FACING THE ENERGY AND GLOBAL WARMING CRISIS

RECOMMENDED RENEWABLE ENERGY PROVISION FOR THE SNIPERLEY PARK DEVELOPMENT

Report Prepared by the City of Durham Parish Council, 6 May 2022

Foreword

The proposed Sniperley estate offers Durham County Council an opportunity to create sustainable, ultra-low carbon houses that are energy secure, affordable to heat and desirable to live in. Such a development would demonstrate nationally the opportunity that exists to meet the national climate change goal of net zero (greenhouse gas emissions) by 2050 and be a model for new housing across the whole of the UK.

The people of Durham led the way in the industrial revolution, using natural resources, creating wealth and promoting inward investment. It is time to recreate that sense of enterprise and entrepreneurship, but this time without the carbon.

Summary

We believe that the housing estate at Sniperley Park should be designed and built to last at least 100 years, matching the longevity of many houses in the centre of Durham City. Furthermore, all new houses built in Durham must be future proofed and in particular meet or exceed specifications to ensure that they comply with the UK law of being net zero of carbon dioxide (equivalent) greenhouse gas emissions by 2050. This means that Durham County Council must act now, not in 2050.

The argument in favour of the prograde introduction of paired solar panels with a ground loop heating system during the building of the Sniperley Park Estate is very strong, as is the exclusion of any gas network. For its intended community it would offer secure and economically viable energy at a time when conventional fossil fuel energy sources are becoming unaffordable; it would meet the ever-growing demand for the introduction of sustainable and renewable energy throughout the UK; and it would provide the building lobby and the County Council with the opportunity to be a national leader in creating homes that are energy efficient and environmentally friendly.

REPORT

A short version of this report, presented to the City of Durham Parish Council on 29th April 2022, proposed to adopt the following recommendations regarding essential renewable energy provisions for the Sniperley Park development. The report encouraged City of Durham Parish Councillors to demonstrate thought leadership on this vital matter by calling on such provision, and to engage on it with the city's neighbouring Parish Councils and Durham County Council.

1. The Parish Council's previous related actions

a) On 10 January 2022, the City of Durham Parish Council submitted their detailed comments on the consultation on the Sniperley Park Masterplan.

b) On 27 January 2022, the City of Durham Parish Council agreed to the Climate Lead Terms of Reference which requires the holder of that role to "provide guidance on, and - where requested to do so – coordinate the actions of the Parish Council as a whole and its committees".

c) Throughout February and March 2022, Cllrs G Holland and R Friederichsen, in their role as a member of the Planning Committee (Cllr Holland) and Climate Lead (Cllr Friederichsen), identified the Sniperley Park development as a site of strategic significance in which low carbon and energy saving solutions to a very high standard should be implemented, reflecting the city and county's determination to confront some of the most critical problems now facing our nation: the high cost of energy to many households, green-house gas emissions from heating, and the long-standing issue of energy security/independence.

d) On 8 April 2022, the Planning Committee reviewed, commented on, and resolved to submit to Full Council the list of energy solutions given below.

2. Recent external developments relevant to this report

Since completion of the consultation on the Sniperley Park development, significant events and national policy statements, relating specifically to energy, have occurred, in particular:

a) The significant rise of household energy costs.

b) The war in Ukraine with its serious and potentially long-term impact on global energy markets and energy security.

c) The IPCC's Third Assessment Report.

d) The UK government's energy White Paper and its stated direction of travel on a low-carbon future.

All of these recent events justify further action by the Parish Council to ensure that current and future residents of the city and its neighbouring parishes are protected from energy-related threats to both their livelihoods and their well-being, while contributing to the ongoing task of reducing greenhouse gas emissions.

3. The purpose of this report

This report seeks to offer guidance to the Parish Council concerning improved energy efficiency and security, recognising national and international aims on energy provision, energy efficiency, and reduced greenhouse gas emissions.

In the immediate vicinity of the Parish, the Sniperley Masterplan has yet to be finalised. The size of this proposed development will have a strong impact on a shared commitment to sustainable housing development in both Durham City and the County of Durham. To reflect this commitment, we propose that he following list of solutions should be implemented in full for the Sniperley development:

a) A detailed Energy Assessment for the entire site designed to minimise energy consumption and greenhouse gas emissions with all properties satisfying the 2030 operational energy and embodied carbon targets set by the RIBA 2030 Challenge which identify the optimal set of energy solutions to minimise energy consumption and greenhouse gas emissions[1].

b) All homes and buildings to be built to EPC A rating standard as a minimum.

c) No connection of the site to the national gas network[2].

d) Photovoltaic panels and battery storage in all homes and buildings.

e) Ground and/or air source heat exchange systems for all homes and buildings.

f) District heating system using any potential geothermal energy from the underlying abandoned and flooded coal mines[3].

g) All houses to have electricity supply points for electric cars.

