Highlands and Islands Enterprise
Iomairt na Gàidhealtachd 's nan Eilean

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Dear Sir/Madam,

Ofgem / BEIS call for evidence: A Smart, flexible Energy system

Thank you for inviting input from industry stakeholders in relation to the future development of smart, flexible energy systems. We welcome the coordinated approach between Ofgem and BEIS to deliver this Call for Evidence (CfE) and fully support the focus on reducing energy costs for consumers and businesses. We also welcome the commitment to creating a level playing field across the energy industry, to ensure that all parties – small and large – can participate in an open market for providing flexibility and value, locally and nationally.

Highlands and Islands Enterprise (HIE) takes a distinctive approach to regional development – supporting the growth of communities as well as businesses and economic sectors. Operating across a largely rural area that covers half the land mass of Scotland and includes over 100 inhabited islands, the enterprise agency recognises that strong, sustainable communities are critical in supporting economic growth across the region, particularly in remote mainland and island areas. Increasingly this has meant empowering communities to acquire and manage key assets for themselves, including land, infrastructure and energy.

HIE along with its local partners - the democratically elected local authorities covering the north of Scotland and the islands; Shetland Islands Council, Orkney Islands Council, Comhairle nan Eilean Siar, Highlands Council and Argyll & Bute Council, make representations to key participants on behalf of industry to influence the way in which regulation of the energy industry is managed in order to ensure the needs and interests of the Highlands and Islands are understood and taken into consideration. HIE also works closely with Scottish Government in relation to regulatory matters. Local Authorities have a pivotal role in the establishment of smart, local energy solutions.

In addition to our key message below and answers to questions posed in the CfE, we offer a case study for consideration (Appendix 1), illustrating how a local community has embraced renewable energy and developed a solution to meet local energy needs (West Harris Trust: Pairc Niseaboist Community Energy Project).

Highlands and Islands Region
We believe we can offer unique perspective with regard to smart, flexible networks, as the north of Scotland has a particular set of circumstances:

- High penetrations of low carbon, intermittent generation. Local stakeholders have a long history of engaging with the DNO and TO to manage and overcome network constraint issues by adopting methods to extract more value from networks (e.g. Orkney RPZ, first commissioned in 2009).
- High proportion of consumers that pay electricity suppliers through time of use tariffs, using tele-switched meters.
- Disproportionately high network costs due to the geography of the region – with the potential to gain more than most from avoided additional infrastructure costs.

With a significant volume of consumers on time of use tariffs and large volumes of intermittent generation, yet constrained network infrastructure, the Highlands and Islands has a particular interest in market design and regulation which reduces barriers to allowing network users to be rewarded for providing flexibility.

However, we are concerned that the opportunities for rural customers to engage with and respond to market opportunities and/or price signals will be limited through:

- Poor communications infrastructure to facilitate smart network management and Smart Meters.
- Insufficient consideration of how to engage consumers with a new energy system which rewards flexibility.
- Higher participation costs (particularly network costs) in national markets.

Local Energy Systems
We urge further consideration of the potential value brought from local and community energy systems. There are significant synergies between the local energy system models and the proposed smart flexible energy system opportunities described in the CfE, including:

- Reducing the need for new network infrastructure.
- Providers of flexibility able to generate value from their activity

We believe that local energy models have the potential to deliver the same benefits as the market designs discussed in the CfE, but are more likely to result in higher levels of customer engagement and participation.

In our experience [illustrated in Appendix 1)], organised local community groups have an important – if not critical - role to play in building consumer confidence, understanding of the potential benefits and helping vulnerable consumers actually

benefit. We also believe that there is the potential for community groups to play a role in the development of smaller-scale demand aggregation that offer routes to achieve maximum consumer benefit. In practice this role includes dissemination of information, building local relationships, working in partnership with tech developers and energy companies to help them engage with and understand local realities. We recommend that where feasible, BEIS / OFGEM should encourage this approach within a wider approach to 'good practice' on smart system roll-out. This may also be particularly relevant to any moves to increase the provision of demand response services beyond large-scale consumers.

Network services (flexibility providers/users) – distinct market
Balancing and ancillary services is emerging as a distinct 'flexibility' market, alongside the energy and capacity markets that already exist. We consider that there is merit in considering a significant review and reform of the procurement process for existing balancing and ancillary services with a view to creating a market design for whole system flexibility.

- Ancillary and balancing services procurement not designed for facilitating dedicated service providers.
- Existing procurement processes not securing best value due to short contract lengths.
- DNOs becoming system operators – with local markets for balancing services.
- Coordination required across transmission and distribution to avoid conflicting and counter-productive system balancing actions.
- Revenue certainty and visibility required for industry to make investment
- Better coordination of flexibility value streams to facilitate effective stacking and cost reductions to realise whole system value.

We consider that, in order for this review/reform to deliver maximum whole system value – market design needs to be instigated and led by BEIS/Ofgem and progressed as a priority to take advantage as soon as possible of the opportunities presented by more open competition for providing flexibility services.

Network, connections, planning and charging
Providers of flexibility will use networks in different ways to other types of network user and will result in different investment drivers and this should be reflected in network design and charging arrangements. Overall, the ways in which these participants will use the networks will depend on the flexibility market design.

We believe that there is clear rationale to consider a review of network planning, connections and charging to understand how flexibility providers fit into the existing frameworks and that access to markets isn't, as far as possible, distorted across transmission and distribution.

Regulatory clarity for storage
It is very clear that electricity storage is a key facilitator to providing system flexibility – providing a time-shift in the requirement/supply of energy. Without storage, the opportunity available for moving towards smart, flexible systems is limited.

We believe such a significant potential new activity within the electricity system should be properly reflected in legislation. We consider that this most naturally should be accommodated within primary legislation. However, this must be balanced against the immediate concerns regarding the visibility and clarity about regulation and avoid uncertainty.

The policy and regulatory barriers that face storage have been well articulated. However, final consumption levies are the main barrier to allowing stand-alone storage to operate on a level playing field with other providers of flexibility. We urge BEIS/Ofgem to address this particular issue as a priority.

Whole Energy System

We note that this call for evidence is focused almost exclusively on the electricity system, rather than the wider energy system. Therefore, we are concerned that any market design developed for the electricity system does not erect barriers to innovative approaches to whole energy system solutions – e.g. electricity to gas facilities and that steps should be taken to ensure that market design does not disadvantage these potential new users.

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We offer more detailed responses to the questions posed in the CfE, and hope you find our response helpful, but please do not hesitate to contact us should you have any further queries or require additional information.

