Isle of Man Government

Reiltys Ellan Vannin

Energy Strategy 2023

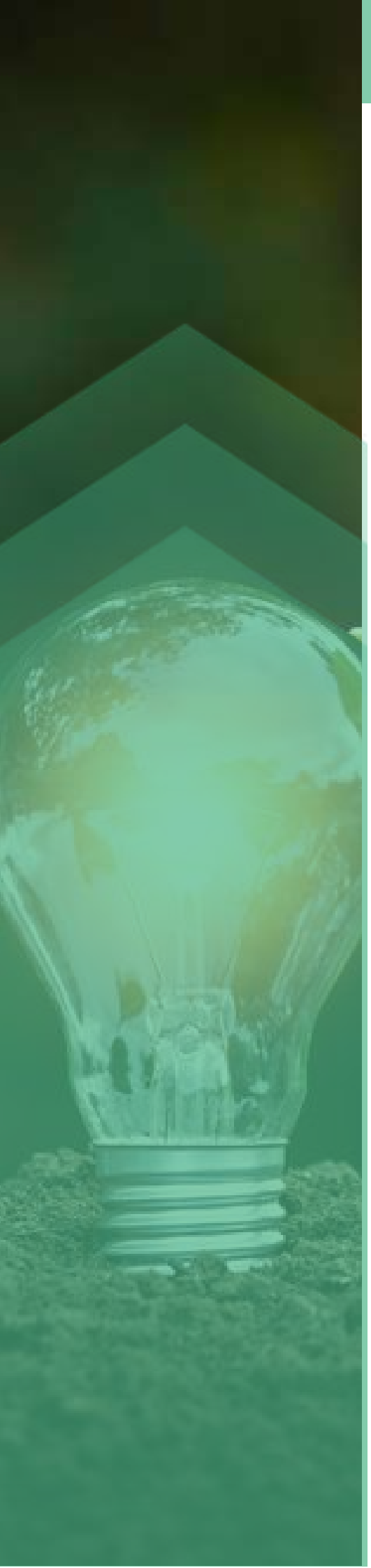
Department of Environment, Food & Agriculture

Isle of Man Government

Reiltys Ellan Vannin

DEFA

Contents



Introduction

The Isle of Man's energy strategy is being developed during a time of high energy prices, combined with broader cost of living pressures and in the context of a globally recognised need to decarbonise economies and reach net zero greenhouse gas emissions by 2050.

The societal priorities this strategy sets out to address include delivering reliable, affordable and sustainable energy for the benefit of everyone on our Island. To do so is a significant challenge and involves complex technical, economic and political issues, sometimes with unavoidable trade-offs. Nevertheless, we also see this as a significant opportunity, to harness the latest in green technology to cut emissions and grow our economy.

Although the document refers to an energy strategy, the scope of it is primarily focused on the power sector. That being said, power is fundamentally interlinked with decarbonisation elsewhere in the economy, particularly heat and transport. We will return to these sectors in more detail at a later date, but there are instances in this document where it was felt relevant to incorporate them, particularly as they relate to the household journey to net zero.

Vision for the future

Our vision for the Island's energy future is one in which our net zero ambition supports the economic strategy, taking advantage of the latest low carbon technologies, and optimising our own abundant natural resources, making us more independent and prosperous.

Strategic Aims

The key strategic aims that our energy policy seeks to achieve are:

To provide support to the delivery of Our Island Plan and the economic strategy

To provide support to the delivery of the Island's net zero targets

To enable the transition of energy generation to occur in an economically efficient manner, when considering the economy as a whole

To ensure the energy transition to occur in a manner that is fair and equitable

To ensure that people and businesses are able to benefit from decarbonisation

To make greater use of our own energy resources

To increase energy independence

To maintain the Island's existing levels of power system resilience

The overarching purpose of our energy strategy, is to provide a framework within which policies can be developed, allowing us to achieve the above aims, accounting for the full array of intersecting pressures that impact on energy policy, and in a manner that maximises benefits and minimises trade-offs.

The current situation

The Isle of Man has a highly resilient but fossil fuel dominated power system that needs to be decarbonised in order to meet our net zero targets and facilitate wider energy system emission reduction. We are currently almost entirely import dependent, a fact that leaves us exposed to international energy markets, the risks of which have become plain in recent times.

Despite the strengths of our system in terms of resilience, the status quo has meant that we have been subject to global increases in gas prices, emissions that are very high on a per capita basis and a scenario in which inward investment is threatened because business is unable to source the low carbon power that it needs.

However there are a number of important areas that have seen substantial progress recently. These include:

Average power system demand on Island is around 40MW and therefore the renewables that will be delivered in the near term represent a major step on our journey to a net zero power system. These initial actions are a strong platform on which our future strategy can build and demonstrate a clear commitment to action

An evolving policy framework

It is our intention that the Island's energy strategy is in effect a "live" document, one that is updated on an annual basis to reflect our evolving policy stance. Our understanding of the energy landscape changes over time, in response to a variety of external factors in technology, economic and market development. Therefore, there is a need to maintain agile policy in this space. Additionally, there are a number of areas where we wish to see further analysis and will return to these in the coming months and years.

As a consequence, the policy principles outlined below are split into two categories. Firstly, those areas that we are confident will play a key role in our future direction and/or that we are committing to now. We do not intend to revisit the fundamentals of these principles in future versions of the strategy, but the details will be refined and updates provided. Secondly, topics that we anticipate will play a key role but that require a greater level of development and commitment.

Ultimately, the strategy will continue to be developed in such a way as to meet the strategic goals listed above.

Current Policy Principles

At a high level, our policy principles are as follows. A more detailed discussion can be found in Annex A.

1. We will increase our energy independence and security through on Island renewables and carbon neutral energy generation

Harnessing our considerable natural potential for renewable energy generation will increase the Island's energy independence, promote energy security, deliver low carbon power and add resilience against future energy shocks.

Actions:

- Develop 30MW of renewables on Island by 2026, with a greater focus on wind energy which better fits our demand profile
- Commission a second interconnector, to support renewable energy and maintain current levels of system resilience
- Conduct an assessment of the practical barriers to renewable delivery through experience
- Work with Manx Utilities to determine a fair policy for curtailment
- Work with stakeholders on the potential for bioenergy development on Island, including an assessment of likely lifecycle emissions and the establishment of robust sustainability standards
- Assess the potential for offshore wind to make a contribution to our power system in the future
- Build on our pioneering blue carbon research to establish the role that the ocean bioeconomy may play in decarbonisation

Current policy principles

2.We will optimise the level of on Island renewables and carbon neutral energy generation

Our aim is to seek a level of home grown energy production that maximises the benefits of energy independence, balances costs and economic benefits, and accounts for other intersecting societal priorities, whilst also maintaining existing levels of resilience.

Actions:

- Build on existing Manx Utilities analysis, and gather further feedback from stakeholders, to refine our assessment of the optimal technological vision beyond our current 30MW of renewable commitments
- Based on this, publish a finalised view on our future plans for power system development that will map out the route to net zero

Current policy principles

3. We will provide a supportive environment for business low carbon needs

Low carbon is crucial to Island businesses, through the environmental, social and governance (ESG) agenda and through the increasingly attractive investment opportunity that renewables provide. Enabling companies to meet their low carbon requirements will help drive investment, support growth and deliver economic benefits.

