arc21

Working with our partners to prevent, recover and dispose of waste

Energy Strategy
Department for the Economy
Netherleigh
Massey Avenue
Belfast
BT4 2JP

energystrategy@economy-ni.gov.uk

20 March 2020

Dear Sirs

Ref: **Energy Strategy Call for Evidence 2019**

Please find attached the arc21 response to the Consultation on the Energy Strategy-Call for Evidence 2019.

By way of background: arc21 is a local government sector organisation consisting of the six councils located along eastern NI, covering 33% of the land base, populated by 59% of the national population and accounting for 60% of the local government controlled Municipal Waste arisings. The establishment of arc21 together with its functions is set in statute (e.g. The Local Government (Constituting a Joint Committee a Body Corporate) Order (NI) 2015). It is primarily responsible for activities associated with the production, development and implementation of a Waste Management Plan for the arc21 area.

The Waste Management Plan covers a range of waste arisings, not all the statutory responsibility of Councils to manage, which legislation needs to see included in the Plan. The constituent councils of arc21 are Antrim & Newtownabbey Borough Council, Ards &North Down Borough Council, Belfast City Council, Lisburn & Castlereagh City Council, Mid & East Antrim Borough Council and Newry, Mourne & Down District Council.

If you would like to discuss any of our response further, we would be pleased to help.

I would be grateful if you would confirm receipt of this submission in due course,

[redacted]

Kind regards

[redacted]

Enc

[redacted]

Energy Strategy Call for Evidence

Response Template

How to Respond

This template replicates the questions asked in the Call for Evidence found at: https://www.economy-ni.gov.uk/energy-strategy-call-for-evidence

It is recommended that you should read the full consultation document before completing your response. Please note that the text boxes used throughout this template can be expanded to accommodate your response – there is no character limit.

For further information on how we handle your personal data please read our Privacy Notice

Early responses are encouraged but all responses should arrive no later than **5pm on 20 March 2020.**

Please send your response to:

energystrategy@economy-ni.gov.uk

Or alternatively by post to:

Energy Strategy
Department for the Economy
Netherleigh
Massey Avenue
Belfast
BT4 2JP

Quote the reference "**Energy Strategy Call for Evidence 2019**"

1. General Information

1. **Name (required)**

[redacted]

2. **Are you responding:**

   ☐ **as an individual (please complete 3 to 5 below)**

   ☑ **on behalf of an organisation / company (please complete 6 to 8 below)**

If you are responding as an individual:

3. **E-mail address**

4. **Address**

5. **If you are responding as an individual, please read the Privacy Notice and tick the statement below as applicable.**

   ☐ **All responses will be published on the Department for the Economy website following completion of the Call for Evidence process. Please tick if you are content for your name to be published alongside your response.**

If you are responding on behalf of an organisation / company:

6. **Organisation / Company**

arc21 Joint Committee

7. **Position within Company / Organisation**

[redacted]

8. **Contact details**

   a. **E-mail address**

[redacted]

   b. **Address**

[redacted]

2. Energy in Northern Ireland

Q1. What lessons can we learn from elsewhere in addressing energy within an overarching climate action framework?

Q2. What are the key considerations for decarbonising Northern Ireland's energy sector given existing linkages to other jurisdictions?

Q3. To what extent should Northern Ireland implement the key energy-related recommendations from the CCC 'Reducing Emissions in Northern Ireland' report?

Q4. Do you agree with the 30-year timeframe? If not, please state your preferred approach and reasons.

The two biggest single and immediate lesson to learn from elsewhere is to reduce the amount of travel by private passenger vehicles using fossil fuels. Banning cars from city centres and making zero emission public transport free will be a start. The other is to reduce the amount of fossil fuel energy used in heating buildings by a range of interventions.

District heating used heat recovered from green waste or other processes such as electrolysers powered by renewably generated electricity should be deployed were possible. Air sourced heat pumps could be used to replace oil fired boilers. Community based heating schemes (e.g. mini-district heating schemes) should be encouraged.

Reducing green-house emissions to limit global temperature rise is very challenging. The 30-year timeframe risks an irreversible and possible runaway change to Earth's climate and infrastructure enabling decarbonising should be foreshortened to be developed in the next 10-years.

3. The Energy Transition in Northern Ireland

Q5. What are the unique characteristics of Northern Ireland that need to be considered in a net zero carbon energy transition?

Q6. Is your organisation undertaking or planning to undertake projects to support the energy transition? If so, please provide further details.

Northern Ireland is endowed with good wind resources that has allowed generation of renewable zero emissions electricity at over 1000 sites. More wind generation is possible but there is currently no route to market for developers. Solar PV generation is also significant.

arc21 has proposed a development at Hightown Quarry to develop a suite of core facilities consistent with the Circular Economy principles and have worked with an environmentally led developer (B9 Energy) to provide a comprehensive approach to decarbonise power, heat and transport energy in the Mallusk, Glengormely and Corrs Corner area.