[1] Royal Institute of British Architects (RIBA): 2030 Climate Challenge. Available online at https://www.architecture.com/about/policy/climate-action/2030-climate-challenge (last accessed 13 April 2022).
[2] Buying or selling your home: Energy Performance Certificates - GOV.UK (www.gov.uk) Available online at https://www.gov.uk/buy-sell-your-home/energy-performance-certificates (last accessed 13 April 2022).
[3] Adams, C.A., Monaghan, A. and Gluyas, J.G. (2019) Mining for heat, Geoscientist, http://nora.nerc.ac.uk/id/eprint/523186/1/Geoscientist_Mineheat_PublishedVersionFeature%201_MAY2019.pdf (last accessed 29 April 2022).

APPENDIX:COST BENEFIT ANALYSIS: HOW MUCH WOULD SNIPERLEY BENEFIT FROM A RENEWABLE ENERGY IMPLANT AND WHAT WOULD IT COST?

1. **Solar panels, or next-generation solar cells, as an energy source at Sniperley**

a. A 5kW solar panel system generates approximately 20 kWh on a good day with sunshine and around 4,500 kWh of electricity is generated throughout the year. Next-generation solar cells are claiming a significantly higher energy output. The real power generated will depend on various factors such as the location, performance of the equipment and the installation.

b. The size of a system will determine how many panels you need. A 5kW solar system is made up of 20 solar panels, assuming that the panels have 250-watt capacity. The size of each panel will be approximately 1.6 m x 1 m, so at least 32 m² of roof space is needed to suit the space needs of this system.

c. 5kW solar system in the UK market varies in price from £6,000 to £7,000. Bought for installing them on 15,000 houses, as at Sniperley the individual cost per house would fall by competitive contract. The price of a 5kW solar power system installation varies as well, depending on the chosen installer.

d. At present, the battery capacity, i.e. how much energy it can store at once, is only about 10-13.5kWh, hence the present need for "feedback to grid" arrangements. Professor Tony Roskilly of Durham University has demonstrated that solar heat can also be stored from summer and released during winter on a scale that would suit domestic properties.

e. A solar battery is essential to any paired system and costs about £2,600

2. Ground Loop Heat Exchange Pumps as 4-Fold Energy Enhancers

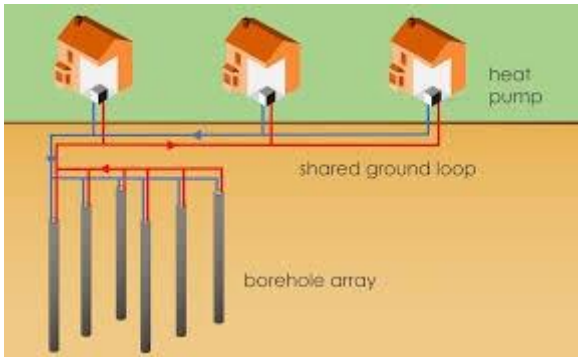
a. A ground source heat pump uses a ground heat exchange loop to tap into this constantly replenished heat store to heat buildings and provide hot water. The technology used is the same as that used in refrigerators.

~~b.~~ While modern condensing boilers can be over 90% efficient, a ground source heat pump can achieve efficiencies of up to 400% (compared with direct use of electricity for heating, meaning that electricity bills would be reduced by 75%). The difference in efficiency is significant.

c. At the smaller end of typical IMS Heat Pumps projects, would usually install a 6kW heat pump. These heat pump units have an integrated hot water cylinder with a small horizontal ground loop; usually 250-300 metres in length. This type of system would cost around £10,000 to £12,500 to install." However, if installed on 1,500 houses, as at Sniperley, the individual unit cost would fall with a competitive deal on a £15-18 million contract.

3. The Importance of Shared Ground Loop Arrays at Sniperley

The shared ground loop is installed as a series of boreholes, central to either a community of houses or serving one large building of multiple dwellings.



Similar to a standard ground source heat pump system, the ground loop runs on a continuous cycle through the ground, absorbing thermal energy. The ground loop then provides this thermal energy (typically from ground temperatures between 5^0C and 12^0C, but significantly higher using mine waters at between 12^0C and 20^0C) to individual heat pumps connected to the shared ground loop system. Each heat pump is then responsible for raising the heat to a temperature that's suitable to be used in the property's central heating system.

4. Difference between Shared Ground Loops and Heat Networks

A shared ground loop is similar to a district heat network in that both use one communal ground loop to gather thermal energy from the ground. Where they differ is that a shared ground loop allows multiple individual heat pumps to be served by one ground loop, while in a district heating network, the ground loop serves one or two large heat pumps which supply the heat for all properties in the network.

