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Humshaugh Net Zero CIC

RCEF

Low Carbon Feasibility Study

Workstream 7 – Energy Trading

Final Report

February 2021

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Document Revisions

No.	Details	Date
1	First Draft Report	Dec 2020
2	Second Draft Report following client comments	Feb 2021
3	Final Report	Feb 2021

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Report for
Humshaugh Net Zero CIC

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1 Introduction

Humshaugh Net Zero CIC (HNZ) are engaged in the process of reducing the Parish's carbon footprint and tackling climate change and to achieving the Government and Northumberland County Council Net Zero targets. They have consulted with the local community to ascertain their views and are looking to identify a viable approach to low carbon energy generation, particularly electricity, in the Parish of Humshaugh.

The Rural Community Energy Fund (RCEF) is a £10 million programme to support rural communities in England to develop renewable energy projects. HNZ have been successful with a stage 1 application, the funds being used to deliver this feasibility study. Stage 2 grants are available to further develop identified feasible projects for business development and planning.

1.1 Description of the Brief

HNZ is seeking to explore how to use the local grid to allow local consumers to balance their demand with local embedded generation output where the generator is not 'behind the meter', as part of its overall plans to drive forward opportunities to reach a Net Zero Carbon level as targeted by Regional and National Policy in an economic manner.

The Local Electricity Bill is one initiative that might result in this being feasible soon, but are there other solutions, for example energy trading through brokers, which could be cost effective if properly incentivised.

HNZ is seeking tenders for the provision of a study, technical advice and assistance in reviewing the obstacles that currently exist to exploiting local 'remote' generation for local demands and ways which these could be overcome. The consultant will provide technical advice and assistance to help the local community optimise its utilisation of local, low-carbon, energy resources, with the aims of supporting the Government Net Zero Target, in a cost effective manner for the local community and increasing employment opportunities in the locality.

1.2 Scope of Work

This report describes the feasibility of energy trading at NHZ and initial discussions with possible partners. It identifies possible routes to energy trading across the community and an outline of the next steps needed to progress in this area.

2 Community Energy Trading in UK

Community Energy Trading in the UK is predominantly based on electrical power trading with energy suppliers; however some private other relevant projects do exist as feasibility studies such as district heating.

Focussing on electrical power trading, more recently Demand Side Response (DSR) using energy aggregators forming Virtual Power Plants (VPPs) has become a rapidly developing market, as aggregation of smaller generators at a community level allows participation in further energy markets. In some areas flexibility services are now also providing some interesting opportunities.

2.1 A Changing Energy Market

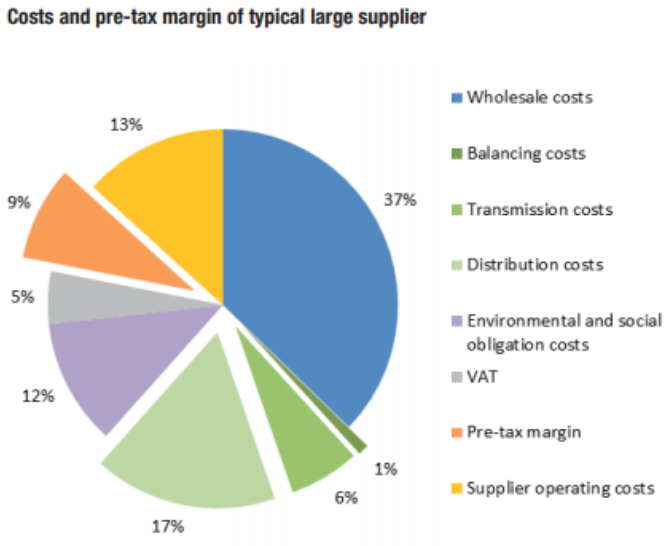
Particularly for electrical supply, the energy market is rapidly changing to accommodate the huge rise in distributed energy resources (DERs). Distribution Network Operators are transitioning into Distribution System Operators where they are actively managing the network and taking advantage of local dispatchable generation and loads.

Access to markets is now within reach of a number of smaller generators, with innovative using services such as Flextricity, Upside Energy and other Internet cloud based platforms able to leverage value from DERs due to advanced connectivity and changes in Capacity Market and other areas.

For domestic consumers wishing to participate in energy markets, the FIT tariff has now been replaced by less valuable SEG tariffs, however domestic half hourly metered wholesale tracking tariffs now provide further opportunities for export.

This changing landscape is resulting in a number of rapid consultations and changes to the way the energy is generated, transported and consumed. This is resulting in some unusual moves such as DNO's requesting reductions in system charges due to availability of local supply and demand capability.

Over the next few decades, with the further introduction of electric vehicles, the makeup of the UK energy market will change beyond recognition, with smaller suppliers and aggregators taking advantage of market opportunities. Operating costs of larger suppliers not participating in innovative markets will continue to rise.



OFGEM chart showing costs that make up an electricity bill

2.2 Demand Side Response

Demand Side Response continues to be a key enabler of energy trading. With the addition of more smart products at both a commercial and domestic energy consumer level, this allows remote monitoring and control of assets that are able to respond instantaneously to changes in supply or energy pricing. These can be larger grid/utility scale generation assets and high baseload consumers, but also more recently the aggregation of smaller generators and groups of energy consumers who collectively are able to participate in market mechanisms such as the capacity market and flexibility services.

2.3 Virtual Power Plants and Aggregation

With the availability of smart devices connected to communications infrastructure such as the Internet, half-hourly settlement metering and time-of-use tariffs, there is significant involvement from third parties who are providing brokerage services against demand response.

“Aggregators are defined as third party intermediaries specialising in coordinating or aggregating demand responses from individual consumers to better meet industry parties’ technical requirements for specific routes to market. Aggregators send signals to their consumers to modify their demand as a response to the System Operator requirements and/or market price signal”.

Aggregators do not need a license to operate - aggregators form contractual relationships with individual customers, relaying the signals given by the procurers of flexibility to these providers of flexibility, the relationship does not involve the Supply of electricity as defined above.

Aggregators that are able to condense a number of DERs into a single entity are able to create Virtual Power Plants which are able to compete on a similar basis to existing generation.

Implementing Virtual Power Plants, Demand Side Response and similar services is becoming easier than ever, with a number of highly complex platforms being made available as open source software.

This has led to a number of innovative projects in the UK from organisations such as Carbon Co-Op with their community aggregator PowerShaper platform, and EU funded research such as https://www.rescoopvpp.eu/

Domestic aggregation is still in its infancy, however this has resulted in a number of interesting feasibility studies being undertaken in this area including BEIS domestic flexibility competitions – https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/631718/Flexibility_Markets_Feasibility_Study_Competition_Guidance_-_final_draft.pdf. It is likely that further research in this area will be of high value to BEIS.

2.4 Power Generation and Supplier Options for Communities

A number of approaches are possible to supply energy from distributed energy resources if it is desirable to form a commercial entity to sell to the community:

- License Lite – Community forms a small energy supplier organisation but partners with senior suppliers who manage industry code on behalf of lite suppliers.
- License Exempt application - <5MW or <2.5MW to domestic customers
- White Labelling – partnering with an existing supplier who provides services behind a brand to a target group.

