

Scotland's Energy Future

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Introduction

Scotland has a bountiful supply of natural resources of minerals, hydrocarbons, marine, agriculture and clean water which have been the cornerstone of our economy. Visionary thinking within Scotland has yielded great progress in renewable energy generation. Regrettably, Scotland's story has been one of watching these resources being exploited in a manner which leaves no significant legacy.

Energy policy remains reserved to Westminster under the Scotland Act (1998), and it is clear it is an asset that is also vitally important to the UK Government, and one it is keen not to let slip from its grasp.

There are increasing calls for the complete overhaul of the energy market, highlighting the opportunity for Scotland to have the cheapest energy in Europe should a zonal market be adopted. Scotland has not been served well by a regulatory regime established by Westminster.

The failure to tackle energy pricing has been most painfully felt by consumers in Scotland who face colder winters, a problem exacerbated by the higher standing charges. It is an outrage that energy-rich Scotland has some of the most expensive energy in Europe.

A regulatory regime focused on Scotland's priorities has the potential to reduce energy prices and positively impact fuel poverty in Scotland. It may also enable Scotland to attract and retain energy consuming industries which wish to benefit from Scotland's 'green energy' resources, or who seek to become active players in the green energy technology 'supply chain'.

This could be done with zero impact to the security of supply. A credible first step would be to enact a Scottish Energy Act which will put in place an independent Scottish Regulator for energy and the energy infrastructure.

Energy Scotland: An Advisory Group

Energy Scotland is a group of professionals with a range of experience within the energy field – including generation, supply and regulatory affairs. The group includes entrepreneurs bringing renewable technology innovation to the market from within Scotland.

Energy Scotland has a vision for Scotland’s future energy mix and is passionate about the opportunity this presents to allow Scotland to be the world leader in the transition from a Hydrocarbon based society to a truly decarbonised, prosperous economy - a vision for Scotland which is desirable, imaginable and credible for all.

The group’s objective is to progress Scotland’s response to what we refer to as the Energy Quadrilemma – which, stated in basic terms, is how to meet the challenges of delivering a secure, decarbonised energy supply for Scotland which supports the ‘just transition’ and which reduces the cost of energy to the people and industry of Scotland.

An Industrial Strategy To Meet the Energy Challenge

Energy Scotland seeks to support the development of a pragmatic, credible industrial strategy which addresses all aspects of the Energy Challenge in the short to medium term.

In his recent article ‘Scotland’s energy story is a tragedy’, Simon Forrest – CEO of Nova Innovation – highlighted the need for an industrial strategy which provides a legacy for future generations from this latest phase of energy extraction from Scotland.

Enabling the people of Scotland to take control of this valuable asset to provide clean, affordable and reliable heat and electricity for our homes and businesses is the primary goal. However, becoming key players in the innovation of ‘supply chain’ technologies is a massive economic opportunity which we must also embrace nationally.

The UK Regulator – Ofgem / Energy Market Reform

Scotland is an energy rich country with massive potential for 'green' energy which should yield benefit to the people of Scotland and provide an advantage to attract new business.

The cost of energy indicates that the energy market is 'inefficient'. The market, which was designed during the 'dash for gas' of the 1990s, sees the wholesale electricity price being set by the marginal generating unit, which is generally a gas-fired turbine.

Disappointingly, Ofgem, the UK Energy Market Regulator, has not sufficiently progressed energy market reform. The 2023 spike in energy prices (linked to the Ukraine conflict) yielded a huge increase in the bills faced by all UK consumers. Ofgem implemented an energy price cap. However, given the simultaneous rise in profits of the large vertically-integrated energy companies, Ofgem stands accused of not doing enough to tackle such practices as the 'rocket and feather' pricing of energy (prices go up like a rocket and fall like a feather).

The failure to tackle energy pricing has been most painfully felt by consumers in Scotland who face colder winters. This problem is exacerbated by the higher standing charges faced by many Scottish consumers. It is difficult to accept why energy rich Scotland should have some of the most expensive energy in Europe.

There are increasingly wide calls for the complete overhaul of the energy market. Many countries have adopted a zonal pricing model, which allows consumers in areas of high generation capacity to pay less for their energy. Whether or not zonal market pricing is the appropriate solution for Scotland remains a matter of discussion.

Has Scotland been served well by a regulatory regime answerable to Westminster ? Having in place a regulator focused on Scotland's priorities has the potential for tackling fuel poverty in Scotland and supporting an industrial strategy which takes advantage of our capacity for 'green energy'.