5. Advantages of a Shared Ground Loops to Earth or Mine Waters

a. Independence: Occupants have an individual heat pump, powered by their own electrical supply. Individual billing gives people clarity over their bills and control over their spending, while having the ability to adjust the system to personal preferences.

b. Cost Savings: The cost of installing a shared ground loop is typically less than for an individual ground source heat pump system. Fewer boreholes are needed to serve the shared loop system and mobilisation costs are kept to a minimum.

c. Versatility: Shared ground loops are suited to any building, whether it be new builds or retrofits. The loop can be expanded at any time in the future to expand the network. The boreholes of the system can be distributed flexibly across the site, helping ensure that significant,–local heat-depletion of the ground does not occur.

d. Resilience: Should a fault with an individual heat pump occur anywhere on the shared ground loop network, it will not affect any other heat pump connected to the system. Each heat pump is entirely independent of one another, so should a heat pump go down or need maintenance, no other heat pump is affected."

6. Pairing Solar Panels with Ground Loops at Sniperley

a. A geothermal heating and cooling system integrate well in tandem with solar panels because the geothermal heat pump helps regulate your home's temperature using the electricity provided by the solar panels. Solar and residential geothermal, operating together, deliver both electricity and heat for the home without producing any emissions of climate changing greenhouse gases.

b. A 5kW solar panel system generates approximately 20 kWh on a good day with sunshine and around 4,500 kWh of electricity is generated throughout the year. A coupled ground source heat pump can achieve enhancement efficiencies of up to 400% (COP ranging from 3-5) in delivering heat compared with use of electricity alone.

c. According to the suppliers, the unit cost of installing this paired system for a single house is about £6,500 for a solar installation plus £2,600 for a battery, and £11,250 for a ground source heat pump, that is about £20,000 in total. The installation of combined renewable energy system should pay for itself in less than 4 years. Furthermore, the net cost of £20,000 should not be this high when applied to its introduction into 1,500 new build properties where the installation is prograde, rather than retrograde, and forms part of a managed and integrated building programme. In addition, the size of this £30million project should reduce the unit costs significantly for reasons already discussed.

d. In terms of the full cost to the house buyer of installing renewable energy into the property will be modest compared to the full cost of the house sale. It will also introduce, from the outset, significant savings in the monthly burden of energy bills to the householder as well as the essential energy security in future.

e. The test of this benefit can be achieved by following the Part L regulatory processes (noted below) which involves the SAP (Standard Assessment Procedure) for an assessment of energy, carbon and cost. The SAP software

produces the predicted EPCs (Energy Performance Certificates) at the planning stage, the design stage, and at the post construction stage. It is believed that the district heating configuration with ground source heat pumps coupled to solar panels improves SAP ratings and achieves large carbon savings. The level of this benefit at Sniperley should be confirmed.

7. The National Response

In the last few years central government has finally recognised the long-standing need for renewable energy in the national fabric. As a result, over the last 4 years they have introduced a series of initiatives, some of them subsequently countermanded, mainly via press announcements.

The central theme is that the government's "Net Zero Strategy sets out how the UK will deliver on its commitment to reach net zero emissions by 2050".

The design of this strategy has been outlined in a series of documents. For example, on 19th January 2021 the Ministry of Housing, Communities & Local Government published its manifesto for "Rigorous new targets for green building revolution".

Not to outdone, the Department for Business, Energy & Industrial Strategy on 19 October 2021 (updated 5 April 2022) outlined a policy entitled "Net Zero Strategy: Build Back Greener"; and on 15 December 2021 the Department for Levelling Up, Housing and Communities outlined their "Zero Carbon Policy".

Of particular relevance, on 25th February 2022 the Department for Levelling Up, Housing and Communities and Ministry of Housing, Communities & Local Government updated its "Statutory guidance Conservation of fuel and power: Approved Document L Building regulation in England setting standards for the energy performance of new and existing buildings". The government is also offering "Green Energy Grants" to those who qualify.

The strength of the government's desire to follow a net zero strategy is evident; but its ability to deliver may be another matter. That can only be achieved with the full co-operation of the national building lobby and the planning authorities, which may have to be enforced by legislation. Without their collaboration, and probably without enforcement, the net outcome will be very different in 2050.

Academic papers have also examined this dilemma. In 2014 David Fuller discussed a "Zero carbon policy for new homes in England". In Energy Policy, v. 159, December 2021, Forde, Osmani and Morton outlined "An investigation into zero-carbon planning policy for new-build housing"; and at the same time Jankovic, Bharadwaj and Carta (University of Hertfordshire) ask "How can UK Housing Projects be Brought in Line with Net-Zero Carbon Emission Targets?". All of these publications provide a cautionary tale.

Conclusion

The proposed Sniperley estate offers Durham County Council a golden opportunity to create sustainable, ultra-low carbon houses that are energy secure, affordable to heat and desirable to live in. Such a development would demonstrate nationally

the opportunity that exists to meet the national climate change goal of net zero (greenhouse gas emissions) by 2050 and be a model for new housing across the whole of the UK. The people of Durham led the way in the industrial revolution, using natural resources, creating wealth and promoting inward investment. It is time to recreate that sense of enterprise and entrepreneurship, but this time without the carbon.