**Zero Carbon Homes:**

**Some short case studies**

This note includes a selection of case studies of current examples of homes that are presented as ‘Zero Carbon Homes’. It shows some of the opportunities presented by adopting a low carbon/ zero carbon approach to building developments, and focuses on residential schemes.

It includes:

1. Cases from the ‘Building for 2050’ project
2. Low / zero carbon developments in Oxfordshire
3. Other examples from across the UK

*This note has been prepared by Oxford Friends of the Earth (*[*www.oxfoe.co.uk*](http://www.oxfoe.co.uk)*) Sept2020*

**Section 1: Case studies from the ‘Building for 2050’ project (launched 2019)**.

This research is funded by the Department for Business, Energy and Industrial Strategy (BEIS) - <https://www.buildingfor2050.co.uk/>. It examines the drivers, attitudes, barriers and challenges relating to delivering low cost, low carbon housing. The project highlights the need to construct housing which is low carbon through design rather than through reliance on technology.

Five low carbon buildings are being tracked. ‘Building for 2050’ will gather observations from the design and construction stages, as well as ongoing performance monitoring and resident feedback. Integral to this work will be wider stakeholder input from professionals and consumers. Findings will be published.   The 5 low carbon developments featured in the BEIS study are: Marmalade Lane (Cambridge); Etopia Homes (Corby); Active Homes Neath (South Wales); Tallack Road/Church Road, Leyton (East London) and Rayne Park (Norwich).

**1.1 Location: Marmalade Lane, Cambridge** is a custom-built co-housing development of 42 homes and shared facilities, including meeting rooms, large gardens and a child-friendly, car-free street that runs through the development. This award-winning development (RIBA East Ward 2019 and 2019 National Urban Design Award – public schemes) is Cambridge’s first co-housing scheme.

Project partners: Developer, TOWN & Swedish builder Trivselhus UK. Mole Architects

Date: Completed December 2018

Low / zero carbon technology: Designed with a Fabric-First approach; off-site manufactured timber panels; triple glazing; high levels of insulation and air tightness. Air source heat pumps to supply heating and hot water, Mechanical ventilation and heat recovery (MVHR)

Web / images:

<https://www.buildingfor2050.co.uk/>
<https://marmaladelane.co.uk>

<http://www.wearetown.co.uk/marmalade-lane/>

**1.2 Location: Etopia Homes, Corby, Northamptonshire**

The Avenue, Priors Hall Park is a development of 47 modular homes equipped with energy saving technology to deliver a net zero carbon standard on site. The 31 houses are a mixture of 3,4 and 5 bedroom properties and sixteen 2 bedroom apartments set in a communal landscaped garden.

Developer: Project Etopia [www.projectetopia.com](http://www.projectetopia.com)

Date: Under construction (2020)

Low / zero carbon technology: Combined solar photovoltaic and thermal panel; heat pump; inter-seasonal storage and smart home equipment. Early tests found some homes achieving a **S**tandard **A**ssessment **P**rocedure (SAP) reading of 103/100 (Energy Performance Certificate (EPC) – beyond an A) demonstrating they are energy-positive and creating more energy than they use. Project Etopia have linked-up with electronics giant, Samsung to install their equipment and heat-pumps.

Web / images:

<https://www.buildingfor2050.co.uk/>

<https://www.pbctoday.co.uk/news/modular-construction-news/project-etopia-modular-eco-home/61968/>

**1.3 Location: Active Homes Neath, South Wales**

This is a small development of 16 social rent homes (8 2/3- bedroom houses and 8 1-bedroom apartments). The homes are designed as mini power stations using battery technology, heat pumps and solar PhotoVoltaic (PV) to generate around 80% of the energy they consume and cutting tenants’ bills by at least 50%.

Developer: Project is a partnership between housing association Pobl Group, Neath Port Talbot Borough Council and Swansea University’s SPECIFIC Innovation and Knowledge Centre. It is a pilot project for the region’s Homes as Power Stations scheme (Swansea Bay City Deal)

Date: Completion 2019-2020

Low / zero carbon technology: includes structurally insulated panels, exterior steel walls;

includes solar walls, solar roofs, heat pumps and Mechanical heat ventilation recovery (MVHR), Tesla batteries to store and release excess energy

Web / images:

<https://www.buildingfor2050.co.uk/>

<https://www.poblgroup.co.uk/activehomes/> (video showing how technology works) <https://www.activebuildingcentre.com/project/active-homes-neath>

**1.4 Location: Tallack Road / Church Rd, Leyton, East London**

This scheme is a mix of 50 new affordable and private flats and houses, delivered under the London Plan policy for low carbon homes. It is the first to use a large-scale communal air source heat pump feeding an ambient temperature heat network and individual heat pumps, together with solar photovoltaic panels to provide a predicted 57% reduction in carbon emissions on site. Heat pump technology used as a safety alternative to installing individual gas boilers.