A credible first step would be to enact a Scottish Energy Act which would put in place an independent Scottish Regulator for energy and the energy infrastructure; realistically, this will not happen without significant constitutional reform.

Scotland's Energy Challenges

An overview of the political backdrop is included as Attachment 1. Energy Scotland will continue to assess the key political and regulatory developments as they relate to Scotland's Energy challenge, which include:

- the emergence of GB Energy
- the formation of the National Electrical System Operator (NESO)
- the creation of the National Infrastructure and Service Transformation Authority (NISTA)
- the Scottish Government's 'Just Transition' strategy, including its Hydrogen Action Plan and Hydrogen Export Plan
- the on-going activities of Great British Nuclear

This 'political backdrop' highlights the following challenges:

- Obtaining clarity on GB Energy's role, including how GB Energy will prioritise investment to ensure the continued investment in Scottish renewable generation (including Scottish community energy projects).
- Progressing the Scottish Government's 'Just Transition' strategy to support the Oil & Gas and Petrochemical sectors' move to hydrogen and Carbon Capture, Usage and Storage (CCUS). This involves helping to overcome the 'chicken and egg' challenge to establish a hydrogen market.
- Interacting with NESO and NISTAs to ensure that investment in grid interconnectors, grid enhancement and other infrastructure projects is aligned to the development of Scotland's energy strategy.
- Managing intermittency and grid stability. The anticipated influx of renewables necessitates the development of robust energy storage solutions which can address the challenges of intermittency, maintaining grid stability and balancing supply and demand mismatches.

- Overcoming Ofgem's lack of regulatory action to address the cost of energy, including the reluctance to engage in Energy Market reform.
- Resisting attempts by the UK Government to impose expensive, under-developed new nuclear stations on Scotland. The Scottish Government must maintain its moratorium on new nuclear plants.
- Encouraging the Scottish Government to support community energy projects in the form of technical and planning resources, and to put Community Energy at the heart of their Industrial strategy.
- Encouraging the Scottish Government to raise public awareness of the role and benefits of microgeneration, and to consider a fit-for-purpose financial incentive mechanism for the increased roll out of microgeneration technologies.
- Recognising the economic significance of emerging energy technology, supporting the Scottish Government's efforts to encourage, fund and promote innovation.

The Vision for Scotland's Energy Future

Scotland will be among the first countries to have a fully decarbonised economy and a sustainable, secure energy supply – with a mix of generation and storage solutions based on the location of consumption.

The bountiful supply of clean, affordable and reliable energy will enable the development of a plethora of energy-intensive Scottish industries from 'green' industrial manufacturing and assembly, to agriculture, water production, and food and drinks production.

Other key aspects include:

- The continued growth in renewable generation – including off-shore wind, on-shore wind, large scale solar, domestic solar, tidal.
 - The growth of community energy hubs which provide local communities with the benefit of cheaper energy or access to energy markets where gains can be shared within the communities.
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- The continued development of a stable electrical transmission and distribution grid to support the growth in renewable energy and community energy hubs.
 - The establishment of a strategic hydrogen production, storage and export market supporting the 'just transition' from oil and gas.
 - The establishment of an energy market regulatory and pricing regime focussed on supporting economic growth and fuel affordability.
 - The continued moratorium on new nuclear projects.
 - The large-scale implementation of Long Duration Energy Storage (LDES) capable of providing back-up to cover periods of intermittency.
 - The deployment of blended gas fired Combined Cycle Gas Turbines (CCGTs) and peakers (fast response simple cycle gas turbines) to provide grid stability and reserve capacity.
 - The establishment of green hydrogen clusters located where grid enhancement is not feasible or desirable.
 - The growth of district heating solutions (hydrogen and heat pumps).
 - The growth of micro-grids and micro-generation (which will also smooth the loading on the National Grid).
 - The establishment of balanced economic tariffs on all energy flowing in and out of Scotland, to provide revenue to support long term funding of our energy infrastructure.
 - The continued use of balanced Carbon tax/levies to ensure that Scotland's green energy displaces carbon emitting sources in domestic heat pumps, fuel cells and in district heating.
 - The provision of cheaper electrical energy to Scotland's public services, NHS trusts, councils and other government bodies to promote the expansion of large-scale heat pumps - thus reducing the burden on the taxpayer.
 - The growth of energy technology solution providers and technology service providers attracted by world class innovation and service hubs.
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- The continued growth of Scotland's Project Financing, Project Management and Engineering Consultancy sector supporting infrastructure projects and innovation and service hubs.
- The on-going development of a thriving academic sector supporting innovation and service hubs and professional services.

