SUBMISSION FROM JOHN MUIR TRUST

Executive Summary

The following three aims should be achieved by successful energy and Climate Change policy measures:

- A secure, adequate and affordable energy supply
- The required reduction in greenhouse gas (GHG) emissions
- A commitment to protect our local, national and global environment as much as possible.

The John Muir Trust does not consider that focusing on the renewables targets alongside other Scottish or UK governments’ current energy strategies will adequately contribute to these three essential aims. The Trust believes that an independent National Energy Commission is urgently needed to assess the technical and economic aspects of current Scottish and UK policy.

Targets

Q. Are the 2020 renewables targets (for electricity and heat) achievable? If not, why not?

A. If enough public money in direct and indirect subsidies is made available, plus soft loans from government-backed banks, and decision-making in the planning process continues to consent most of the large-scale wind developments coming forward, there seems to be little doubt that the target of “generating the equivalent of 100 per cent of Scotland’s own electricity demand” by 2020 can be achieved.

However, it is the belief of the Trust that achieving the renewables target primarily with industrial-scale wind generation would be a Pyrrhic victory - due to the cost to the environment, cost to the economy, cost to social cohesion in local communities and lack of substantial contribution to the Greenhouse Gas emissions reduction (GHG) targets.

Effect on natural environment and tourism

If the Scottish Government 2020 renewable target is achieved primarily by wind generated electricity, which is what is currently assumed by the government’s Routemap for Renewable Energy in Scotland 2011, the consequences for the natural environment and Scotland’s landscapes, both locally and nationally, will be severe - See Sir Donald Miller’s submission to the Committee for statistics on the estimated scale of development required.

Already between 2002 and 2009, Scotland has lost one third of “landscape free from visual impact from built development”. Figures produced by Scottish Natural Heritage showed that 41 per cent of Scotland was “unaffected by visual impact from built
development” in 2002, whilst by 2009 that figure had dropped to 28 per cent. The detail shows that most of the loss is attributable to energy projects and infrastructure.¹

Whilst the Scottish Government-commissioned Moffat Report² on wind farms and tourism is often quoted as if it gives evidence that supports a position that “wind farms don’t put tourists off”, this is not what it says. For instance, even at the time it was researched (data gathering from 2005), when there was little development, the Report noted the potential for a negative effect if development was sited on the most sensitive areas -

“There is often strong hostility to developments at the planning stage on the grounds of the scenic impact and the perceived knock on effect on tourism. However developments in the most sensitive locations do not appear to have been given approval so that where negative impacts on tourism might have been a real outcome there is, in practice, little evidence of a negative effect.”

Increased risk to security of electricity supply
A dash to achieve the renewables target, relying on wind development, may well unacceptably increase the risk to security of electricity supply - because of limited power availability in certain circumstances and also due to instability from trying to balance the grid whilst excessive intermittent wind generation is coming on – see later in submission for example of challenge on 3rd January 2012.

Q. What contribution will achievement of the 2020 renewables targets make to meeting Scotland’s CO2 emissions targets (a reduction of at least 42% by 2020 and an 80% reduction target for 2050) under the Climate Change (Scotland) Act 2009?
A. The Trust does not think the evidence suggests a major contribution will be provided by the renewables expansion to the reduction of GHGs.

If the 2020 renewables target is delivered primarily using wind, the evidence that this will significantly help to deliver the GHG emissions reduction target is very weak. GHG reduction targets are the primary policy tool, both in Scotland and the UK, with which the UK and Scotland aim to contribute to international climate change action - and so are more important than the renewable energy targets. The renewable energy target is a secondary target whose aims are to contribute towards the GHG target and adequately provide for energy needs.

So the following three aims should be achieved by successful energy and CC policy measures:

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¹ SNH Natural Heritage Indicators - Feb 2009, June 2010
² “The Economic Impacts of Wind farms on Scottish Tourism” Moffat Centre, Caledonian University
- A secure, adequate and affordable energy supply
- The required reduction in greenhouse gas (GHG) emissions
- A commitment to protect our local, national and global environment as much as possible.