Yours sincerely

Audrey MacIver
Head of Energy

In partnership with:-
Shetland Islands Council
Orkney Islands Council
Comhairle nan Eilean Siar
Highland Council
Argyll & Bute Council

1 Removing Policy and Regulatory Barriers

1.1 Enabling storage

	Question
1	Have we identified and correctly assessed the main policy and regulatory barriers to the development of storage? Are there any additional barriers faced by industry? Please provide evidence to support your views.

- The two key barriers for further deployment of stand-alone storage are: final consumption levies, and; clear, stable access to markets through longer term service contracts.

Final consumption levies

- The issue of 'double charging' of final consumption levies is a key barrier to, licence exempt, stand-alone storage sites. There are no proposals within the CfE to address this. Final consumption levies are a significant operational cost which limits the potential value for storage operators from providing services in the market.
- We consider that addressing this particular anomaly represents a 'quick win' opportunity and will remove a significant barrier to more storage deployment.

Service contract arrangements (length)

- Contract length for service provision is crucial to providing value to the consumers and facilitating new flexibility market entrants.
- Until recently, all ancillary services procured by National Grid through open market tenders have contract lengths varying from 1 month to 2 years.
- However, it has been clearly demonstrated through the 2016 Enhanced Frequency Response (EFR) tender that there is significant value available in procuring services through longer term contracts. EFR is a premium service compared to other all other frequency response products that National Grid procures. However, the prices secured for the provision of this service are well below the prices that National Grid is able to secure for other frequency response products.
- There is clear justification for a review of the balancing market arrangements to realise better value for consumers.

Route to market

- There is an issue currently within industry that there is a perceived lack of visibility of potential route to market for storage facilities. We acknowledge this and would be keen to see further focus from Ofgem/BEIS on this particular point.
- System wide flexibility market(s), across transmission and distribution, could address many of the route to market issues identified in terms of undervalued flexibility, procurement coordination and value stream stacking.

	Question
2	Have we identified and correctly assessed the issues regarding network connections for storage? Have we identified the correct areas where more progress is required? Please provide evidence to support your views.

Network constraints

- Barriers to connection for storage are very similar to the any other type of user that wishes to export onto the grid – lack of network capacity due to existing connected generators and/or contracted generators. However, storage projects are faced with additional barriers as they require significantly more import capacity than generators. This can, in many cases, require additional network investment even beyond what would be required for a new generator only seeking export capacity.
- Network constraint and high cost of connection have been issues in the North of Scotland for a decade. Across the north of Scotland, network constraint and high cost of connections affects almost all G59 connections and presents a significant issue for smaller sites that want to provide generation capacity and/or flexibility services.

Queue management

- We welcome the efforts made by the ENA to progress connection queue management through milestones. We note that milestones have been part of connection offers made by Scottish and Southern Energy Networks for a number of years. Although a welcome step forward, it is not clear that these contractual arrangements have been effective.
- The use of contractual milestones hasn't stopped capacity queues forming and resulting in connections for customers that are costly and/or not within a reasonable timescale.
- We are concerned that DNOs are unwilling to resolutely enforce milestones. It is not clear why this remains an issue, but we consider that strong policy leadership should be provided by the regulator on this matter.

Connection design and planning standards

- We believe that in order to provide clear guidance within network planning, connections and charging arrangements – regulatory clarity regarding how storage is defined and treated under legislation is very significant. Therefore, we urge Ofgem/BEIS to progress the workstream relating to providing such clarity as a priority.
- Storage, as a system flexibility provider, can perform many different roles and functions. The potential function and value from a storage facility, as far as possible shouldn't be constrained by the connection criteria.
- Nonetheless, the connection criteria and planning standards clearly need to account for the type of user, rather than simply what technology is deployed on the site. The criteria used to determine network investment for a provider of peaking capacity (or constraint management) to the DNO is very different

to a provider of supplier tolling or frequency response. This issue is not limited to storage sites but to all types of flexibility provider.

- Clearly there is a case to review the design standards used to determine the connection arrangements necessary for these sites. Clarity, transparency and consistency across DNOs and the SO is important here.

Incentives for change

- It is not clear that existing LCNF/NIC arrangements (as part of the wider RIIO framework) provide enough incentive for the network owners to incorporate flexibility to improve system capacity and resilience.
- We have not seen any evidence of connection offers being issued by DNOs that utilise a flexibility provider (e.g. storage) as an alternative to network reinforcement. Nor have we seen evidence that network owners consider this when assessing minimum scheme solutions.

Delays to adoption of innovation into business as usual

- We note that 'flexible' offers for connection, based on constrained connections, are becoming much more commonplace and are the key tool used by network owners to increase network utilisation. However, there has been significant delay between the trialling of these services (e.g. Orkney RPZ first commissioned in 2009) and the widespread adoption of active network management into 'business as usual' activities for network owners, despite a clear, long term industry need for faster, lower cost connections – especially for low carbon generation.
- Another issue associated with network owner procurement of third party service solutions is network resilience and risk management. 'Flexible' offers from DNOs place all of the risk on connecting customers. However, the utilisation of flexibility service providers to manage network constraint is likely to present a number of perceived network risks (reliability of service providers, comms, etc.) that need to be understood and mitigated. We consider that this is likely delay adoption by network owners.
- We consider the slow approach to change and adoption of innovation by the DNOs suggests that RIIO is not sufficiently incentivising DNOs to embrace innovation.

Specific 'quick win' - G83 connection criteria

- G83 generators (and therefore storage facilities) are largely immune to grid constraints. However, the co-location of storage with G83 generation needs consideration as the upper capacity threshold (16A per phase) does not relate to the export capacity from the site, but to the installed generation capacity. Therefore, smaller installations are limited in the generation capacity that can be installed, regardless of whether storage is used behind the meter to limit export onto the grid.
- Therefore, the deployment of behind the meter storage with generation (to remain within G83 criteria) is not an enabler for avoiding grid delays (and costs) for smaller and domestic schemes.
- We consider this as a specific barrier to small, domestic installations from realising maximum value from storage.

	Question
3	Have we identified and correctly assessed the issues regarding storage and **network charging**? Do you agree that flexible connection agreements could help to address issues regarding storage and network charging? Please provide evidence to support your views, in particular on the impact of network charging on the competitiveness of storage compared to other providers of flexibility.

- We strongly support Ofgem's focus on total system flexibility – moving towards a decentralised energy system, with DNOs actively managing networks and procuring local balancing services. Future charging arrangements must be fit for purpose to facilitate this.