Strategic Action

In the first days of an Independent Scotland, the Scottish Parliament could enact The Scottish Energy Act to replace Westminster's Energy Act (2023). This Scottish Energy Act would establish a new regulatory agency.

The creation of an Independent Energy and Network Regulator for Scotland might be perceived as a limited ambition for those who would seek to scrap the current market model. However, it is imperative that the people of Scotland can interrogate a plan that is desirable and realistic.

Replacing a market model which has been in operation for 35 years is not something that can be done overnight. **The key, however, is that there is no need to take ownership of the physical assets or the commercial management - we simply need to take on their governance.** All of the hardware necessary for delivering energy to homes and businesses - the cables, switchgear and turbines, etc - will remain in place. The commercial arrangements will remain in place. The energy trading systems will continue to operate. The energy will continue to flow. However, licensing obligations will focus on the needs of the people and businesses of Scotland.

Conclusion

Energy will remain at the heart of the debate around Scotland's constitutional future – it has the power to galvanise the thoughts and actions of those striving to shape the future of the country. The creation of a Scottish Energy Act which empowers an independent Scottish regulator would be a credible first step.

This new regulator could ensure that all 4 dimensions of the Energy Challenge (decarbonisation, affordability, security of supply and the promotion of 'green economy') are given due consideration.

This regulator would oversee the licensing regime which all market participants currently operate within, to ensure the resources of Scotland serve the people of Scotland – and, in so doing, energise the Independence campaign and indeed the people of Scotland.

The prize is a Scotland with a secure, decarbonised and inexpensive energy system serving a country where fuel poverty no longer exists and where energy intensive industry thrives and powers the economy !

Attachment 1 - Notes

1 - The Political Backdrop - GB Energy

The Labour Government was elected with the policy of establishing GB Energy as one of the most prominent planks of its 2024 election platform. What this entailed was neither explained nor explored throughout the election campaign.

One significant claim was that GB Energy (GBE) would be an investment vehicle that would facilitate a £300 per annum reduction in average energy bills. How this would be achieved remained a mystery throughout the 6-week election period, and it now appears that this promise was merely gesture politics.

The Labour Government's plans for GB Energy includes a commitment to deliver the desired decarbonisation of the economy – but, prior to the election, they cropped back GB Energy's budget from £28 Billion down to £8.3 Billion to match the previous Government's fiscal program (notwithstanding emergent 'black holes').

The UK Government has now published the enabling legislation (The GB Energy Bill) and is seeking to enact this legislation, which intimates that GB Energy will be an investment vehicle for developing, owning and operating clean power projects. There has been considerable debate in both houses of the UK Parliament on the objectives of GB Energy.

The Government has committed to supporting Community Energy projects, but has steadfastly refused to include any targets for this in the legislation. Similarly, it has refused to include any specific objectives for the reduction in energy pricing.

A target has been set for GBE to be directly responsible for generating 8 GW of renewable power by 2030 by working with developers to take minority stakes in projects including offshore wind, hydrogen power, carbon capture and storage (CCUS), and nuclear power developments.

The Government has appointed Juergen Maier, former head of Siemens UK, as the CEO of GB Energy, and has now opened an office in Aberdeen. Energy Scotland will be following with great interest to see how many new jobs this brings to the city. To the extent that the CEO, Juergen Maier, will be based in Manchester, there is a valid concern

that the Aberdeen office will not be the decision-making hub which Labour promised in their pre-election pitch.

With this on-going lack of clarity of purpose, the UK Government is now facing claims from political opponents that GB Energy will be an expensive quango operating at the whim of the Secretary of State for Energy Security and Net Zero.

The key issue for Scotland is understanding how GB Energy will prioritise investment – to ensure Scotland’s energy objectives are not pushed aside to accommodate the priorities in the rest of the UK.

2 - The UK Energy Act (2023), the National Energy System Operator and the National Infrastructure Commission

The UK’s 2023 Energy Act established the National Energy System Operator (NESO) as an independent system planner and operator to help accelerate the UK’s decarbonisation program.

NESO is built on the previous experience of the National Grid as the Electricity System Operator (ESO), which was responsible for balancing electricity and gas supply and demand. The recognition that the future energy mix might also include hydrogen and CO₂ transmission and storage has been reflected in the remit of NESO.

NESO is a nationalised company, having bought out National Grid in September 2024, and will work closely with Great British Energy to accelerate the deployment of renewable energy in the United Kingdom.

