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A smart energy future for rural areas

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Foreword
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The way in which we buy and use our energy is changing, with new and exciting choices increasingly being introduced to us as consumers.

Where we choose to live and work can have an impact on the options that are available to us, with rural areas of low population and poor connections often drawing the short straw. However, smart technologies are enabling the introduction of new and different solutions to how we use our energy, wherever we live.

This paper draws together examples of innovative energy projects based in rural areas that employ smart technology to address supply and demand challenges in local energy production and consumption. This initial research shows these projects bring clear benefits to many local communities.

Alongside other smart technologies, smart meters have the potential to play an important role in changing behaviours, reducing consumption and increasing the efficiency and security of the local energy supply. The evidence also highlights their role in enabling rural communities to harness their renewable energy assets for the benefit of the local population.

I hope this paper helps to encourage further discussion about the possibilities that smart technologies bring to rural areas and enables further innovative projects to emerge.

Sacha Deshmukh
Chief Executive

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1. Introduction

Local energy production is a complex and rapidly evolving world. Local community energy projects are driven by factors such as the desire of consumers to have greater control over their own energy combined with an interest in the local community and self sufficiency. These changes in consumer demands are outlined in Ofgem's Future Insight Series[1] which recognises the benefits of increased competition with the mainstream energy system.

Opportunities to produce renewable energy from sources such as wind, solar and hydro are generally higher in rural areas compared to urban areas. Communities located near these natural assets may, in turn, have greater potential to benefit from these energy sources. However, a range of technological, economic and behavioural factors can limit the extent to which rural communities can take advantage of these opportunities. Significant portions of distribution networks in rural areas face grid constraints which show the extent of the challenge in fulfilling the potential of rural areas to exploit renewable energy resources[2]. In addition, homes in rural areas are typically less energy efficient and can be more reliant on potentially more expensive heating fuels. Smart technology, including smart meters, can increasingly help communities overcome barriers to harnessing local sources and to benefit from energy that is cheaper, more efficient and more secure.

Smart meters are being offered to every household and microbusiness across Britain between now and 2020. A number of studies have been undertaken in the UK, and other EU member states, to review the benefits smart meters and smart technology have on energy supply and consumption patterns. Much of the focus of these studies has been on community projects in cities where community groups have come together to produce and consume locally generated electricity. Research in rural areas however, has been confined mainly to studies focussing on individual projects.

The development of programmes such as the Rural Community Energy Fund in England and the Local Energy Challenge Fund in Scotland is likely to generate a larger pool of good practice in rural areas in coming years. However, as the evidence base is still emerging, this paper seeks to fill some of the current knowledge gap by synthesising examples of good practice in rural areas and drawing out common themes that characterise their successes.

This paper seeks to provide an overview of how smart technology is being utilised by rural community energy projects across Great Britain.

1 Ofgem's Future Insights Series - Local Energy in a Transforming Energy System.
2 See, for example, Western Power Distribution grid constraints maps showing areas of grid constraints and thermal overload. **https://www.westernpower.co.uk/Connections/Generation/Distributed-generation-EHV-constraint-maps.aspx**

2. Current work on smart energy in rural areas

There are a variety of community energy projects in rural areas seeking to use smart technology and data. The aims of these projects vary but tend to include one or more of the following:

- reducing overall energy consumption
- improving the stability and security of local energy supply
- increasing use of renewable generation
- increasing use of energy that is produced locally
- reducing consumer costs and fuel poverty

In the following pages we summarise the good practice currently seen in rural communities, focusing on those projects that utilise smart technology to manage the supply of electricity and those that seek to enable a demand-side response.

Supply side projects

Many rural community energy projects have been developed in response to specific energy supply challenges that face remote areas. These challenges are often linked to the limitations of the local distribution network infrastructure. In some cases, local electricity networks cannot accept new connections from renewable energy sources. In others, the connections are constrained limiting the amount of energy that can be produced. As a result, the potential of local renewables often cannot be harnessed and local community energy generation projects are financially unattractive or simply not viable.