2.5 Community Tariffs

A number of community energy tariffs have recently been made available by suppliers such as Co-Op Energy where energy is purchased from community groups rather than the open market. This also avoids “greenwashing” where renewable energy certificates that other suppliers have been undertaking where renewable energy certificates have been purchased at discount to make non-renewable energy green.

With sufficient numbers it is also possible to negotiate a white label tariff for a community, however BEIS trials clearly demonstrate that suppliers are only interested in communities benefiting from special tariffs for the duration of the trial (whilst they are receiving innovation funding) and these tariffs cease to operate at the end of trials with customers reverting to the suppliers’ regular tariff. The numbers of

participants must be in the thousands to make the trial appealing to the supplier who will also consider this an easy way to capture new business.

2.6 Community Power Purchase Agreements

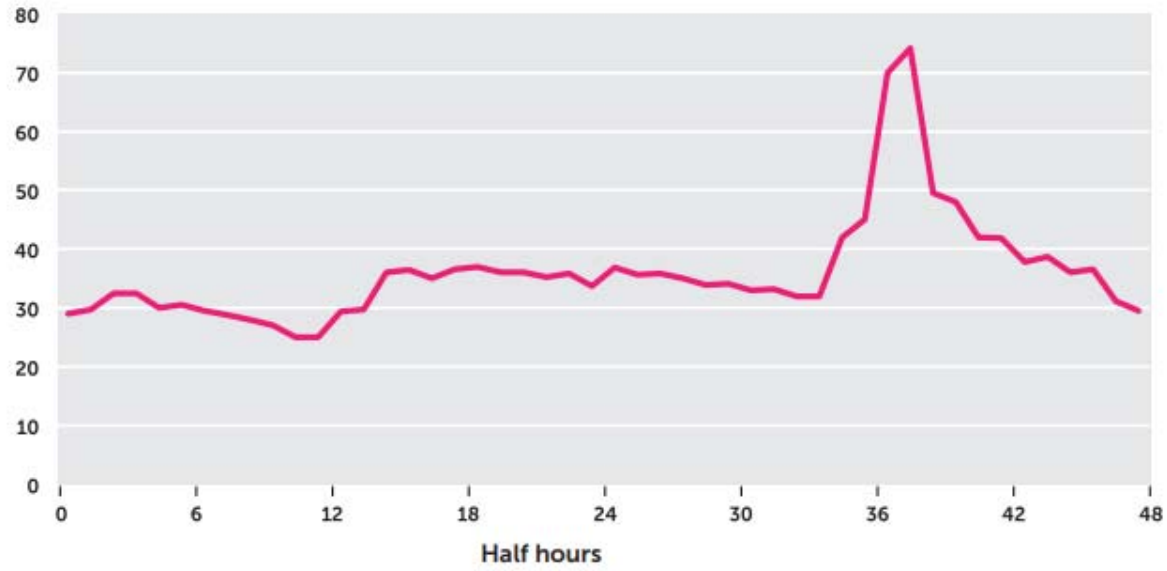
Corporate Power Purchase Agreements is usually a long term contract where a consumer agrees to purchase electricity directly from an energy generator. These differ from buying energy from a licensed supplier under a utility PPA. These are more suited to larger consumers, however with bulk requirements e.g. pooled/centralised EV charging this may be cost effective.

Recently a number of community energy schemes have partnered up with energy suppliers to take advantage of community focussed PPAs, in particular “sleeved” PPAs where energy is taken from a renewable energy project and sleeved to the buyer at point of intake. The renewable energy project is located on a different site rather than a private wire arrangement. The utility acts as an intermediary for a fee. Energy can also be purchased from the grid to smooth import. This allows an energy contract to be agreed between a local generator and consumer, matching the renewable energy generation to load at the exact time of production.

3 Flexible Tariffs

From a domestic consumer standpoint, with the availability of SMETS2 meters it is possible for a number of domestic level smart energy trading options to become available.

Over a 24 hour period the cost of wholesale electricity can be very volatile, and this results in fixed tariffs building in headroom.



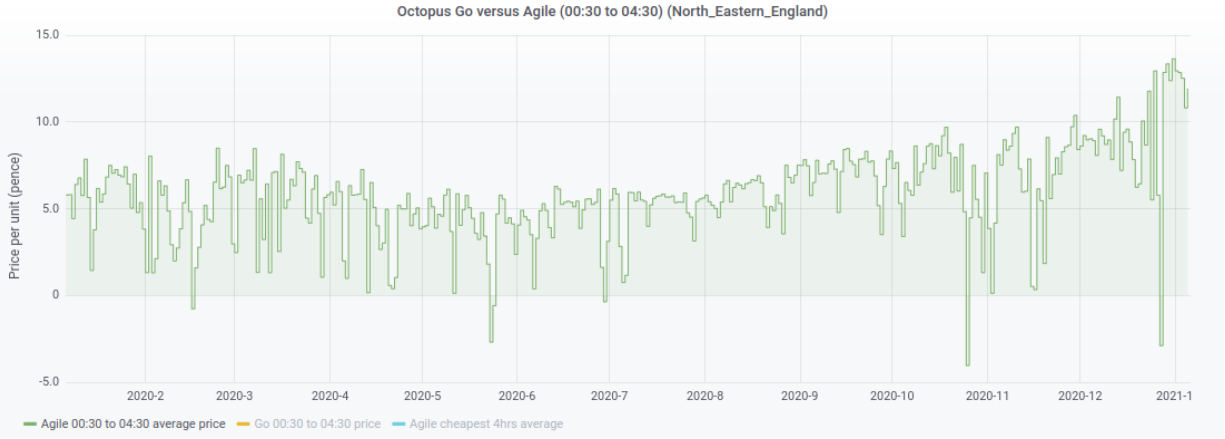
Wholesale prices fluctuating over 24 hours £/Mwh

However, suppliers such as Octopus Energy are now providing day ahead pricing for their Time of Use (ToU) tariffs to domestic customers. It is beneficial that HNZ have already been in some dialogue with them. This is a recommended supplier for any trial as they are already successfully being used across a number of other platforms and also have the most flexible access via an API (see below).