Included as an annex to this response is a schematic of the concept included as part of a submission to the UK Parliament - Northern Ireland Affairs Committee Call for evidence on the *New Decade, New Approach Agreement* titled: *Climate change and next stage decarbonisation – the role of Power-to-X infrastructure* prepared by B9 Energy.

4. Consumers

Q7. How should we ensure that energy remains affordable for domestic consumers? What approach should be taken to eradicate fuel poverty?

Q8. What steps could be taken to improve the relative cost competitiveness of larger non-domestic consumers?

Q9. Is a strategic position of "enable and protect" the correct policy stance?

a) What policies or schemes are needed to enable active consumers?
b) What policies or schemes are needed to protect vulnerable consumers?

Q10. What types of advice and information are required by all consumers and what are the best mechanisms for facilitating this?

Q11. Are there examples of successful citizen energy projects in Northern Ireland and elsewhere that have delivered improved energy efficiency and/or clean energy to local communities?

Q12. What opportunities are there in both urban and rural areas for citizen energy communities in Northern Ireland? What role could government have in facilitating these?

Q13. What evidence can you provide that identifies the challenges and opportunities for NI energy consumers in decarbonising energy?

Energy affordability is something that needs to be included in a policy to give effect to a "just transition".

A market in decarbonised energy provision needs to be enabled that is not reliant on long-term subsidies. A rational economic approach that properly values decarbonisation benefits and costs fossil fuels impacts is essential.

Town scale Power to X schemes to completely decarbonise the heat energy and local transport energy for towns with populations to 8,000 to 10,000 can be readily developed.

Regional energy hubs with an essentially autonomous network could be developed in rural areas using wind and solar resources to produce fertilizer/ammonia, bio-plastics, hydrogen and methanol. All the associate technologies are available now. Over time as grid reinforcement proceed these hubs could be integrated into the NI grid.

5. Energy Efficiency

Q14. What, if any, energy efficiency target or targets should be set for Northern Ireland?

Q15. How should we define, measure and monitor energy efficiency to optimise its potential in our homes, business, economy and environment?

Q16. What are the most important policy levers for government to ensure zero carbon in:

a) New domestic and commercial buildings by 2050?;

b) Existing domestic and commercial buildings by 2050?

Q17. What should the future of energy efficiency support look like and who should be the key delivery bodies?

Northern Ireland needs to adopt energy efficiency targets to supress the price of renewable energy as the crutch of cheap, abundant fossil fuel energy is removed.

To put in context the scale of the challenge the UK Government has developed an Emissions Intensity Ratio (EIR) to measure 'clean growth' performance which it intends to publish each year. This measures the amount of greenhouse gases (tonnes of carbon dioxide equivalent) produced for each unit of Gross Domestic Product (GDP) created.

The numbers are stark

- In 1990 the EIR = 720 tonnes/£ million GDP.
- In 2018 the EIR = 270 tonnes/£ million GDP
- By 2032 the EIR = 100 tonnes/£ million GDP
- By 2050 the EIR = c 0 tonnes/£ million GDP.

To reach the UK's 2032 targets the emissions intensity of the economy needs to driven down by an average of 5% per year to 2032, an acceleration in the 4% annual fall since 1990.

For Northern Ireland (perhaps in conjunction with other devolved administrations) a regional EIR based on tonnes/£ million GVA could be developed.

The future of energy efficiency support (in the sense of taxpayer funded grant aid rather than subsidy) would have to be focused. In a domestic context in relation to heat energy it could mean making some rooms in dwellings so they have high levels of comfort (insulation/heating/ventilation) for the occupants with other rooms left untouched.

Local councils building control function could be funded and expanded for a period to oversee the delivery of energy efficiency initiatives related to dwellings.

6. Heat

Q18. What is the appropriate pathway and timeline for the decarbonisation of heat between now and 2030, and subsequently to 2050?

Q19. What are the appropriate ways to measure the progress of decarbonising heat?

Q20. What are the most cost-effective and sustainable steps that government might take to accelerate the reduction of the carbon intensity of heating fuels?

Q21. Is decarbonisation of the gas grid a viable option and what evidence can be provided on both the speed and affordability of decarbonising the gas grid?

Q22. What evidence can you provide on the opportunities for district heating schemes in Northern Ireland and where should responsibility lie for facilitating these?

Q23. Can you provide any evidence or information on the opportunities for geothermal heat supply?

The advent of high efficiency / high availability membrane free electrolysers coupled with the falling prices for wind generation makes the prospect of “green” hydrogen being cost competitive with “blue” hydrogen. Electrolysers located to adjacent to substations make for suitable controllable loads that can be despatched by system operator via a suitable algorithm.

