



SUSTAINABLE DEVELOPMENT ADVISORY PANEL - 16TH JANUARY 2014

SUBJECT: RENEWABLE ENERGY & WATER SOLUTION TO AN “OFF GRID”, NEW BUILD FARMHOUSE AT MAES YR ONN, MANMOEL

REPORT BY: ACTING DEPUTY CHIEF EXECUTIVE

1. PURPOSE OF REPORT

- 1.1 To provide members of the Sustainable Development Advisory Panel with an update of a partnership project, led by the Rural Development Plan (RDP) Sustainable Energy Team, that has delivered a renewable energy and water solution in an “off grid” setting.

2. SUMMARY

- 2.1 The RDP Sustainable Energy Programme aims to engage with farm households and rural businesses to reduce energy use, promote the uptake of renewable energy, and help them to adapt to climate change.
- 2.2 The Maes yr Onn project is part of the high-level exemplar programme, which aims to demonstrate how sustainable design and use can lead to high quality projects that can also enhance quality of life.
- 2.3 CCBC’s RDP sustainable energy team developed a partnership with the Building Research Establishment (BRE), and utility provider SSE to design and deliver a modern farmhouse and family home that reflects the stunning location and resolves the challenges of an off grid location.
- 2.4 A launch was held on 6th June 2013 with Alun Davies AM, Minister for Natural Resources and Food to celebrate the delivery of this exemplar project. The project recently won the top prize at the prestigious RTPi Wales Planning Awards 2013.

3. LINKS TO STRATEGY

- 3.1 The project supports the following strategies and priorities:
- “Living Better, Using Less” Sustainable Development Strategy, 2008.
 - Caerphilly Single Integrated Plan, 2013 - 2017.
 - Local Development Plan
 - Education for Sustainable Development & Global Citizenship Strategy, 2009.
 - CCBC Corporate Improvement Plan 2009 – 2012.
 - Rural Development Plan.
 - Carbon Reduction Strategy.
 - Waste Management Strategy.
 - Corporate Travel Plan.
 - CCBC Strategic Equality Objective 3 - Physical Access.

4. THE REPORT

- 4.1 The Rural Development Plan for Wales is the mechanism by which the Welsh Government delivers activities which supports the countryside and rural communities. The Caerphilly Cwm Y Mynydd RDP Programme is currently delivering a number of innovative rural projects across the county borough.
- 4.2 The RDP Sustainable Energy Programme aims to engage with farm households and rural businesses to reduce energy use, promote the uptake of renewable energy, and help them to adapt to climate change. The Team provides a 3-tiered system of support for farms and rural businesses, from low-level telephone advice and factsheets through to detailed mentoring and support. The Maes yr Onn project is part of the high-level exemplar programme that aims to demonstrate good practice and to showcase sustainable energy projects. The Maes yr Onn Farm off grid project was identified as an important opportunity to put the principles of sustainable development into action and to demonstrate how sustainable design and use could lead to high quality projects that can also enhance quality of life.
- 4.3 Maes Yr Onn Farm is well respected in the agricultural community and has an impressive and high quality stock of South Wales mountain sheep. Over the last 5 years, the farm has been successful with showing and achieving top price sales. The farm comprises 208 acres in the remote location of Manmoel, approximately 1400 feet above sea level. The site has never had access to mains gas, electricity, water or sewerage services and even though owners, Mr & Mrs Davies previously travelled a seven-mile journey to the farm twice daily, sometimes during the winter months, the site would be inaccessible which eventually led to welfare concerns.
- 4.4 In 2011, Mr Davies was successful in securing outline planning permission for an agricultural dwelling in order to secure a permanent residence at Maes Yr Onn Farm and to further expand the business commensurate with the mountain grazing rights he possesses over the adjacent Manmoel Common.
- 4.5 The initial concept involved a relatively simple design incorporating 3 bedrooms, lounge, kitchen and porch areas to the front and rear. Due to the lack of utility infrastructure, it was envisaged that heating and lighting to the new farmhouse would be derived from a large diesel generator on site. Water supply was initially proposed via a borehole.
- 4.6 After receiving outline planning consent, the family undertook some of their own research into potential renewable energy options for the site but found it increasingly frustrating in not being able to source independent and site-specific advice. Caerphilly's RDP sustainable energy team were approached by Mr. Davies and following an initial site visit, it was evident that there was a huge opportunity to develop a truly sustainable off grid solution which could demonstrate sustainability in action, as well as delivering a high quality family home.