3.1 Import

Octopus Agile is a dynamic tariff offering day-ahead pricing on half hourly metered energy. Recently in the media, it was noted that Octopus were paying some of their customers due to prices going negative.

https://www.energy-stats.uk/octopus-go-versus-agile-north-eastern-england/

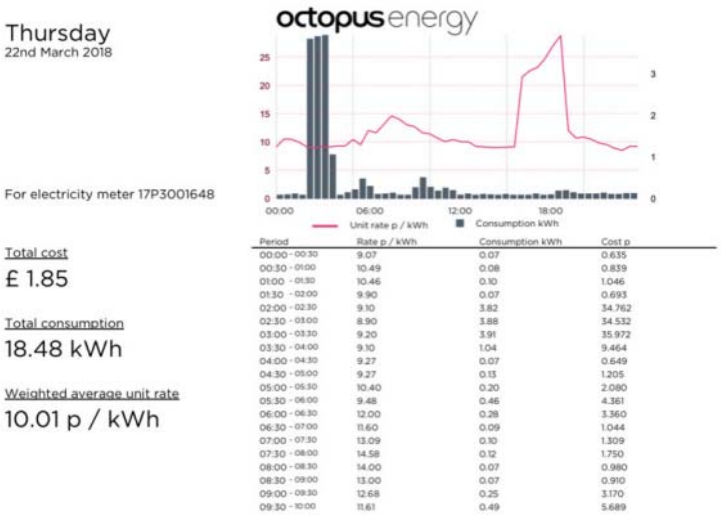


3.2 Export

In addition to Octopus Agile, for export Outgoing Agile smart export tariff matches your half-hourly prices with day-ahead similar tracking wholesale rates as used for import. This can provide a significant revenue stream compared to SEG.

3.3 Billing

Octopus are able to provide detailed billing information which can be very beneficial in assessing energy usage.



Thursday
22nd March 2018

octopus energy

For electricity meter 17P3001648

Total cost
£ 1.85

Total consumption
18.48 kWh

Weighted average unit rate
10.01 p / kWh

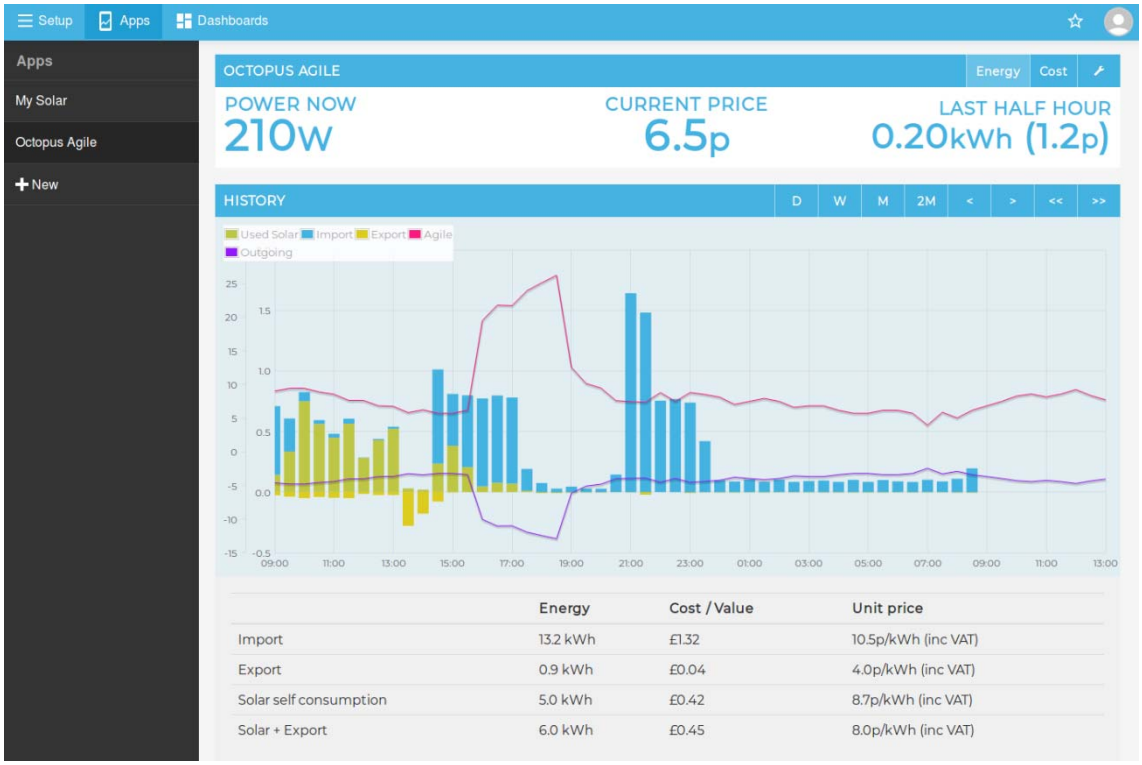
Period	Rate p / kWh	Consumption kWh	Cost p
00:00 - 00:30	9.07	0.07	0.635
00:30 - 01:00	10.49	0.08	0.839
01:00 - 01:30	10.46	0.10	1.046
01:30 - 02:00	9.90	0.07	0.693
02:00 - 02:30	9.10	3.82	34.762
02:30 - 03:00	8.90	3.88	34.532
03:00 - 03:30	9.20	3.91	35.972
03:30 - 04:00	9.10	1.04	9.464
04:00 - 04:30	9.27	0.07	0.649
04:30 - 05:00	9.27	0.13	1.205
05:00 - 05:30	10.40	0.20	2.080
05:30 - 06:00	9.48	0.46	4.361
06:00 - 06:30	12.00	0.28	3.360
06:30 - 07:00	11.60	0.09	1.044
07:00 - 07:30	13.09	0.10	1.309
07:30 - 08:00	14.58	0.12	1.750
08:00 - 08:30	14.00	0.07	0.980
08:30 - 09:00	13.00	0.07	0.910
09:00 - 09:30	12.68	0.25	3.170
09:30 - 10:00	11.61	0.49	5.689