Actions:

- Enable business to demonstrate the purchase of renewable electricity through the interconnector as an initial step towards meeting ESG targets, prior to renewable development on Island
- Assess current barriers and challenges to self-generated renewable provision for businesses
- Through our work on bioenergy, seek to provide an additional revenue stream to the farming community, should this be deemed a viable approach

Current policy principles

4. We will work to deliver offshore wind and scope out a future licencing round for offshore wind

Offshore wind has the potential to provide a transformative new revenue stream for the Island that can support both our net zero ambitions and wider societal spending priorities

Actions:

- As our highest priority, work with the current lease holder in the coming years to deliver and maximise the benefits of the existing Agreement for Lease
- Over the next two years, we will conduct a scoping study to determine whether or not a new future licencing round is feasible and whether current challenges can be overcome
- Begin work on the development of a marine spatial plan that will allow us to allocate areas of seabed for future leasing of offshore wind, if viable. Such a plan will facilitate the sustainable use of our territorial seas in general.

Current policy principles

5. In the near term, Government procured renewables projects will be in public ownership, to deliver the lowest cost to the consumer

Currently, government will utilise the expertise of the private sector when developing low carbon projects, but will then adopt a public ownership model as this will result in the lowest direct costs to the consumer.

Actions:

- Finalise procurement model for public ownership ahead of initial renewable projects
- Conduct further economic analysis to determine long term public private balance, based on whole system economic assessment
- Building on this work and evidence to date, develop long term financing strategy for net zero transition

Developing policy principles

6. We will enable consumers to take advantage of the net zero transition

The net zero home of the future is one in which consumers are empowered to take greater control of their energy consumption, live in more comfortable homes, with reduced energy demand and lower running costs and in which electrification integrates power with heat and mobility, driving further emission reductions.

Actions:

- Scope out a successor scheme to the Green Living Grant Scheme to launch in 2024
- Work in parallel on a low carbon heating strategy to provide a delivery platform for this crucial aspect of a net zero home
- Work on the assessment of a series of finance related policies to establish the funding of home energy decarbonisation
- Work with Manx Utilities on their upcoming Demand Evolution programme, to bring about the benefits of flexibility and demand side response to consumers
- Review planning rules and permitted development to see if they remain fit for purpose in this context
- Adopt the Future Home Standards once launched, to ensure future proofing for net zero homes

Appendix A - Policy principles discussion

Policy principles

1. We will increase our energy independence and security through on Island renewables and carbon neutral energy generation

The benefits of greater independence

TThe cost of energy and cost of living crisis we have been living through is driven by fossil fuels. Although gas prices have fallen from their peak and some of the worst security of supply outcomes have been avoided, considerable uncertainty remains in international markets and there is an expectation that energy prices will remain elevated for a number of years.

As a result of these challenges, there is a strong driver to make greater use of our own abundant on Island energy resources. This will make us less reliant on energy imports, providing a buffer against future energy shocks.

Our existing levels of energy resilience are high and the Island has an extremely strong recent track record of delivering reliable power. We intend to maintain a system with current levels of resilience, one that homes and businesses know that they can rely upon. Security of supply will be our guiding principle and renewables will be integrated into the system in a manner that has this focus at its heart. Moreover, this future power system will be less reliant on volatile fossil fuel markets, therefore our energy security will be boosted by the net zero transition and the use of home grown renewables.

Future iterations of this strategy will focus attention on an exact phase out timeline for our existing fossil fuel assets. This timeline will deliver a practical vision that will guide the transition, including addressing the question of under what circumstances we might consider continued use of gas or diesel in order to maintain security of supply, whilst also meeting our decarbonisation commitments. This is a subject that the UK Climate Change Committee has recently addressed[1] reflecting the heightened focus on energy security post the Ukraine conflict.

Our relationship with the UK

Our links with the UK do bring important benefits that must be recognised when considering this issue in the round. For example, whilst more challenging in the future, as described elsewhere in this document, our connection with the UK offers a revenue generation mechanism that can partly offset the cost of investment in net zero.

Most importantly, interconnection provides guarantees of security of supply and also allows us to access the grid stabilisation services provided by the GB grid. This in turn strengthens our ability to add renewables onto our network and potentially at a lower cost than would be the case through purely on Island solutions.

Paradoxically, therefore, energy independence driven by renewables is facilitated by interconnectedness with the UK and to a degree arguably reliant on it, through the security of supply benefits that it provides. Energy independence is not an absolute position, with ever increasing degrees along a simple sliding scale. Rather, it is an issue of complex interrelationships that we must always be cognisant of. Our focus through policy is to promote greater independence, but do so in a way that addresses the need to maintain resilience in the round and when accounting for the system as a whole.

The benefits of additional interconnection

As described above, interconnection comes with inherent benefits and does not contradict a desire to have greater independence. Indeed, it can support it. Analysis to date not only confirms this, but also demonstrates the potential value of a second interconnector in order to maintain our existing levels of

1 https://www.theccc.org.uk/publication/delivering-a-reliable-decarbonised-power-system/

system resilience in a future world of renewable and low carbon technologies. Under this vision, a second interconnector would help us to integrate

As described above, interconnection comes with inherent benefits and does not contradict a desire to have greater independence. Indeed, it can support it. Analysis to date not only confirms this, but also demonstrates the potential value of a second interconnector in order to maintain our existing levels of system resilience in a future world of renewable and low carbon technologies. Under this vision, a second interconnector helps us to reliably integrate renewables, deliver energy security, meet our policy principles and achieve our emission reduction targets. We are therefore committed in principle to the installation of a second interconnector and will now begin the detailed process of scoping and business case development. The next version of this strategy will provide an update on progress in this report.

Wind energy as the dominant source of renewable power on Island

In general terms and at scale, we believe that wind offers the most cost effective means to deliver renewables. This is simply a function of the fact that wind generation is more closely matched with Island demand. It generally produces reliably during winter when demand is highest and the windy nature of our geographical location means that it also has a valuable level of production even in summer. Solar, by contrast, is typically more productive during summer days when demand is at its lowest. However, solar can still have a valuable role to play. It is quick to deploy and can be located in locations where there are no issues with competing land use, such as on the roofs of public buildings. Moreover, there is already an established solar industry on Island and hence procurement of solar could directly benefit the local economy.

Facilitating renewable development

As we proceed through the process of initial renewable development, we will learn from the experiences of Manx Utilities, and the expertise of our planning teams, to establish whether there are changes that can be implemented for any future renewable projects, or indeed any other form of low carbon installation.

Additionally, given that grid constraints do exist, as described elsewhere in this document, we will work with Manx Utilities to determine a fair policy for curtailment given predicted increased demand for renewable production.

Other technology options for greater independence

A potentially key technology in the future is bioenergy. Bioenergy can provide a reliable source of on demand, dispatchable power that helps to maintain system stability in a world where intermittent renewables must be balanced to ensure security of supply. It could therefore play an important role in the future, although delivery timelines were we to proceed down this route in time for 2030 would be challenging.

Recent analysis for Defa has demonstrated potential for on Island feedstock production in the farming sector, for example through growing energy crops such as miscanthus. The forestry sector could also expand to utilise sustainably managed forest resources in bioenergy. More speculatively, it may also be possible for the fishing industry to "farm" kelp to use as a feedstock.

Development of a biomass feedstock supply chain on Island could also provide a valuable contribution to the decarbonisation of heat. However, particularly at large scale, the production of bioenergy feedstocks may compete with food production.[2] Therefore, before progressing with this option, we will work with the farming community and through the development of the Food Strategy to determine whether this is a feasible option, that is right for our Island.

We will also commission bespoke research to establish likely lifecycle emissions from various feedstock types, in order to determine their low carbon status.

[2] If we did pursue bioenergy but found that we had insufficient levels of on-Island feedstock production, we would then be reliant on imports. Biomass supply chains globally are not yet particularly robust. This would therefore be a risk and also counter to our independence principle.