Smart technology is playing an important role in helping to overcome these challenges through the creation of ‘smart grids’. Several projects (e.g. Heat Smart Orkney, ACCESS in Mull and Iona) have focused on closer monitoring and control of distribution networks (often referred to as ‘Active Network Management’) to ensure that local networks are not overloaded at any given time. This ‘real-time’ data allows distribution network operators greater visibility and control over the network and enables more community renewable energy projects to come online.

Case study: Assisting Communities to Connect to Electric Sustainable Sources (ACCESS), Mull and Iona Community Trust, Scotland

The Assisting Communities to Connect to Electric Sustainable Sources (ACCESS) project on the Isles of Mull and Iona uses smart technology to balance local renewable generation and local electrical energy demand from homes and businesses on the islands. Local network constraints mean that community generators cannot realise the full potential of their renewable assets. Rural communities are often paying more to heat their homes with electricity as there is no access to mains gas. Whilst there is an abundance of renewable energy opportunities in locations such as Mull and Iona, the electrical grid in these areas is often in need of upgrades or lacking in capacity to absorb new, clean generation.

ACCESS seeks to enable more locally owned renewable generation from generators, such as the 400kW community owned Garmony Hydro Scheme used by the project, to connect to the grid at their full capacity. The ACCESS solution essentially creates a 'virtual district heating' system for customers who are unable to connect to gas or conventional district heating networks. Enabling them to also benefit from sustainable energy.

The project is led by Community Energy Scotland and is a partnership between Mull and Iona Community Trust (who represent community interests and support participant involvement in the project), SSE (the supply company and partners in the domestic installations), Element Energy (examining the business case for rolling out the ACCESS solution in other suitable locations) and VCharge (who have designed and now operate the smart system to balance the electricity produced from the Garmony Hydro Scheme with demand for electricity for heating on Mull). The project has been funded through the Scottish Government's Local Energy Challenge Fund and Ofgem's Network Innovation Allowance.

Smart data use

The project aims to use smart technology to enable local homes to use locally produced renewable energy. The intention is to reduce reliance on the grid infrastructure on the mainland and provide cheaper, sustainable-sourced local energy to local demand. Smart 'dynamo' switches are fitted to electrical heating demand (such as storage heaters and hot water cylinders) in local houses, which are charged in line with each participant's heating settings whenever the local hydro scheme is generating. If sufficient energy is being produced by the local Garmony hydro project, the household devices can be remotely told to charge and make use of the renewable electricity. When the hydro scheme is not generating, the household devices are charged as normal. This means that locally produced energy is consumed locally.

Behaviour change

The project is investigating a type of energy tariff to reward customers that make use of local renewable generation. Under the ACCESS project, roughly 70 households (including ~20 West Highland Housing Association properties) and a handful of small businesses and community groups will benefit from the lower tariff as well as their highly efficient heating systems. As a local energy tariff doesn't yet exist, participating households and businesses have had their fuel bills manually adjusted by SSE to reflect times when their heating is brought on during on-peak times instead of during their off-peak allowances. The project also aims to increase efficiency on the local network through reduced losses and avoiding the need for network upgrades.

Challenges and opportunities

Community engagement has been a key part of the ACCESS project. The project is ultimately trialling a new system that interacts with householder's heating and hot water. Project partners Mull and Iona Community Trust and Community Energy Scotland have been paramount in engaging local participants and keeping them informed about the project's aims and objectives and delivery progress.

Next steps

It is hoped that the ACCESS Project will prove a new model that can help make better use of Scotland's variable renewable energy generation. The ACCESS solution is hoped to enable other renewable energy projects to connect to the grid with a 'non-firm' offer across the Highlands and Islands. The local network operator, SSE Networks has now approved the ACCESS connection solution as one of its non-firm connection offers. This allows other generators to request connection to the network.

Supply side projects

Some supply-side projects are focused on a longer-term, strategic plan to change the balance of energy supply. For example, the NINES project in Shetland is using smart data and a range of other technology to change the balance of energy production from fossil fuels to renewables. The project makes renewables the main source of energy on the islands when the main fossil fuel power station is eventually replaced.

