Reforming Scotland

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September 2016
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The UK energy industry has historically had a significant amount of government ownership; electricity generation, transmission and sales were until relatively recently essentially state owned; the UK had its own nationalised oil and gas company until 1981; gas transmission and sales was one of the flagship privatisations of the Thatcher era. As the state has withdrawn from active ownership, it is generally acknowledged that there are areas where government should continue to have an active role, for example in tackling the impact of global climate change. However, when considering energy policy from a liberal economic standpoint, how does one determine the role that a government (whether at local, Scottish, Westminster, EU or global) can and should have and what should be left to the market and local concerns? Should, for example, the government get directly involved in energy prices through a price cap or by subsidising fuel to tackle so-called 'fuel poverty', or are there other solutions? The oil price drop over the last two years (from about $110/barrel in June 2014 to about $30/barrel in February 2016 and then rising to about $50/barrel in August 2016) shows the significant impact that world markets can have on the sector which is entirely beyond the control of individual governments. This paper aims to set out the key issues that should be addressed by an energy policy and the appropriate role of government.

It is clear to the overwhelming majority of scientists and the vast majority of the public that human caused global warming is taking place and that the response to the threat requires a global effort. The recent agreement in Paris, although it has flaws, appears to be a major step forward in countries agreeing to tackle the issue. However, does this necessarily require an interventionist government approach or are there areas where the market should decide? Likewise, issues of fuel poverty are clearly of great concern at present but again does this require government intervention (say through capping energy prices) or are their market solutions? At present, most policy appears to be driven by a very top down interventionist approach that makes big implicit assumptions about the future cost of energy that may not be valid.

From a Scottish perspective, the Holyrood Government has been active in laying out an energy policy. However, there are a number of contradictions in that policy. The Scottish Government has a commitment to zero emissions from electricity generation by 2020, yet an outright rejection of nuclear power and continued support for a coal power station at Longannet. The government shows unbridled support for the offshore oil and gas industry (but not onshore unconventionals), despite this being counter to its green credentials on electricity generation. They have displayed a fervent evangelism for the beauty

of the Scottish countryside, yet wholesale support for industrial scale windfarms which are having a dramatic effect on the landscape. They are an avowedly social democratic government which says it wants to reduce inequality but, through its commitment to zero emissions, adds a burden to all household fuel bills and provides significant income to wealthy landowners through subsidies. Can and how can these contradictions be addressed? And, as the UK Government is backtracking on a raft of green energy supportive policies, what role should the Scottish Government take?

Many papers that discuss 'energy' focus on electricity. However, total energy consumption also includes household heating and cooking, often by gas except in more rural areas, transportation and industrial usage. A review of energy has to take a holistic view particularly in relation to the impact of climate change.

This chapter aims to lay out the key issues associated with energy policy in Scotland, the main sources of energy and the policy choices that could be made from a liberal framework to address the key issues.

The key issues in relation to energy which will be discussed below are: how to commit to tackle climate change in an affordable, holistic way; security of supply; affordable supply; and Scotland's role in developing new technologies. Obviously a number of these issues are interlinked – for example, developing nuclear technology could satisfy the climate change issue, security of supply, and could make Scotland a technological leader in the field.

Electricity Generation

In 2014, Scotland generated c.50GWh of electricity, of which 38% was from renewable sources, 33% from nuclear and 28% from fossil fuels (coal, oil and gas). Scotland consumed 31GWh which meant that, taking into account generators' 'own use' and transmission losses, 12GWh (24% of generation) was exported to the rest of the UK. The exported power is obviously a good source of revenue for Scotland, and has a significant impact on the rest of the UK's renewable energy obligations where much smaller proportions of electricity are generated from renewable sources. It is also worth noting that installed renewable energy capacity is increasing rapidly having grown from 5.8GW at end 2012 to 7.1GW by Q2 2014 and to close to 8GW by Q2 2015, with at least another 4GW already consented.