Initial feasibility study

- 4.7 BRE were commissioned to carry out the initial feasibility of the building, taking into consideration occupation, usage and power requirements. Detailed energy modeling was undertaken to analyse the energy and water usage patterns of the family in their previous grid connected house in order to establish their likely future demand.

Design concept

- 4.8 Early discussions centered on a house design that did not address the real exposure of the site, the code for sustainable homes and the Client's aspirations. The scheme was consequently abandoned and the BRE were commissioned again to undertake the architectural redesign with a brief to deliver a low energy family home, inspired by the traditional welsh longhouse but updated to provide a comfortable family home. Various ideas were offered to the family and pre-planning consultations were held before the final scheme was agreed.

Final scheme

- 4.9 A major requirement for the property was to minimise heat loss from every part of the building fabric (fabric first approach). The envelope of the building has been designed as a super-insulated home to achieve U values demonstrating minimal heat loss.
- 4.10 The architectural response draws from the existing farm's enclosure of stonewalls to extend a shield around the new house, providing shelter and protection against the prevailing winds that reach over 100mph at times.
- 4.11 Internally the rectangular footprint allows a cost effective construction and beneficial surface area : volume ratio to help retain heat.
- 4.12 As the site slopes from east to west, the BRE were able to design in a basement, underneath the house in order to accommodate the appropriate renewable energy and water technologies, which from a planning perspective was granted as being inhabitable space.

Technologies considered

- 4.13 SSE's Contracting division who provide mechanical and electrical contracting services, installed all of the power, heating and water supply technologies which included
- Solar photovoltaic's
 - Battery bank
 - Rainwater harvesting
 - Biomass boiler
 - Thermal storage
 - Skirting heating
- 4.14 Preliminary assessment of wind technology was also considered as an option for the future. CHP and heat pumps were also considered but deemed not practical. Specialist software tools including SAP, design builder, PV sol and Code for Sustainable Homes Water Calculator were used to specify the size of the systems.

Electrical power

- 4.15 21 solar PV panels have been installed on the south facing roof pitch, with an installed capacity of 3.88kwp. The system provides general power throughout the day and any surplus that is not used is stored in an off grid battery bank and drawn on in hours of darkness. Should the battery charge drop below 40%, a small diesel generator takes over to provide the necessary power.
- 4.16 The generation of electricity through photovoltaics will mean that the family will never have to pay for their electricity in the future. As the system is approved through the Government's Feed in Tariff Scheme, the family will also be paid for the energy generated from the system, therefore providing them with an additional income stream.

Water supply

- 4.17 Getting water to the house is not possible with conventional pipework. To overcome this, a water demand calculation was established and a rainwater harvesting system installed which includes potable water for drinking.
- 4.18 Rainwater is collected from the roof of the house and stored in a 5500 litre tank located in the basement plant room. The water collected is filtered and treated with UV light to sterilize bacteria and then pumped around the house to feed the two bathrooms, kitchen and utility area.

Heating and hot water system

- 4.19 Heating and hot water to the house is provided by a 20kw biomass boiler, fed with logs from the family's own woodland and therefore providing a self-sufficient supply of fuel. The heat generated is transferred to 2 separate heat stores, with a total capacity of 1200 litres and which the family when required can draw on.
- 4.20 An innovative skirting radiator system has also been installed which provides an even heat to the perimeter of each room. This avoids the use of installing a traditional radiator system and doubles up as a skirting board too.
- 4.21 The generation of heat through biomass will mean that the family will never have to pay for their heating in the future. As the biomass boiler is approved through the Government's Renewable Heat Incentive Scheme, the family will also be paid for the heat generated from the system when the domestic tariff becomes available (anticipated Spring 2014), therefore providing them with an additional income stream.

