Scotland's Wind

A report for the Green MSPs by Dr David Toke

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Executive Summary

This report argues that the costs of delivering the UK's low carbon programme could be reduced substantially if the Scottish Government were given powers to fund its own renewable energy programme.

This could be done by giving the Scottish Government control to spend money that would otherwise be added to Scottish electricity consumer bills to fund the Hinkley Point C (HPC) nuclear power plant (and any other new nuclear plant). UK electricity consumers will each have to spend around £16 a year extra for 35 years to pay for HPC. If Scottish consumer's money was spent on supporting renewable energy rather than paying for their share of Hinkley Point C nuclear power plant then, even on conservative calculations, nearly double the amount of electricity would be generated from wind power as from Hinkley C. The costs of onshore windfarms and also offshore windfarms even on current prices need much less support from consumer surcharges to generate an equivalent amount of electricity compared to HPC. Wind power costs are falling rapidly, with some especially low prices being reported in Denmark and The Netherlands. Under such a programme organised by the Scottish Government the cheapest onshore windfarms could start generating in 2020 and offshore windfarms organised under a new, Danish-style framework, could be online in 2026.

The Scottish Government's own preference for renewable energy over nuclear power lends support to the suggestion that the Scottish Government should be able to use Scottish consumers' money to pay for new renewable energy rather than new nuclear power. Moreover the best value for money for Scottish consumers in terms of generating non-fossil fuels is likely to come from the Scottish Government having powers to fund its own renewable energy programme from Scottish consumer bills. This is because the Scottish Government will be able to decide on what contract length to offer wind developers, for example offering to pay guaranteed prices for 20 years rather than 15 years as done by the Westminster Government now with renewable energy.

Also, the Scottish Government will be able to organise a much more effective offshore windfarm programme than is being done by the Westminster Government. The Westminster Government's methods are increasing the costs of offshore wind by leaving too much uncertainty to be dealt with by developers. The Scottish Government could organise a much cheaper offshore wind programme on the lines done by the Danish Energy Agency. This is likely to lead to lower costs and less confrontation in the courts over planning issues than is the case with the current offshore windfarm programme.

Introduction

The aim of this report is to examine the potential outcomes for increasing renewable energy and keeping the costs of decarbonisation down for the Scottish energy consumer through increasing Scottish ability to finance renewable energy programme that is deployed in Scotland.

This report contains a discussion of current arrangements to finance non-fossil electricity generation. The costs of Hinkley C and renewable energy options will be compared and the implications for energy bills and the output of non-fossil energy production will be assessed. Calculations will be made about the amount of renewable energy that Scotland would be able to generate for the amount of money spent on nuclear power if Scotland has power to issue of contracts to renewable energy companies to pay them for energy production. The Government is, in theory, supporting several nuclear developments. However, for the moment only one, Hinkley C, has been given a power purchase agreement and has a stated projected date for generation (2026). Hence the costs and generation associated with Hinkley C are used to represent the comparison with nuclear power in this analysis. This report assumes that windpower, onshore and offshore, supplies the renewable energy. This does not imply that possibilities for other fuels are absent, but merely that resource constraints mean that a simplified model is applied and that costs of onshore wind and offshore wind on their own allow analysis to be conducted at a manageable level.

This report examines scenarios wherein the Scottish Government would have the power to use money that Scottish consumers would pay for the Hinkley C development for spending on renewable energy. The point here is that the Scottish Government have always opposed funding new nuclear power, specifically Hinkley C, on the grounds that money would be much more cost-effectively spent on renewable energy. Partly this was about the future. Renewable energy costs are coming down whereas costs of nuclear power have not come down. But increasingly this is also about the present. As discussed here, the costs of onshore wind and solar farms at least, and probably also offshore wind power, is falling below the cost of Hinkley C. This means that much more energy is likely to be generated from these renewable energy sources for a given amount of money paid by electricity consumers compared to spending the same amount of money on Hinkley C.
This reports calculates this comparison between renewable energy (RE) and Hinkley C and explores not only some options for a generation mix that the money might pay for, but also how the Scottish Government could better organise its own RE programme compared to what is being done by Westminster.

The rest of report is therefore structured into the following sections:

1. Current position of Scotland and renewable energy policy: problems that need to be addressed
2. Why and how Scotland could be given more control over renewable energy funding
3. Comparison of costs of Hinkley C and renewable energy
4. How much renewable energy could be produced for the amount spent by Scottish consumers to support Hinkley C under different scenarios

Scotland and Renewable Energy Policy

Current position and problems that need addressing

Currently Scotland's main levers over renewable energy outcomes are the Scottish Government's supervision of the planning system and also discretionary funding from the Sottish Governments own budget. Although these powers are substantial, control over the levies placed on consumer bills to fund non-fossil energy sources resides solely with the Westminster Government.