The Scottish Government states that Scotland is on track to meet its objective of having zero emissions from 100% of gross electricity consumption (which is Scotland's consumption plus generators' own use and transmission losses) by

2020. In fact, on average, Scotland already generates 100% of gross electricity consumption from renewables and nuclear (which is a zero carbon emitter and will be in place until at least 2023). Further, currently installed and planned onshore windpower could in principle generate 100% of the county's energy requirements by 2020. Scotland chooses to have an overcapacity in power generation which is then exported to the rest of the UK. So, there is an argument to be made that no further generation capacity is required in the short to medium term.

The key risk with this approach is the provision of base load electricity when wind is such that there is no generation. In a small country like Scotland, we will have days (sometimes cold, calm days in mid winter) when the whole country will have effectively zero wind generation. And, of course, this problem is not solved by installing further wind generation. At present, the problem of base load capacity is satisfied by nuclear capacity, fossil fuel generation and imports. However, in the future, post the planned decommissioning of the two Scottish nuclear power stations it is likely that electricity will be imported from England (which will continue to generate nuclear and already imports approximately 5% of its power from mainland Europe, including largely nuclear France). Therefore, without new, non-wind reliant, generation capacity, Scotland will not have base load capacity.

Further, the 'rush for wind' is underpinned by a number of other problems. Firstly, Scotland now has 2,315 onshore wind turbines with a further 405 under construction. Windfarms dominate the landscape in large parts of the country, particularly in the Borders, Aberdeenshire, round Glasgow and increasingly in Perthshire. These windfarms, often on an industrial scale, and the associated requirement for high voltage power lines, are probably visible from a third of Scotland including a large proportion of highland Scotland and an increasing proportion of wild land is affected. Recent proposals, for example, to construct Stronelairg in the Mondahliath, at Talladh-a-Bheithe on Rannoch Moor and at Glencassley, Sallachy and Caplich in the North-West run completely contrary to the Scottish Government's stated aims to protect wild land. Some recent decisions made by the Scottish Government do suggest a change in attitude towards industrial scale windfarms in designated wild land. However, despite government claims, opposition to further large scale windfarms is extremely widespread and not just from local residents directly affected by the disruption, noise and visual impact. Interestingly, Fergus Ewing, the previous Scottish Government Energy Minister, was opposed to wind farms in his constituency prior to entering government. Secondly, the existing subsidies required for windfarms largely end up with large landowners on whose land the wind turbines are sited and who currently benefit to the order of several hundred million pounds per year. In many cases, the siting of wind farms is determined

by land ownership, and therefore access to subsidies, rather than technical rationale. Although receiving much less attention than the visual impact, this has to be a concern to anyone interested in social justice. Thirdly, as stated above, the increase in wind generation is essentially increasing the amount of electricity exported from Scotland. Although local campaigners against wind farms often use the 'we are already generating more than we use locally' argument, the national question of should we be building more windfarms in Scotland, with the impact on the natural environment, to export power to England has not been asked. This is a major energy policy that has been progressed without an explicit democratic mandate.

The recent statements by the Scottish Government arguing against the UK Government's plans to accelerate the end of the existing subsidy regime should be seen in the context of the arguments presented above. Further, from an economic point of view, if onshore wind is as competitive as the industry and Government claim, then it should not require continued subsidies (with the implications for household bills) which should instead be focused on nascent technologies.

Therefore, with the requirement for base load capacity and the increased pressure against further large scale onshore windfarm development, what are the options?

Firstly, there has been increased interest in offshore windfarm developments, either on fixed or floating structures. Despite the additional construction costs, subsea transmission lines and complexity of maintenance, windfarms are now commercially viable off the Scottish coast. The recent decision to overturn consent for 2.3GW from four fixed offshore developments due to the perceived impact on seabird migration is being contested by the Scottish Government who do seem to have some support from the RSPB who brought the challenge. The huge areas of potential development with more reliable wind conditions and distant from communities make this a viable alternative to onshore development.

Secondly, improvements in storage systems (whether it be batteries, phase change materials, pumped storage or other systems) and smart technology will allow balancing of electricity generation with demand. However, commercial, large scale solutions still seem some way off. There will be likely continued reductions in energy use (eg per unit of GDP) which will aid these approaches, although the potential significant increase in electricity requirements from a large scale transition to electric cars does not seem to be factored in to the UK or Scotland's electricity generation plans.