Transmission and distribution charging – total system review

- We consider that it should be of upmost importance to properly consider charging issues in the round – covering the whole energy system and the value to the consumer rather than narrow fixes to address perceived issues with particular market frameworks (like the outcome of the capacity market). Therefore, we urge Ofgem to reconsider the merits of a significant code review with regard to network charging arrangements (transmission and distribution).

'Quick wins'

- In this context, we believe the immediate actions identified within the CfE seem reasonable 'quick wins' but shouldn't be progressed at the expense of wider reforms.
- Regarding these immediate actions:
  - Intermittent / Non-intermittent – we consider that treating storage as sub-set of generation for charging purposes is not particularly appropriate. As storage is a distinct activity in itself, we do not believe that treating it in the same way as generation within the charging regime is appropriate. Consideration should be given to the extent to which storage, uniquely, drives network investment rather than simply applying generation tariffs.
  - We agree that charging arrangements for flexible (i.e. constrained) connections needs to be addressed as a priority. Constrained connections do not have the same network investment drivers as 'standard' minimum-scheme connections and this should be reflected in charging arrangements. However, this issue is not limited simply to storage sites – the treatment of charging arrangement for 'flexible' connections for all types of network user need consideration. This is an issue not restricted to distribution – it is also applicable to transmission.
- Further to the issues highlighted within the CfE:
  - Consideration of import charges for EHV storage connections result in disproportionately high charges and are prohibitively costly. We do not believe that the current arrangements result in charges that are cost reflective and fair.

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	Question
4	Do you agree with our assessment that **network operators could use storage** to support their networks? Are there sufficient existing safeguards to enable the development of a competitive market for storage? Are there any circumstances in which network companies should own storage? Please provide evidence to support your views.

- We agree that there is a clear opportunity for network operators – transmission and distribution – to use storage as a key tool to address the future challenges posed by the energy trilemma (low emissions, low cost and security of supply) and the potential electrification of heat and transport networks.

Network owner / storage business separation

- We do not support DNO/TO ownership of storage and flexibility solutions, which would conflict with unbundling requirements and sit at odds with all other licensable activities, resulting in market distortion and inhibit market based flexibility solutions.
- Under the licensing options for storage activity discussed in CfE – as a subset of generation or distinct licensable activity through primary or secondary legislation – we consider that there are suitable safeguards to prohibit storage activity by network operators (through EU unbundling legislation).

	Question
5	Do you agree with our assessment of the **regulatory approaches** available to provide greater clarity for storage? Please provide evidence to support your views, including any alternative regulatory approaches that you believe we should consider, and your views on how the capacity of a storage installation should be assessed for planning purposes.

- We agree that the reasonable and realistic options for introducing regulatory clarity for storage have been identified by the CfE. We support the progression of regulatory clarity that will:
    - Provide certainty and clarity for storage as soon as possible.
    - Facilitates storage to be incorporated into other codes clearly and in a streamlined way.

	Question
6	Do you agree with any of the **proposed definitions of storage**? If applicable, how would you amend any of these definitions? Please provide evidence to support your views.

- We support the adoption of the definition developed by the Electricity Storage Network. However, we consider that it is important that the definition of storage is consistent throughout regulation to avoid conflicts and confusion.

- Note that the Call for Evidence is focused on Electricity Storage, not energy storage in its wider context. Therefore, any changes to policy, regulation, charges and market arrangements needs to consider the wider potential for energy storage within the energy system – e.g. within the gas network, hydrogen storage.

1.2 Aggregators

	Question
7	What are the impacts of the perceived barriers for aggregators and other market participants? Please provide your views on: Balancing services; extracting value from the balancing mechanism and wholesale market; other market barriers; consumer protection. Do you have evidence of the benefits that could accrue to consumers from removing or reducing them?

	Question
8	What are your views on these different approaches to dealing with the barriers set out above?

	Question
9	What are your views on the pros and cons of the options outlined in Table 5? Please provide evidence for your answers.

	Question
10	Do you agree with our assessment of the risks to system stability if aggregators' systems are not robust and secure? Do you have views on the tools outlined to mitigate this risk?

2 Providing price signals for flexibility

2.1 System value pricing

	Question

11	What types of enablers do you think could make accessing flexibility, and seeing a benefit from offering it, easier in future?

- We welcome acknowledgement from BEIS and Ofgem regarding the wide system potential for flexibility and the identification of 'flexibility users' and 'flexibility providers.' We feel that this articulation helps to illustrate that there is the potential to carve out flexibility services as a distinct market spanning transmission and distribution.
- We consider that there is merit in considering a significant review and reform of the procurement process for existing balancing and ancillary services with a view to creating a market design for whole system flexibility.
    - Ancillary and balancing services procurement not designed for facilitating dedicated service providers.
    - Existing procurement processes not securing best value due to short contract lengths.
    - DNOs becoming system operators – with local markets for balancing services.
    - Coordination required across transmission and distribution to avoid conflicting and counter-productive system balancing actions.
    - Revenue certainty and visibility required for industry to make investment
    - Better coordination of flexibility value streams to facilitate effective stacking and cost reductions to realise whole system value.
- We consider that, in order for this review/reform to deliver maximum whole system value – market design needs to be instigated and led by BEIS/Ofgem and progressed as a priority to take advantage as soon as possible of the opportunities presented by more open competition for providing flexibility services.

	Question
12	If you are a potential or existing provider of flexibility could you provide evidence on the extent to which you are currently able to access and **combine different revenue streams**? Where do you see the most attractive opportunities for combining revenues and what do you see as the main barriers preventing you from doing so?

Stacking of value streams – procurement coordination

- Stacking value streams has been identified within the CfE, and many other research papers[1] as key to extracting the maximum value from storage facilities (and other flexibility providers).

[1] National Infrastructure Commission, March 2016, Smart Power; Scottish Renewables, July 2016, Cracking the Code; The Carbon Trust, Feb 2016, Can Storage Help Reduce the Cost of a Future UK Electricity System?