This would be accompanied by the development of robust sustainability standards. Additionally, if we were to proceed down a bioenergy route, it is possible that some level of import would be required, which would come with its own risks and undermine a drive for greater independence.

As well as onshore renewables, we will actively investigate the possibility of a contribution from offshore renewables, in particular wind. While we do not intend to commission our own offshore project, we will work with developers in Manx waters to identify ways in which we might connect into their installations. There would be the need for appropriate contractual and regulatory arrangements over the allocation of power between competing users. Nevertheless, this is certainly an opportunity worth pursuing, especially if we consider that the Island's demand is a tiny fraction of that of a large offshore wind farm. In this context, we may have an advantage because even relatively wind-less days, could have sufficient generation to meet our needs.

In addition to offshore wind, there is the possibility of tidal energy in future, which offers a predictable source of power. Previous analysis[3] has demonstrated the potential in this regard, although there would be the need to conduct a detailed feasibility study to understand physical and technical constraints. Furthermore, tidal energy is currently extremely expensive and we would need to observe significant cost reductions before judging this to be suitable. There is the prospect of this occurring, however, now that tidal is eligible for UK Government subsidy, although it is very unlikely to be feasible until post 2030.

More speculatively, in the future, Liquid Air Energy Storage (LAES) and Flow Batteries could be good options to provide system balancing for renewables providing the costs reduce as expected after 2030. Further into the future, hydrogen production from onshore or offshore renewables could perhaps provide fuel that integrates well with intermittent renewables. If there is also a generator which is capable of running on a range of future fuels including hydrogen it may be able to produce electricity across gaps in renewable generation.

Home grown energy could also include gas, if the activities under the current licence demonstrates that an economically viable reserve is available and if that gas were transported to the Island. However, there is only a limited time window in which gas can be used on Island, if we are to meet our climate goals and the imperative of net zero. Therefore, we expect that its use will be limited[4], mirroring the anticipated gas demand curve observed in the UK and Europe.[5] As noted above, we will publish our detailed views on fossil fuel phase out in the next update of the strategy.

We also take this opportunity to reiterate the Tynwald approved policy that there will be no further licences issued for hydrocarbon extraction in our territorial seas.

Innovative Solutions

Finally, one area where we may be able to demonstrate innovation and leadership on is blue carbon. A pioneering Defa funded research project is currently underway to establish the levels of sequestration occurring in our territorial seas and how this might be enhanced. Once this is complete, we will have a strong understanding of its potential. This could be used to mitigate difficult to decarbonise emissions from industrial sectors or enhance our carbon sinks in general. There may also be the potential for the production of biofuel from kelp.

3 https://www.netzero.im/media/2rcdlhbq/appendix-17-tidal-power.pdf

4 Gas for heat is likely to play a bigger role for longer than for power, though ultimately this too will be phased out. Fossil fuel boilers will be banned in new builds in the coming years

5 See, for example, Figures 1 and 2 here https://www.theccc.org.uk/publication/letter-climate-compatibility-of-new-oil-and-gas-fields/

2.We will optimise the level of on Island renewables and low carbon energy production on Island, maximising economic benefits, affordably.

As discussed above, there are considerable benefits to a drive towards greater energy independence. However, there are also potential trade-offs to consider. Therefore, our second key principle is to attempt to reach an "optimal" level of power production capabilities on Island energy using available energy sources, that maximises benefits and minimises dis-benefits of a shift to greater indigenous energy production.

The exact optimal level is a difficult issue to precisely identify and depends on various quantitative and qualitative factors. Some key considerations are:

- Our evidence suggests that greater energy independence comes with increased investment costs because of the higher capital requirement. This is in terms of both generation assets such as wind power and the demands for storage to back up intermittent renewables. It is important to recognise the full system cost implications of our future technology choices.

- Once installed, the operation expenditure (opex) of renewables is very low and this therefore offers cost savings relative to fuelled thermal power plants. That fuel has recently been extremely expensive, although analysis on behalf of Manx Utilities suggests the savings (at various levels of renewables) are not as significant as might be straightforwardly expected.

- As the current energy crisis has demonstrated, energy markets can be subject to significant levels of volatility. There may be considered to be an inherent and, to some extent intangible, benefit to be less reliant on other jurisdictions and wider markets for our power. Or, to consider greater diversification in our energy links, where possible

- Analysis for the economic strategy demonstrated the potentially key economic driver that ESG can play, supporting investment and growth. This encourages us to think about the economic system as a whole and not just focus on one aspect, for example direct cost to the consumer.

- There are potential trading opportunities with the UK, particularly from firm power on island.However, this is sensitive to our technology choices as well as future developments in GB markets

- Greater renewable capacity on Island inherently involves a greater level of landscape change and intersects with other important societal factors such as landscape perception, biodiversity and food production.

Bearing these points in mind and building on existing analysis from Manx Utilities, in addition to further consultation with stakeholders, we will publish our technology roadmap for next zero power.

3. We will provide an enabling environment to support businesses, driving inward investment

An opportunity to enhance the Island's reputation as a sustainable home for business

As discussed, accessing renewable power is a key requirement for business and we will enable this. Initially, we are exploring the possibility of demonstrating that renewable electricity has been imported through the interconnector. We will then follow this up with our initial installation of renewables on Island, placing businesses in a much stronger position to be able to demonstrate their ESG credentials.

We also recognise that the private sector may wish to develop renewable projects to provide power for their own operations. In a world of high energy prices, there is an increasingly strong rationale for organisations to take[6] greater control of their energy consumption and benefit from the operational cost reductions that renewables can provide. Our policy stance is to support and facilitate such projects and we will work with stakeholders to further understand existing barriers and establish solutions to these.

An additional business benefit from our energy strategy may accrue from the production of bioenergy feedstocks, were we to proceed down this route. This could provide a valuable additional revenue stream for the farming sector and, possibly were kelp to prove viable, the fishing industry. Related to the bioeconomy, the work mentioned above on blue carbon may offer the opportunity for robust offsets and insetting for business, that deliver genuine carbon reductions, consistent with a robust decarbonisation strategy.[7]

Challenges

It is important to recognise some of the policy challenges associated with a desire to provide greater support for business. For example, given that the most common form of renewable power that an organisation is likely to invest in will be solar pv, this will typically operate at times when demand on the network as a whole is low. Any major scale up could pose challenges if there is a significant level of power export to the Manx Utilities grid. This would have to be managed through curtailment, although this could be mitigated by those projects having storage solutions associated.

Additionally, through the sustainable generation tariff, projects such as solar pv do result in an associated cost to the consumer. There are, as discussed, considerable benefits to supporting these schemes in terms of creating a positive investment and business environment. Moreover, there will be some emissions reductions benefits as well (although our evidence suggests that they are modest and will decline). Nevertheless, we must be mindful of this as an issue and work to avoid scenarios in which Manx Utilities is being compelled to effectively provide an excessively generous subsidy to the private sector, at the expense of consumers. Where schemes are entirely off grid, we will work to support these where they are likely to bring a positive economic benefit and notwithstanding any particular substantive planning issues.

We will continue to strive for the best value to the consumer, balanced with a careful consideration of the economy as a whole. In support of this (and also relevant to principle 5, below), we will conduct further analysis of whole system economic consequences to allow us to better understand the benefits and trade-offs of different levels of business support

6 Such projects will be subject to feasible grid connections

7 Insetting is a relatively new concept and refers to a company offsetting their emissions from within their own business boundary and supply chain (or possibly local community), rather than paying for the offset through an external contract with a remote forestry (for example) project.