Smart meters and technology play a key role for energy suppliers in understanding how and when customers are using electricity. Regular data collected by smart meters enables suppliers and communities to offer different types of tariffs and develop new business models with customers and bill them accordingly. This also enables suppliers to provide more regular data to consumers on their energy use to show them when they are benefitting from reduced tariffs. For example, half-hourly data collected by advanced meters in Bethesda, north Wales, enables the community to shift their power use to match the times when a local hydro generator is running. The generator and the local community agree a price for this power that is used locally, developing a new working relationship and business model with the supplier.

Case study: Cyd-ynni: Ynni Lleol (Energy Local), Bethesda, Wales

Cyd-ynni:Ynni Lleol in Bethesda is a pilot project that seeks to harness power from local hydro-electric generation and use advanced meter data to provide local residents with cheaper electricity. The project's aims are to strengthen the local community, reduce fuel bills and promote renewable energy. The pilot involves several partners: Energy Local, Parneriaeth Ogwen (a local social enterprise), Cooperative Energy (as an energy supplier), 10:10 (a climate change charity) and National Trust as owners of the local hydro plant.

Smart data use

An advanced meter is installed in all households participating in the Cyd-ynni / Energy Local pilot that measures usage every half an hour. Residents pay a lower rate (7p/kWh) for the power used when the hydro is operating. When the hydro isn't operating, the project operates a time of use tariff with four rates – most expensive at tea-time, cheapest at night, with lunchtime and breakfast tariffs in between.

Customers are provided with access to an online 'dashboard' and monthly reports to view their household and their Energy Local Club member's total electricity use. They are also provided with information on the best times to use electricity. Monthly reports and the dashboard also show households how much power they used when the hydro was operating.

Behaviour change

The project forecasts potential savings of 10-30per cent for around 100 households that will take part in the pilot. Over 90 households have already joined the pilot and although the total savings for customers have not yet been evaluated, evidence suggests that households are already beginning to see the benefits. With Open Energy Monitor, Energy Local is also developing the dashboard further to create a 'Home hub'. This gives households and the community a helping hand to automatically schedule appliances to operate at the cheapest times of day.

Challenges and opportunities

Community engagement is a key challenge for the project. The involvement of trusted local community officers from Partneriaeth Ogwen has been key to the project's success in recruiting households to take part. Project managers also consider that the presence of a physical hub in Bethesda where local people can visit to find out more about the project or sign-up as a member has been important.

Reducing the cost of the smart home hub to schedule appliances and enabling it to be used for a range of services to make it cost effective is also a key challenge.

"A project like this relies on people in the community getting involved - energy companies just don't have the contacts on the ground. Having a trusted local officer has been vital as we're not known locally and getting people to switch requires quite a bit of legwork" Amy Cameron, 10:10

Next steps

The project is working with the meter operator to improve communication for the meters in rural areas. Better communications will allow the dashboard to show customers' own electricity use and total Energy Local Club's data every half an hour. In future incorporating greater levels of appliance scheduling via the home hub will maximise the benefits of the hydro and time of use tariff.

"They're a really enthusiastic community. This is a huge factor – they care about the savings but they see it as a community project. They see themselves as pioneers." Amy Cameron, 10:10

Demand side response

Smart meters form part of a wider focus on energy efficiency that seeks to influence consumer demand. In rural areas, many projects profiled in this paper have sought to incentivise customers to change their energy use in different ways such as:

- time-of-use tariffs – cheaper energy at certain times of day
- lower tariffs for locally produced renewable energy
- capping energy use for households and businesses

In all of these projects, smart technology plays a key role in enabling customers to be aware of their energy use and modify their behaviour based on the incentives/ constraints. The rollout of smart meters could enable further projects to develop.