- Currently, the structure of potential revenue streams for flexibility providers are a barrier to new market entrants. The procurement of balancing services by DNOs from third parties is a very long way from maturity. SSEN's current tender for network capacity under its Constraint Management Zone (CMZ) in Oxfordshire is the only industry example of a DNO proactively seeking a flexibility solution as a network investment.
- The procurement of balancing and ancillary services by the SO is perceived as a barrier to market entrants. The procurement is considered ad-hoc and opaque and many services are procured via bilateral agreements. This is symptomatic of a system where balancing service revenues are incidental to the operation of power stations, rather than valued as a specific and distinct market.
- Therefore, the opportunity to stack flexibility services across both the existing balancing and ancillary services market and across distribution and transmission is unclear, at best.
- Nonetheless, stacking of revenue streams is important to realising the full benefits of flexibility and is likely to be an important part of making investment decisions based on technologies to provide flexibility (e.g. storage facilities, smart demand control systems).
- Coordination is required across flexibility users (i.e. transmission and distribution network operators) to ensure the whole system value can be identified and reflected to flexibility providers. However, the development of this kind of market is likely to required significant change to the future roles of parties, particularly DNO/DSOs and the SO (discussed below).

	Question
13	If you are a potential or existing provider of flexibility are there **benefits** of your technology which are not currently remunerated or are **undervalued**? What is preventing you from capturing the full value of these benefits?

DNO ANM schemes

- Unlike at transmission, under the Connect and Manage regime, DNOs rarely have a price signal to respond to in order to relieve system constraints.
- ANM schemes offered by DNOs do not provide users with compensation for lack of network capacity. Therefore, the price signal for the DNOs is lost. The net result is that low carbon generation gets spilled.
- Under the Connect and Manage regime, at transmission, the cost of the lost low carbon generation is factored in through the bids and offers received through the balancing mechanism. No such mechanism exists at distribution, which provides a clear market distortion and should be considered.
- We consider that intervention on this matter should be considered.

Technical Codes

- The Grid Code and Distribution Code also have an impact on appropriate price signals for flexibility providers. The connection codes outline technical performance criteria that users should have, regardless of whether the technical performance capability is valuable to the network or not.
- For example, there is no price signal available to providers of reactive compensation due to grid code mandatory requirements for reactive power from generators. As all generators are required to be able to provide reactive power, there are is limited requirement on NGET to hold reactive power capability. This results in no commercially agreed reactive power agreements, and zero availability payments through the default payment mechanism.

Existing tele-switch meters

- At the consumer level – users with teleswitched are not valued within the market at all. The CMA concluded that there is apparently no advantage for consumers with Economy 7 meters as "the choice of tariffs and suppliers is similar to that for customers on single-rate meters" and indicates that "competitive pressures are not as strong for customers with Economy 7 meters"[2] .This is a key issue for consumers in the north of Scotland given the high penetration of tele-switched meters still being used on time of use tariffs.

	Question
14	Can you provide evidence to support changes to market and regulatory arrangements that would allow the efficient use of flexibility and what might be the Government's, Ofgem's, and System Operator's role in making these changes?

Coordinated system services procurement

- Procurement of services needs to be done centrally, with a view on whole system value. The need for such whole system planning was shown through the recent tender exercise conducted by National Grid for EFR.
- EFR is a key contract that can be used for funding construction of new flexibility providers (specifically battery sites). However, the parts of the network where these providers were most likely to be able to provide the widest range of services and maximise value were precluded from the tender exercise.
- The EFR contract terms precluded sites that had constrained connection offers. This is not unreasonable given the service being procured, but it showed that the procurement exercise was being performed in isolation and did not consider the wider system value of flexibility.
- Constrained (or 'flexible') connection offers are issued by DNOs where there is a lack of network capacity. These are the precise parts of the network where other value streams exist for providers of flexibility.

[2] Competition and Markets Authority, June 2016, Energy Market Investigation Final Report

3 Smart (retail) tariffs

	Question
15	To what extent do you believe **Government and Ofgem** should play a **role in promoting smart tariffs** or enabling new business models in this area? Please provide a rationale for your answer, and, if you feel Government and Ofgem should play a role, examples of the sort of interventions which might be helpful.

	Question
16	If deemed appropriate, when would it be most sensible for Government/Ofgem to take any further action to drive the market (i.e. what are the relevant trigger points for determining whether to take action)? Please provide a rationale for your answer.

	Question
17	What relevant evidence is there from other countries that we should take into account when considering how to encourage the development of smart tariffs?

	Question
18	Do you recognise the reasons we have identified for why suppliers may not offer or why larger non-domestic consumers may not take up, smart tariffs? If so, please provide details, especially if you have experienced them. Have we missed any?

- Lots of tele-switched meters.
- Price signal no longer reflects the value that these users can provide to the system as the lowest cost time of use tariffs are more costly than the lowest cost single rate tariffs.
- HIE is concerned that without proper market design, that future time of use tariffs using smart metering, could also result in the potential for poor tariff signals being seen by customers. Therefore, careful consideration is required to understand and address the scale of the 'flexibility' market and the overall balance/mix of flexibility providers.
- The stability and clarity of charges is a very important issue. Consumers must be protected against investing in technology in response price signals which are unstable (for example if network tariffs no longer present a significant signal due to changes in network arrangements – connection of a large storage facility).
- We would urge more consideration of local and community energy systems . We consider that there are significant synergies between the identified system value pricing and community energy systems.
- Community energy systems have the potential to engage and empower consumers in the energy system, as well as provide market driven opportunities for flexibility and further penetration of low cost, low carbon generation.

Commented [ED2]: The H&I area their is limited fuel choice and high levels of fuel poverty. Inovative new systems will provide better qulity heating which will deliver the benfit of reducing fuel poverty.

4 Smart distribution tariffs – incremental changes

	Question
19	Are **distribution charges currently acting as a barrier** to the development of a more flexible system? Please provide details, including experiences/case studies where relevant.

- The current use of system charging regimes do present a barrier to flexibility as:
  - Do not provide strong signals to providers of flexibility.
  - The charging arrangements aren't sophisticated to capture the potential variation in types of network user.
  - The charging regimes do not reflect the value of flexibility to the networks.
- At distribution, the lack of transparency within charging presents an issue. The EDCM and CDCM methodologies are clearly stated within the DCUSA. However, the derivation of charges requires network and financial variables which are unpublished by the DNOs (e.g. DOC/NOC contribution rates – key variable in determining EHV charges). This makes third party verification difficult and provides a market entry barrier.
- Further, the lack of transparency also makes forecasting of charges is extremely difficult.
- There are several other immediate barriers to being able to unlock the value of flexibility providers:
  - It is unclear how hybrid sites are treated. Sites with a combination of technologies installed – generation/storage/demand – are poorly reflected in the charging regimes.
  - Discrimination between intermittent/non-intermittent generation sites with regard to super red tariffs distorts the market and provide a signal that is too simplistic – does not reflect the actual value of these types of user.
  - Import capacity charges are disproportionately high compared to other operational costs, which distorts the market between flexibility providers.
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No discrimination for domestic customers with intermitent generation as regards DNO charges. Is this a true reflection of the cost of the network especially winter peaks.