The absence of economically rational and environmentally beneficial balancing despatchable load in a world of near total intermittent renewable generation of grid electricity will be barrier to investment in such generation. The absence of such controllable loads will also result in a lot more expensive and inefficient grid reinforcement whose costs will need to be carried by consumers. The absence of such controllable loads could delay decarbonisation at scale by decades.

The lack of a statutory regulatory framework for district heating schemes makes them unfundable. If it can never be acceptable that heat energy is to be provided to citizens on a unregulated basis then the Department should recognise that immediately and start to develop a suitable regulatory framework that will unlock private sector funds to complement HMGs commitment for public underpinning.

Ground source heating and indeed air source heating for clusters of houses (5 to 10) to create a mini district heating system may be viable with the right structures in place. The economics of the equipment improves if the capex is shared and it may be possible when using standardised designs to create a market for small energy services companies.

7. Power

Q24. What is the appropriate pathway for the decarbonisation of power from now to 2030, and subsequently to 2050?

Q25. What target for electricity consumption generated from renewable sources by 2030 is ambitious, achievable and affordable?

Q26. How can the new infrastructure necessary to meet a new renewable electricity target be delivered in a timely, affordable and acceptable way for consumers and society?

Q27. What innovations and solutions could contribute to meeting a new renewable electricity target?

Q28. What market incentives and support are necessary for investors to deliver the investment in renewable generation assets at a scale that will achieve a new renewable electricity target?

Q29. What steps need to be taken by Government to facilitate investment in offshore and marine renewables for NI?

Northern Ireland has not developed its off-shore wind generation potential and there have been no positive signals from the Department that it would welcome such development.

The few wind farm developers who are active now seem to work at near GW scale so Northern Ireland's situation may be uneconomic for them to be interested, particularly for fixed installations. Emerging technologies for floating installations may be suitable for Northern Ireland's territorial waters and at a scale appropriate to Northern Irelands requirements. (2 or 3 circa 500MW installations)

Affordability can be improved significantly by economies of scale. There is a case for co-development by the public sector of off-shore wind resources as is happened in other European countries. The public sector could commission all the technical studies and surveys and fund sub-sea cable installations and surface works planning applications to de-risk the investment proposition so as to attract institutional funding. Extinguishing regulatory risks for the development phase needs to be tackled. 10-years to secure planning and permitting and other consents makes Northern Ireland an unattractive place to develop off shore generation.

Sub-sea interconnectors could be daisy chained to connect the North Coast, Ballylumford, Belfast and on to Dundalk and connect off shore wind generation.

SONI anticipates as part of the 2050 climate change mitigation with a target of 70% of electricity consumption from renewable energy sources will require the grid to operate with over 95% renewable power on the system at any one time. In order to achieve this, around 1,600 MW of new renewable generation will be needed.

Reducing the “at risk” period for private capital and time to energise off shore generation will improve attractiveness for investors and bill payer support via contracts for difference or production subsidies may not be required.

8. Transport

Q30. What would be an appropriate pathway to decarbonised energy for transport to 2050?

Q31. What role should active travel have in the decarbonisation of the transport sector and what should government do to support this?

Q32. What energy infrastructure is needed to facilitate the uptake of electric vehicles in line with UK Government’s ‘Road to Zero’ targets?

Q33. How will transport integrate with other energy uses (e.g. homes with solar generation, battery storage, EV charging) and what can government do to optimise the opportunities represented by this integration?

Q34. To what extent can alternative low carbon transport fuels contribute to decarbonisation of the transport sector?

Q35. Do you have any data/research to help inform and reduce the carbon intensity of our transport energy in order to achieve net zero carbon by 2050?

Indications are that passenger vehicles and local buses are going to dominated by electric powered motors fuelled mainly by batteries with some powered via hydrogen fuel cells.

HGVs, trains and long-range buses and coaches are going to be powered via hydrogen fuel cells. Specialist vehicles such as refuse collection vehicles may use both technologies. Hydrogen fuel cell “extenders” are starting to emerge to provide greater range for vehicles using a battery as their power source.

The vehicle borne batteries are likely to play an important role in load balancing by being able to act as a storage of electrical power when plugged into the charging infrastructure. However, the appropriate infrastructure to allow two-way transfer of energy to this needs to be deployed.

The availability of renewable energy for transportation will probably require a modal shift to public transport, with single occupancy private cars used for the ‘last mile’ type of journey.

9. Other Issues:

a. Security of Supply

Q36. What specific risks to security of energy supply are likely to emerge as a result of our changing energy mix, and what actions can be taken to mitigate these?

Q37. What measures or indicators could be adopted or developed to monitor energy security of supply?

The dependence on intermittent wind generation presents a vulnerability to a single failure mechanism that could have extensive impact. A single high wind speed event that exceeds the design parameters for the structures (i.e. towers or masts) supporting the wind turbines could result in 100s of wind generators being out of commission for a considerable time. This should be on someone's risk register and assessed.