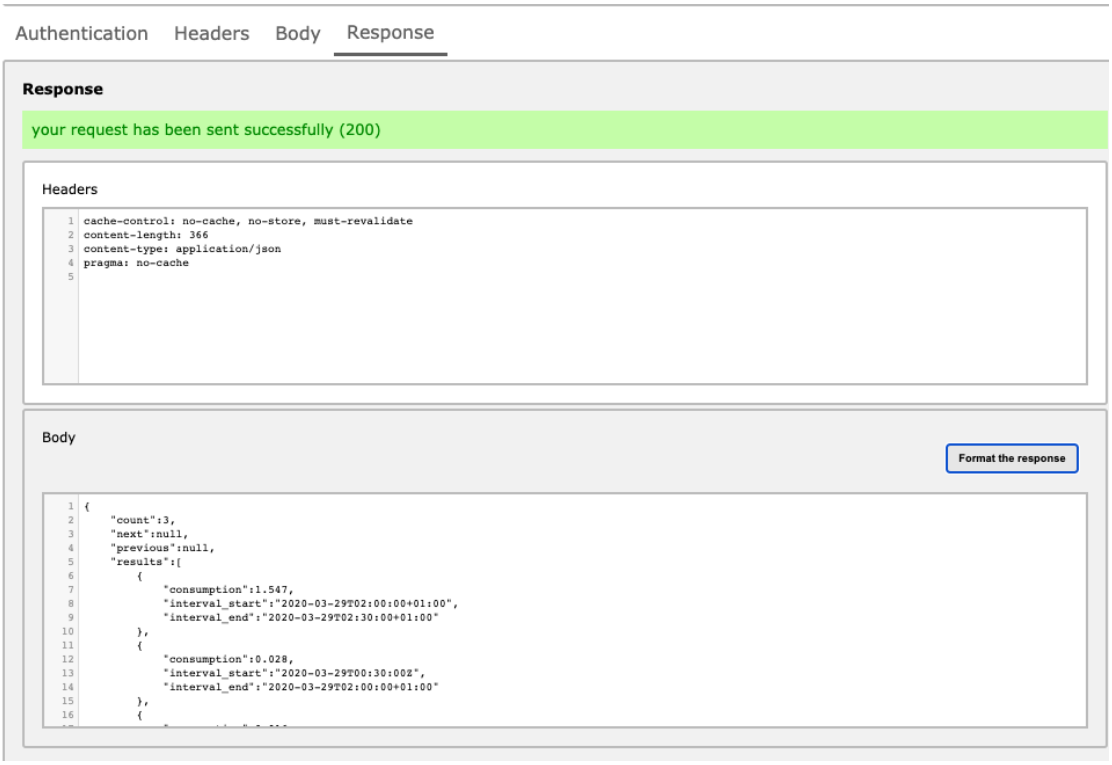
3.4 API Access

Octopus provides Application Programming Interface (API) access with a secure key allowing access to key information such as tariff details, meter information, instantaneous consumption and a number of other useful parameters.

This publicly available well documented capability is a key unique feature at this moment in time for Octopus Energy

This could be used for example to provide detailed information on village usage if a platform were to be developed/integrated that could with resident's permission access this data (anyone in the world can get the data from Octopus as long as they have the secure key for that account).





In addition, utilising open source software in addition to this API, it is possible to create advanced behind the meter trading and demand side response platforms that are able to control loads such as EVs etc. in response to changing energy prices. Milliamp Technologies can advise further regarding the technical development requirements if needed.

It is also possible to directly access more detailed third party data via DCC access and other API providers, however this requires further opt in from consumers. For a straightforward approach Octopus API provides all the information required.

3.5 Pooled Assets

Communities are taking advantage of pooled assets such as electric vehicle charge points where individual dwellings are unable to host an EV charge point for economic or logistical reasons. With Vehicle to Grid expected to be more widespread over the coming years, this leads to a large DER asset capable of flexibility and aggregation.

ChargeMyStreet is a Lancaster based initiative that is currently rolling out community charge points across the UK.

ChargeMyStreet rollout map:

Utilising shared community spaces such as village hall car parks etc. provides a central charging facility no more than 5 minutes' walk from the bulk of residents' houses in any particular area. This allows ChargeMyStreet to obtain better deals from the supplier and there is also the option of DSR services.

4 Flexibility Services

Flexibility Services are seen as a key future requirement to allow the rapid expansion of the power grid at both transmission and local network level. Due to the rapid rise in energy use by Electric Vehicles, and further de-centralisation of the energy system, system operators are facing significant costs from network reconfiguration and reinforcement. In order to avoid these costs, they are procuring flexibility services from DERs and consumers that can assist them in maintaining network stability and operation which can mitigate capital expenditure and reinforcement. By turning up/down and shifting generation or consumption patterns, sometimes in a very dynamic way in collaboration with Active Network Management, it is possible to avoid and risk to security of supply.

In many configurations, the three main modes of operation are Secure - pre-fault, Dynamic – post fault, and Restore - outage.

4.1 DNO Flexibility Services

DNO/DSOs have been procuring flexibility directly to generators and consumers via DNO Constraint Contracts.

Northern Powergrid sees flexibility services as key to their transition as a Distribution Service Operator. They have been relatively innovative in their approach to flexibility services and have been procuring services through tendering/auction services (https://www.northernpowergrid.com/news/flexibility-goes-under-the-hammer) looking for a minimum of 100kW flexibility.

Whilst some of their network flexibility requirement is currently focussed on dense network areas, it is likely that over time this will spread across the whole of their network as they are forced to upgrade and re-inforce due to the further rollouts of EVs and heat pumps.

Maps of current areas of flexible service procurement in the Northern Powergrid network.

Location	Postal sector	Substation	Maximum requirement (MW)	Requirement		
				Months	Days	Hours
Doncaster	DN32; DN33; DN74; DN76; DN85	Armthorpe 66/11kV STP	0.6	Jan - Feb	Mon, Tue, Sat, Sun	1600 - 1800
Goole	DN140; DN148; DN149; YO88	Pollington 33/11kV STP	0.7	June - Aug, Dec	Mon, Wed, Thu, Sat, Sun	0630 - 0800, 1100 - 1330
Harrogate	HG11; HG12; HG13; HG14; HG15; HG20; HG28; HG31; HG32; HG33; HG59	Harrogate 132/11KV	3.4	Nov - Mar	Mon, Tue, Wed, Thur, Sat, Sun	1000 - 1900
	HG13; HG14; HG27; HG28; HG31; HG33; HG50; HG58; HG59	Starbeck 33/11kV	0.4	Nov	Sat, Sun	1630 - 1700
Heckmondwike	BD46; BD49; WF156; WF160; WF169; WF170; WF175; WF177; WF178; WF179; BD111; BD112; BD194; BD195; BD40; LS270; WF134; WF140; WF156; WF157; WF158; WF160; WF167; WF169; WF170; WF178; WF179	Heckmondwike 132/33kV	0.1	Jan	Mon	1630 - 1830
Knottingley	DN69; WF110; WF118; WF119; WF83	Weeland Road 33/11kV	1.3	Jan - Mar, May, Jul - Dec	Mon, Tue, Wed, Sat, Sun	0700 - 1630, 1900 - 2000
Leeds	LS165; LS167; LS168; LS42; LS53; LS61; LS62; LS63; LS64	Moor Road 33/11kV	0.8	Feb	Sat, Sun	1730 - 1830
Malton	YO124; YO140; YO178; YO250; YO253; YO254	Butterwick 66/11kV STP	1.5	Sep - May	All	0600 - 2100
	TS134; TS135; YO130; YO139; YO170; YO176; YO177; YO178; YO179; YO187; YO188 YO188; YO211; YO212; YO213; YO224; YO225; YO253; YO259; YO301; YO302; YO322; YO325; YO329; YO411; YO606; YO607; YO611; YO613; YO614; YO621; YO624; YO625; YO626; YO627; YO88	Malton Grid 132/66kV	2.7	Dec	Mon, Tue, Sat, Sun	1530 - 1700
Middlesbrough	TS104; TS105; TS11; TS118; TS146; TS36; TS60; TS66; TS67; TS68; TS69; TS70; TS96	Grangetown 66/11kV	1.5	Nov - Feb	Mon, Tue, Wed, Sat, Sun	0700 - 0800, 1500 - 1800
Scunthorpe	DN156; DN158; DN159	Foxhills 33/11kV	1.8	Apr - Dec	Mon, Tue, Wed, Sat, Sun	0630 - 1600
Sheffield	S303; S350; S358; S58; S59; S61; S62; S64; S66	Claywheels Lane 33/11kV	0.1	Nov	Sat	1630 - 1830
	S305; S350; S357; S361; S362; S363; S364; S369; S66	Wheatacre Road 66/11kV STP	1.1	Nov - Mar	All	1130 - 1300, 1530 - 1800
Whitley Bay	NE250; NE258; NE259; NE261; NE262; NE263; NE264; NE270; NE298	Monkseaton 33/11kV	2	Dec - Mar	Mon, Tue, Wed, Sat, Sun	1630 - 1830
York	YO306; YO307; YO318; YO319; YO322; YO323; YO324; YO329	Haxby Road T2 T3 33/11kV	1	Nov - Feb	Mon, Tue, Wed, Sat, Sun	1630 - 1800

During discussions with Northern Powergrid, this has been acknowledged as an issue with rural communities such as Humshaugh:

“Northern Powergrid’s area design manager has indicated that voltage management is a major consideration in long rural networks such as Humshaugh and that it could well be a key issue in connecting any new renewable generation. Quantifying this would need detailed assessment of a specific generation proposal.”