	Question
20	What are the **incremental changes** that could be made to distribution charges to **overcome any barriers** you have identified, and to better enable flexibility?

- Better data publication from DNOs to give greater transparency of charging calculations and provision of charging forecasts.

- Review of the discrimination between intermittent / non-intermittent charges and review of treatment of hybrid sites in this regard.
- Review of the application and cost reflectivity of super-red tariffs at EHV.

	Question
21	How **problematic and urgent are any disparities** between the treatment of different types of **distribution connected users**? An example could be that that in the Common Distribution Charging Methodology generators are paid 'charges' which would suggest they add no network cost and only net demand.

The definition of transmission and distribution

- The continued definition of the 132kV network in Scotland as transmission means that it is difficult to consider changes to charges for, and treatment of benefits arising from, embedded generators across GB without reconsidering this definition.

5 Smart distribution tariffs – fundamental changes

	Question
22	Do you anticipate that **underlying network cost drivers** are likely to substantively change as the use of the distribution network changes? If so, in what way and how should DUoS charges change as a result?

- We believe there is value in review the network charging regimes across transmission and distribution.
- We note some significant ongoing workstreams in this space:
  - National Grid's ongoing informal 'wider charging review'
  - Review of triad avoidance payments (CUSC modifications)
  - Changes to the treatment of transmission losses (BSC change proposal)
- Moving towards a flexible energy system is going to continue to drive the development of three distinct markets within the electricity industry – energy, capacity and system services. In reality network users are likely to continue to participate across these markets.
- The networks facilitate access for all types of participant and changes to the overall market design will influence the utilisation of the networks. For example, providers of capacity (at times of system stress) are likely to have infrequent utilisation of the network compared to parties operating primarily in the energy market or parties that provide flexibility which could include services to the local DNO to avoid/defer network investment.
- We consider that it is likely that the types of network user will continue to diversify and evolve, which will alter the demand for networks.
- This diversity across network users should be accommodated within design and connection arrangements, and therefore network charging.

- All parties should pay for the required investment and O&M of the networks in a cost reflective way.
- Network entry capacity will continue to dominate the local asset requirements for all users. However, the utilisation of shared network is likely to change. The extent of this change will depend on the incentives (market design) placed on different users to alter their use of the network. For example distribution time of use tariffs could move demand/generation away from peak loading periods.
- Network requirements based on conservative assumptions regarding 'peak' demand and/or generation output is unlikely to continue to be representative of the ways that networks are utilised.

	Question
23	Network charges can send both **short term signals** to support efficient operation and flexibility needs in close to real time as well as **longer term signals** relating to new investments, and connections to, the distribution network. Can DUoS charges send both short term and long term signals at the same time effectively? Should they do so? And if so, how?

- At distribution, the key economic signal for network users is capital connection costs. This drives behaviour regarding site selection. Use of system charges are less significant. This is clear through the outcome of the recent EFR tender which shows that the lowest cost providers of this service are located on sites where there is very low capital connection cost (i.e. existing connection assets).
- Nonetheless, time of use tariffs are likely to be helpful in providing short term signals to users relating to network capacity.

	Question
24	In the context of the **DSO transition** and the models set out in Chapter 5 we would be interested to understand your views of the interaction between potential distribution charges and this thinking.

- The CfE discusses, in relation to DSO transition, distribution network need and investment options being identified in a similar way to the current approach for transmission.
- The future energy scenarios is developed and iterated annually by National Grid along with input stakeholders and is central to the process at transmission. The output of this process informs the probability of strategic network investment need, and ultimately justification for wider system reinforcement.
- This decision making process has been facilitated by the adoption of flexible access arrangements for network users connected at transmission (Connect and Manage). However, network investment at distribution is still based on 'invest then connect' type principles.

- The knock on impact on transmission charging of Connect and Manage was developed through Project Transmit. The outcome of Project Transmit being that network users pay for their utilisation of the network and reflects more closely the investment driver's specific to each type of user. For example, only generators that are likely to be contributing to network flows at peak periods are exposed to a charging signal which reflects the network investment required to accommodate peak flows (as opposed to 'year-round' flows).
- It would follow that, if DNOs do move towards the DSO model, the distribution charging arrangements would similarly evolve. We would anticipate a charging model which reflects a user's network utilisation and a more sophisticated approach to determining a particular user's impact on network investment drivers.

6 Other government policies

	Question
25	Can you provide evidence to show how existing Government policies can help or hinder the transition to a smart energy future?

- CfD regime precluding the use of storage to shift energy in time.

	Question
26	What changes to CM application/verification processes could reduce barriers to flexibility in the near term, and what longer term evolutions within/alongside the CM might be needed to enable newer forms of flexibility (such as storage and DSR) to contribute in light of future smart system developments?

	Question
27	Do you have any evidence to support measures that would best incentivise renewable generation, but fully account for the costs and benefits of distributed generation on a smart system?

7 A system for the consumer

Before we respond to specific questions, we have a general comment to make reflecting our experience and through working with Community Energy Scotland, of working at the community level to take forward 'smart' local energy system projects.

The projects have mostly been driven by a desire to overcome extensive grid constraints limiting distributed generation, the wish to maximise the local economic value of local renewable energy generation, the desire to reduce high carbon energy use, particularly in heating and transport and a desire to overcome inequalities created by disadvantage.

Our experience is based on a number of practical smart system projects, including:

- The Accelerating Renewables Connections project (ARC) (LCNF – funded)- ANM as a means to enable renewable projects that would otherwise be unable to connect to the grid

- The ‘Assisting Communities to Connect to Electric Sustainable Sources’ (ACCESS) project on the Island of Mull (Scottish Government LECF and NIA funded) – smart local heating in a constrained grid
- The ‘Surf ‘n’ Turf’ Project (LECF funded) – generating hydrogen and an energy vector for marine transport in a constrained grid
- The Heat Smart Orkney project (LECF) – smart local heating in a constrained grid
- The Tower Power project, Edinburgh (LECF) – aggregating electricity demand and integrating renewable to control and reduce heating costs in high density housing.]

We note that as a general rule the consultation assumes that in the move to a smarter system, the main players are seen as the regulator, energy companies, system operators, tech developers, appliance manufacturers - and consumers. However, we do not think it will be sufficient to rely on generic customer relations strategies as a means to fully engage consumers in the changes required to achieve the potential of a smart system as envisaged in the call for evidence.

