# SUSTAINABILITY STATEMENT

Proposed Site at Bamford Close/Haddon Close
Dodworth

Strata Homes

## Introduction

Energy Usage in buildings is attributed to nearly half of the total energy use of the UK, with energy use on space heating being a major contributing factor. This sustainability statement has been compiled to assess the renewable and low carbon technologies available to the proposed site, and determine which would be the most cost effective and suitable technology to be implemented, to contribute to the overall reduction in energy usage and running costs.

This report intends to identify renewable and low carbon technologies that are appropriate for the considered site and the barriers faced by incorporating them, including the aesthetics, technical constraints, safety and costs .

## The Site




The site comprises approximately 1.4 hectares of land on the western side of the centre of Dodworth in Barnsley. It is bounded by Dodworth Church and cemetery to the west Champany Fields estate to the north, and the Ponds Farm estate to the east and south. It is directly accessed from both Bamford Close and Haddon Close in the Ponds Farm estate.
The site slopes gently from north to south and from east to west. The houses have been orientated to follow the contours and maximise solar gain where possible.

## Considered Technologies

Renewable Technologies are constantly evolving and updating, however given the site constraints the following technologies have been considered as having potential for implementation on the site, each considered technology will look at the overview of the system and how it works, the benefits and constraints.

- **Solar Hot Water**
- **Photo Voltaic**
- **Air Source heat pump**
- **Passive Solutions - Enhanced Fabric Solution.**



## Solar Hot Water

Solar collectors (panels)are fixed to the roof in the most southerly facing orientation, so they can absorb solar radiation ( the suns heat) and convert it to heat which is transferred to a hot water cylinder by circulating fluid through a series of pipes to pre-heat the water in the cylinder. This pre-heated water is then further heated to useable temperature by an auxiliary system (boiler or electric (or PV) immersion heater). Solar hot water systems do not usually contribute to the central heating system.

There are two standard types of collector:

- flat plate
- evacuated tube.

**Flat plate collectors** are simple but effective devices, comprising a dark plate within an insulated box with a glass or durable plastic cover. The plate is usually coated with a 'selective' coating to ensure that it has high absorption but low emissivity (heat loss by re-radiation).
**Evacuated tube collectors** are more sophisticated, with a series of metal strip collectors inside glass vacuum tubes. Their efficiencies are usually higher and they are more effective in cold weather because of their low heat losses, but they do tend to be more expensive than flat plate collectors, and succumb more easily to vandalism.

The Solar Hot water system is best suited to a site which has very little over shading such as a more rural or suburban location with roofs that are facing directly south (although is still operational with east and west facing but less efficiency), with a pitch between 25 and 45 degrees.

### Benefits

- tried and tested technology
- reduction in CO2 emissions
- Integrated with low surface temperature heat emitters ie under floor heating
- Little to no operational noise
- Integrated into a traditional boiler system

### Constraints

- Not suitable for north facing roofs and heavily shaded areas i.e. woodland areas
- Can be easily vandalised
- Maintenance and access is required
- Seasonal fluctuations
- Is visible
- Restrictions on the position of the internal services giving constraints to higher storey buildings

## Solar Photo Voltaics



Solar PV Panels are very similar in appearance to Solar hot water panels and require the same considerations in terms of orientation.
The energy in sunlight is converted directly into electricity by photovoltaic (PV) cells, similar to a calculator. No moving parts are involved which reduces the maintenance. The cells only generate low voltages and currents, so they are usually grouped in rectangular 'modules' with a transparent cover, a metal mounting frame and a back-plate, which forms a water tight module. PV cells can also be sourced as solar slates or solar tiles for integration into roofs, or bonded onto glass ornamental sheets for incorporation into architectural glazing and fascia systems making the system a more versatile system that fixed panel sizes.
PV is generally referred to as peak power output (KWP).