Thirdly, the development of carbon capture and storage (CCS) should allow the continued long term use of gas and coal fired power stations. The proposed CCS project which was being developed by SSE and Shell at Peterhead Power Station showed considerable promise. With the expertise in geology in Scotland from the oil and gas industry, the apparently favourable geology and decommissioned gas fields, Scotland could become a leading developer of this technology both for its own power stations and for export. The announcement by the UK Chancellor in November 2015 to stop funding of the CCS 'competition' was therefore extremely short sighted. It will also have very damaging effects on any future collaboration with industry partners who have a range of other issues to consider without having to deal with ill-judged government decisions.

Thirdly, the development of unconventional gas, along with CCS in the medium term, provides potential local supply as discussed further below.

And finally, and most controversially, the construction of new Scottish nuclear power stations. The proposed power stations at Hinkley Point and Sizewell in England would generate 6.4GW of power, equivalent to the entire capacity of all the current windfarms in Scotland and equal to the capacity the Scottish Government suggest will be constructed until 2020. Despite the perceived high costs of nuclear power, the agreed strike price at Hinkley Point of £92.50/GWhr compares favourably with £95/GWhr for onshore windfarms and £155/GWhr for offshore windfarms. The total subsidy paid to windfarm operators for the last decade has been £10 billion which is less than the 'subsidy' required for new nuclear plant. Therefore, the cost argument, which is often used as an argument against nuclear energy is not valid. A key difference is the significantly larger investment on a single nuclear plant compared with a single windfarm because of the much higher generating capacity of the nuclear plant. Although there are cost and security concerns regarding the design and funding model proposed for Hinkley Point, neither of these are a given and indeed not being applied for other proposed plants in England and Wales.

Although there are some local groups objecting to the construction of new nuclear capacity, recent opinion polls show a majority of public opinion supports nuclear power as part of a balanced energy mix. The current Scottish Government is however opposed to new nuclear power stations with their key argument appearing to be on the risk of disposal. Although long term storage issues have to be resolved, short term storage of the relatively small quantities of highly radioactive waste is manageable. Further, as nuclear power is increasingly recognised as the only large scale solution in terms of tackling climate change, and new stations are constructed in England, Europe, the US and China, solutions will be found for this issue. In this respect, the

commitment to new power stations in Scotland, with the existing expertise at Dounreay and the two plants, could give Scotland a niche expertise.

Domestic Heating and Power

In most parts of Scotland, the key domestic fuel for heating and cooking is mains gas which accounts for 50% of domestic energy usage. As UK North Sea gas supplies decline, there will be an increasing requirement for imported gas to fill the supply gap (in winter 2013-14 this gap was estimated at 50%). However, with Norwegian gas and LNG imports in the short term and the longer term potential of onshore gas (of which further below), it is likely that there will be sufficient gas in coming decades to satisfy demand. Although in the medium term a low carbon alternative will need to be found for domestic gas, the relatively low CO_2 emissions from this fuel mean that it is appropriate for continued use for the forseeable future.

The issues of domestic 'fuel poverty' (defined as when a household spends more than 10% of its income on energy) and the broader issue of affordability, has been of great political interest recently. In the 2015 general election, the Labour Party proposed an interventionist approach of price caps. This is unlikely to be effective for a number of reasons. Capping fuel prices will likely lead to significant reductions in investment which will only exacerbate the issue. A better approach is to decrease the cost of supply and reduce the energy requirements of households.

Firstly, there are no certainties that power prices will stay high as shown by the recent drop in oil prices, essentially due to surplus production. Although of a scale inconceivable in Scotland, the shale gas revolution in the US has had a marked impact on gas prices (dropping from $12/MMbtu to c$2-3/MMbtu currently). As the US starts to export gas this will act as a dampener on worldwide prices. This effect will be compounded as shale gas developed in other countries starts to have a direct (through increased local use e.g. in China) or indirect impact (by increasing international LNG supply). Local onshore gas production in Scotland has the potential to increase this effect, in addition to improving supply of feedstock for the Grangemouth plant, use of local expertise and improving security of supply. Therefore, there is no certainty that the current high prices will continue and hence the 'fuel poverty' issue will be alleviated without government intervention in the market.