Analysis of the Energy Demand Research Project (EDRP)[3] found that incentives, such as variable tariff charges had little effect on changing energy consumption patterns unless they were also accompanied by the use of smart meters. The findings suggest that smart meters are a necessary enabling platform to encourage and measure behaviour change incentivised by other interventions such as time of use tariffs.

3 Energy Demand Research Project: Final Analysis – AECOM (June 2011)

Case study: Eigg Electric, Isle of Eigg, Scotland

Eigg Electric is a community owned, managed and maintained company that provides electricity for all island residents from the renewable sources of water, sun, and wind. As the island is not connected to the mainland electricity supply, the Isle of Eigg electrification scheme was established to provide reliable power to residents for the first time in 2008. As the electricity system is entirely stand-alone, it requires careful monitoring and management of supply and demand to ensure that nobody goes short and excess supply is managed appropriately.

"Eigg Electric has been life-changing for the residents of Eigg. No more dirty, expensive, loud, smelly and inconvenient diesel generators to fill or maintain. Just cheap, clean, green, silent, reliable power, 24/7" Lucy Conway, resident.

Smart data use

Eigg Electric uses smart OWL meters and caps on energy use to manage the supply and demand for electricity on the island. Each household has a 5kW usage cap and each business 10kW. On rare occasions when households or businesses exceed their limit their supply automatically switches off. The Eigg Electric team have to visit the property to turn the electricity supply back on.

People can see how much power they're using at any given time, the meters also indicate when the 5 or 10 kW cut-off point is approaching. The information provided by the meters have enabled residents to recognise the energy used by various appliances and equipment. The residents are no longer as reliant on the meters now to provide continuous information on usage as they were initially. However, the data the meters provide is still useful if new electrical equipment is introduced, or when visitors come to stay or work on the island.

Behaviour change

The energy monitors have enabled residents to understand how many appliances they can use at a time whilst staying within their limit. Residents are now very familiar with what energy different appliances use and are habitually low energy consumers. This means they can operate within the limits without having to think about it. However, the monitors are particularly useful for visitors using holiday homes on Eigg.

"It's useful to explain to visitors in holiday accommodation to ensure they don't go over the limit, but as most holiday homes only have low energy appliances it would be very hard for visitors to use more than 5kW." Lucy Conway, resident

Challenges and opportunities

The system is entirely self-contained and involves no external input from a mainland utility company. This means that a team of local residents has been trained to maintain the system. The maintenance team of five people operate a rota system to ensure there is always someone on duty and to do the daily checks required to maintain the system.

Occasionally, the renewable sources produce more electricity than is consumed by residents. This has been overcome by installing a battery storage system in a central control building on the island. When the renewable sources produce insufficient power to meet demand, power flows out of the batteries and they progressively discharge. When the system produces more electricity than can be used (including battery storage), automated switches enable excess energy to be used to heat community buildings such as the Community Hall and local churches.

Demand side response

Smart technology has been promoted in many rural community energy projects. Several projects have provided consumers with incentives to install and use advanced storage heaters and boilers that can be programmed to shift energy use to times that benefit consumers, suppliers and the community. This type of approach to 'load shifting' is seen in projects such as Heat Smart Orkney and ACCESS.

On a larger scale, some projects have sought to utilise excess energy through engaging community assets such as district heating systems (e.g. NINES project), large scale battery storage (e.g. Eigg Electricity), heating community buildings and providing free charging for electric vehicles in public areas (e.g. Orkney). In many of these projects automation is a key part of the process, with excess energy from local sources being diverted in a systematic way to community assets when supply outstrips demand.

Case study: Northern Isles New Energy Solutions (NINES) project, Shetland, Scotland

The Shetland Islands are the windiest locations in the UK and have significant potential for wind energy generation. However, the percentage of energy generated from renewables on Shetland has historically been quite low (around 7per cent of consumption). The island is not connected to the mainland AC grid and the instability of the ageing local energy distribution network means that there have been restrictions on the development of new wind energy projects.