So far there have been three renewable energy programmes organised by Westminster, and these account for almost all of the renewable energy generation in the U.K., the main exception being large hydro schemes in Scotland which now generate around 1 per cent of U.K. electricity supplies. The Non-Fossil Fuel Obligation, launched in 1991, was the first post electricity privatisation renewable energy (RE) programme, but, large hydro apart, most of the renewable energy currently operating today is funded by the Renewables Obligation (RO). Under the RO the electricity suppliers were set increasing targets to supply renewable energy expressed as a percentage of their total electricity supplied. The RO incentivised renewable energy because electricity suppliers were penalised according to the amount of RE that they failed to supply to meet their legally mandated targets for RE. The generators benefit from the RO incentives for 20 years from the start of generation.

Then, as a consequence of the Westminster Government's Electricity Market Reform Act passed in 2013, which set specific amounts of money, a 'strike price' that renewable energy suppliers were to be paid for each unit of electricity generated over contracts, that is power purchase agreements that lasted 15 years. These are called 'contracts for difference' CFDs, the 'difference' referring to the fact that generators will be paid the difference between the wholesale market price of electricity and the CfD 'strike price'. This change was introduced in the context of introducing a CfD scheme to fund new nuclear power stations, although the contract that has been negotiated for Hinkley C lasts for 35 years.

As yet no scheme is operating using CfDs, although various contracts have been issued for a range of RE technologies. However, following the 2015 General Election the Westminster Government prevented onshore wind and solar farms that had not been given planning consent by the time of the General Election from receiving incentives under the RO. They have also ruled out giving any more CfDs to onshore wind and solar farms. This is despite the widely acknowledged fact that these are the cheapest renewable energy technologies currently available. This is also despite the fact that there are substantial quantities of onshore wind farms that are in various stages of the planning process but which did not have been planning consent by June 2015. The Westminster Government is still intending to fund further offshore wind farms, and it is also giving subsidies to fossil fuel power plant on the basis that it will provide 'capacity'.

Certainly the proportion of electricity supplied by RE has grown tremendously since the inception of the RO, from little more than 2 per cent to over 25 per cent in 2015, and likely to supply over 30 per cent by 2020. However, the scale of the ambition represented by U.K. carbon reduction targets is very high, meaning that accelerated progress needs to be achieved, rather than the programme

being slowed down.
Indeed, the lack of availability of CfDs for onshore wind and solar farms means that The Scottish Government's target of supplying the equivalent of 100 per cent of Scottish electricity demand from RE by 2020 seems unlikely to be achieved. This is despite the availability of considerable capacity for onshore wind that either has already been given planning consent since the 2015 General Election (and which cannot be funded under the RO) and the great amount of capacity that is in the planning pipeline, or indeed would be proposed if there was a funding stream that is available.

In fact there is little that the Scottish Government can do to alter this state of affairs with the powers that it has at its disposal at the moment. Money to pay for the incentives for renewable energy, new nuclear power and new fossil fuel capacity is derived from precepts added to the bills of electricity consumers. Only the Westminster Government can levy such charges.

However, it would be relatively straightforward for the Scottish Government to be given responsibility for the levying and spending of all or part of precepts on the bills of Scottish electricity consumers. Indeed it is already the case that a distinct Scottish precept is added onto Scottish bills to pay for electricity distribution costs in Scotland.

So far the precepts added to electricity consumer bills needed to pay for non-fossil energy sources have, at least since 1998, been in respect of paying for renewable energy. However, when the UK's new nuclear power stations start generating the cost of paying for the premium price deals accorded to nuclear operators will also have to be borne by electricity consumers. This will be added as an identifiable addition to all UK electricity consumer bills. The first of such additions will come in the form of monies needed to supplement payments to the operators of the Hinkley C nuclear power scheme. This is scheduled to start generating in 2026.
However, there is a divergence of policy on the issue of new nuclear power between that of the Scottish and Westminster governments. The Scottish Government has opposed giving premium price contracts to operators of new nuclear power stations. The position of the Scottish Government is that spending money on new renewable energy projects is better value for money than paying it to operators of new nuclear power plant.

However, currently there is no effective mechanism for the Scottish a government to realise this policy involving a preference for Scottish consumer money on renewable energy rather than nuclear power. Yet it is highly plausible for this to be put into practice, and moreover, there are excellent arguments for doing so. In the following sections we outline the arguments for doing so and then give an outline of how this could be put into practice.