This is a good indicator that there may be a need to procure flexibility in more rural areas.

Electricity North West (ENWL) recently undertook a tender for RESTORE response for a minimum of 100kW or 250kW aggregated.

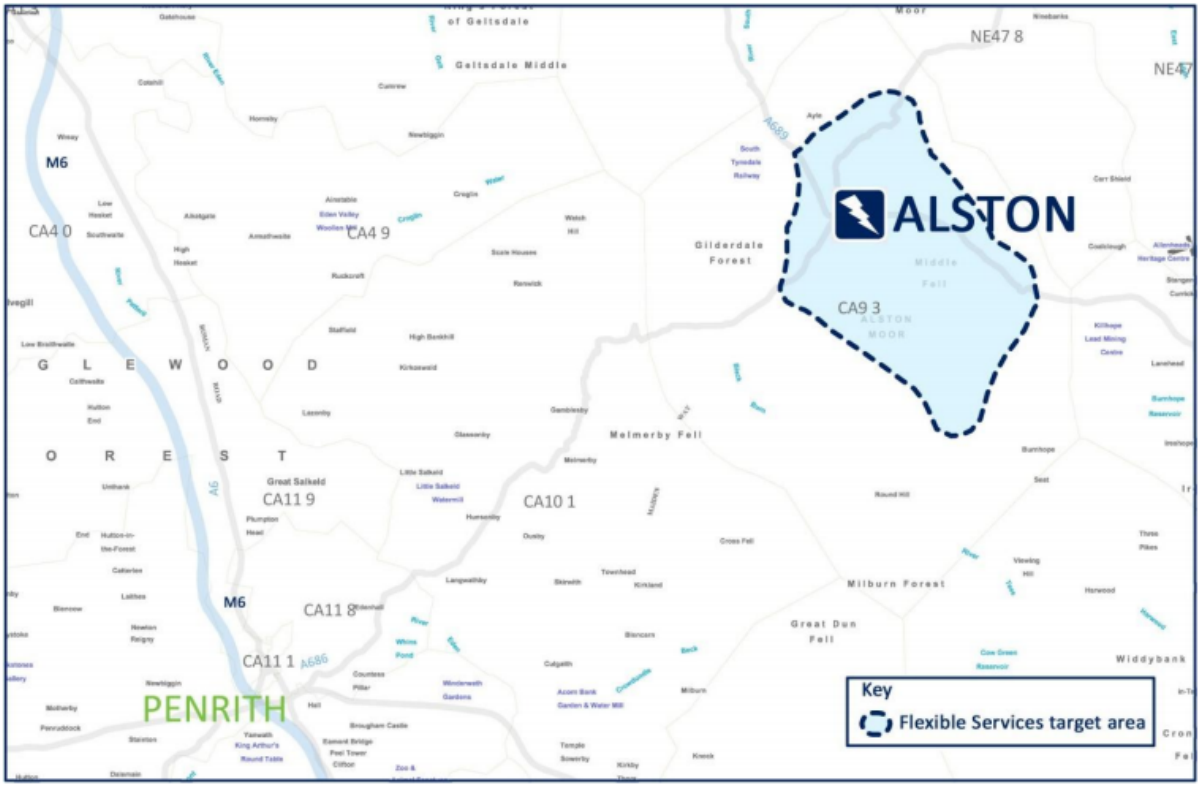
Network location	Voltage	2018/19 Flex Requirement (MW)	Availability window		
			Months	Times	Days
Alston	LV or HV	0.5	Nov - Mar	06:30 to 21:30	All week
Coniston	LV or HV	1.0	Nov - Mar	All day	All week
Easton	LV or HV	2.0	Nov - Mar	All day	All week
Nelson	HV or 33kV	20.0	Oct - Mar	06:30 to 21:30	All week
Blackfriars	LV or HV	0.5	Jan - Feb	16:30 to 21:30	Weekdays
Cheetham Hill	LV or HV	2.5	Nov - Mar	11:30 to 21:30	All week
Stuart Street	HV or 33kV	9.5	Nov - Feb	06:30 to 21:30	Weekdays

The tender ultimately failed as the minimum requirement could not be met. Aggregation of community flexibility with domestic consumers could be a key area of development in the future, and this is something that Carbon Co-Op are currently trialling with their PowerShaper platform, based on open source software, which HNZ could join or create a similar trial and apply for innovation funding.

If Northern Powergrid continues to develop their flexibility services procurement strategy, then engaging with them on a community basis, in addition to having an insight into real time, planned and estimated usage of the community could really provide value to both the DNO and consumers. By providing a local trial demonstrating capability this could encourage them to advance their strategy in areas such as HNZ.

Whilst it is assumed that network flexibility only applies to urban areas, in reality mitigation across the network can occur in a number of places, and Alston demonstrates this.

Map of ENWL Alston flexible service requirement:



Other areas such as Western Power Distribution who have even more severe network costs due to reinforcement and reconfiguration have been even more proactive in the area of DNO flexibility and they are a good indication of things to come and associated revenues that can be derived from flexibility services.

WPD Heatmap

Figure 3 – WPD online Network Capacity Map

WPD 2018 Flexibility Payments:

Constraint	Flexibility Zones	Service	Arming Fee	Availability Fee	Utilisation Fee
Exeter City	Exeter City	Dynamic	--	£5/MW/hour	£300/MWh
		Restore	--	--	£600/MWh
South Hams and Plymouth	Plympton Milehouse Plymouth Totnes Paignton Torquay	Dynamic	--	£5/MW/hour	£300/MWh
		Restore	--	--	£600/MWh
Rugeley	Stafford 132 Stafford South Rugeley Town Cannock Burntwood Lichfield	Secure	£75/MW/hour	--	£150/MWh
		Restore	--	--	£600/MWh
Northampton	Northampton East Northampton West Northampton	Restore	--	--	£600/MWh
Beaumont Leys	Beaumont Leys Wider Area	Secure	£118/MW/hour	--	£150/MWh
		Restore	--	--	£600/MWh
Coventry Interconnector	Coventry	Secure	75/MW/hour	--	£150/MWh
		Restore	--	--	£600/MWh
Harbur and Warwick	Harbury Warwick 33kV Warwick 11kV	Dynamic	--	£5/MW/hour	£300/MWh
		Restore	--	--	£600/MWh
Brackley and Banbury	Brackley Banbury	Dynamic	--	£5/MW/hour	£300/MWh
		Restore	--	--	£600/MWh
Whitley, Rugby and Daventry	Whitley Rugby Daventry	Secure	£118/MW/hour	--	£150/MWh
		Restore	--	--	£600/MWh
Bletchley, Bradwell Abbey and Stony Stratford	Bletchley Bradwell Abbey Stony Stratford	Secure	£118/MW/hour	--	£150/MWh
		Restore	--	--	£600/MWh