The NINES project has been established to provide greater control over renewable generation and demand connected to the local grid and enable more renewable energy generation capacity to come online. The project's objectives are to reduce energy demand and energy production by fossil fuels. The NINES project is led by Scottish Hydro Electric Power Distribution (SHEPD) in co-operation with Hjaltland Housing Association. Other key partners include Shetland Heat Energy and Power and the University of Strathclyde.

Smart data use

The NINES project has involved demand side management by installing smart technology in households to try and shift electricity use from peak periods of high demand to times where there is an excess of generation compared to demand. The project seeks to do this by utilising different types of technology that are connected to the electricity grid. These include storage heaters, immersion water cylinders, battery storage.

Behaviour change

Smart storage heaters have been installed in 235 Hjaltland Housing Association homes. New hot water cylinders have also been installed in around 155 homes. These devices can be triggered automatically at times where the supply of electricity from renewable generation outstrips the ability of the Shetland system to absorb it whilst remaining stable. As well as helping to balance peaks and troughs in energy demand, these devices are more efficient and it is hoped they will help lower bills for households. The project hopes that with greater control available, meaning the potential for less wasted heat, the new heaters and tanks could save up to 15 per cent on tenants' current heating bills.

Challenges and opportunities

Shetland faces a significant energy supply challenge due to its location, lack of connection to the national grid and reliance on local sources of generation. There is no gas supply to properties on the islands outside Lerwick, and heating needs are met by oil and electricity. The overall challenges for the project have been to increase the ability to monitor the distribution network in Shetland and gain greater control over the balance of supply and demand to enable greater use of renewable sources.

"Shetland couldn't fit more wind generation onto the grid because they lacked grid stability and had no visibility or control over renewable generation connected to the system. NINES is trying to address this so that more wind energy can be harnessed"
Dr Simon Gill, University of Strathclyde.

Next steps

Shetland's main power station at Lerwick was built in the 1950s and is reaching the end of its operational life and a decision is due on its replacement by 2030. It is hoped that the learning from the NINES project will help enhance the role that renewable energy can play in the Island's electricity supply. The introduction of flexibility on the demand side, combined with monitoring and control of renewable generators, has the potential to significantly reduce the reliance on the replacement station.

Automation

Automation is also a theme in domestic settings that runs through many successful rural community energy projects. The Heat Smart Orkney project has involved monitoring and control of advanced storage heaters to shift usage to coincide with production from a local community wind turbine.

Information

Information is also a key factor that can influence changes in energy consumption behaviour. Smart meters can provide key data and in-home-displays (IHD) can relay that information to consumers. However, the EDRP[4] findings outline that in order to maximise the influence these devices have on changing energy demand patterns they need to be accompanied by further information and prompts, particularly in the form of support and advice provided by device installers. The findings also conclude that information provided directly by a device installer was critical at changing energy consumption. The use of an honest broker or the support of a trusted local organisation to relay information to participating households has been a key success factor for many of the case study projects.

4 Energy Demand Research Project: Final Analysis – AECOM (June 2011)

Case study: Heat Smart Orkney, Orkney Isles, Scotland

Community owned wind turbines in Orkney have significant renewable energy production capacity, thanks in part to Active Network Management (ANM). However, the ANM system must routinely limit the amount of electricity a turbine can generate (whether for use in the vicinity, across Orkney or further south). At times of low local electricity use, the supply of renewable energy can outstrip demand by a factor of three or more.

Heat Smart Orkney works within the ANM, using Internet-linked sensors and controllers to despatch household electrical heating in key locations during local superabundance.

The project is a two-year community based trial, funded by the Scottish Government's Local Energy Challenge Fund. The trial seeks to demonstrate how smart controls and local rebating can mitigate the limitations placed on the amount of electricity that can be harnessed from community turbines in Orkney. It also seeks to address local fuel poverty by enabling community wind turbines to generate more electricity and reduce the price of electricity to customers in their own community.

Smart data use

The Heat Smart Orkney trial uses smart data to monitor the supply and demand for energy, and to despatch electrical heat load at any time a turbine is curtailed below its potential output, if in-home thermostats indicate heat is wanted. The amount of energy being generated by community wind turbines is monitored, and automated systems can evaluate the benefit to each individual turbine.