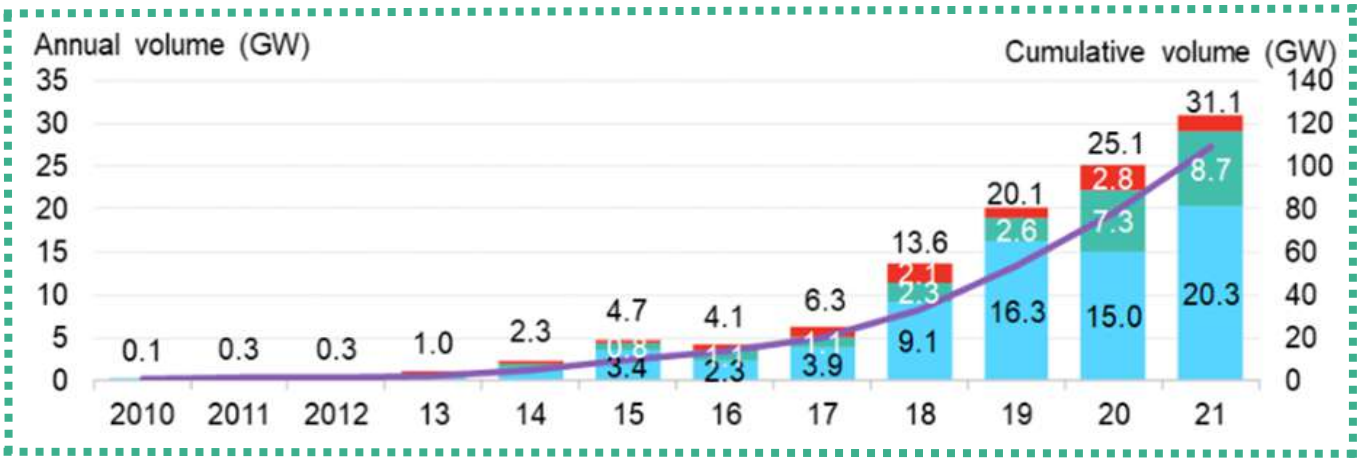
4. We will work to deliver offshore wind and scope out a future licencing round for offshore wind

Offshore wind has the potential to deliver significant benefits to the Isle of Man, principally as a valuable new revenue stream that could be used to help fund our net zero transition, as well as other crucial societal priorities. As discussed above, there is an exciting possibility of future power from an offshore project, but, currently, we view offshore wind primarily as an economic opportunity.
We currently have an Agreement for Lease in place and our highest priority is to work to maximise the benefits from this arrangement. This includes having the necessary consenting regime finalised in order to facilitate the smooth development of the project in the coming years.

As well as our ongoing work on the current lease, a major future action will be the consideration of a future licencing round for additional offshore wind capacity. Offshore wind is expected to be the dominant power source for the UK in the coming years and there is still considerable anticipated demand that is unmet, despite the rapid increase in capacity. Moreover, a more geographically diverse set of offshore assets, for example in the Irish Sea, away from the current east coast bias, has been shown to have significant power system benefits.[8]

The Island economy could, potentially, benefit very significantly from additional future offshore wind projects through substantial royalty payments. The Crown Estate sees an income of around £900 million annually from just one leasing round. This is a scale beyond which would be received here and there is no guarantee at this stage that it would be realised. Nevertheless, there is the potential for very significant financial benefits.

Reflecting the growth of the net zero economy discussed above, there is now a greater range of potential routes to market, that make the prospect of a successful future licencing round look more realistic. The following figure[9] demonstrates the recent emergence of corporate power purchase agreements for renewable capacity:



It is clear that alternative mechanisms have become more common.[10] Given that projects in Manx territorial waters are currently not eligible for UK subsidies, this change in market dynamic is very welcome. That being said, subsidy does remain the dominant route to market and we cannot assume that this challenge has yet been definitively solved for us. Moreover, there are emerging difficulties for the offshore wind sector that reflect inflationary pressures, and UK policy challenges.[11] A particular complication is the increasing delays being observed in terms of grid connections. We will therefore proceed cautiously, accounting for ongoing developments in this landscape and acknowledging that there is uncertainty as to the viability of future Manx licencing

8 https://regensw.wpenginepowered.com/wp-content/uploads/Regen-Go-West-Oct-2022.pdf
9 https://about.bnef.com/blog/corporate-clean-energy-buying-tops-30gw-mark-in-record-year/
10 https://auroraer.com/insight/the-role-of-ppas-in-the-gb-power-market/
11 https://www.energy-uk.org.uk/index.php/publication.html?task=file.download&id=8423

We also recognise that there are other vital uses of our seas, that have significant value in terms of the Island economy, society and biodiversity. This includes the importance of the Isle of Man Fisheries Statement[12], recognising that our lifeline links through the Steam Packet are crucial and acknowledging the intrinsic value of nature and a healthy, biodiverse ocean. Any future licencing round will account for these issues and involve full consultation with all relevant stakeholders.

One approach we may take could be to mirror the methodology[13] recently applied by the Crown Estate in establishing the locations of the sites that form Leasing Round 4. This consisted of the establishment of a database of a wide range of metrics that were integrated together to refine the spatial areas available. The resulting selection reflects a balance of the benefits and trade-offs that are inherent when undertaking any form of marine spatial planning. Our intention is to formally commence a marine spatial planning process for the benefit of policy development in all aspects of our territorial seas.

5. In the near term, Government procured renewables projects will be in public ownership, to deliver the lowest cost to the consumer

Private sector expertise will play a key role in delivery of our energy strategy, with design and installation opportunities available in the near term for the development of both wind and solar capacity. Our intention is to use the expertise and experience of the private sector to deliver, efficiently, future new low carbon generation on Island. However, our preferred procurement model is one in which ownership of these assets ultimately lies with the public sector.

The rationale for this follows recent analysis on behalf of Isle of Man Government, by both specialist procurement and technical consultants, which demonstrates that the lowest cost to the consumer lies with this model. By contrast, signing long term power purchase agreements (for example) with the private sector will typically involve an additional premium that must ultimately be passed on to bill payers. Additionally, public ownership is also arguably more consistent with the independence principle above.

This model will hold for the near term, unless private sector organisations are able to demonstrate that they are able to develop projects more cost effectively than the public sector. We we will remain open to conversations with any private developer who wishes to propose projects with alternative finance models. They will be considered on their merits in terms of value for money, integration into the grid and compliance with financial regulations.
Moreover, we will keep a proposed public ownership model under continual review. Given a finite amount of capital within the economy, this approach may compete with other Government spending priorities, compared to one in which we sign contracts with the private sector. We will therefore continue to assess financing arrangements to ensure the most efficient approach to procurement and determine whether the near term commitment described here remains the most appropriate as we move towards medium and long term investment decisions.

As described above, we intend to conduct a broader analysis of the most beneficial approach to net zero investment when considering the economy in the round and this will support our ability to make evidence based judgements in this respect. Additionally, and more generally, we will build on such work to develop a comprehensive financing strategy that we will use as a framework to develop policies that will allow us to sustainably fund the net zero transition.

12 https://regensw.wpenginepowered.com/wp-content/uploads/Regen-Go-West-Oct-2022.pdf
13 https://about.bnef.com/blog/corporate-clean-energy-buying-tops-30gw-mark-in-record-year/

6. We will enable consumers to take advantage of the net zero transition

The household transition to net zero comes with potentially significant benefits in terms of warmer, more comfortable homes that use less energy and take advantage of lower energy costs. The policy challenge is to deliver these improvements for all, while also making the costs associated with change as affordable as possible. Given the need to prioritise a just transition and make the benefits available to all in society, it seems likely that Government will have a significant role to play in terms of funding and creating enabling policies.

