm. F8 incoming filters have been found to control incoming pollen and particulates. Healthy construction using natural materials has been found in another project to result in a very low VOC count, both from the building construction materials and from household products.

Comfort

Health & comfort : The above indoor air and humidity conditions contribute to very healthy and comfortable conditions. Also both summer and winter temperatures have been found to be very comfortable, with negligible seasonal, daily or hourly fluctuations.

Calculated indoor CO2 concentration :
500-800ppm

Measured indoor CO2 concentration :
500-800ppm

Calculated thermal comfort :21 degrees centigrade in summer and winter
Measured thermal comfort : approx 21 degrees centigrade in summer and winter

Acoustic comfort : The concrete construction with first floor screed floating on XPS insulation makes for an extremely comfortable acoustic condition.

Carbon

GHG emissions

GHG in use :16,00 KgCO₂/m²/year

Methodology used :

Indirect emissions from electrical power consumption are estimated in PHPP through the use of electrical emission coefficients in Germany (GEMIS)

Contest

Reasons for participating in the competition(s)

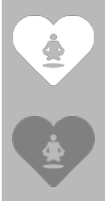
Building candidate in the category



Energy & Temperate Climates



Low Carbon



Health & Comfort



Users' Choice



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