Automated equipment has been installed in households to switch on devices (smart storage heaters, water heaters, oil boiler preheaters) that increase local demand for electricity – and displace oil/coal. The shifting of demand helps reduce the likelihood of the network reaching capacity and enables wind generators to keep producing energy.

Behaviour change

Participating households in the Heat Smart Orkney project receive a rebate on their increased electricity consumption, funded by increased income to the community turbines. This reduces the cost of their electricity and makes it more competitive with oil heating.

Challenges and opportunities

The relatively low price of oil presents renewables producers with challenges in trying to incentivise households to switch to using locally produced electricity. However, the Heat Smart Orkney pilot is seeking to make electricity more competitive by increasing local generation from renewables and sharing that community revenue with domestic bill payers.

Next steps

The Heat Smart Orkney project will be piloted over the next two years and will be evaluated by the Scottish Government alongside other projects funded by the Local Energy Challenge Fund.

3. Opportunities and challenges

Deploying smart technology successfully in rural community energy projects often relies on overcoming particular challenges that face areas with lower populations. However, the nature of rural communities also presents unique opportunities to engage communities in innovative and inclusive ways. In the following, we outline some of the opportunities and challenges that characterise the use of smart energy in rural community energy projects.

Community engagement

Successful community energy projects rely on participation and local buy-in which requires significant investment of time from local communities, project managers, energy suppliers and other partners. In rural areas, the benefits of projects being located in smaller, more cohesive communities can potentially help those seeking to foster a sense of collective purpose around a community energy project. Some of those involved in managing the projects profiled here were of the view that it could be easier to achieve this feeling of having a shared goal in rural areas.

Geographic proximity to renewable energy assets is also a potential benefit in rural areas. Renewable energy sources are often more visible to rural populations, and this in itself can generate a stronger sense of community ownership. Several representatives of projects profiled here expressed a willingness of rural communities to engage that they felt stemmed from a desire to benefit from local renewable assets for their community as well as individuals. Recognising this could help rural community energy projects recruit members and secure active participation.

Capacity

Recruiting enough participants to make projects financially viable is a challenge for community energy projects. This is particularly acute in rural areas with lower populations, where projects need to engage a higher percentage of the population in order to achieve the required critical mass of participants to make a project viable.

Evidence shows that energy suppliers face a number of challenges in recruiting participants to these types of projects. These include:

- a lack of capacity to recruit individuals
- a lack of trust, particularly for larger suppliers
- a lack of familiarity, particularly for smaller suppliers
- a reluctance to switch suppliers ('sticky customers')

Community involvement is seen to play an important role in overcoming these barriers. A number of rural projects have utilised community organisations and local companies or volunteers to recruit participants, design marketing materials and run local energy shops (e.g. ACCESS in Mull and Iona). These trusted intermediaries can help overcome barriers by encouraging participants, reassuring them about projects' motivations and demonstrating the benefits of taking part. Other projects see themselves more as developing their own local market working in partnership with suppliers e.g. Cyd Ynni: Ynni Lleol, Bethesda.

Information

The importance of ensuring that participants are provided with good information about projects through the most appropriate channels has been crucial in many of the projects. For example, evidence suggests that projects that have provided customers with smart meters and accompanying written information have been less successful compared with those where participants have been engaged face-to-face. Peer to peer learning and communication is key.

More detailed engagement can help consumers understand their smart meter, its benefits and potential application. In rural areas, there are potentially greater opportunities to ensure that this type of face-to-face engagement takes place through the engagement of trusted intermediaries. This is considered critical in getting participants to 'buy-in' to projects and ensuring that they are able to actively take part.

Case study: Welcome to our Woods, Upper Rhondda Valley, Wales

Welcome to our Woods is a not for profit social venture in the upper Rhondda valley. The company is planning to build a micro hydro energy project to produce electricity that can be used to reduce fuel poverty locally by providing power for local community buildings and low-income households. Around 40 local community members have been involved in the project as volunteers.