The John Muir Trust does not consider that either the Scottish or the UK governments' current energy strategies will adequately contribute to these three essential aims.

**Problem of a renewables target based on future use**

The Trust believes that it is misguided to have a renewables target that is a percentage of an unknown quantity – i.e. a percentage of the amount of electricity that Scotland will consume in 2020. If a renewable target is to be used, it should refer to a fixed, historical base – as does the GHG emissions reduction target which is a percentage of the historical figure of 1990 emissions. This would lead to an emphasis on energy conservation and energy efficiency, which would reduce overall energy demand.

The Trust believes the excessive renewables target distracts from the key target of GHG emissions reduction and that the GHG target should be the focus of government policy effort. Far too much emphasis has been placed on renewables targets with inadequate report-back about what level of emissions reductions are being achieved by the renewable expansion as currently rolled out.

**Is there evidence that achieving the renewable target will not contribute significantly to the GHG emissions target?**

One key flaw in the Scottish Government's strategy is the aim to very considerably over-produce electricity to achieve "100% equivalent of Scottish electricity consumption produced from renewable sources". The target requires Scotland to still use a very considerable quantity of fossil-fuel-produced electricity to produce rapid-response energy supply. This can be estimated as the equivalent of 85% of Scottish consumption.

**So, in 2020, the plan is for Scotland to still produce approximately 85% of our consumption by conventional means.**

This explains the following tables, taken from the Citigroup report, "An Independent Scotland?", p4, Figures 1,2
Figure 1. Scottish Generation Capacity Evolution (GW)

<table>
<thead>
<tr>
<th></th>
<th>2011</th>
<th>2020 E</th>
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</thead>
<tbody>
<tr>
<td>Coal</td>
<td>3.6</td>
<td>3.2</td>
</tr>
<tr>
<td>Gas</td>
<td>1.8</td>
<td>1.5</td>
</tr>
<tr>
<td>Nuclear</td>
<td>2.4</td>
<td>2.4</td>
</tr>
<tr>
<td>Oil</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Pumped storage hydro</td>
<td>0.7</td>
<td>0.7</td>
</tr>
<tr>
<td>Renewables</td>
<td>4.3</td>
<td>17.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>12.9</td>
<td>25.7</td>
</tr>
</tbody>
</table>

Source: Citigroup report “An Independent Scotland?” derived from Scottish Renewables; Citi Investment Research and Analysis

Figure 2 shows what Citigroup’s estimate of the Scottish generation output in 2020 to deliver the 50TWh target.

Figure 2. Scottish Generation 2020E

<table>
<thead>
<tr>
<th></th>
<th>GW</th>
<th>Load factor</th>
<th>Output (TWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>3.2</td>
<td>30%</td>
<td>8.3</td>
</tr>
<tr>
<td>Gas</td>
<td>1.5</td>
<td>40%</td>
<td>5.2</td>
</tr>
<tr>
<td>Nuclear</td>
<td>2.4</td>
<td>80%</td>
<td>16.6</td>
</tr>
<tr>
<td>Oil</td>
<td>0.1</td>
<td>5%</td>
<td>0.0</td>
</tr>
<tr>
<td>Pumped storage hydro</td>
<td>0.7</td>
<td>5%</td>
<td>0.3</td>
</tr>
<tr>
<td>Hydro flow</td>
<td>1.3</td>
<td>35%</td>
<td>3.9</td>
</tr>
<tr>
<td>On-shore wind</td>
<td>6.5</td>
<td>26%</td>
<td>14.7</td>
</tr>
<tr>
<td>Off-shore wind</td>
<td>10</td>
<td>38%</td>
<td>32.9</td>
</tr>
<tr>
<td>Renewables subtotal</td>
<td>17.8</td>
<td></td>
<td>51.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>25.7</td>
<td></td>
<td>82.1</td>
</tr>
</tbody>
</table>

Source: Citigroup report “An Independent Scotland?” , derived from Citi

This continued substantial use of conventional fuel use is also explicit in government policy and statements.