WPD consider their network flexibility activity a huge success for both themselves and their customers as this infographic from 2019 shows:

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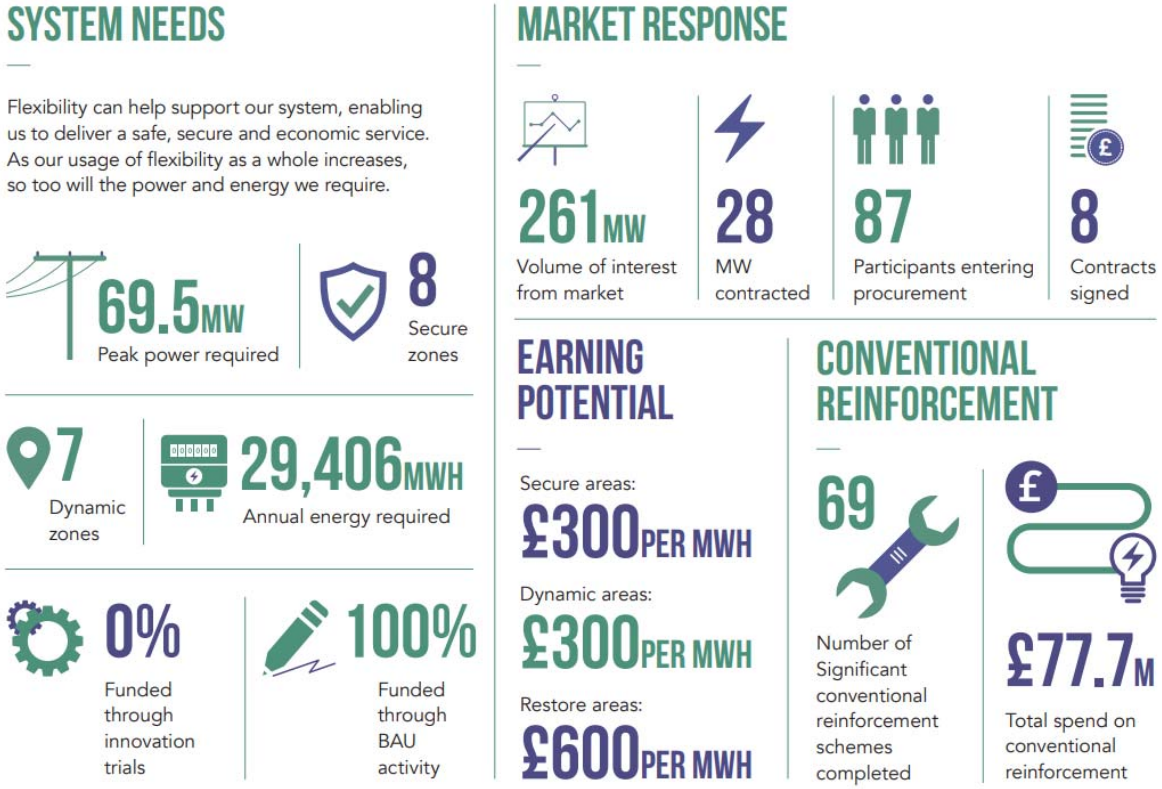
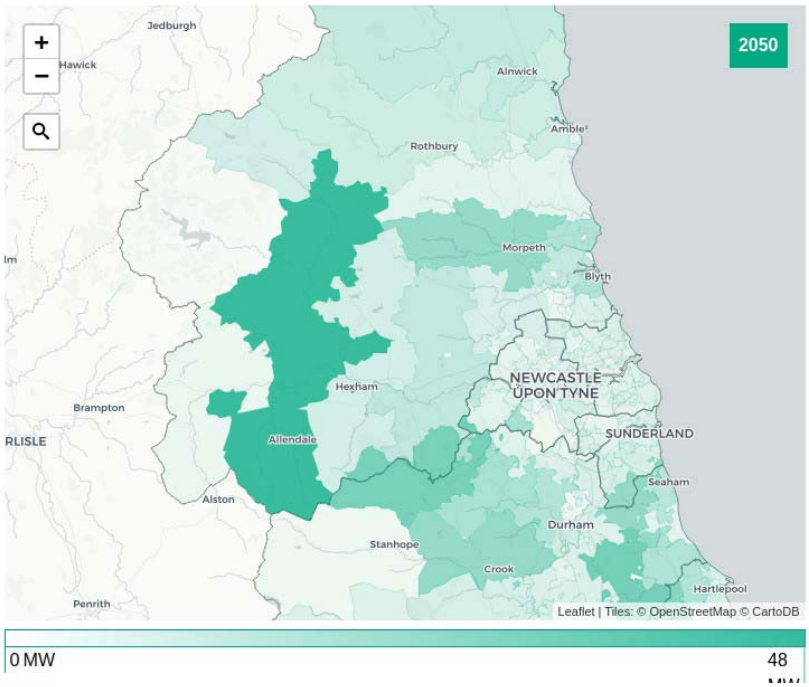


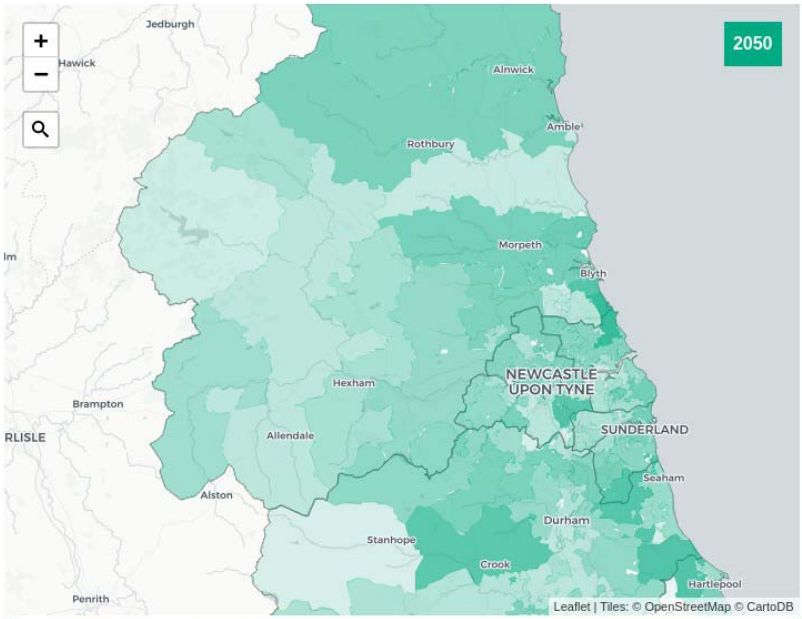
4.2 DNO Flexibility Opportunity

Within Northern Powergrid there is currently an ongoing programme of tendering for flexibility services likely due to the current demand for energy in areas with a large number of users. However as EVs are further deployed by customers on their network, this may change the configuration of the network significantly, and the requirement for flexibility that can support network faults may increase in the areas close to areas of generation.