It should be a policy that beyond say 15% wind despatch-down no new intermittent generation will be allowed without a matchable controllable load being also developed.

There will be no route to market for new intermittent generation if the business case is that they generate for 20% of the time and when they do the system marginal prices are near zero.

The ratio of installed controllable load to connected generation will be useful indicator of security of supply. Some of these controllable loads will be energy storage or energy transformation installation and need to be economically viable and environmentally beneficial.

Renewably fuelled base load generators will provide an important function for system operators. Biomass from waste - driving steam turbines for base load generation (as proposed in arc21 residual waste treatment project) and green hydrogen produced via electrolysis using otherwise curtail or constrained wind generation for driving peaking gas turbines will both be required.

A modern energy from waste plant as proposed for Hightown Quarry will be able to provide a range of system services that help enable further wind and solar generation to get connected and provide base load synchronous generation. The robust electrical infrastructure will also allow import as well as export of electricity and be a platform for green hydrogen production and an extensive district heating system.

b. The Role of Data

Q38. What is the most cost-effective method of capturing consumer energy usage data in electricity and natural gas (where meters are in place)? In heating oil (where there is no metering obligation)?

Q39. What concerns need to be addressed regarding data privacy, security and/or ownership?

Q40. What are your views on applying the key recommendations of the Energy Data Taskforce for NI?

Q41. What organisations or businesses do you see as having a key role in optimising the value of data? How will they do this?

The totality of the energy market needs to be subject to effective regulation in respect of both the total amount and the carbon intensity of the energy it provides whether it is electrical power, gas, or liquid fuels such as heating oil or heat energy provide by district heating systems.

c. Carbon Capture and Storage

Q42. What steps, if any, should NI policy-makers consider with regard to the development or implementation of CCUS in NI?

The policy for Carbon Capture and Storage (CCS) strategy is not devolved to Northern Ireland and is managed on a UK wide basis.

Northern Ireland is uniquely placed to produce “blue hydrogen” from natural gas imported via the Scottish Northern Ireland Pipeline (SNIP) and distributed hydrogen across its territory using the existing gas transmission and distribution network that because of its young age has pipe materials that make Northern Ireland unique in the UK to transition to a hydrogen gas as an energy vector immediately. The Department should be making representations to HMG on the attractiveness of making Northern Ireland a ‘test bed’ for deployment of both ‘green’ and ‘blue’ hydrogen technologies.

Floating or land-based carbon capture equipment could be developed near the SNIP landfall with ships carrying captured carbon dioxide to repositories in the North Sea.

Appliances will have to be suitable for running on hydrogen gas but there could be a phased replacement. “Blue hydrogen” could be blended with natural gas up to 20% for a few years to allow new dual gas appliances to be deployed. The network could then be changed over to 100% hydrogen within 5 years.

However, ‘green’ hydrogen technologies – using advanced electrolyser technology - will be faster to deploy than creating the infrastructure to produce ‘blue’ hydrogen. Economics dictate that ‘green’ hydrogen will be used were the price point is highest, which will be the private hauliers using hydrogen powered heavy good vehicles. However, the market should be managed to encourage some green hydrogen production for using in the gas grid in a defined area for heating purposes to provide confidence to consumers. That could be via dedicated hydrogen gas pipe network for 100% hydrogen fuel or a zone which is natural gas with 20% hydrogen blend.

d. Energy and the Economy

Q43. What specific economic opportunities will arise from the decarbonisation of energy?

Q44. What skills are needed to realise the potential economic benefits of energy in the future?

Q45. What are your views on the future of overall energy demand in NI and how can we ensure that any potential demand growth aligns with our net zero carbon target?

arc21 has been at the forefront in local government in Northern Ireland in promoting and implementing projects and initiatives aligned with better resource management and reducing green-house gas emissions. The diversion of garden and food waste from landfill into composting facilities has reduced methane emissions, as will the diversion of residual waste when the facilities proposed for Hightown Quarry are developed. The configuration of these facilities anticipated the Circular Economy by 10-years.

The facilities proposed for Hightown Quarry represent a £240million inward strategic investment into Northern Ireland and will create 100s of construction jobs, apprenticeships and skilled operational jobs.

In the context of the on-going Covid-19 epidemic having a robust, modern well-regulated energy from waste facility firing at 950 deg C would have been a comfort to mitigating the risk to public health. Collecting waste from households with individuals actively infected with the virus then, at ambient temperatures, spreading the waste at landfill sites or processing and storing it for export is not risk free. Waste collection services could become restricted and materials recovery facilities may need to cease processing waste to protect workers. The virus will be viable for many days, even weeks. Household waste lifted from the kerbside and taken immediately for thermal treatment at 950 deg C thereby annihilating any virus would be much safer for people and the economy of Northern Ireland.