These challenges and benefits also extend into the relationship between homes and our power grid. This may be seen, for example, with the potential to support more efficient decarbonisation through flexibility services, whilst on the other hand bringing about issues in terms of intermittent renewable management, as well as the potential need for grid upgrades in certain areas.
Reflecting these complexities and the potentially major burden that will lie with Government, we have assigned this policy principle to the developing category. We will use the time prior to the 2024 to develop the heat decarbonisation strategy, as well as conduct an assessment of policy levers to support, fairly, the household transition to net zero, including an evaluation of the consequences for public finances.

There are also a number of other actions that we will commit to. Firstly, we will scope out a replacement for the Green Living Grant Scheme to be launched in 2024, reviewing which technologies will be best suited for support, in line with our overarching policy principle. This will include a consideration of any network consequences, particularly for solar PV.[14] Making progress on the GLGS replacement is an important recognition that we need to continue to drive forward progress on household decarbonisation and that this can continue even though not all aspects within this overall policy space have been determined.

Secondly, we begin work to address flexibility and demand side response more generally. There are a range of benefits from this vision of the future, both for the consumer and also the supplier. For example:

- Smart tariffs in heat and transport can form a range of options that help smooth out demand profiles during the day, reducing the scope (and hence cost) of future capacity additions.
- Smart metering and a smarter energy system can better match supply and demand, supporting efforts to integrate renewables onto the grid.[15]
- Particularly in well insulated homes, consumers can pre-heat ahead of peak, again taking advantage of lower costs at such times
- Electric vehicle batteries could potentially act as a source[16] of storage that helps to support grid management.

We will work with and support Manx Utilities as it progresses with its Demand Evolution project, to understand the potential for these types of demand side response measures.

Thirdly, we will review permitted development to see if it remains fit for purpose in relation to the net zero homes of the future. We will also work to adopt the UK Future Homes Standard, which will future proof our housing stock for the decarbonisation transition.

Finally, we wish to acknowledge that this is a complex area in terms of just transition. We recognise that currently many of these technologies are out of reach for many households and we do not wish to simply encourage a regime in which the already better off are the only ones that are able to benefit from these technologies and policies. A key priority as we work on this area will be to design policies that have fairness and equity embedded within them.

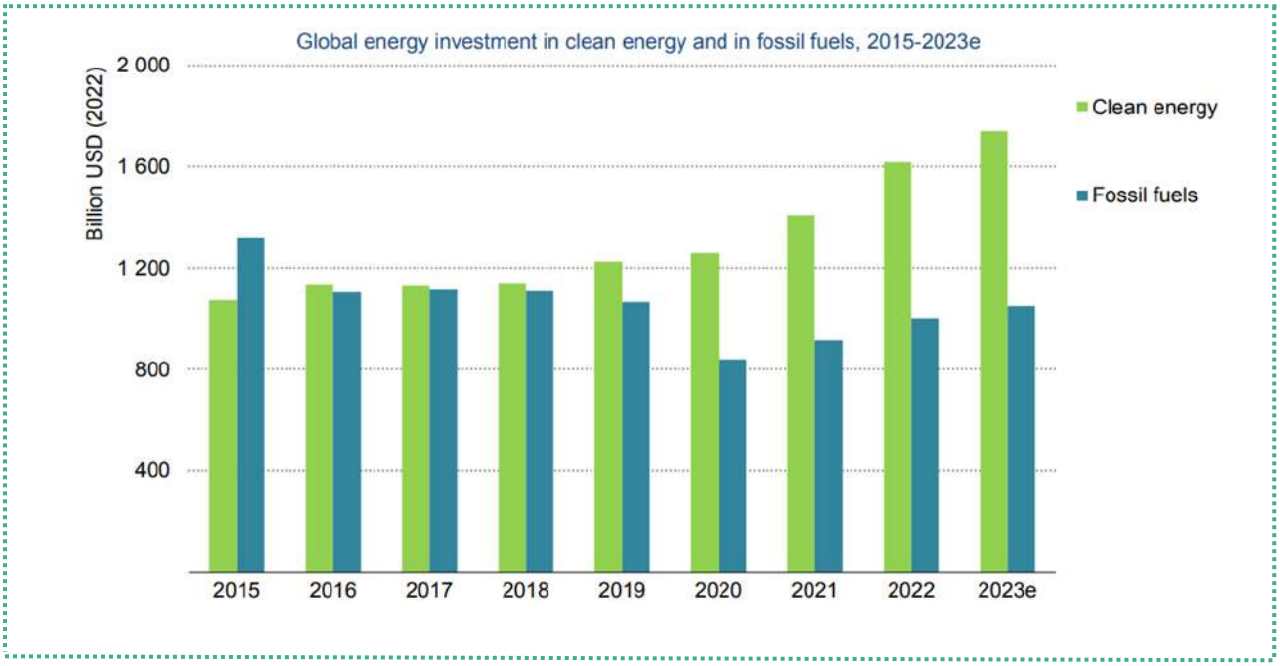
14 Manx Utilities are currently undertaking internal analysis in support of this
15 https://www.manxutilities.im/smarter-living/about-smart-meters/
16 https://www.nature.com/articles/s41467-022-35393-0

Appendix B - Contextual information

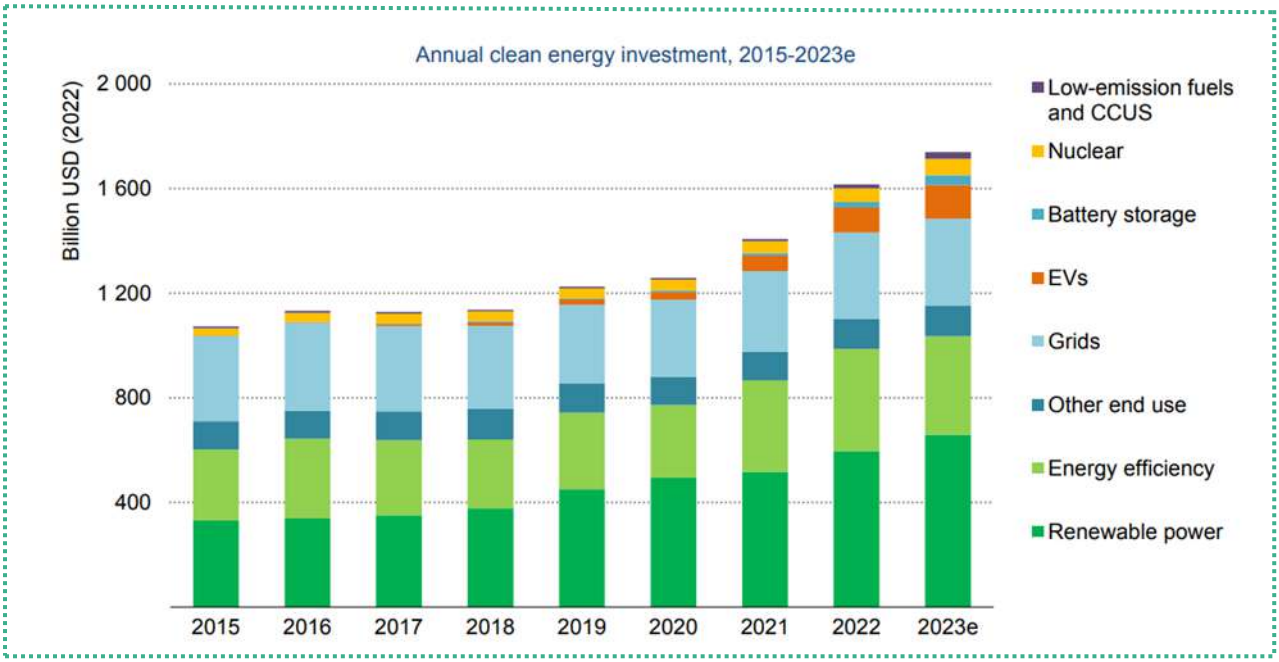
This section provides information on a number of issues that may help to contextualise the discussion above.