In the maps below, the bulk of generation expected by 2050 will be local to HNZ (shown in dark green) with peak demand more evenly spread across the network but still peaking in dense areas such as Newcastle.

Renewable Generation installed capacity and peak utilisation (%) at primary substation by 2050 using Northern Powergrid Net Zero Early scenario.





Graphs to accompany this tool | Get the data | Report any issues you find with our tool

5 Energy Audits

In order to fully assess the capability of the Humshaugh, further detailed gathering of energy usage could be undertaken utilising off the shelf monitoring plugs, either manual readings or wifi enabled smart plugs which can upload individual household data to a cloud platform. Milliamp Technologies can advise further on suitable technology and platform integration should this be needed.

Gathering datasets on daily usage, ideally at the consumer appliance level, would be very beneficial in making any case to further develop any NHZ strategy.

Gathering data from legacy meters using their optical output would also enable further information on the viability of a smart meter enabled platform that can provide flexibility or DSR capability.

6 Innovative Technologies

Across the UK over the past few years there have been a number of Government funded feasibility studies carried out in a number of different areas. Many feasibility trials require the participation of a licensed supplier to deliver any real value, and receptive suppliers to R&D approaches include Bulb, Ovo, Octopus and EDF. InnovateUK has recently been tasked with distribution of £1.25bn of commercial research and development funding to mitigate effects of Covid19.

Whilst there have been a number of trials, there is still some way to go before the products of many of these trials reach maturity. Many trials last 12-24 months and are unwound once the programmes finish. This results in a lack of "off the shelf" solutions available, and it is recommended that any strategy focuses on community driven research and development as this is likely a good source of funding and more likely to achieve results.

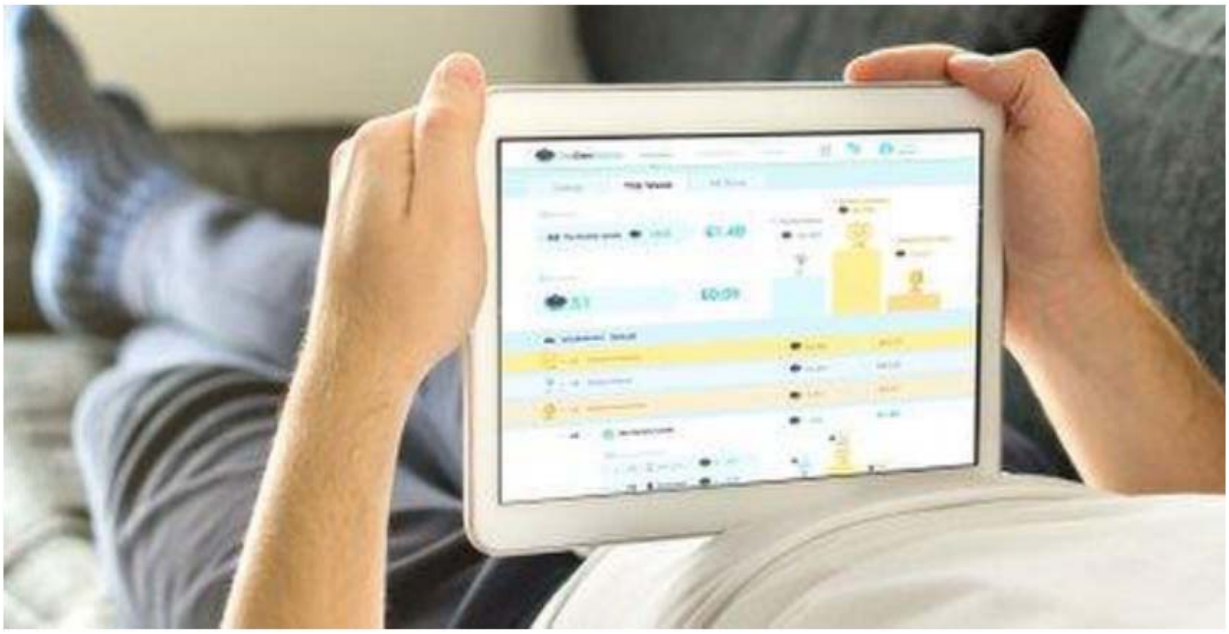
There have also been some trials undertaken with OFGEM "sandboxing" where a derogation is given for a short duration to allow for trials that would normally not be allowed on the power networks due to regulatory restrictions.

Some innovative sandboxed trials in trading include:

- Repowering London - (UCL, EDF and Electron) – P2P trading of energy between households in London
- Origami Energy – allowing commercial consumers to buy direct from independent generators

There have been many aggregation and flexibility trials due to greater ease of access (due to less regulation). Some innovative trials in aggregation and flexibility include:

- ECAS (Carbon Co-Op) – community based aggregation
- Ipswich Local Supply Community Project - (Pixie Energy) – exploring bottom-up flexibility of end users
- AHEAD (Levelise) – residential battery focussed demand side response with aggregation and blockchain
- Incentivisation through engagement with "gamifying" of energy (Northern Powergrid) - https://www.northernpowergrid.com/ACE



Ongoing research activities are currently underway at a number of UK Universities who are well placed to jointly develop any technology or trading feasibility studies to build on top of what has already been achieved. Lancaster University has spent some years working in this area, with one of its leading professors (Prof Adrian Friday) having spent some years working with Scottish Islands such as Tiree to help microgrid communities trade energy.

Ongoing interesting projects to watch include:

- Carbon Co-Op PowerShaper

7 Battery Storage and Electric Vehicles

Key to demand side response is the provision of energy storage. Coupled with flexible tariffs, this provides a robust solution to aggregation and DSR. It is suggested that a commercial model be developed for further energy storage capability within HNZ.

7.1 Domestic Scale Battery Storage

A number of suppliers are currently trialling energy storage as part of their ongoing range of tariffs. Octopus Energy. This allows the supplier to take full advantage of flexibility capability.

Powervault – a UK based product - https://octopus.energy/blog/powervault/

Tesla Powerwall is also being offered integrated with Agile Octopus https://octopus.energy/tesla-energy-plan-faq/

It should be noted that Tesla and Octopus have had some technical difficulties integrating Powerwall, HH metering and Agile Octopus (https://octopus.energy/blog/perils-working-tech-innovators/) due to one of the parties equipment not meeting CE / EMC specifications it has been approved to meet.

Sometimes even reliance on the largest trial partners can be challenging especially where the technical risk is not visible.

7.2 Utility Scale Storage

At a grid level, whilst there are a number of projects currently planned in the UK, there is a pause on many implementations by developers due to recent regulatory derating activities on capacity market – sometimes resulting in a market derating by up to 80%. This is currently being challenged as this mechanism is currently benefiting fossil fuel generators disproportionally.