In our experience [from the projects listed above], organised local community groups have an important – if not critical - role to play in building consumer confidence, understanding of the potential benefits and helping vulnerable consumers actually benefit. We also believe that there is the potential for community groups to play a role in the development of smaller-scale demand aggregation that offer routes to achieve maximum consumer benefit. In practice this role includes dissemination of information, building local relationships, working in partnership with tech developers and energy companies to help them engage with and understand local realities. We recommend that where feasible, BEIS / OFGEM should encourage this approach within a wider approach to ‘good practice’ on smart system roll-out. This may also be particularly relevant to any moves to increase the provision of demand response services beyond large-scale consumers.

Our other general point is to note that in existing constrained grid areas, one of the key purposes of smartening the local distribution network through ANM and smart load switching (such as with the ARC project and the ACCESS project) is to allow additional generation onto the system which would otherwise have been constrained off or unable to connect in the first place. With the ACCESS project, this has involved the development of direct signalling between the generator (in that case a community hydro scheme) and multiple small loads in local domestic dwellings and businesses (mostly new storage heaters).

This direct generator – load signalling capability is a technical measure enabling additional local renewable generation without reinforcement but is not based on price signalling per se. For this sort of innovation to be rolled out, there will need to be the scope to allow / encourage local tariffs based on supply from specified local generators.

In relation to Ultra Low Emission Vehicles, we would make the general point that considerations on ULEVs should include any particular opportunities and issues relating to ferry transport in the Highlands and Islands, which use large quantities of fossil fuel in areas which typically have large un-utilised renewable energy resources.

There is tremendous scope to address the de-carbonisation of a significant transport sector whilst creating additional load in grid constrained areas. This could also release currently constrained embedded renewable energy generators.

We would also observe that with low population densities and longer travel distances the norm, range anxiety and availability of rapid charging points are particularly significant factors for EV users in the Highlands and Islands. Intermediate bodies such as local authorities and organised community groups have an important role to play in promoting and supporting and building confidence in their use, but viable business models for non-domestic charging stations (especially those based on renewable energy) depend on the simultaneous development of demand and supply.

Finally, it is important to note that broadband and mobile signal connectivity can be very poor in parts of Scotland and this may disadvantage consumers who might otherwise be able to adopt smart systems and appliances. Also, it is possible that pre-pay consumers in remoter areas may experience problems if they are unable to pay owing to power outages or poor connectivity. These factors need to be considered in the development of robust smart systems

7.1 Smart appliances

	Question
28	Do you agree with the 4 principles for smart appliances set out above (interoperability, data privacy, grid security, energy consumption)? Yes/no (please explain

- Yes, we agree with the principles.

	Question
29	What evidence do you have in favour of or against any of the options set out to incentivise/ensure that these principles are followed? Please select below which options you would like to submit evidence for, specify if these relate to a particular sector(s), and use the text box/attachments to provide your evidence. Option A- Smart Appliance labelling; Option B Regulate Smart Appliances; Option C Require Appliances to be Smart; Other/none of the above (please explain)

- Option B – we believe that this is a new development area where technology-forcing regulation is desirable.

	Question
30	Do you have any evidence to support actions focused on any particular category of appliance? Please select below which category or categories of appliances you would like to submit evidence for, and use the text box/attachments to provide your evidence: Wet appliances (dishwashers, washing machines, washer dryers, tumble dryers); Cold appliances (refrigeration units, freezers); Heating ventilation and air conditioning; Battery Storage Systems; Other (please specify)

- Heating, ventilation and air conditioning.
- Our main experience is linked to the installation of new heating equipment and associated control equipment, including distribution network modifications to allow load switching synchronised to local generator output (e.g. the Mull Access project).
- Our comment here is that the development of good practice standards for actual installation procedures and snagging may be worthwhile for larger / fixed appliances, to give greater confidence to consumers.

	Question
31	Are there any other barriers or risks to the uptake of smart appliances in addition to those already identified?

	Question
32	Are there any other options that we should be considering with regards to mitigating potential risks, in particular with relation to vulnerable consumers?

- Whilst on the one hand the introduction of smart pre-pay meters could make cost management easier, any additional complexity linked to appliance management and time of use tariffs may be problematic. It will be important to try to ensure that there is objective and easily accessible advice available, which allows vulnerable consumers make the most of the cost reduction possibilities of a smarter system.

7.2 Ultra low emission vehicles

	Question
33	How might Government and industry best engage electric vehicle users to promote smart charging for system benefit?

	Question
34	What barriers are there for vehicle and electricity system participants (e.g. vehicle manufacturers, aggregators, energy suppliers, network and system operators) to develop consumer propositions for the: control or shift of electricity consumption during vehicle charging; or utilisation of an electric vehicle battery for putting electricity back into homes, businesses or the network?

	Question
35	What barriers (regulatory or otherwise) are there to the use of hydrogen water electrolysis as a renewable energy storage medium?

- Based on Community Energy Scotland's experience so far in leading the Orkney Surf 'n' Turf project designed to generate hydrogen using electricity from a constrained community wind farm and EMEC, to then feed a fuel cell in Kirkwall harbour we would note the following points and issues:

- So far ‘renewable’ hydrogen production is only likely to be financially feasible where the power would otherwise be lost owing to system constraints. Therefore it is important that DNOs see a price signal for spilled generation under ANM schemes.
- There will need to be a staged approach to introduction of hydrogen powered fuel cells on vessels, beginning with installation to power auxiliary loads;
- Before units can actually be deployed in vessels, regulations require crews to be trained on land first – requiring significant investment in land-based training facilities;
- The inter-linked Horizon 2020 –funded project ‘Big Hit’ (Building Innovative Green Hydrogen Systems in an Isolated Territory) will be piloting the operation of 10 electric-hydrogen vans with a refuelling station in Kirkwall; once this project is fully underway we will be able to advise further on practical barriers to implementation.

7.3 Consumer engagement in DSR

	Question
36	Can you provide any evidence demonstrating how large non-domestic consumers currently find out about and provide DSR services?

	Question
37	Do you recognise the barriers we have identified to large non-domestic customers providing DSR? Can you provide evidence of additional barriers that we have not identified?

	Question
38	Do you think that existing initiatives are the best way to engage large non-domestic consumers with DSR? If not, what else do you think we should be doing?

- Domestic and smaller non-domestic consumers - we strongly agree that this sector offers significant potential for flexibility over the longer term, particularly with the electrification of transport and heating.

