Broomhaugh & Riding Electric Energy Developments

Ideas for action

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1. Introduction

There is a desire amongst the Parish Council both to do more to address the impact of climate change and, specifically, to explore ways in which the Parish Council could do more to promote the installation and use of renewable energy sources.

To put the need in context, in 2019, Riding Mill consumed almost 1.5GWh of electrical energy[1] though this is low compared to the gas consumption which, in 2018, was just over 9GWh[2]. The government currently uses energy performance certificates (EPC) as a means of assessing energy efficiency of premises. Whilst these have serious shortcomings, it does provide a way to compare the energy efficiency of residences and settlements. The average score for a house in Riding Mill is 54, compared to a national average across all residences of 60, though it is estimated that there is the potential to reach an average of 75.

These figures suggest firstly that focusing on the generation of renewables will only address a small part of the problem: the big need is to reduce the reliance on gas. This means that homes need to become more energy efficient, and considerably better insulated, as well as making greater use of alternatives such as heat pumps (though the economics are more questionable in existing houses than they are in new houses). The Government's Climate Change Committee makes assumptions about the growing use of electric vehicles and the replacement of gas heating with heat pumps and forecasts that national consumption will rise from 300TWh to 360TWh (that is 20%) by 2030 and 610TWh (an increase of just over 100%) by 2050[3]. If the growth in demand in Riding Mill mirrored the national average, that would imply a demand growing to 3GWh per annum, without allowing for additional growth as a result of additional housing.

The conclusions from the figures suggest that we need a three pronged approach:

- New houses need to be much more energy efficient than current stock – and planning policies should encourage this – with applications for planning permission for extensions being used as opportunities to encourage efficient upgrading of existing stock.

[1] https://www.gov.uk/government/statistics/postcode-level-electricity-statistics-2019-experimental

[2] www.gov.uk/government/statistics/postcode-level-gas-statistics-2018-experimental

[3] Sunday Times 30 May 2021

- Owners of older housing stock should be encouraged to explore all possible means of improving energy efficiency with a focus on reducing gas consumption.
- The village should explore the scope for developing community generation facilities, especially if this offers opportunities to generate a small profit which can supplement the Parish Council budget.

This paper focuses on renewable energy generation and considers solar and hydro. One of the benefits of living in Riding Mill is the fantastic views and so wind has been excluded; in any event there are better sites in Northumberland to expand wind generation.

2. Hydro

In principle, it should be possible to install a hydro-electric generator in the River Tyne situated at the weir adjacent to the pumping station and sewage farm.

The Environment Agency uses instrumentation on the weir to monitor depth and flow rates. They tell me that Riding Mill is one of the gauging sites whose ownership was not transferred to the NRA (the predecessor to the Environment Agency) in 1989 and as such it remains a Northumbrian Water asset. The gauging stations included the weirs and instrumentation. The Environment Agency are however responsible for maintenance of the weir under the terms of the Kielder Operating Agreement. The pumping station appears to be owned by a joint venture company established when the water companies were privatised, with EA having a 50% share. However, it is operated and managed by Northumbrian Water (NWL) and works intermittently to pump water from the Tyne to the rivers Derwent, Wear and Tees.

Northumbria Water's planning application required before they refurbished the pumping station included a site plan showing the boundary of their land and the boundary is shown on the map in figure 1.

A project would almost certainly require the agreement of both NWL and the Environment Agency. Unless access from the road is required to the west bank of the river, a scheme could potentially proceed without disturbing land owned by Styford Estates.

One of the critical requirements for a hydro-electric plant is that the water level does not fall below the inlet level of the pump. At this location, the level of the river is between 0.33m and 2.1m and has been for 90 per cent of the time since monitoring began[4]. The highest level ever recorded was 5.99m.

[4]See https://riverlevels.uk/river-tyne-broomhaugh-and-riding-riding-mill#.YB0MhnnLdhE

Figure 1: The location (and boundary of land in possession of Northumbria Water)

Source: OpenStreetMap

The pumping station was originally designed to have six pumps, each requiring a 1MW supply and thus the sub-station can provide 6MW. Although the existing pumps are powerful enough to pump the volume of water in an Olympic-sized swimming pool

in around 13 minutes, I understand that there are only three pumps and that each consumers less than 1MW. This would mean, subject to NWL and Northern Powergrid agreement, that the electricity supply cables to the pumping station will be of sufficient capacity to take whatever power can be generated by a scheme.

It looks, prima facie, as though this would be a good location though all parties would need to be persuaded and the site considered in detail as part of any feasibility study.

Initial discussions with Renewables First, a company that not only undertakes feasibility studies for all manner of renewable energy but also operates and maintains installations, suggest that installing hydro could be accomplished using multiple Archimedes screws or a Kaplan turbine. Having looked at the possible head and the water flow rate, Renewables First thinks that the site has the capacity to generate around 450kW which equates to about 2GWh per year, somewhat more than the village currently consumes.

Assessing costs and income is not straightforward. Income is generated either by off-setting or by exporting the power generated to the grid which can be paid for through a Power Purchase Agreement or by entering into a contract with an electricity supplier as part of the government's Smart Export Guarantee (SEG). Electricity consumed on the site typically delivers 12p/kWh (Northumbrian Water have indicated informally that they could be a customer but their demand is intermittent dependent on when the pumping station is pumping) and 6.5p/kWh for electricity exported to the grid. There may be scope for an arrangement in which power is sold to villagers but this would still need to be carried via the grid, so will almost certainly need to await enactment of the Local Electricity Bill

Renewables Energy offer several scenarios on their website, though it should be noted that these are only indicative. However, for a 500kW generator, with 100 per cent of power exported to the grid and two per cent inflation, a net income of £195,000 (after maintenance costs, business rates and land rental, estimated at 8% of gross income) might be achievable over the 40-year expected lifespan. This is currently dependent on securing an SEG contract.