Secondly, the Scottish Government should be lauded for the schemes it has implemented to improve building insulation and local heat and power generation. These schemes have a direct impact on energy usage and the cost of

energy and should be encouraged and developed. The Heat Policy Statement issued on 14th June 2015 is well considered from a liberal perspective, balancing the role of government and the private sector. The recent award of £250,000 to 5 separate geothermal feasibility projects is a good example of this approach. If the Heat Policy Statement is implemented, one could envisage a fundamental change to domestic heat and power, from a cost, total consumption and CO_2 emissions perspective, in the foreseeable future.

Affordability is of greatest concern in rural communities where the lack of grid gas supply results in the use of fuel oil or tank gas for heating. In addition to the additional inconvenience of this fuel supply (e.g. storage requirements, planning deliveries), these sources of energy are significantly more expensive than grid gas (although the recent oil price drop has had a significant impact in reducing heating oil bills). Although there are clearly very remote communities which are unlikely ever to be reached with grid gas, there are a lot of semi-remote areas which should be accessible. Industry, pushed and supported by government, should be encouraged to develop ways of reaching such communities.

Oil industry

The oil industry remains a vitally important part of the energy sector and overall economy in Scotland. The industry employs approximately 340,000 people in the UK offshore industry with several hundred thousand more in the supply chain supporting international operations, particularly in sub-sea engineering. The recent dramatic fall in oil price, with potentially 120,00 jobs lost by end 2016, has led to almost daily media coverage of the impact on the offshore North Sea industry.

However, even before the fall in oil price, there was a general recognition that things had to change in the industry. The Wood Report, published in February 2014, set out proposals to deal with the key challenges. The report proposed a number of recommendations that involve a more interventionist approach, albeit through an independent regulator which seeks to build a consensus of industry, government and other stakeholders to ‘Maximum Economic Recovery’. There is little doubt that there have been development decisions in the North Sea that have not maximized government revenue. Further, there are existing fields where much more could be done if the fields were in the correct hands. The experience of new operators coming into fields has generally been very positive, in terms or increased capital expenditure, increased production and reserves and extended field life, all to the benefit of the Exchequer. Further, the tax regime has been volatile, and is currently a mish-mash of various allowances. All these factors should be addressed by the new regulator and hence has found support

across all parties at Westminster and Holyrood. However, the challenge will be to implement the new Oil and Gas Authority in a manner which encourages new development without stifling the entrepreneurial spirit that has been very positive for the industry, say in comparison to the Norwegian approach. Since the publication of the report, the drop in oil price has completely changed the landscape. It remains to be seen whether this will be the spur for the changes recommended in the Wood Report leading to renewal in the industry or the current gloom and despondency will take hold and lead to rapid decline.

A contradiction in the current Scottish Government's approach is its support for the oil and gas industry while supporting renewables. To see this in context, the CO_2 emissions generated by consuming the UK's daily oil production is equivalent to 30 times Scotland's annual electricity generation. There is a case to be made for this; that oil and gas are required bridging technologies, that oil also provides invaluable input for the chemical industry. However, it is disingenuous at best for this not to be laid out explicitly.

In the medium to long term, the move from petrol and diesel powered transport to electric powered transport is a clear way of dramatically decreasing CO_2 emissions. A large scale move to electric cars would also require significant increases in low carbon electricity generation (otherwise the net impact is minimal or zero) and hence the need for the switch to nuclear power advocated above. The Norwegian Government has implemented various incentives to encourage the use of electric cars, including tax free purchase of cars (particularly powerful in Norway given the high rate of purchase tax), free charging in city centres, zero vehicle tax and use of bus lanes. Norway is dealing successfully with these issues in a country that is larger and more mountainous than Scotland so the solutions are clearly applicable in Scotland. Some of these solutions are in policy areas which are not currently devolved. However, there is local action, often requiring the government to step back rather than intervene, that could significantly increase the attractiveness of owning an electric car.