In November 2024, NESO published its report to achieve ‘clean power’ by 2030. The definition of clean power allows for 95% of power to be from ‘clean’ sources – which includes renewables, hydrogen, and nuclear. This recognises that 5% can be delivered from unabated (gas burning) Combined Cycle Gas Turbines (CCGTs). This is an important recognition that CCGTs will be required to maintain grid stability and capacity to deal with the intermittency of renewables. This also appears to recognise that new nuclear plant will not be fully operational by 2030.

The National Infrastructure Commission (NIC) – an executive body operating under the aegis of the UK Treasury - published its second National Infrastructure Assessment in

October 2023. This included a series of recommendations aimed at the delivery of the 2030 decarbonisation targets, which have now been embraced by NESO.

The UK Government has now established the National Infrastructure and Service Transformation Authority (NISTA), which will absorb the work of the NIC. The Chairman of the NIC (Sir John Armitt) has been appointed as Chair of NISTA to oversee the establishment of this 'taskforce', which has the remit of developing and implementing a ten-year infrastructure strategy.

All infrastructure projects which will be built to support Scotland's future energy system will be required to be developed in conjunction with NESO and NISTA. The key issue for Scotland is understanding how NESO and NISTA will prioritise investment – to ensure Scotland's infrastructure needs are not relegated in order to accommodate the priorities in the rest of the UK.

3 - Scottish Government's 'Just Transition' Strategy

The Scottish Government published, in January 2023, a draft Energy Strategy and Just Transition Plan which sought to set out a vision 'for an energy system that delivers affordable, resilient and clean energy'. This was issued as part of a consultation process, but the final strategy has not been issued. However, there have been a number of developments.

The importance of the Scottish Government's 'Just Transition' strategy is something in which Energy Scotland takes great interest, particularly in light of the planned closure of Scotland's oil refinery at Grangemouth. The adverse impact on Scotland's economy will be significant.

Energy Scotland takes the view that the radical reduction in demand for Oil and Gas is an imperative. However, the decision to shut down refinery capacity should be demand driven, and the Scottish Government should have the objective of making Grangemouth viable and at the top of the stack in terms of refinery performance and viability.

The Scottish Cluster is a key part of the Scottish Government's Just Transition strategy. This includes the Acorn Project - Scotland's Carbon Capture and Storage initiative - which seeks to re-purpose the energy infrastructure at St Fergus to safely lock Carbon Captured

from industry in rock formations below the North Sea. The plan seeks to capture 10 million tonnes of CO₂ by 2030 (this being the equivalent of taking 2 million cars off of the road).

4 - Scottish Government Hydrogen Action Plan / Hydrogen Export Plan

A key element of the 'Just transition' strategy is the Scottish Governments Hydrogen Action Plan. This plan, linked to the UK Government's Hydrogen strategy, seeks to promote 'green' Hydrogen clusters in remote areas of Scotland where there is a potential surplus of renewable energy and where 'electrification' of the grid may not be viable or desirable.

In November 2024, the Scottish Government published a plan for exporting Hydrogen, 'A Trading Plan'. This outlines the Scottish Government's vision for Scotland becoming a net exporter of hydrogen and hydrogen derivatives such as ammonia, which is a more readily storable and transportable energy source. To the extent that hydrogen can be stored, this presents an opportunity for this to be developed in conjunction with renewables to offset the concerns on intermittency.

The Hydrogen Export Plan outlines how the government will support the development of an international market for Scotland's hydrogen sector, enabling businesses to capitalise on export opportunities. It is noteworthy that European countries have incorporated the use of hydrogen as a key element of their Net Zero goals.

Scotland aims to have 5GW of clean hydrogen generation by 2030 and at least 25GW by 2045, with the goal of becoming an enduring and reliable exporter of hydrogen to Europe. The Hydrogen Action Plan sets out steps to achieve this ambition.

The relationship of hydrogen, Carbon Capture and Storage and the renewable electricity generation capacity of Scotland is of great significance to the future of Scotland's economy, and Energy Scotland will actively track progress in this sphere.

5 - Great British Nuclear

Great British Nuclear is a nuclear energy company owned by the UK Government with the aim of achieving net-zero targets. The company was launched in 2023 under the previous government. The current UK government has continued to support the development of Sizewell C and other nuclear energy facilities.

Supporters of the nuclear program highlight the need to maintain energy security – but this appears to discount the fact that the UK currently has security of existing gas fired assets, which will continue to run – albeit at lower capacity levels - until they are displaced by renewables or abated CCGTs (as recommended in the National Infrastructure Assessment).

The Scottish Government continues to support a moratorium on the development of new nuclear facilities in Scotland, primarily on the grounds of environmental safety and the challenge of managing nuclear waste in the long term.