There is a need for skills to identify and screen decarbonisation opportunities and integrated and blend technologies so as to be commercially viable and make them investible for the private sector. The public sector needs to enable, rather than frustrate decarbonisation initiatives.

e. Delivery Framework for an Energy Strategy

Q46. Do the existing division of responsibilities and powers across government enable the most effective approach to the overall aim of decarbonising energy? If not, what are your suggestions for improvement?

Q47. What are the opportunities for local government to contribute to the delivery of the net zero carbon target?

Q48. What are your views on how statutory duties and accompanying legislation and regulatory frameworks would need to change to facilitate the transition to net zero carbon by 2050?

Q49. Is there a need for a dedicated organisation to champion, lead and deliver sustainable energy interventions? If so, what should this look like?

The existing division of responsibilities and powers across government can only result in incremental change. To meet the UK's commitments in 2032 and 2050 in-line with the Paris Accord targets a step change is required.

Of necessity "disruptive" challenger providers of outputs and services that enable decarbonisation should be encouraged. The providers and distributors of fossil based gas and electricity and transport fuels should - by policy and legislation and fiscal measures - be put onto a track of managed decline.

Existing utility companies who have a duty to shareholders to be economically rational and are discouraged by the Utility Regulator to innovate and invest in decarbonising infrastructure should be given 24-months to rebase their businesses model to align with decarbonising the economy and using energy more efficiently. If such companies remain with the mind-set that they can only implement a managed, reluctant retreat from fossil fuels Northern Ireland (and the UK) will miss all of its targets.

A new body should be created to screen large scale decarbonisation opportunities at a 'utility' scale and issue licenses to companies to implement them that allow for a period of exclusivity (a minimum of 12-years) within a coherent geographical area i.e. **"a decarbonisation zone"**. This will allow funders to see a prospect of returns and stop 'cherry picking' where energy efficiency opportunities are foregone for the sake short-termism. e.g. the heat from a 5MW electrolyser producing green hydrogen for commercial transport is not captured for beneficial use as investors cannot make immediate sufficient financial returns.

Until decarbonised energy sources become abundantly available a “managed market” will be essential. Every kWh of primary energy from renewable sources will need to work 2x or 3x harder that fossil fuel kWh from 2030 onwards.

By 2050 the UK as an economy will need to effectively use 720 times less carbon than it did in 1990 relative to the size of the economy. It is unlikely that by 2050 we will have replaced the fossil fuel energy we use now with renewable primary energy sources. So it will be essential to make each kWh of renewable energy / electricity to go further. Energy efficiency will become more and more important and the need for holistic solutions which achieve high levels of utilisation will be critical. Collaboration across energy vectors and statutory undertakers – the current bête noir of utility regulators – should become the norm. Or if they won’t or can’t collaborate - for the benefit of the environment and the economy - a new type of statutory **“decarbonisation integrator”** should be created such that it can oblige existing utility companies to conform to decarbonisation initiatives – rather than the other way round. It would be good if Northern Ireland can take the lead in developing commercially viable models for decarbonisation compatible with a ‘just transition’ to achieve this.

Local government will have an important role in relation to development of decarbonising infrastructure. Planning legislation should provide extensive permitted development for licence holders in decarbonisation zones so they can implement and integrate all the components necessary to achieve decarbonisation and generate the necessary benefits, including a diverse “revenue stack” to improve the financial viability of such decarbonisation initiatives and make them investible propositions. Those responsible for planning policy should not ignore the need to achieve financial viability of decarbonisation schemes and should not bake in the means of allowing endless objections so nothing at scale ever happens in Northern Ireland.

Local government should have a role in the identification of decarbonisation zones and the basis in which they may want to participate. District heating systems across Europe are only viable when municipally led. The UK Government, in its Clean Growth Strategy, identified that it expects district heating to be supported by public funding.

10. Additional information

Q50. Is there anything else you would like to add in response to this Call for Evidence?