7.4 Consumer protection and cyber security

	Question
39	When does engaging/informing domestic and smaller non-domestic consumers about the transition to a smarter energy system become a top priority and why (i.e. in terms of trigger points)?

- In addition to the building blocks referred to (smart meters, half hourly settlement, smart appliances and smart tariffs) we believe that the scope for

aggregating domestic consumers into collective demand response should be examined too, rather than solely considering individual consumer DSR based on use of smart appliances and tariffs.

- In other words, we think there is another category of DSR provision between the large non-domestic customer and the individual consumer.
- Localised aggregation of demand through a recognised community-based organisation would also provide a very good basis for widening awareness and engagement in the system. This in turn could help to overcome the stated risk that these consumers will not offer their flexibility to the system because they are unaware of the opportunities or wary of the risks.
- Community Energy Scotland is currently piloting, with partners, the aggregation of domestic demand and conversion to half-hourly metering in disadvantaged high density housing areas, linked to the introduction of smart storage heaters. One important purpose is to enable negotiation of a preferential tariff for residents, with the potential for time of use benefits and improving heating arrangements. Learning points so far include:
    - It is not unusual for 'dumb' pre-pay meters to be preferred as a means of managing budgets – even though costs are higher;
    - The current complex arrangements for smart meter installation and data management are not conducive to the creation of local aggregation;
    - An established local community group can be an important route to raising awareness and engagement in new supply arrangements;
    - Local trusted community groups have an important role to play in interpreting complexity and, potentially, acting on the behalf of vulnerable consumers.
- In an entirely different context (remote, rural and constrained grid), the ACCESS project, led by Community Energy Scotland on the Island of Mull (referred to previously), is pioneering the use of switchable loads as a means of overcoming a local grid constraint on a local community-owned hydroelectricity plant. We have done this through the introduction of new storage heaters into around 70 homes along with smart signalling between the generator and the heaters, creating an aggregated switchable load that switches on when the generator reaches a point where it would otherwise have been constrained off. This project has effectively engaged local individual consumers in the piloting of a local smart system which also brings benefits for the local generator and the distribution network.
- Again, vital to the success of this project so far has been the role of the local community group (the Mull and Iona Community Trust) who have played a key role in recruiting local consumers into the project, raising awareness and resolving local customer relations issues.
- This project also shows that it is technically feasible to create an aggregated demand response at a level above the individual consumer but below the large scale non-domestic level (which could be referred to as 'community scale demand response') which has potential to be rolled out to other areas. This, in turn, could add to the range of measures available for smart demand response whilst providing distribution-level system benefits.

- From our experience, there can be a very low level of trust in electricity suppliers. Securing a high level of consumer buy-in will require new consumer engagement strategies. We believe that the projects referred to above show the value of organised local community groups in helping local consumers to see and understand the benefits of a smarter system. Prioritising this approach in communities / areas with the most to benefit from smart system developments would be a useful way of testing consumer engagement strategies. These would include areas where grid constraints are precluding local renewable energy development; and / or where there are high levels of fuel poverty and / or high densities of vulnerable consumers.

	Question
40	Please provide views on what interventions might be necessary to ensure consumer protection in the following areas: Social impact; Data and privacy; Informed consumers; Preventing abuses; Other

	Question
41	Can you provide evidence demonstrating how smart technologies (domestic or industrial/commercial) could compromise the energy system and how likely this is?

8 Roles and responsibilities

	Question
43	Do you agree with the emerging system requirements we have identified (set out in Figure 1)? Are any missing?

	Question
44	Do you have any data which illustrates: a) the current scale and cost of the system impacts described in table 7, and how these might change in the future? b) the potential efficiency savings which could be achieved, now and in the future, through a more co-ordinated approach to managing these impacts?

	Question
45	With regard to the need for immediate action: a) Do you agree with the proposed roles of DSOs and the need for increased coordination between DSOs, the SO and TOs in delivering efficient network planning and local/system-wide use of resources? b) How could industry best carry these activities forward? Do you agree the further progress we describe is both necessary and possible over the coming year? c) Are there any legal or regulatory barriers (e.g. including appropriate incentives), to the immediate actions we identify as necessary? If so, please state and prioritise them.

Role of DSOs

- We consider that DSO being a natural further step for DNOs in responding to the likely future network challenges (low cost, low carbon and resilient).

However, the detail of how this will be achieved is not clear and should be considered further with wider industry stakeholder engagement ahead of decisions being made about the future direction to take.

- Further consideration is required to understand the potential conflicts that may arise due to DSO models. For example, a DNO's 'bread-and-butter' revenue is aligned to the value of its asset base. The easiest way for a DNO to earn an increased return is to invest in more assets. Therefore, it is not clear what true drivers and incentives the DNOs have for invested in flexibility service providers. We would encourage more discussion regarding the effectiveness of the RIIO framework in this regard – perhaps with a counterfactual analysis of alternative price control frameworks to understand if RIIO is truly influencing DNO behaviour and culture. An alternative is to identify a separate party (that does not have vested interests) to make decisions regarding system operation.

Increased coordination between DSO / SO / TO

- We do agree that there needs to be better coordination between these parties to coordinate network investment and the use of resources, particularly with regard to flexibility services. We strongly support the introduction of a coordinated market for system services/flexibility.
- The example cited in the CfE (ANM scheme contradicting BM action) is a clear example of how the implementation of a DSO model not only limits the value offered by flexibility but also conflicts with the requirements of the SO. Continuing to implement systems that do not consider the impact on other parties is counter-productive and is not likely to result in a good outcome for consumers and generators alike.
- The illustrative models of whole system procurement, discussed in the CfE, are interesting. We consider that the models presented should be explored further in more detail and that this should be done alongside a review of the procurement of balancing services. The potential impacts of taking forward any one of these proposals is extremely significant.

	Question
46	With regard to further future changes to arrangements: a) Do you consider that further changes to roles and arrangements are likely to be necessary? Please provide reasons. If so, when do you consider they would be needed? Why? b) What are your views on the different models, including: i. whether the models presented illustrate the right range of potential arrangements to act as a basis for further thinking and analysis? Are there any other models/trials we should be aware of? ii. which other changes or arrangements might be needed to support the adoption of different models? iii. do you have any initial thoughts on the potential benefits, costs and risks of the models?

- We note that the discussion in the CfE, relating to DSO transition discusses network need and options being identified at distribution in a similar way to transmission. The future energy scenarios is developed and iterated annually by National Grid along with input stakeholders. The output of this process informs the probability of network investment need, and ultimately justification for system reinforcement.