The reality of living "off grid"

- 4.22 A significant part of the lessons learnt from the research at Maes Yr Onn will be the way in which the family have to adapt to living with a different utility infrastructure. To maximise electrical power usage, some appliances will need to be run during the day where possible to take advantage of the photovoltaic generation, instead of taking power from the battery bank. The summer months may also present challenges, if there are long hot dry spells, using water efficiently will be important. New maintenance regimes for regular checking of the systems will need to be established and preparing and storing wood in optimum conditions will also be required in order to get the best performance from the boiler.

Replicability

- 4.23 All of the installed technologies are beneficial to those who are on grid as well and can be replicated quite easily either individually or collectively should for example, another rural business within the county borough wish to become self sufficient in their heating demand, water or electricity demand.

Next steps

- 4.24 The build completed in June 2013 and offers a huge opportunity for partners to now work with Constructing Excellence in Wales and the Wales Low Zero Carbon Hub (WLZCH) to monitor and evaluate the building's performance and occupant behaviour to identify and fully understand and explore any performance gap, off grid living, the renewables interaction and the wider application and dissemination opportunities.
- 4.25 The benefits of this will
- Provide an understanding into how the building performs.
 - Determine whether and why there may be a design expectation and performance gap.
 - Provide an understanding into occupant behaviour and its implications.
 - Demonstrate the business case for change with a low cost/low zero carbon sustainable building.
 - Assist builders and developers to deliver more efficient, better performing buildings.
 - Evidence cost/carbon savings and energy efficiency performance improvements for new and existing buildings (design and operation), with particular application to off grid properties.
- 4.26 A bespoke social engagement programme will also ensure that the wider community benefits are delivered effectively. It will also facilitate educational opportunities for schools in their

ecoschool programmes of work. Through the ESD Officer, trials are scheduled in January to visit SSE's newly renewable heat facility at Treforest Industrial Estate. If successful, it is hoped that further tours will be rolled out to all schools within the county borough.

Partners

4.27 The project has involved an effective working partnership between key stakeholders including:

- Maes Yr Onn Farm - Client
- Caerphilly CBC - Local planning authority
- Caerphilly RDP Sustainable Energy Team - Mentoring and coordination
- BRE Wales & South West - Building design, Phase 1 renewable energy technology solution, Agents for the planning application
- SSE - M&E contracting, renewable energy finance
- Constructing Excellence in Wales - monitoring strategy and independent verification body for behaviour change

Communication

4.28 A key element in the success of the project has been a communications plan that has provided a strategic framework for the partnership to deliver effective promotion and engagement with all stakeholders and interested parties. The project has positively featured in a number of media outlets including the Western Mail, Campaign, South Wales Echo and Sunday Telegraph. A ministerial launch was held on 6th June 2013 with Alun Davies AM, Natural Resources and Food to celebrate the delivery of this exemplar project. This prompted a request from Radio Wales for a live interview with Mr. Davies. The project also took the overall winners position at the prestigious RTPI Wales Planning Awards 2013.

5. EQUALITIES IMPLICATIONS

5.1 There are no equality implications associated with this report.

6. FINANCIAL IMPLICATIONS

6.1 There are no financial implications associated with this report.

7. PERSONNEL IMPLICATIONS

7.1 There are no personnel implications.

8. CONSULTATIONS

8.1 There are no consultation responses, which have not been incorporated in this report.

9. RECOMMENDATIONS

9.1 It is recommended that members of SDAP note the achievements of this RDP supported project.

10. REASONS FOR THE RECOMMENDATIONS

10.1 For the reasons set out in the report.

11. STATUTORY POWER

11.1 There are no statutory powers associated with this report.

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