Developer: Galliard Homes / Osel Architects

Date: Completion 2020

Low / zero carbon technology: Communal heat air source heat pump, PV.

Web / images:

<https://www.buildingfor2050.co.uk/>

**1.5 Location: Rayne Park, Norwich** is the largest low-energy Passivhaus development in UK – and one of the largest in Europe. The scheme will have 112 of the 172 homes certified to Passivhaus standard, reducing heating bills by 70%.

Developer: Norwich Regeneration

Low / zero carbon technology: Offsite fabrication of structural insulated panels (SIPs) provided by Kingspan TEK

Web / images:

<https://www.passivhaustrust.org.uk/news/detail/?nId=856>

<https://www.buildingfor2050.co.uk/>

**Section 2. Low carbon/zero carbon new build developments in Oxfordshire.**

**2.1 Location: Springfield Meadows, Longworth, near Southmoor, Oxfordshire**

District: Vale of White Horse

Springfield Meadows is a small rural development of 25 houses, designed to maximise the use of energy-efficient building techniques and sustainable construction materials. The developer, Greencore Construction, describe themselves as a ‘small but ambitious organisation’, aiming to deliver carbon-positive homes to tackle the climate challenge.

When complete, the 7.7. acre site, near the village of Longworth, will have a mix of custom-built 2, 3, 4, and 5 bedroom properties built to zero-carbon standards, interspersed with green community spaces, landscaping and wildlife-friendly planting. The 25 homes include 9 affordable properties (6 affordable rent and 3 shared ownership) for Sovereign Housing Association.

Greencore believe the time is now to transition to low-carbon living. Their development is underpinned by environmental charity Bioregional’s ‘One Planet Living’ design principles.

Project partners: Greencore Construction Ltd; Ssassy Properties Ltd.

Date: Construction started in May 2019 with completion scheduled mid 2021. By Spring 2020 at least 7 properties had been completed, with only a handful of private ownership plots remaining on the market in July 2020.

Cost: Greencore suggest that building to zero carbon standards costs only ‘fractionally’ more and ‘completion times are faster’. If volume house-builders get involved, the benefits could be scaled up. A £5.5 million financing package was secured from Triodos Bank UK in Spring 2020. This loan to Ssassy Properties was the first the ethical bank has made to a residential development. It indicates it is looking for similar opportunities in future.

Low / zero carbon technology: Greencore believe that Springfield Meadows may be the first UK housing scheme to be zero carbon at the construction stage, as well as being zero energy and zero emissions in use. The build is based on Passivhaus principles to reduce demand for heating and cooling. The pre-fabrication is modular, using off-site closed timber panel frames, with hemp-lime insulation and natural fibre insulation made from waste timber. The pre-fabricated panels are part of Greencore’s unique Biond Building System and have a high thermal-efficiency.

Use of the bio-based materials locks up CO2 to such an extent that the sequestered carbon compensates for the CO2 emissions from the high energy materials to give a zero carbon footprint overall.

Low Carbon Technology: Electricity is generated from photovoltaic (PV) panels on roof, with battery storage. Mechanical ventilation with heat recovery (MHVR) system and mini heat pumps to generate heating and hot water. Electric vehicle (EV) charging points.

Web / images:

<https://www.ukgbc.org/ukgbc-work/case-study-springfield-meadows/>

<https://greencoreconstruction.co.uk>

<https://www.greencoreconstruction.co.uk/portfolio/springfield-meadows-southmoor/>

<https://ssassyproperty.com/portfolio-items/springfield-meadows>

<https://www.greencoreconstruction.co.uk/why-greencore/energy-efficiency/> (includes reference to Bath University research that hemp-lime panels are 4 times as energy-efficient compared to mineral wool)

<https://www.bioregional.com/projects-and-services/case-studies/springfield-meadows-zero-carbon-homes-immersed-in-nature>

<https://www.oxfordmail.co.uk/news/17970554.ssassy-property-greencore-construction-say-springfield-meadows-uks-first-zero-carbon-homes/>

**2.2 Location: King’s Farm Close, Longcot, Oxfordshire**

District: Vale of White Horse

A small development of 15 low-carbon homes, including 6 affordable properties for Sovereign Housing Association. Three of the 2 bedroom houses and one 3 bedroom house will be let at below-market rates by Sovereign, and two properties will be shared ownership.

Project partners: Oxford Advanced Living; Greencore Construction

Date: Completed 2019

Low / zero carbon technology: Offsite manufactured timber panels with high thermal insulation properties due to the unique hemp-lime construction pioneered by Greencore Construction. Mechanical ventilation with heat recovery.