The growth of the net zero economy

The signing of the Paris Agreement and the subsequent raft of net zero targets,[17] has led to the beginnings of a realignment of the global economy in favour of net zero. In practice, this has led to a shift towards renewable deployment and investment in the clean economy in recent years. This has been further boosted by the response to the global energy crisis. Investment into low carbon technologies now clearly outstrips that of fossil fuels,[18] albeit not yet at a rate that would meet the necessary decarbonisation trajectories to achieve the 1.5°C target.



This trend is led by renewables, in particular solar:[19]

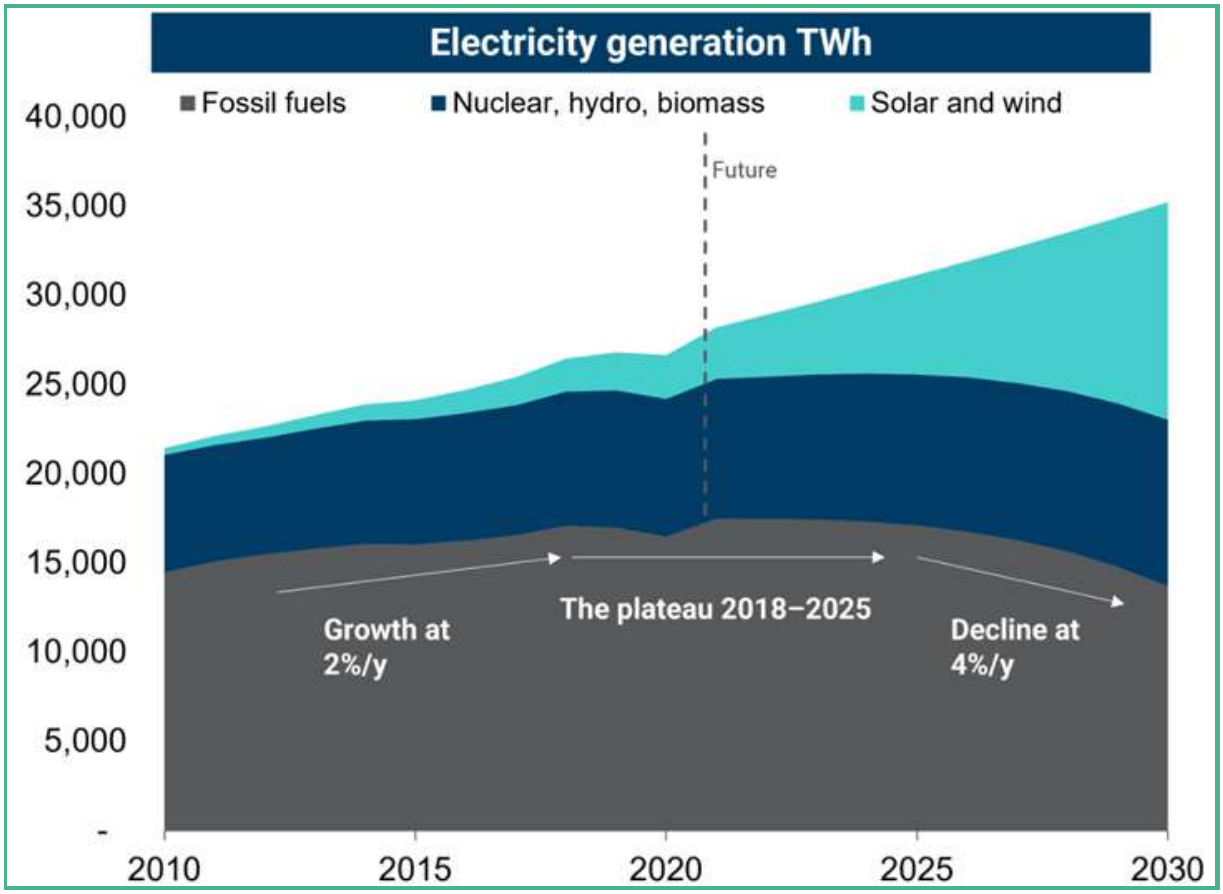


17 As of November 2022, around 140 countries have announced or are considering net zero targets, covering close to 90% of global emissions https://climateactiontracker.org/global/cat-net-zero-target-evaluations/. A large number of companies have also set net zero targets https://sciencebasedtargets.org/companies-taking-action.

18 https://www.iea.org/reports/world-energy-investment-2023/overview-and-key-findings

19 https://www.iea.org/reports/world-energy-investment-2023/overview-and-key-findings

The result of these developments may be that global fossil fuel consumption for electricity has peaked:[20]



It also becoming increasingly apparent that the pursuit of net zero can deliver considerable economic benefits. It has recently been estimated[21] that the net zero economy is worth £70 billion to the UK, supporting over 20,000 businesses. The UK Government Net Zero Review[22] describes net zero as "the growth opportunity of the 21st Century."

The growing importance of ESG

Related to the reshaping of economies around net zero, the growth of corporate ESG (Environmental, Social and Governance) targets has become increasingly significant. More than half of FTSE 100 companies now have a board level ESG committee for example.[2]

Major businesses on Island, that do much to drive the Manx economy, now have ambitious ESG goals. Companies that may wish to invest here also have similar targets. Such targets exist, firstly because these organisations wish to make an increasingly positive impact on environment and society, and secondly because they recognise that it is an increasing imperative to winning and retaining business.