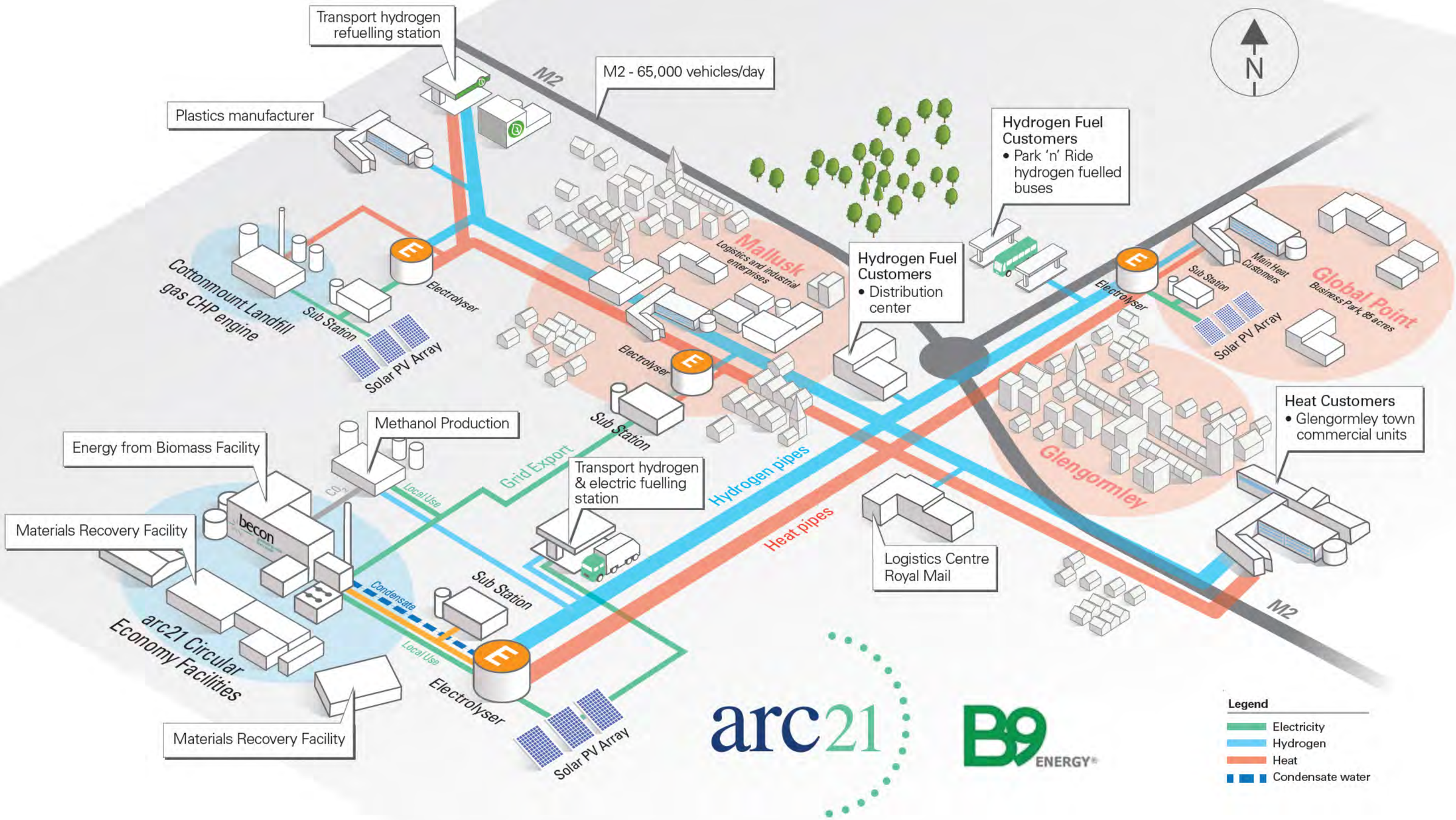
An annex to support the response to question 6 in section 3 *The Energy Transition in Northern Ireland* follows.

It is an example of a comprehensive approach to decarbonise power, heat and transport energy in the Mallusk, Glengormely and Corrs Corner area.

Mallusk - Glengormley - Corrs Corner

Annex

Decarbonisation - Enabling Clean Growth



B9 ENERGY®

[redacted]

[redacted]

20th March 2020

[redacted]

UK Parliament - Northern Ireland Affairs Committee
Call for evidence - *New Decade, New Approach Agreement*
Climate change and next stage decarbonisation – the role of *Power-to-X* infrastructure

Further to your request for a description of the technical and commercial aspects of proposed additional decarbonisation opportunities at Mallusk, Glengormley and Corrs Corner areas beyond those previously proposed for the core residual waste treatment project facilities at Hightown Quarry, I have set out the key features below. I would be happy to provide evidence in person to the Northern Ireland Affairs Committee, if required and if allowed under the Coronavirus travel restrictions. As you know, I avoid air travel but if I had sufficient notice I could arrange to be in London using surface transport.

By way of background, B9 Energy has been leading a collaborative effort to define an appropriate ***Power-to-X*** infrastructure model for Belfast which is being extended to Mallusk and other towns and rural areas across Northern Ireland. These projects will be much needed if we are to advance decarbonisation initiatives at scale within the short timescales that remain available under what is now widely recognised as the 'climate emergency'. The initiative is compatible with the aims and objectives of *'The New Decade, New Approach Agreement'* document, which emphasises the important role of infrastructure development and the need to tackle 'head on' the immediate and short term impacts of climate change.