7.3 EV Charging V2G

With the continued successful rollout of Electric Vehicle (EV) charging, the next major phase of development will be the successful implementation of Vehicle to Grid (V2G) or Vehicle to Home (V2G). This will have a major impact on the ability for groups to further provide flexibility, aggregator and virtual power plant services

Currently the only technology that supports V2G is CHADeMO, however this has recently become obsolete, with most of the world standardising on CCS, including Nissan who are the main proponent of CHADeMO. CCS2 will fully support V2X, with bidirectional inverter support required on new vehicles or chargers which is due for release with these features by 2025.

8 Community Energy Usage and Engagement

8.1 Engagement

Key to changing energy usage in a community such as HNZ is increasing awareness and understanding on energy usage and how it fits in to the global challenge to reduce carbon emissions. Displaying community energy usage statistics to the community in real time and in shared spaces such as shops and pubs brings reducing carbon emissions to the forefront of the community. The use of Internet technologies and “dashboards” is a simple and effective way to gauge live and historic carbon emissions.

8.2 Data Collection

Data could be collected from a number our sources already identified:

- smart meter data via supplier Internet services (APIs)
- national power consumption and carbon emission data from online services e.g. electricitymap.org (see below)
- gamifying energy usage via mobile phone apps, website where the community is encouraged to enter in their carbon usage data.
- “out of band” passive sensing technology connected to meters, appliances etc. that can measure and record energy generation and consumption.

This data can be used to display real time information in a variety of ways as well as providing historic datasets of interest which in themselves can be the basis of further study and research.

8.3 Mapping Data

Utilising live data from energy systems it could be possible to create an interactive map on the HNZ website to help the local community understand its energy usage patterns. Using off the shelf opensource software components it is possible to quickly build highly interactive Internet based tools to demonstrate live and historic statistics.

A great example of other website using similar technology is https://www.electricitymap.org/zone/GB which shows electricity consumption. A similar concept could be refocussed for HNZ community using any data available. Purple Renewables has experience of creating similar interactive mapping tools.


Great Britain
February 5, 2021 3:15 PM
274g
Carbon Intensity
52%
Low-carbon
32%
Renewable
Electricity consumption | Carbon emissions
by source
nuclear
geothermal
biomass
coal
wind
solar
hydro
hydro storage
battery storage
natural gas
oil
unknown
BE
FR
GB-NIR
GB-ORK
IE
NL
NO-NO2
Carbon intensity in the last 24 hours
2:30 PM
8:45 PM
3:00 AM
9:15 AM
Now
Tweet
Slack
production
consumption
Romania
Live data temporarily unavailable
0
200
400
600
800
built by Tomorrow

9 Recommendations

It is suggested in order to progress the trading capability in HNZ that the following courses of action are further investigated as part of a stage 2 feasibility:

- Feasibility of further detailed energy audit of commercial and domestic properties to assess possible assets that could be utilised for DSR and aggregation and develop datasets on usage patterns.
- Commercial model developed for energy storage
- Analysis of possible pooled asset capability such as multiple EV chargers coupled with energy storage in a suitable location (5 minutes' walk from residences). Purple Renewables undertook the assessments for ChargeMyStreet so are able to process this data in GIS producing heat maps of capability and usage.
- Further discussions with the DNO regarding their flexibility requirements over coming years
- Identification and engagement of suitable research partners who would support any trial activities, such as academic and commercial partners, including possible receptive energy suppliers.
- There are a number of projects worth looking at in more detail especially those that have been funded by BEIS. Most are listed at: https://www.gov.uk/guidance/funding-for-innovative-smart-energy-systems
- There are a number of companies and organisations involved in a number of smart energy trials, however we would recommend opening discussions with organisation such as Carbon Co-Op.
- Extending further the HNZ website (https://www.humshaughnetzero.org/) and introducing further interactive mapped stats e.g. showing live energy usage data for the dwellings via Internet based smart meter access is also recommended as a good demonstrator of community intent.

10 Regulatory Restrictions

Some comments are made below on the regulatory restriction aspects of community energy trading and current issues:

10.1 Aggregators

Whilst there is no requirement for licenses in the UK due to their relatively recent introduction to the market and their novel market position, ultimately to fully participate in the wholesale markets and balancing mechanism they need to be licensed – however this then ends up forcibly bundling aggregation with supply. There is currently disagreement in the industry on if licensing is a good or a bad thing in this area so may be subject to change in the future.

10.2 Access to Smart Meter data

In order to access any smart meter data, either third party access or supplier access is required. In order to use advanced DSR capability of smart meters, supplier access is needed. This results in most trials requiring active involvement of an electricity supplier.

10.3 Private Wire Systems

If private wire systems including trading are implemented, it is important to avoid any possible regulatory or legal issue that could arise, for example the requirement to register as a license exempt operation. Expert regulatory advice should be sought.

10.4 OFGEM Sandboxes

OFGEM are now offering innovation proposals and Energy Regulation Sandbox - time-limited derogations which allow for previously excluded activities to be allowed. One of the biggest areas as detailed above is the use of peer to peer energy trading – effectively allowing multiple suppliers onto one consumer. As OFGEM embraces more regulatory flexibility, this will further enable more innovative products and services within the energy market.

11 Funding Schemes for Demonstrator Projects

Funding is available from a variety of sources for demonstrator projects:

- UK Gov BEIS tenders - There have been a number of UK Gov commercial funding opportunities made available for smart energy system projects in the UK over the past few years. Further ITTs are expected from BEIS shortly. For example
  - https://www.gov.uk/guidance/funding-for-innovative-smart-energy-systems
- Horizon 2020 funding – a 79bn EUR research fund that is able to support research and innovation in this area. Also smaller ERDF and Social Fund (or post Brexit equivalents) are available via national contact points such as RTCNorth (Purple Renewables regularly work with this organisation)
- Academic Research funding – funding from UK research councils may be leveraged via University research activities into energy management. Lancaster University have expressed some interest in working together on any relevant proposals and they have pioneered energy research into usage, hydrogen and smart grid. Purple Renewables works closely with Lancaster University in a number of areas so can advise further.
- InnovateUK SMART Funding – commercially driven funding via InnovateUK – 70/30 split or 100% de-minimis possible
- Sufficiently innovative project to attract R&D funding via InnovateUK

12 Development Risk and Mitigation

Risk	Probability	Mitigation Measure
Regulatory Regime to Aggregation	Medium	Ensure visibility of regulation before committing to any community based aggregation platform
Delay in Flexible Service Rollout by NPG	Medium	Ensure high visibility of Northern Powergrid strategy in this area
Technology integration problems	High	Avoid being first to market where untested off the shelf technology is relied upon.
Smart Meter Availability	High	In order to rely on any trials requiring advanced smart metering, a SMETS2 meter is required. Supplier installation schedules should be closely examined.
Lack of participation	Medium	Making a step change in a rural community can be challenging. The data shows that 35% of the village has a smart meter installed so significant engagement will be required to bring people onside with energy saving and technology solutions