Web / images:

<https://ssassyproperty.com/greencore-homes-praised-sustainable-affordable/>

<https://www.greencoreconstruction.co.uk/portfolio/kings-farm-close-longcot/>

**2.3 Location: NW Bicester Eco-Town**, **Oxfordshire**

District: Cherwell District Council

The flagship Elmsbrook development made North West Bicester the UK’s first ‘eco-town’. Phases 1 &2 comprise 393 zero carbon homes and community facilities shaped by Bioregional’s One Planet Living framework. The eventual plan for NW Bicester is 6,000 homes.

Project partners: Includes A2Dominion, Cherwell DC, Bioregional

Date: Phase 1 completed 2016

Low/zero carbon technology: Construction and materials - Code for Sustainable Homes Level 5, roof photovoltaics; combined heat and power, real-time energy monitoring

Web / images:

<https://www.bioregional.com/projects-and-services/case-studies/nw-bicester-how-one-planet-living-helped-shape-the-the-uks-first-eco-town> (case study of development by project partner, Bioregional)

<https://www.willmottdixon.co.uk/projects/north-west-bicester-eco-town> (includes video of construction features in Exemplar Phase 1)

<https://www.constructionnews.co.uk/news/knowledge-news/eco-town-exports-nw-bicester-in-energy-challenge-27-01-2015/>

**2.4 Location: 3 individual sites in Oxford, Oxfordshire**

District: Oxford City Council

8 single storey homes, 3 sites, bungalows planned

https://www.oxford.gov.uk/news/article/1427/work\_starts\_to\_build\_zero\_carbon\_council\_homes\_in\_oxford

(link May 2020) wheelchair compliant design, disabled facilities, off-site manufactured panels, Oxford ‘model’ in house services. Completion aimed for Dec 2020.

***More information to come***

**Section 3. Other examples around the country**

**3.1 Location: BedZED, Hackbridge, London Borough of Sutton, South London**

Beddington Zero Energy Development (BedZed**)** is theUK’s first large-scale, mixed use sustainable community including 100 homes, offices and community facilities. This 3.5 acre site is a RIBA award winner, cited for its sustainability features (2001) and its history is well-documented.

Project partners include: Peabody Trust; London Borough of Sutton; Bill Dunster Architects; Bioregional; Arup

Date: Completed 2002.

Low / zero carbon technology: Passive solar design, highly insulated, well ventilated;

Biomass boiler for whole site; PV panels

Web / images:

<https://www.bioregional.com/bedzed-the-story-of-a-pioneering-eco-village> (information booklet about the project)

https://www.bioregional.com/projects-and-services/case-studies/bedzed-the-uks-first-large-scale-eco-village

**3.2**  **Location: Hanham Hall, South Gloucestershire**

This development of 187 private and affordable homes was England’s first large-scale volume housebuilder scheme to achieve the 2016 zero carbon standard and was one of the flagship Carbon Challenge schemes promoted by former Homes and Communities Agency (a non-departmental public body replaced in January 2018 by Homes England). The award-winning 9 acre site includes a Grade II-listed Hall (restored to BREEAM standards), community facilities, green spaces and allotments.

Project partners: The scheme was a partnership between HTA Design, Barrett Homes, South Gloucester Council and Sovereign Housing.

Date: Completed 2013

Low / zero carbon technology: Includes offsite pre-fabricated building envelope; Kingspan TEK Structural Insulated Panels; mechanical ventilation heat recovery system; roof-mounted photovoltaic panels; high levels of insulation reducing need for space heating

Web / images:

<https://www.ukgbc.org/ukgbc-work/hanham-hall/>

<https://www.hta.co.uk/project/hanham-hall>

**3.3 Location: Goldsmith Street, Norwich**

This social housing scheme of 105 low energy homes, built to Passivhaus standards, secured the coveted RIBA Stirling Prize in 2019 and has won other awards. The sensitive design of this high-density development was lauded by the judges: “This is proper social housing, over ten years in the making, delivered by an ambitious and thoughtful council. These desirable, spacious, low-energy properties should be the norm for all council housing." The design allows 45 houses and 60 flats to fit within the 7 terraced blocks, arranged in 4 lines and with ample communal car-free spaces and play areas. All in a site less than one hectare in size.

Project partners: Norwich City Council, architects Mikhail Riches with Cathy Hawley

Date: 2019

Low/zero carbon technology: Passivhaus design and build, fuel bills expected to be low - £150 a year.