There may be some grant aid available but if we assume that the entire installation cost has to be raised (perhaps through a mix of investment by residents looking for a steady return and commercial lending), that the average cost of capital is five per cent and that the cost of installation is £2m, then £100,000 will be required each year to service the investment. If we further assume that three quarters of the investment is commercial lending, repayable over 25 years, then a further £60,000 per annum would be required. That would, however, provide £35,000 a year in profit, potentially contributing to the Parish's budget.

Making this happen will require co-operation from several parties including the Environment Agency, Northumbrian Water and potentially Styford Estates (who own the land on the north bank of the river) or the owners of the land around the sewage farm, if that is not either Northumbrian Water or the Environment Agency.

There is a further major challenge with the weir in that it is the Environment Agency's main fish migration monitoring station with both a fish counter across the part of the weir known as a crump

weir (the part with water flowing across it in the front cover photo) and video cameras to monitor species. The EA has suggested to me that none of this would necessarily be an obstacle to installing hydro but we would need to ensure that they could still use the weir to monitor the fish.

Next steps: the EA has a 'national permitting team'. They can provide up to 15 hours of support at no cost – and, as part of that support, can be clear about the constraints and challenges that we might need to overcome. It is quite likely that this would effectively provide key questions that would need to be included in any feasibility study.

We would need to raise funding to undertake a feasibility study – and I had hoped that this might be forthcoming from the Rural Community Energy Fund. They are currently out of funds but hope to have more money available shortly, so I recommend that we talk to the EA permitting team to identify the constraints. If that does not rule out the possibility, then we should pitch to RCEF (or others) and commission a feasibility study.

3. Solar

Solar generation is more of a challenge since the most power is generated when it is least needed (daylight hours in summer) and no power is generated when it is most needed (hours of darkness in winter). The costs of solar, now that there is no feed in tariff available, are such that it generally only makes financial sense if there is a local (directly fed) customer able to take at least 75% of the power generated. The proposed Local Electricity legislation would enable us to become a local generator and able to feed power into the grid and have customers anywhere we like but that is unlikely to become las any time soon.

Potential sites for solar include the roof of the Parish Hall, the roof of the Millennium Hall, the roof of the church – though none of these are likely to be big consumers (unless we can also install a power storage system, so that consumption can be time shifted to the evenings) – and the roof of the school, which may be able to take a decent amount of energy. One, more ambitious, idea might be to convert the school's heating to ground source heat pump and then use the solar energy to drive the pump – though that still does not overcome the challenge that most power will be need in the winter when the solar cells are producing the least amount of power. The roof of the pumping station could provide another big area to install solar cells, and there is a convenient sub-station so feeding the grid would be easy, but the pumping station will not be a big customer.

A further thought is whether solar could be used to power one or two EV charging points.

A typical domestic solar installation costs around £400 for each 0.25kWp panel, so around £6,000 for 4kWp. My array generates around 3,600kWh/year which, at a current purchase price of 6p/kWh, would be worth £216. My tariff is 14.97p/kWh, so direct sales might generate say 12p/kWh, giving a total of just £432.

I have been in touch with Octopus and spoken at length with Younity, a joint venture in which Octopus is a key partner. Younity undertakes to buy excess power from any community scheme at their purchase rate, currently about 6p/kWh. In their view, unless there is a local user of solar, it is unlikely that a scheme will be financially viable unless it can generate at least 6MWp. This would represent a big scheme.

The Rural Design Centre has a small grant from the Rural Community Energy Fund and has brought together a small number of communities in Northumberland to explore potential actions including community solar. Whilst Riding Mill is not part of that initiative, it seems that we may be able to benefit from some of the consultancy support that is being commissioned, in the sense that joining community solar and EV charging points, for example, is not location specific.

I have already indicated to the RDC that we would be interested in participation if the opportunity arises. The key contact is Liz Gray, Rural Design Centre, liz.gray@ruraldesigncentre.com.

I am not convinced that the economics of solar currently make sense unless it is possible to secure a grant towards the capital cost. However, as a **next step**, I would like to confirm to Liz that we are interested in further discussions and additionally in participation if the opportunity arises.

4. Climate action plans

Northumberland County Council is keen for every ward (all 66) to have a climate action plan, though they would be very happy if smaller communities, such as Parishes, wished to develop their own plan. For a Parish like Broomhaugh & Riding, which is quite different to Stocksfield, this would make considerable sense. There are currently 12 wards developing formal climate action plans. These should be ready shortly and may provide a model for other communities to follow. One possible example is provided by Humshaugh which, in addition to preparing a climate action plan, has also set up a community company, Humshaugh Net Zero. They have created a website which explains all the actions in which they are currently engaged and which may therefore give us a few additional ideas. Whilst setting up a community company or cooperative may make sense in due course, I would not be rushing to do this until it is clear that a legal entity is necessary. I do think, though, that creating a climate action plan could be complementary to the neighbourhood plan and give us somewhere to record all the ideas and actions other than planning policies.

NCC is keen for communities to volunteer. The key contact is Matt Baker, Services Director, Climate Change, NCC, 07957 385638, matthew.baker@northumberland.gov.uk.

I propose as a next step that we confirm to matt Baker that we are interested in preparing a climate action plan.