In becoming familiar with emerging decarbonisation strategies from both public and private sources, B9 Energy are firmly of the view that carbon reduction targets and timescales will not be achievable without maintaining investor confidence in the renewable electricity generation sector – particularly the developers of wind farms - both on land and off shore - and solar farms. This, in turn, will not be realised without deployment of sufficient controllable load to balance otherwise grid curtailed/constrained intermittent generation.

In a nutshell:

- the absence of economically rational and environmentally beneficial balancing dispatchable (i.e. controllable) load in a future scenario where customers are reliant upon intermittent renewable generation of grid electricity, will be barrier to investment in such renewable generation;
- the absence of controllable loads will result in a lot more expensive and inefficient grid reinforcement whose costs will need to be carried by consumers; and
- the absence of controllable loads will delay decarbonisation at scale by decades.

That takes you on to the question: *what could be the economically rational and environmentally beneficial balancing dispatchable loads?* Power-to-X technology is ideally suited to this purpose and Appendix 1 shows a calculation of why B9 Energy has concluded that a portfolio of Power-to-X projects distributed across the whole of Northern Ireland of 760MW load total is viable and environmentally and economically justifiable. The projects would use existing technology, landbanks and grid connections to improve the chances that full deployment could be achieved as soon as 2030, if the will existed. Prioritisation of projects can help to alleviate capacity constraints in both the electricity network and the waste water networks.

Appendix 2 provides an overview of the basic concept of Power-to-X as applied at city scale in Belfast. Smaller town versions and rural versions would be simpler in their configuration and would feature a range of site specific adaptations to meet user requirements. Appendix 3 lists the current 23 stakeholders in the Belfast project.

Finally, as someone who witnessed the lost opportunity in the early 1990s for Northern Ireland to develop its indigenous manufacturing for wind turbines and associated towers and ancillary equipment despite providing evidence to those responsible for economic development in Northern Ireland that wind energy had a bright future, only to watch officials and economists side with the vested fossil fuel and nuclear industries to class it as 'too risky', I have to point out that an equally important opportunity exists today for NI plc to capitalise on an emerging energy industry sector, namely energy storage and in particular Power-to-X technology.

The decision not to support the manufacturing of wind turbines and associated components has resulted in over 1400 MW of connected wind generation across more than 1000 sites in Northern Ireland all being produced by imported plant, equipment and structures. The development of a wind turbine supply chain in Northern Ireland with associated workforce could have used the home market as a springboard into the international market for on-shore wind generation but the opportunity was missed. The irony is that Northern Ireland has progressed to having the highest instantaneous penetration of intermittent wind generation in the world, 65% rising soon to 75%, **but not one kilowatt-hour is produced by locally sourced equipment** even though Northern Ireland has first class industrial capabilities. This was a monumental loss of economic development potential.

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[redacted]

I would make a heartfelt plea to the Northern Ireland Affairs Committee that it not only endorses the *Power-to-X* concept but also encourages the development of an indigenous equipment and skills supply chain to implement it. Northern Ireland is probably 5 years ahead of the rest of Europe in experiencing high levels of wind generation 'despatch down[1]' of circa 11% (and increasing) and it has a unique opportunity to develop the equipment manufacturing base, the control algorithms and technology integration skills to export the Power-to-X model to the rest of the world.

Please let me know if you require any further information. I am happy that you share this letter with the Becon Consortium sponsors.

Yours Sincerely

[redacted]

[redacted]

Encs.

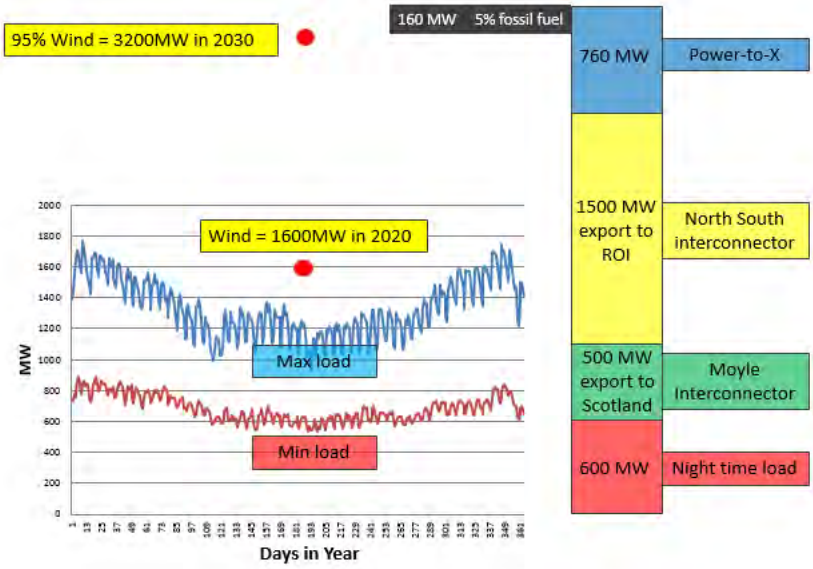
Appendix 1 – Calculation for 760MW Power to X portfolio size
Appendix 2 – Power to X concept description
Appendix 3 – List of stakeholders in the *Power-To-X - Belfast*

[1] What is **Wind Dispatch-Down**?
Dispatch-down of wind energy refers to the amount of wind energy that is available but cannot be utilised for electricity generation.