The case for Scottish funding of renewables and how powers to do this could be given to the Scottish Government

Giving effective powers to the Scottish Government to fund renewable energy is a necessary extension to devolution of powers in an area where there is a stated preference for a different policy emphasis. Previously the Scottish Government did have some powers over renewable energy funding of the Renewables Obligation, but this was lost with the passage of the 2013 Energy Act. Paradoxically, then, in energy policy this constituted a diminution of powers exercised by the Scottish Government at a time when there was a tide towards increasing devolution of powers.

Given the widespread antipathy in Scotland towards Westminster's decision to spend Scottish consumers' money on nuclear power rather than on more renewable energy (instead) there are arguments in favour of devolving some powers over the funding. Whilst it is very important to renewable energy deployment in the U.K. that Westminster continues to fund new renewable energy developments in Scotland from monies from all UK energy consumers, it is also very plausible to argue that, on top of this, the Scottish Government should have power to spend Scottish consumers' money that would otherwise be spent on new nuclear power. Certainly a failure to do so may well evince opposition among Scottish consumers to paying that part of the levy to support nuclear power. By contrast the impact on English and Welsh consumers' bills needed to take up the extra payments needed to meet the loss of nuclear levy payments would be very small.

New powers for the Scottish Government

Hence we are suggesting in this report that some of the powers on funding non-fossil fuels should be transferred to the Scottish Government. We are suggesting that the Scottish Government be able to a) add a precept onto Scottish Government bills to fund renewable energy, with this extra charge being offset by the removal of charges on Scottish consumers needed to pay for nuclear power and b) be able to offer long term power purchase agreements (PPAs) to renewable energy generators whose expedition would be funded through the Scottish renewable precept. There would need to be an Energy Act put in place by the Westminster Parliament to effect this to give Scottish ministers the authority to put this policy into practice. The scheme could be implemented in cooperation with OFGEM. OFGEM could advise the Westminster and Scottish Governments about what level of monies (that would otherwise be paid by Scottish consumers for nuclear power) would therefore be available to the Scottish Government to fund renewable energy schemes.

The Scottish Government could therefore be free to spend this money according to arrangements agreed by the Scottish Parliament. Because of the long term saving that would accrue to Scottish energy consumers by using the same level of surcharge for funding renewable energy as opposed to HPC (given that the HPC contract would last much longer than any contracts given to renewable), then the Scottish renewable energy powers should be able to fund the cheapest schemes to come on line from 2020 onwards. This would, in any case, involve little extra expense for Scottish consumers since there will be many projects that are viable at relatively low prices. However, currently these schemes are prevented from being built because the Westminster Government has no plans to issue long term power

purchase agreements giving guaranteed prices for energy generated from onshore wind schemes.

Scotland may or may not decide to replicate the system of CfDs that is now in place for UK wide arrangements. This report does not therefore go into the argument about whether, for example, there is a feed-in tariff for onshore wind set administratively or through a competitive auction (as was done in the last completed auction whose result were announced in February 2015). However, this report does suggest that the arrangements for funding offshore wind are changed compared to that currently operated by Westminster. Specific new powers should be given to the Scottish Government to organise offshore wind projects off the Scottish coast.

New offshore wind powers

In the case of offshore wind in Scotland, offshore wind deployment in Scotland has suffered in two important ways from the way that the Westminster Government has organised the offshore wind procurement system. This has left the Scottish Government with only very partial control over the way the windfarms are planned. First, it has been left up to prospective wind developers to conduct planning consultations on their own, without sites being organised by the Government in advance. This has laid the groundwork for the (continuing) planning argument between the RSPB and the Scottish Government concerning the appropriateness of offshore wind sites. Second, the 'laissez faire' approach of the system which has left all of the planning and arrangements for grid connection up to the developers may have led to much increased costs compared to the way offshore wind has been organised, for example by comparison to Denmark. In the case of the UK, developers are left with various uncertainties, including planning consultations, investigations of site conditions, cost of grid connection and even whether the schemes will be given planning consent.