- We support continued use of this process as it is an effective tool for garnering stakeholder input, performing analysis of need and determining requirements for network investment.
- Concerned at potentially extending the use of the NOA, or similar process into the determination of distribution network reinforcements will impact on the ability of projects to connect – particularly as there are some critical differences between transmission and distribution:
    - NGET has a price signal through the BM to inform decision making, there is no such signal at distribution
    - However, there is no similar mechanism for distribution and so there is no appropriate signal to DSOs for taking flexibility actions – this also undermines the potential value of flexibility.
- We are concerned however about extending the FES/NOA process, as it currently exists. The current process results in subjective judgements being made by the SO regarding which network users will come forward (and fall away) in future. We are concerned by this process as:
    - The specific user requirements under each scenario are not visible to industry to critique and challenge.
    - It picks winners and losers to determine network flows and required boundary capabilities.
    - The assessment and analysis used to justify which network investment should be taken forward is opaque.
    - The determination of network need should to take better account for stakeholder requirements, particularly as network access requirements (and flexibility offerings) for customers become more sophisticated.

9 Innovation

	Question
47	Can you give specific examples of types of support that would be most effective in bringing forward innovation in these areas?

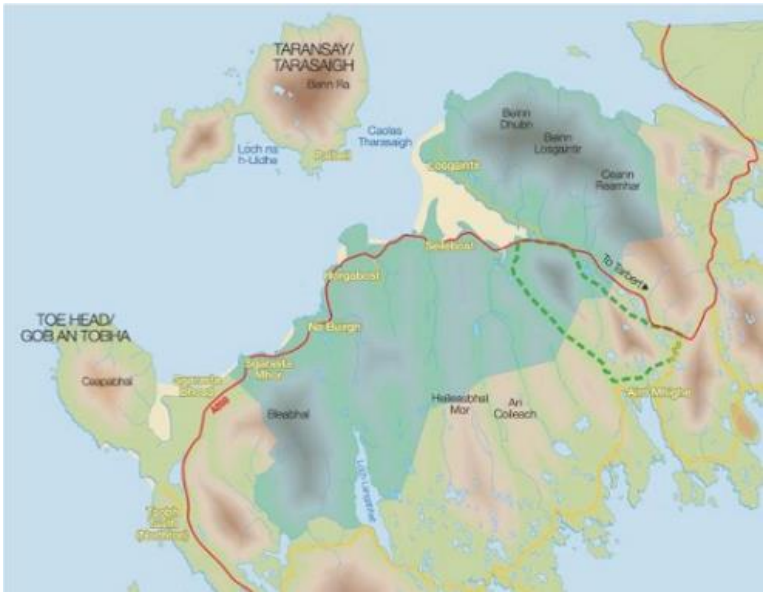
	Question
48	Do you think these are the right areas for innovation funding support? Please state reasons or, if possible, provide evidence to support your answer.

The H&Is have a number of local energy systems demonstrator projects that are the at the cutting edge of innovation. Through the testing of new models of local energy systems both technology and business model solutions will be identified. Challenge funds, funding calls, and loan finance have helped bring such innovative projects to fruition. Support is therefore required for further demonstration projects, and investment is necessary to attract private, public and community support.

Further scope for innovation across a range of smart, flexible, grid-friendly technologies exists - data analytics, digital platforms, power electronics, sensors, electric vehicles, ICT, storage, network ancillary services, and engineering services. Supporting innovation and growth in businesses operating in these areas will not only bring benefit to the UK energy system, but will provide international trade opportunities for the supply chain.

Appendix 1
Case Study – West Harris Trust: Pairc Niseaboist Community Energy Project

The Isle of Harris is located in the North West Outer Hebrides. West Harris Trust is a community charity responsible for managing 7225ha of land on the west side of Harris. . The key aims of the Trust are to revitalise the community by attracting new residents and creating new housing and employment opportunities; create environmentally sustainable energy for the community via small hydro and micro-wind projects; and conserve and increase understanding of the natural and cultural heritage.



Map showing boundary of West Harris Trust land – photo source: WHT

The Western Isles suffers from severe grid constraints limiting the ability of communities and business across the islands to export the valuable renewable resources available to them. The Trust has, therefore, developed the Pairc Niseaboist Community Energy Project which aims to put in place a sustainable energy generation, storage and consumption system.and thus create a resilient self-sustaining local energy economy incorporating a 70-100kW wind turbine and potentially down the line, a 45-75kW wave energy array. It is intended the settlement will be capable of maintaining energy supply – and provide a resilient community hub – during times of grid constraint and/or power outage from the grid. The project will produce renewable energy at an affordable cost from locally available wind (and potentially wave at a later stage) resources to power the new Community Enterprise Centre, and 6 new social housing units with a further 4 plots with extremely low greenhouse gas emissions and zero from device operation.

Development of Pairc Niseaboist Community Enterprise Centre and associated Community Energy Project – photo source: WHT

Project Development/Technical Solution

The first phase of development for this project sought to explore initial feasibility of the project scope and to develop an outline business case for taking the project forward, as well as looking to gain a deeper understanding of the distributed energy challenges in a remote area and seek to apply renewable energy generated at a local level successfully into the local distribution network, and reduce reliance on high carbon generation supplied through the existing grid. This support enabled the project to develop an initial strategy for development of the next stages (through project management and community consultation; electrical distribution and energy storage analysis; marine surveying and project design work; civils and consenting and site lease) of the project and allow financial, technical and legal feasibility to be confirmed.

The work that was carried out showed that the project was feasible. The energy management study has shown that the proposed 100kW wind turbine with 50kW export connection can supply power to the various site users with import required from the grid during low wind periods and an energy store during periods of sustained high output. A battery storage system would not be appropriate for financial and technical reasons. However it was identified that a mini district heating system using hot water or a storage heater system managed by a central control mechanism in the community building could enable supply and demand to be more evenly matched.

The second phase of the project built on the results of the energy management study to commission the necessary detailed design work (including cost estimates, site

specific issues to be addressed and any associated risks) for a mini district heating system and private electricity supply from the wind turbine (and potential wave array) to the HHP new social housing development. The project is underway, with the installation of the wind turbine now complete, and the final touches being made to the completion of the HHP social housing development and community centre.

Project nearing completion – photo source: WHT

Project Funding/Support

The development work for the project is being supported through the European Regional Development Fund – the Low Carbon Infrastructure Transition Programme (for which HIE is a delivery partner in the H&I region), West Harris Trust, HIE and Albatern.

HIE would be happy to provide more information on this project if requested.

January 2017