Unconventional Oil and Gas

As demonstrated by the report from the British Geological Survey, published in June 2014, and the Scottish Government's Independent Scientific Panel report published in July 2014, there is significant potential for unconventional oil and gas development in Central Scotland in shale oil and gas and coal bed methane. Although downplayed at the time as having comparatively much smaller potential than in the North West of England, these are still very significant potential resources. Most recently INEOS, which owns the Grangemouth

refinery and petrochemical complex, has acquired interests in Central Scotland demonstrating the potential in this area.

The key issue at present is that the commerciality of the resources is essentially unknown. A large amount of further data is required before the resource can be estimated and, unlike the Westminster Government, the Scottish Government has been lukewarm about the potential resource. Although the licensing of acreage is currently at Westminster level, the Scottish Government has primacy on planning issues, including subsurface trespass issues, so has a vital role to play.

Although a number of organisations are against unconventional development in principle because it involves developing fossil fuel resources, and the First Minister and new Energy Minister are both 'deeply sceptical', this is not a logical objection for the Scottish Government given its support for the offshore industry. Ineos are also now importing ethane from the unconventional gas industry in the US to keep Grangemouth running. A laudable outcome from the Scottish Government's perspective presumably as it involves 'fracking' in the US to keep the largest industrial complex in Scotland in business.

The key concerns in relation to unconventional development are around aquifer influx from drilling, methane leaking and seismicity. However, these issues onshore can be managed with a robust regulator such as is present offshore. Further, the areas with potential lie in formerly industrial and coal mining areas. In principle, there must be a basis for agreement which makes sense for local communities, developers and government to allow unconventional exploration and thereafter development to take place.

So what is the suggested energy policy framework?

Having briefly laid out the landscape of energy in Scotland, what are the policy responses from a liberal approach?

1. **Climate change.** First and foremost there should be a focus on achieving the target on carbon-free electricity production. However, the Scottish Government's current approach which relies on onshore and, to a lesser extent, offshore windfarms is far too narrow. This does not provide base load capacity, is expensive and is redistributive to wealthy land owners. Further, the huge pressure there is now on any new onshore wind farm development, both from an economic point of view given the removal of Renewable Obligations and local pressure, means this cannot be a significant further contributor to electricity generation. The government should change its stance and support the construction of new nuclear power stations, most likely at the existing sites at

Torness and Hunterston. This will likely have to follow the UK Government's approach and largely be dependent on foreign investment. However, the necessity of providing base load capacity makes support for nuclear electricity generation essential.

Continued use of gas for electricity generation and domestic heating is likely to be inevitable as a 'bridging' technology until alternative sources are found. However, support for CCS development in Scotland for the country's own use and also as a basis for international leadership is important. Given the removal of the UK Government's support for the CCS project at Peterhead, the Scottish Government should step in with its support.

As discussed above, the challenge of climate change requires changes in domestic heating, domestic insulation and transportation as well as electricity generation. The Scottish Government is already playing an active role in this area, through support for local generation, domestic heat generation and improved insulation. This should be extended. These initiatives will also play a significant role in dealing with fuel poverty both through providing cheaper sources of power and allowing households to use less energy.

Further initiatives introduced to encourage electric cars, similar to those in Norway and which can be implemented locally, should also be progressed.

2. **Fuel Poverty** is a key issue for Scotland, particularly in rural areas where households often rely on oil for heating. Fuel poverty can be alleviated through some of the same approaches used to reduce carbon emissions.

3. **Security of supply**. Many of the issues and proposals identified above not only target the challenges of climate change and address fuel poverty, but also address issues of security of supply. Building two new nuclear power stations and the development of shale gas improve security of supply both in terms of reducing the requirement for importing power and also in terms of base load supply.

3. Technological development. Within the framework outlined above, there should be three main areas for technological focus. Onshore unconventional development and CCS development can benefit from existing expertise in the offshore oil and gas industry and the existing supply chain. In addition to the local impact, both technologies could generate significant export earnings. Thirdly, the construction of nuclear power stations in Scotland could invigorate the expertise already existing at Dounreay.

In summary, Scotland has to develop its energy policy beyond a fixation on wind power and point scoring with Westminster. The challenge of climate change does require a decarbonisation of energy but support for nuclear power, unconventional gas, and increased emphasis on reducing energy usage, are all required to meet the challenges of the coming decades.

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