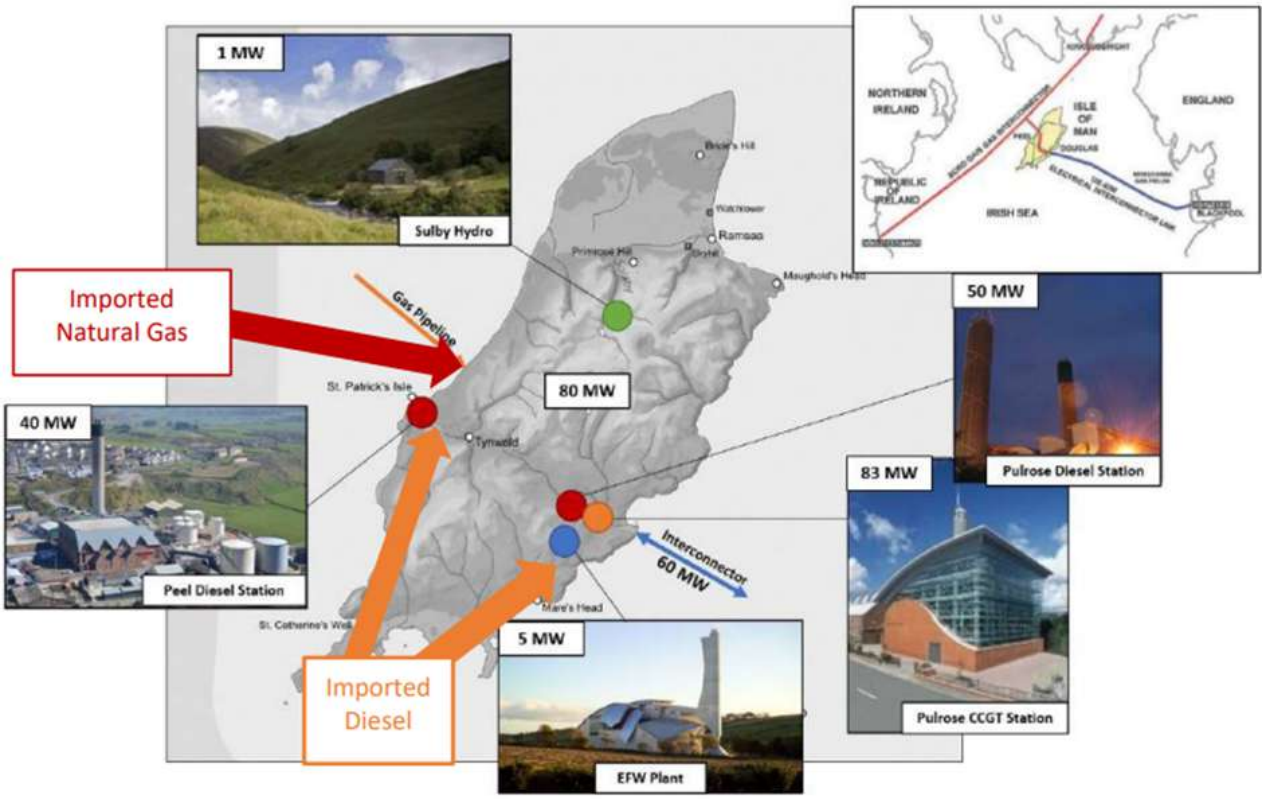
The rise of ESG means that securing low carbon power for Island businesses is now essential. Moreover, there is an intangible element that matters too, delivering the broad reputational benefits that will accrue from the Isle of Man being seen to be playing a role in contributing to global efforts to limit the worst impacts of climate change. All of our close neighbours in Europe have ambitious plans for decarbonisation and are delivering on them, we must not be left behind.

---

21 https://rmi.org/insight/peak-fossil-fuel-demand-for-electricity/
22 https://www.iea.org/reports/world-energy-investment-2023/overview-and-key-findings
23 https://www.iea.org/reports/world-energy-investment-2023/overview-and-key-findings
24 https://rmi.org/insight/peak-fossil-fuel-demand-for-electricity/

The Island's power system

The Isle of Man currently has an import dependent, fossil fuel dominated power system, as summarised in the following figure:



This system is highly resilient, with multiple layers of back-up should there be technical failures in one part of it. The Isle of Man has an enviable record for its security of electricity supply. Any future power system we design must have an adequate level of resilience.

Currently, the only form of wholly low carbon electricity on Island is the Sulby Hydro scheme. This provides a small amount of renewable power, at very low cost. Some fraction of the waste consumed in the Energy from Waste Plant can also be considered renewable, and an increasing proportion of the power we import through the UK interconnector is low carbon, as their grid continues to decarbonise. Overall, however, fossil fuels dominate power production on Island.

Trading relations with the GB grid

An important constraint on the nature of any future power system on the Isle of Man is provided by the nature of our trading relationship through the existing (and any future additional) interconnector. The interconnector allows us to both import power and export power, which provides a valuable revenue stream. However, this relationship comes with obligations that Manx Utilities (or anyone in the future who, hypothetically, wished to use the interconnector to trade) must adhere to.

The Isle of Man is treated by the GB grid as a single onshore generator and we trade over half hour periods. In order for us to sell power through the interconnector, we are required to nominate trading volumes in advance. Failure to meet these nominated volumes would result in penalties being imposed. This naturally lends itself more to generation technologies that have a predictable output. Additionally, we are only able to export on an economic basis, i.e. we must have a power price at that moment that is sufficiently competitive with the GB market to enable us to trade.

In the future, the nature of our trading relationship may change, as a consequence of shifts in generation technologies both here and in GB, as well as potential future market and legislative developments.[25] This may have implications for both the price we pay for electricity coming through the interconnector and any power we wish to sell.

25 The UK Government is currently consulting on potentially major electricity market reform, which may have consequences for the interaction between generation on Island and export to the GB grid https://www.gov.uk/government/consultations/review-of-electricity-market-arrangements

For example, renewables, in particular offshore wind, are expected to provide the backbone of the future electricity system in GB.[26] This will bring multiple benefits but also a growing challenge in terms of grid management and the need for "firm" sources of power generation to be available on demand when renewables are not operating.[27] An Isle of Man power system that is dominated by renewables, and absent firm power, might find selling power to GB more challenging. Conversely, if we have firm power available, we may find it easier to continue to generate a revenue stream, and potentially a particularly profitable one given the value that GB would place on such a reliable source of power.

Demand as an energy system constraint

A key influence on future generation on Island is the level of demand, now and in the future. Demand currently varies from a minimum of 23MW in summer, to a maximum of 75MW in winter. Isle of Man Government have commissioned three pieces of work that provide demand forecasts up to 2050. These vary according to a range of assumptions, in particular regarding the level of consumer behaviour change, and making an accurate forecast is extremely challenging.[28]

It is the duty of a grid operator, in our case Manx Utilities, to accurately match supply with demand. This must be achieved on a continual, second by second, basis and any discrepancy between supply and demand represents a major threat to grid stability. The level of demand therefore acts as a constraint on the supply side.

For the purpose of resilience, we may wish to have additional generation capacity beyond the level that is strictly speaking necessary, to act as back up (for example, the CCGT at Pulrose can meet peak demand, but it is prudent to also have the diesel fleet at Peel also available were it needed). However, in practical terms, there is ultimately a finite amount of capacity required to meet Island consumption.
From the perspective of renewables, there is vastly more renewable potential than there is direct need for its production. This means that there will be times when renewable production may have to be curtailed to prevent challenges to the grid. Curtailment can come at a cost, for example through (depending on the procurement model adopted) making a payment to any private sector company that owns the renewable asset.[29]

There are potentially solutions to the challenges posed by demand and the necessity for curtailment. Firstly, we could invest into storage technologies such as batteries. Any excess power generated would be sent into storage, preventing curtailment and then being consumed at a later point when renewables are not operating, thus making useful use of that energy. Batteries may also potentially have some additional benefits in terms of providing grid management services.[30]

However, the provision of any form of storage will result in additional costs that need to be accounted for. It should also be noted that while impressive cost reductions in battery technology have been observed, it is not entirely clear what the future trend is in this respect, for example given the recent rise in lithium prices.[31] Other forms of energy storage will hopefully see reductions in price as they begin to be deployed at scale.

Secondly, excess power could be traded through the interconnector to the UK. As discussed above, there are a number of challenges to achieving this, although if they could be overcome then there would be a potentially valuable revenue stream available. Any commercial operator wishing to do so would have to be prepared to accept these risks.

Network issues and renewable capacity

Recent work conducted on behalf of Manx Utilities has investigated the physical system limits that exist on the Island's grid. For example, the network must operate between precisely

26 https://www.gov.uk/government/publications/british-energy-security-strategy/british-energy-security-strategy
27 These might include hydrogen, storage and hydropower
28 A summary of these studies can be found here https://www.manxutilities.im/media/2538/wsp-report-summary-feb-23.pdf
29 The UK has spent £1.6 billion on curtailment, a value that will rise in future. https://wind-curtailment-app-ahq7fucdyq-lz.a.run.app/
30 https://www.ge.com/news/press-releases/hybrid-solutions-ge-completes-first-battery-assisted-black-start-ge-heavy-duty-gas
31 https://www.iea.org/reports/world-energy-investment-2022/overview-and-key-findings

defined voltage and frequency limits. In theory, the intermittent nature of renewables can pose a challenge to this, for example through sudden frequency changes. Such changes can be buffered by a grid management service known as inertia, provided by rotating generators. In our case, inertia is provided on Island by the CCGT plant at Pulrose, but also via our connection into the UK grid through the interconnector.
The network stability analysis has provided two important insights. Firstly, that in general, the grid has the ability to accommodate renewable projects with a capacity of 20MW (absent some accompanying storage technology), although multiple such installations are possible. Secondly, the "strongest" part of the network is located closer to Douglas. The further away from Douglas, the more restricted the ability to accommodate renewables. There are particular challenges in the north of the Island which would require costly network upgrades to overcome

System Costs

The dramatic levelised cost falls observed for wind and solar have radically transformed our understanding of the transition to net zero. It has made it easier and cheaper to achieve than could possibly have been conceived of even as recently as a decade ago. It has also altered views of the technological pathway by which this might be delivered, to one heavily weighted towards electrification.