- Dispatch-down due to overall power system limitations is referred to as **curtailment**.
- Dispatch-down due to a local network limitation is referred to as a **constraint**.

[redacted]

Appendix 1 - Calculation for 760MW portfolio size



BUT
At peak wind in NI it is likely that ROI and Scotland will also have high wind penetrations, so these export routes might not be fully available.

Appendix 2 - Power to X concept description

Considerable time and effort has already been expended by the 23 existing stakeholders to arrive at the present design of the generic Power-to-X project concept. A *'Community of Interest'* has been created that has committed to a combined 'contribution in kind' of approximately £1million to assist in seeking funding opportunities: (Partner names are shown on **bold**).

B9 Energy has been pioneering renewable energy development in Northern Ireland for 30 years, working to build the first wind farms and industrial scale anaerobic digestion projects, and is now engaged in development of holistic energy storage solutions that reduce costs and match the aggressive decarbonisation trajectory required to combat the climate emergency.

Our latest most developed project, called *Power-to-X – Belfast*, is located at **Belfast Harbour** and sets out to capture both night-time wind power from across NI that is otherwise wasted and daytime solar PV power, which cannot get cost effective local grid connection. This renewable energy is used to power an electrolyser to make hydrogen fuel for **Translink** buses and trains, oxygen for reducing the energy required in **NI Water's** wastewater treatment process and heat for industrial, commercial, municipal and residential properties in the **Belfast City Council** area. Dedicated hydrogen and hot water pipelines are to be deployed to store energy and distribute it around the end user locations across the city for use when demand is high but renewable energy generation is low. Excess hydrogen will be injected into **Mutual Energy's** natural gas network and delivered to heat and power customers that way. The benefits of reduced greenhouse gas emissions are added to by the lowering of NOx and PM2.5 air pollutants, especially from urban buses that switch from fossil fuel to batteries and hydrogen and visiting cruise ships that turn their engines off when supplied with shore power.

The core electrolyser machine is joined by fuels cells, batteries, compressors, dispensers and a water sourced heat pump to form the Power-to-X system and whilst these components are well known to the supply chain partners, there is an ongoing challenge with the integration, control and optimisation of the system to extract the most efficient and cost effective outcome. Resources are therefore focussed on improving **B9 Energy's** existing H2020 supported smart local energy control system to make it fully capable of predicting, monitoring, analysing, prioritising and scheduling events to optimise benefits so as many as possible are montiseable (producing a revenue stack) and ensure that ambitious city scale decarbonisation strategies can be entered into with confidence.

Working with stakeholders over many months we have discovered that a genuine 'Community of Interest' exists in Belfast that is ready to take the big steps enabled by Power-to-X configuration. Other projects will be developed in other localities like the one for the Mallusk, Glengormley and Corrs Corner area. The *Belfast Power-to-X* project partners intend to use the project deliverables and heightened profile as an exemplar so that replication of the approach is possible in Northern Ireland, across the whole of the UK and internationally.

[redacted]

Appendix 3 - List of stakeholders in the *Power-To-X - Belfast* project

• ABB:	ISEM market operating software
• Arup:	Technical / Commercial modelling including ISEM
• B9 Solutions / B9 Energy:	Project management /Project development / O&M
• Belfast City Council:	Civic engagement / Environmental agenda
• Belfast Harbour:	Landlord / hydrogen offtake / cruise ship liaison
• Bouygues E&S	EPC Turnkey contractor
• CBRE:	Low carbon project debt
• Colloide:	M&E design and contracting – e.g. district heating
• Hyundai:	Vehicle fuelling strategies
• Irish Hydrogen Association:	Strategic and tactical networking
• Kinkead Consulting:	HSEQ & Management Consulting
• KPMG:	Financial services with global reach
• Mutual:	Natural gas pipeline owner / operator
• Newcastle University:	Oxygen uses in water industry
• NI Water:	Waste water treatment plant owner / operator
• Northern Cryogenic:	Hydrogen and Oxygen road transport
• Osborne + Company:	Scirocco works re-development
• Solvera Lynx:	Integrated system design and specification
• SONI / Eirgrid:	Electrical System Operator
• Strategic Investment Board:	Public sector liaison
• Translink:	Bus and Train owner / operator
• Toyota:	Vehicle fuelling strategies
• UK Water Industry Research:	Community of knowledge and expertise
• W-TEC / Wrightbus:	Electric and H2 bus manufacturer