Electricity is constantly being generated in daylight so there are supply and demand constraints. Generally the system is connected to the grid allowing the surplus electricity to be exchanged to the grid and benefit from Feed in tariffs (where electricity is effectively sold back to the grid). If a system were to be supplied off grid, a large battery store would be required.

### Benefits

- Benefits of Feed in Tariffs resulting in a quicker pay back
- Minimal maintenance
- More versatile systems available
- Reliable system
- No mechanical moving parts
- Dry system (less potential problems of leaks.)

### Constraints

- Considerations of site constraints orientation, roof pitch and overshading
- Expensive systems resulting in long payback periods
- Maintenance requirements
- Reduction in efficiency over time

## Air source Heat pump



Air source heat pumps (ASHPs) use the same principles as a typical domestic fridge. The basis of the heat pump, therefore, is to take low-grade energy from the surrounding air by means of a fan pulling the outside air over a heat exchanger (evaporator); this energy is then upgraded and the higher temperature refrigerant vapour is released by means of another heat exchanger (condenser).
In ASHPs this heat exchange can be to the air inside the dwelling, and distributed to the different rooms by ducts and supply grilles. Alternatively, the heat exchange can be to water; it is this hot water that is the basis for the dwelling's heating circuit. This heating circuit can be an under-floor heating system or fan-coil units installed in the different rooms, or a combination of the two.
In an air source heat pump the source air temperature range can be highly variable – not only seasonally but also daily. Also heat pumps operate at their most efficient when the source temperature is as high as possible, but in the UK the mean air temperature for winter is lower than the mean ground temperature. At low air temperatures the evaporator coil is likely to need defrosting.

### Benefits

- Highly efficient system
- Best suited to Low surface temperature emitters such as Underfloor heating

- Can also be used in reverse for cooling in hot summer conditions

### Constraints

- Aesthetically not appealing
- Relies solely on electricity
- Emit noise from the fans

## Passive Solutions – Enhanced building fabric

Passive solutions are widely used across Europe in the form of passive house standards which is a voluntary standard, which can assist dramatically in reducing the heating and energy demand.
By embracing the philosophy of the passive house standards through careful consideration of the building fabric as components, passive techniques can be incorporated into the design through highly insulated external elements such as walls, roofs, floors and ceilings. Particular emphasis has been placed on the junctions of external elements, known as non-repeated thermal bridges. As a minimum accredited construction details can be incorporated giving significantly better values than a standard build where this has not been considered. The movement of air through a building is associated with heat loss, low air tightness would be incorporated (consideration must also be given to the occupants to give comfort). Recent studies of party walls has encountered significant rise in heat loss due to uninsulated party wall cavities. By fully insulating and sealing party walls can also reduce the heat loss of the building and reduce CO2 emissions.
Whilst in the UK there is emphasis is usually around heat production. Particular consideration also needs to be given to overheating lightweight buildings such as timber frame can have a tendency to overheat, Thermal mass assists in controlling the heat generated by allowing heat to be absorbed by the structure an emitted later.

### Benefits

- No maintenance
- Lasts the lifetime of the home
- No aesthetic implications
- No difference in user controls
- No noise implications

### Constraints

- Careful consideration through complex thermal modelling at design stage

## Summary and Conclusions

On the Bamford Close/Haddon Close estate we have adopted a fabric first approach as much as possible. By building to dwellings to enhanced accredited details, higher thermal performance, increased air tightness and upgraded construction specification we are building beyond current building regulations which are further enhanced by installation of Solar Photo Voltaic cells to a number of properties within the site.
We have had an energy reduction assessment report prepared by an accredited energy consultant, Ms Leanne Brooksbank from Plasmor ltd, and the report confirming a 15% reduction in CO2 emissions confirms the full range of energy saving measures incorporated into the dwelling construction

**Bibliography**

www.passive-house.co.uk
NHBC Foundation publication A review of microgeneration and renewable energy technologies
www.on-sunsolar.com
www.trianglemep.com