Despite this remarkable progress, a full consideration of the costs of renewables (and any other technology) must consider the system as a whole, rather than just purely the levelised cost. In the case of renewables, because they are intermittent, there must be generation assets in place when they are not operational. Currently this is typically gas, whereas in a decarbonised system it could be gas with carbon capture and storage, batteries, hydropower, hydrogen or other forms of longer duration storage.

All of these possible solutions have a cost that must be accounted for. Estimating whole system costs is challenging. In a UK context, some evidence suggests that renewables end up approximately on a par with gas (prior to current prices),[32] whereas other studies indicate that they are relatively modest.[33] Our own Future Energy Scenarios indicate that the whole system costs of more renewable dominated scenarios are more expensive, although they come with fuel savings compared to the reliance on fossil fuels.[34]

Whatever technology is chosen to complement renewables, must meet the requirements of grid management discussed earlier. Furthermore, they must deal with the physical realities of intermittent renewable supply. There are times[35] in winter where renewable production can be extremely low for days at a time. Any storage-dominated approach has to be able to account for this, and could potentially be very challenging.[36]

Finally, when considering system costs, we need to always be mindful of the counterfactual to our plans for a net zero power system. In our case there is no option to "do nothing" since a) we must decarbonise and b) generation assets would need to be upgraded or replaced, even were we to stay with fossil fuels. There is therefore no "business as usual" zero cost option available. Additionally, system costs do not equate to economic impacts as a whole and so we must be prepared to analyse the economic consequences of any decisions in the round.

Sustainability concerns and bioenergy

Bioenergy can be a controversial subject. While we may have theoretical potentials as to what could be grown, we also recognise the considerable economic, social and cultural importance of

32 https://www.gov.uk/government/publications/beis-electricity-generation-costs-2020
33 https://ukerc.ac.uk/project/the-intermittency-report/
34 Forecasting gas prices is extremely challenging, although there is a general expectation that they will remain elevated for the coming years
35 A multi day-week period without much wind or sun is known as a Dunkelflaute, literally "dark doldrums" in German. This is an area that National Grid are increasingly planning on modelling https://www.nationalgrideso.com/document/263951/download.
36 https://iopscience.iop.org/article/10.1088/1748-9326/ac4dc8/meta

food production. Similarly, while the biodiversity impacts of some energy crop types can in fact be positive, steps would be need to be taken to realise this.[37]

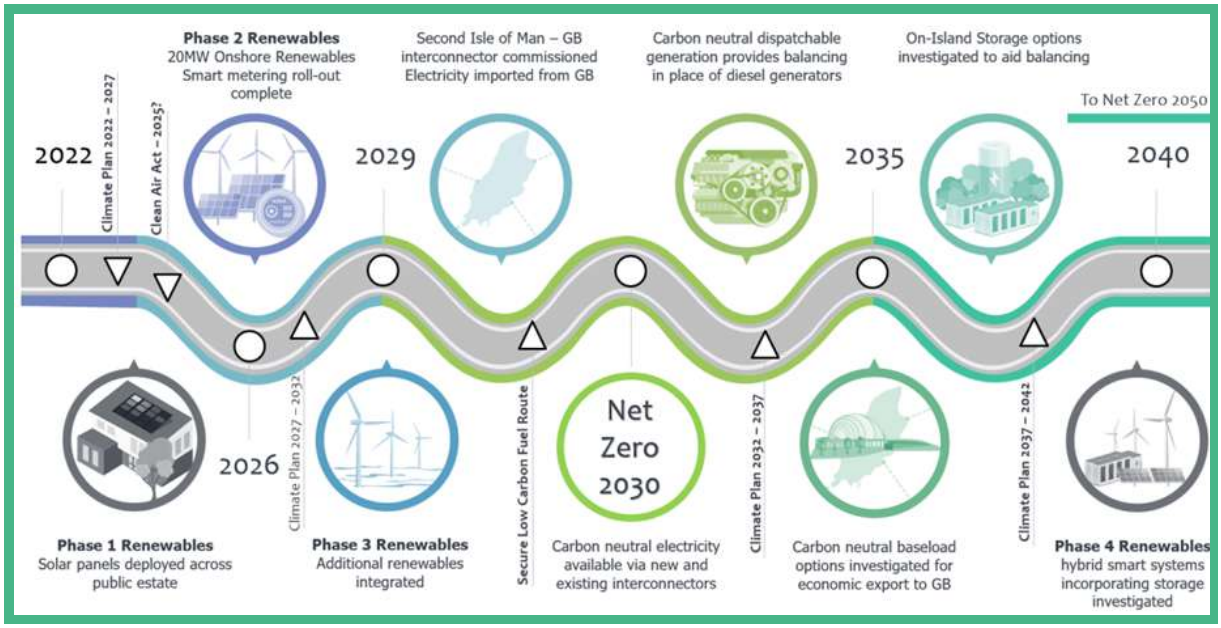
A further important issue is the carbon sustainability of bioenergy. Contrary to common perception, we can have a strong degree of confidence that some forms of bioenergy are indeed low carbon. Robust lifecycle assessments for a number of energy crop types, for example, demonstrate this quite clearly. Indeed, evidence exists to suggest that under some circumstances, energy crops can deliver net negative emissions, even without carbon capture and storage.[38]

Forest bioenergy is, however, more challenging, relying on the importance of counterfactual use of the forest and complex debates regarding carbon debt. Before proceeding any further with this as an option, we would commission further bespoke analysis regarding the potential for sustainably managed forestry that delivers genuine emissions savings. More broadly, we would adopt rigorous sustainability standards to ensure that feedstocks consumed (both on island and any imported) could be viewed as genuinely low carbon.

It is also worth recognising that no form of energy generation comes without a range of associated benefits and trade-offs. We will seek to minimise the negative consequences of our future energy development, by considering a broad set of sustainability considerations. Wind farms, for example, can come into conflict with biodiversity and potentially even carbon, if located on deep peat.

Manx Ultities roadmap

Building on the analysis undertaken in recent years on behalf of the Government and culminating in an additional recent network stability study commissioned by Manx Utilities, MU have produced a suggested roadmap for decarbonisation. This is the Manx Utilities vision of how to successfully balance many of the issues discussed in this document, independence, greater renewables and cost, whilst also robustly maintaining existing levels of resilience and security of supply.
Further details can be found in the accompanying report,[39] with a graphical summary presented here:



37 https://onlinelibrary.wiley.com/doi/10.1111/j.1757-1707.2010.01058.x
38 For a summary of lifecycle assessment issues, see the UK Government report Sustainable Bioenergy Feedstocks Feasibility Study Task 1
39 https://www.manxutilities.im/energy-transition/about/transition-programme/

Isle of Man
Government

Reiltys Ellan Vannin