In the case of Denmark, the Government, through the aegis of the Danish Energy Agency, has carefully assessed, consulted over and selected the sites and taken responsibility for grid connection. Only then, after a tender competition to decide the winning developers, have the developers been left just to install the windfarm. The risk and uncertainties to developers have been mostly minimised. This seems likely to have reduced the costs of the windfarms quite considerably, judging by a comparison of tender prices in the Danish and British offshore wind auctions. Hence we would recommend that the Scottish Government adopt a system much more similar to the Danish one for offshore wind rather than the one operated by the Westminster Government. The Scottish Government would need to be given legislative, or at least executive, authority to expedite this objective. This will include being partners with the Crown Estate in researching and selecting specific offshore wind sites that will be put out to tender. Planning of this Programme from scratch would take time, so a first generation date of 2026, the time that HPC is set to start generating, may seem appropriate.

How do the costs compare?

There is a need to examine the relative costs of investments in Hinkley C and wind power. We can assess how this will affect the amount of non-fossil electricity generated if Scottish consumers spent money on wind power rather than on supporting Hinkley C.

Scottish energy consumers will, as is planned, pay for around 10 per cent of the payments made by consumers for

Hinkley C simply on the basis that Scottish electricity consumption is around one tenth of total U.K. electricity consumption. Hence, in parallel to this we assume that Scottish consumers will pay for 10 per cent of the electricity generated by Hinkley C. A key issue therefore to be examined is how much renewable electricity could be produced for this level of spending.

I make my calculations based on the assumptions outlined in the Annnex.

Here we can summarise the conclusion, that if Scottish consumers' money was spent on supporting renewable energy rather than paying for their share of Hinkley, then nearly double the amount of electricity would be generated from wind power compared to the electricity that would come from Hinkley C. As can be seen from the calculations in the Annex, the costs of onshore windfarms and also offshore windfarms are falling rapidly so that they need much less support from consumer surcharges to generate an equivalent amount of electricity. It is reasonable to point out that the costs to the system of renewable energy and nuclear power are different., however we take such factors into account when we make our calculations so that system costs, e.g. providing extra firm capacity for renewable energy, are taken into account in the calculations.

Whilst Hinkley Point C nuclear power plant is to be paid, in 2016 prices, some £97 per MWh, from 2026 onwards for 35 years, onshore and offshore wind will, from 2020, cost no more than £70 per MWh. Hence wind power will require much less extra surcharge on consumer bills to assure generation of a given quantity of electricity compared to Hinkley C. Indeed, assuming future wholesale power prices of £40 per MWh, the annual surcharge for Hinkley C would be £57 per MWh in 2016 prices as opposed to little more than half of this, £30 per MWh, for wind power.

Hence I find that if Scottish electricity consumers' money that would otherwise go towards funding Hinkley is spent on wind power than almost twice as much electricity will come from the wind power compared to what will be produced from Hinkley C.

In general the notion that renewable energy sources are a cheaper option than nuclear power is now widely supported, including by the National Audit Office (2016a). However, the best value for money for Scottish consumers in terms of generating wind power is likely to come from the Scottish Government having powers to fund its own renewable energy programme from Scottish consumer bills. This is because the Scottish Government will be able to decide on what contract length to offer wind developers, for example offering to pay guaranteed prices for 20 years rather than 15 years as done by the Westminster Government now with renewable energy. Also the Scottish Government will be able to organise a much more effective offshore wind farm programme than is being done by the Westminster Government. This is likely to lead to lower costs and less confrontation in the courts over planning issues.

We would add as a final thought that, having surveyed the falling costs of solar pv farms, much the same story can be told with solar pv technology as with wind power. Hence the Scottish Government would also be best advised to invest in solar pv alongside wind power. However, in order to focus attention, we have in this report looked at a direct comparison with wind power to make the illustrate point about the comparative economics of renewable energy and new nuclear power.

Annex

In my calculations I make the following assumptions:

Costs of Hinkley C nuclear

I assume 25.2 TWh per year generated from HPC's 3.2 GWe, starting in 2026. Central to my analysis is a comparison between the costs of Hinkley C and the costs of onshore and offshore wind. In October 2016 the developers of Hinkley Point C (HPC) finally signed an agreement with the UK Government that meant that the operators of HPC would be paid £92.50 per MWh for 35 years from the start of generation. But this sum was expressed in 2012 prices, which according to the contract terms is increased in line with inflation according to the Consumer Price Index (CPI) (Trading Economics 2016). Hence the 2016 price for HPC taking the CPI increase since 2012 into account is £97 per MWh (payable for 35 years), which is the figure we shall use in the comparison with other prices for wind power which are calculated using 2016 prices.