Web / images:

<https://www.architecture.com/awards-and-competitions-landing-page/awards/riba-regional-awards/riba-east-award-winners/2019/goldsmith-street> (design details and short video)

<https://www.pbctoday.co.uk/news/planning-construction-news/norwich-council-estate/64564/>

<https://www.theguardian.com/artanddesign/2019/jul/16/norwich-goldsmith-street-social-housing-green-design>

**3.4 Location: Halton, Lancaster**

Forgebank, run by Lancaster Cohousing, is a carbon neutral eco-housing development consisting of 41 certified private passive houses with communal facilities, low carbon workspace and a riverside woodland habitat. New members join when homes become available for sale or rent.

Project partnership: Lancaster Co-housing; appointed architect’s Eco-arc.

Low/zero carbon technology: Passivhaus certification, Code for Sustainable Homes Level 6

Passivhaus certification and Level 6 Code for Sustainable Homes. Solar PV, central woodchip biomass boiler and hydro-electric scheme. Construction of this £8.2 million development was estimated to be just 10% more than traditional build but due to savings, properties were sold at the market value.

Web / images:

<https://www.lancastercohousing.org.uk/>

<http://lancastercohousing.org.uk/Project/Standards>

<https://ecoarc.co.uk/lancaster-co-housing/> Includes videos

**3.5 Location: Larch House, Ebbw Vale in Wales**

Larch House Ebbw Vale in Wales was the UK’s first affordable zero carbon (Code 6) certified ‘passivhaus’. It was completed in 2011 and has secured numerous awards (along with another neighbouring Passive House social housing prototype, Lime House (built by the same architects).

Project partnership: United Welsh; Blaenau Gwent Council; bere:architects and Pendragon Design and Build. It uses locally sourced and manufactured materials and components.

Low / zero carbon technology: Passivhaus features allow these properties, built on an exposed hilltop with 1000 feet elevation to generate as much energy from the sun in summer months as it uses for the entire year. Technical specifications and performance reports are available on bere:architect’s website, along with other Passivhaus designs they have been involved with.

Web / images:

<https://www.bere.co.uk/architecture/larch-house/>

**3.6. Location: Solar House, Leicestershire**

Built by a consortium led by Caplin Homes, the Solar House was constructed in 2013 as an exemplar project to demonstrate to members of the building sector that zero-carbon buildings are not just possible but also affordable and economically viable.

Technical details about the build, low carbon technologies and lessons learned are available in a 4 page briefing, still available, on the now-defunct Zero Carbon hub website at: http://www.zerocarbonhub.org/sites/default/files/resources/examples/profiles/ZCH-Profile-CaplinHomes\_0.pdf

**3.7. Location: Parc Hadua in Pontardawe, South Wales**

Billed as one of the world’s first true ‘net zero carbon in operation’ neighbourhoods, the 35 homes are due for completion in 2021. The £8+million development from Cardiff-based Sero Homes (<https://www.serohomes.com>) uses very low energy building design to reduce the energy demands of the homes and their residents. This will be combined with a mix of renewable energy technologies, including thermal and electrical storage, on-site photovoltaic (solar) panels and ground source heat pumps, electric vehicle rapid charging points, together with ventilation systems and smart energy management systems.

Parc Hadau is expected to be the first scheme that will meet the full extent of the UK Green Building Council’s definition of net zero carbon. It will track real-time ‘in-use’ carbon emissions.

The zero carbon neighbourhood planning application was submitted to Neath Port Talbot Borough Council October 2019 and planning permission was granted December 2019. Completion date is summer 2021. In 2019 the scheme secured a £2million grant from Welsh Government Innovation Housing Programme Fund towards the zero carbon and ecological features.

Developer: Sero Homes, Architects - Loyn & Co, landscape architects Farrer Huxley

Web / images:

<https://www.parc-hadau.wales>

<https://www.ukgbc.org/ukgbc-work/case-study-parc-hadau/>

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**Further sources of information include:**

***Zero Carbon Hub Building Profiles*** The Zero Carbon Hub closed in March 2016 (due to government policy changes) <http://www.zerocarbonhub.org/news/zero-carbon-hub-close>

The website is still accessible and provides useful resources, including 10 low carbon building profiles ( <http://www.zerocarbonhub.org/building-profiles>). These case examples provide useful information about manufacturers, developers and clients who found practical, commercially-viable ways of delivering energy-efficient, low carbon homes.

**Oxford Friends of the Earth has produced this material in Sept. 2020. This is a work in progress and will be updated. We welcome further information and new cases (please use the format above) – contact us via** **homes@oxfoe.co.uk****.**

**More info:** [www.oxfoe.co.uk/zero-carbon-homes-for-oxfordshire/](http://www.oxfoe.co.uk/zero-carbon-homes-for-oxfordshire/)