Smart data use

Smart meters are a key part of the project's business plan. The project has identified the potential for installing smart meters in community buildings and social housing in conjunction with the hydro being built. The project hopes that smart meters will enable them to monitor energy use and effectively charge people for the energy they use. Smart data will also be used on the supply side to monitor production and manage generation in a similar way to projects using Active Network Management in Scotland.

Behaviour change

Although the project is not yet established, Welcome to our Woods hope it can have a beneficial economic impact on community organisations by reducing their bills and enabling them to focus on their core activities.

The hydro project aims to break-even rather than make a profit, but the project considers there to be an opportunity to sell local energy.

Challenges and opportunities

Community engagement and participation is a key challenge for the project, but targeting Housing Associations and community buildings is seen as an effective way to overcome this issue.

"One of the key things is working with housing associations as they effectively own these properties, so actually getting this technology into these properties is easier as you've already overcome the hurdle of working with the landlord. We're also planning on working with community buildings, and they usually own the building that they are in charge of." Ian Thomas, WOTW Ltd

Next steps

The project's first micro hydro is set to be installed in spring 2017 and the project has secured funding and planning to develop a further seven micro hydro projects across the south Wales valleys. WOTW consider that there need to be attitudinal shifts in order to achieve.

"Some people consider top of the valley as urban, but it's rural. We've got this clash with countryside meets valley of homes effectively, so we've got this energy sitting on the hillside. It's the right way to create energy, as there's less waste. We can create energy where people live." Ian Thomas, WOTW Ltd

4. Conclusions and future gazing

The evidence base to demonstrate the impact of smart technology on rural community energy projects is still emerging but the benefits perceived by many of the local communities profiled above are clear. Smart technology plays an important role in supporting behaviour change, reducing consumption and increasing efficiency and security of the local energy supply. It can also contribute to enabling rural communities to harness their renewable energy assets for the benefit of the local population, increasing energy resilience and spurring economic opportunities. In the near future smart meters will also deliver the data necessary to facilitate these developments.

In some remote communities, the impact of smart technology has been transformational in maintaining a delicate balance between energy supply and demand. In others, smart technology is being seen as playing a key role in potentially altering the balance between renewable and fossil fuel generation.

The future

Many of the projects profiled are moving towards more frequent and detailed monitoring to enable increased customer responsiveness. There is a trend towards providing customers with more detailed monitoring data and breakdowns of their energy usage. This shift towards providing real-time data for consumers is in its infancy in some of the projects highlighted above. However, there is an increasing trend towards customers being able to view a similar level of information as their energy supplier.

There is also an increasing trend towards automation within rural community energy projects. Several pilot projects have recognised that more significant shifts in demand can be achieved through deploying automated technology. This could involve customers allowing more centralised control of some devices or consenting to having smart devices installed (e.g. advanced storage heaters, timed water heaters). It could also involve greater customer control through a shift towards smart devices and the internet of things.

Rural communities are also embracing emerging smart technologies which can deliver a step-change in the relationship between the local supply and demand of energy.

At a strategic level, there is evidence that some local governments and local communities are seeing the potential in installing network platforms that support smart energy use alongside other applications (e.g. smart street lighting, EV charging, flood defences, smart parking). In rural areas, there are financial barriers to this approach in terms of achieving the same economies of scale as urban areas. However, evidence from this paper shows the potential benefits of engaging large organisations such as housing associations and owners of community assets (e.g. local authorities).

As programmes such as the Rural Community Energy Fund and Local Energy Challenge Fund develop and are evaluated, the evidence on the benefits of smart technology is likely to become clearer. However, the range of examples presented in this paper demonstrate the potential role smart technology has to play in the future of rural community energy.

Smart Energy GB aims to engage with stakeholders up and down the country as we seek to help them and their local residents benefit from the smart digital energy revolution that is underway.

We'd welcome further discussions with you around the content of this paper.

If you wish to get in touch, please contact us:
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