Costs of wind power

In 2016 many onshore wind schemes have been installed under the Renewables Obligation (RO). These windfarms would receive close to £70 per MWh at the time of commissioning since their payments will consist of the wholesale power prices which during this period were running no at just under £40 per MWh and also payments for their renewable obligation certificates (ROCs), which are just over £30 per MWh. The schemes can reclaim their ROCs at this price for 20 years from the start of generation. However, contrary to HPC, whose payment is fixed for 35 years, by the contract issued by the Westminster Government, the cost of future onshore windfarm schemes is likely to fall, according to expert opinion. Hence well before the end of the HPC contract the wind power cost is likely to be even lower than HPC than it is now.

Of course there are said to be additional system costs for wind power to provide firm capacity and also more transmission line capacity. This has been estimated at around £10 per MWh (Evans 2016). On the other hand HPC also has some system costs, not just to provide some back-up capacity but also, arguably, the costs of some liabilities of dealing with nuclear waste and also insurance liabilities (Carrington 2013 and also 2016).

However, the costs of both onshore wind and offshore are falling (NREL 2016, KIC Energies 2016), and projected to fall by large amounts over the coming years to figures well below the £70 per MWh quoted above for recent installations under the Renewables Obligation. Indeed, the most recent information suggests that the costs of offshore wind in Denmark have already fallen well below this figure. In October 2016 the Danish Energy Agency announced the results of the tender for the 600 MW offshore wind project at Kriegers Flak for a price of just under 50 euros per MWh, or around £42 per MWh (Parr 2016, Regulatory Agency 2016). Even after allowing for grid connection costs to be added onto this (which were not included in the tender price since these costs are provided by the Danish Energy Agency), the costs would still come to only around £55 per MWh. Earlier in the year The Netherlands held an offshore

wind auction which delivered a price of £74 per MWh including an allowance for grid connection costs.

Taking these factors into account we believe it is reasonable to use the figure of £70 per MWh as a plausible maximum cost estimate for onshore and offshore wind schemes wind for schemes commissioned in or after 2020.

Costs to consumer of Hinkley C and wind power

Wholesale power prices have varied in the 2014- 2016 period around £35 per MWh to around £50 per MWh (OFGEM 2016). Here we assume a future wholesale power price of £40 per MWh.

Hinkley C: Under this circumstance, HPC will need to be supported from electricity consumers' bills to the extent of £97- £40 per MWh, that is £57 per MWh. This will cost UK electricity consumers £1436 million per year in total. Over 35 years this is £50300 million. Scots will pay 10 per cent of this (i.e. just over £5 billion over 25 years and around £144 million every year) since 10 per cent of UK electricity demand is consumed in Scotland (GovUK 2016). This works out as being around £16 per year on the average UK domestic electricity consumers' bill that is around 3 per cent of an average electricity bill of £600 per year. If people in England and Wales were left to pay for Hinkley C, their annual bills would increase by just under £2 a year, or by 0.3 per cent per year. Meanwhile, Scots bills would be 3 per cent lower if they did not have to pay the surcharge for HPC. However, if this money was spent on renewable energy instead, then this would pay for nearly twice as much electricity being produced from wind power than what the Scots would pay towards being generated from Hinkley C nuclear power station.

Flowing from the fact that about 10 per cent of electricity generated in the UK is consumed in Scotland, then we can assume that Scottish consumers will pay for 10 per cent of the extra money paid by consumers to pay for the output of Hinkley C. If 25 TWh of electricity is generated by Hinkley C each year then, on this basis, Scottish people will pay for around 2.5 TWh of annual production of electricity from Hinkley C.

So, we can see that £144 million a year is spent by Scottish consumers in their contribution towards funding Hinkley C, a contribution that supports 10 per cent of Hinkley C's production that is around 2.5 TWh a year.

Wind power: But what if this £144 million a year is spent on wind power instead? In this case it would go a lot farther. This is because Hinkley C needs an extra £57 per MWh on top of an assumed wholesale price of £40 per MWh (to make up the £97 per MWh contract price in 2016 prices) compared to only £30 per MWh top-up for wind power.

If resources are used to promote wind power, there will only be an extra £30 per MWh on top of the £40 per MWh assumed wholesale power price to make up the wind power cost of £70 per MWh. Hence little more than half (£30 per MWh compared to £57 per MWh) of the top-up payment on top of the wholesale power price is needed to support wind power compared to Hinkley C. In which case nearly twice as much power from wind will be funded by the same (£144 million) annual contribution from Scottish consumers as would be funded through nuclear power. **So Scottish electricity consumers would fund around 4.8 TWh of annual wind power as opposed to only around 2.5 TWh of power from Hinkley C.**

In other words, if the Scottish electricity consumers spent their money on wind power rather than on their contribution to supporting

Hinkley Point C then almost twice as much electricity would be generated.

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