The 3.2 GW nuclear facility at Hinkley C, currently under construction, is forecast to come on-line in 2030, and it is unlikely to be capable of delivering reliable MWs until 2031 – over 8 years late. **The cost is currently expected to out-turn at over £45 Billion – over double the original budget.**

Had Hinkley C come on line in 2023, the consumer would be paying a contractual strike price of £128 per MWh under the Contracts for Difference arrangement. What that strike price will be when it finally generates reliable power (sometime in the 2030s) is difficult to predict.

Sizewell C is being developed utilising the Regulated Asset Based model (RAB). A repeat of the Hinkley C development and construction project performance on Sizewell C would be another 'black hole' that the new Chancellor would be well advised to consider. This cost will ultimately be passed to the consumer and flies in the face of the objective to reduce the cost of energy. There is also significant discussion to be had concerning how "clean" a nuclear installation of this size is and whether its operation is in line with current environmental targets.

One question which might have relevance to the 2026 Holyrood elections is - would a future Scottish Government, with the continuing prospect of having available an

abundance of renewables generation, opt to support taking on the cost of developing, constructing, operating and decommissioning nuclear plant that the Scottish electorate fundamentally do not want?

It is noteworthy that both the Conservatives and the Reform Party have taken firm positions in support of expanding the new nuclear program – and we can anticipate that any attempt to foist expensive nuclear energy on Scotland will be electorally significant.

Energy Scotland is generally technology agnostic, but questions the validity of the plans to achieve net zero on economic grounds, when there are plans to develop renewables capacity potentially less expensive, and certainly in a faster timescale than can be delivered by the nuclear program.

6 - Community Energy Projects.

A crucial part of Scotland's energy future will be the growth of community energy. Both the Scottish Government and the UK Government are very supportive of the concept of community energy – and campaigners have been calling for the UK Government to have this included as an 'object' in the GB Legislation currently making its way through Westminster. The UK Government is resisting inclusion of this as an 'object', but continues to intimate that GB Energy will support appropriate projects. Campaigners within Scotland are calling for the Scottish Government to provide resources to support the local groups (often staffed by volunteers) with officers to help project siting, planning, financing and implementation.

7 - Grid stability

Heavy duty Combined Cycle Gas Turbines (CCGTs) burning natural gas will also provide the necessary grid response and stability, as well as additional energy capacity, until they can be pushed out of operation through the growth of Long Duration Energy Storage (LDES) or the turbines are converted to burning Hydrogen as outlined in the National Infrastructure Assessment (October 2023).

8 - Hydrogen's 'Chicken and Egg' Challenge

The UK Government's hydrogen strategy highlighted the 'chicken and egg' challenge whereby potential consumers of hydrogen and developers of hydrogen technology are looking for confidence that there will be sufficient 'hydrogen budget'.

Similarly, potential hydrogen producers are awaiting confidence that there will be sufficient demand. The impetus for overcoming this challenge is coming from Europe, which has determined that hydrogen will be part of its energy future, and from the Scottish Government's development of an export plan linked to the 'just transition', which would kick start blue hydrogen generation and storage linked to a Carbon Capture and Storage infrastructure.

9 - Long Duration Energy Storage (LDES)

The range of LDES developments includes:

- Large scale batteries (lithium ion, sodium-ion), mechanical storage (compressed air, flywheels, gravity, liquid air)
- Chemical storage, including storable hydrogen derivatives
- Pumped-hydro solutions – including various projects in the area around Loch Ness.

These solutions are at various stages of development, and most are already being deployed using scalable technologies that can be implemented in a distributed manner to achieve the level of scaling up necessary to push the carbon-emitting gas turbines out of the running.

These storage solutions can be employed in areas of generation density, thus alleviating some of the pressure on the Electricity System Operators who are tasked with building the grid infrastructure to support the Net Zero targets.

10 - Microgeneration

Microgeneration (typically considered to be sub-50 kW_e) has the potential to make a significant contribution to all aspects of the Energy Quadrilemma. Historically considered to be less economically competitive (£/kWh) than large-scale electricity or heat production (which benefits from the economies of scale seen at grid level), microgeneration technologies often benefit from the economies associated with mass production (for example high-efficiency, low-cost solar photovoltaic panels).

Microgeneration products now cover almost all of the same technologies as grid-scale generation (wind, solar, hydro, heat pump, etc) and although individually small in terms of generation capacity, as they become more widespread, are becoming significant in aggregate terms to national energy consumption.

Energy Scotland recognises the potentially significant contribution of microgeneration on future energy and environmental targets, as well as the potential economic benefits from the growth of an industry based on the mass manufacture of microgeneration technologies, and will continue to actively track progress in this area.