The First Minister said, when announcing this target: "….we can now commit to generating the equivalent of 100 per cent of Scotland’s own electricity demand from renewable resources by 2020. By then we intend to be generating twice as much electricity as Scotland needs - just over half of it from renewables, and just under half from other conventional sources."  

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3 Scottish Government press release 18/05/11
So even if wind generation was carbon-free, ignoring the carbon costs of construction, there will be significant emissions from the electricity mix envisaged, as that will still include considerable coal and gas output. In fact, there are numerous other factors which make carbon emissions reduction from wind developments an uncertain prediction. The considerable requirement for new roads and grid infra-structure for some of the more remote developments have significant carbon costs. Frequently, such developments are on peatlands which are very significant carbon stores - which could contribute to keeping GHG emissions down if left in an undisturbed healthy state. The Scottish Government is encouraging developers to analyse carbon payback, using the “carbon calculator” but there are questions to be asked about some of the assumptions, including impacts of felling forestry and assumed loac factor.

The evidence above leads to the following questions.

- Whether the 100% renewables target is desirable?
- What it will contribute to global GHG emissions reduction?

i.e. is the renewables target effective in supporting the primary climate change policy target of reducing GHG emissions both at home and abroad?

**Most effective use of public money**
The Trust believes that the most effective way for public money to contribute to reduced GHG emissions within the UK is for tax or subsidies, which are levied as a contribution to energy and GHG emissions reductions measures, to be spent primarily on energy conservation measures. These will generally cost around a third of the cost of generating an equivalent amount of energy (regardless of generation type), thereby reducing demand.

This view was taken by the Scottish Parliament in its excellent 2005 Report into Climate Change, unanimously endorsed in a parliamentary debate, which stated that “approximately 40% of energy could be saved, and half of the 60% CO2 reduction target for 2050 could be achieved cost-effectively by improved energy efficiency”.

**Impacts and contribution to global GHG emissions reduction**
For global GHG emissions to be positively impacted by Scotland’s actions, then key developing countries, such as China and India, must gain some advantage from it and adopt our technology. Otherwise, Scotland’s emissions are insignificant – our policies were promoted as being a useful lead to such countries, and to develop technology which could be adopted there.

**Research and development**
Scotland adopted its ambitious renewables energy plan as an exemplar for the world so that we could demonstrate to key developing countries that the technology worked and that developed countries, such as the UK, were committed to policy tools which would enable developing countries also committing to the use of such tools to compete. The aim was that the developing countries would then adopt the new technologies and start

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4 “Calculating Potential Carbon Losses & Savings from Wind Farms on Scottish Peatlands” SG website
5 John Muir Trust submission to EET Committee Energy Inquiry 15th August, 2008
making a significant contribution to reducing greenhouse gas (GHG) emissions, since they are the biggest emitters of the future.

However, for developing countries to adopt our chosen new technology, it must be efficient and cost-effective. In fact, the costs of the relatively mature technology of wind are not reducing significantly. The major developing countries, whilst installing some wind developments, are focusing on fossil fuels. The number of coal-fired power stations in China has multiplied enormously in recent years.

**Better to direct public money towards research and development**

If public money is to be spent to advance potentially game-changing technology for export to the large developing countries, investment needs to be in research and development in technology that is potentially economic and efficient. Carbon capture and storage might well be a better priority for public investment, for example.

Q. *Has the Scottish Government made any estimation of the overall costs of achieving the targets, and identified which parties will bear them?*

A. There is little evidence in the public domain that the Scottish Government, or indeed the UK government or its agencies, have done analysis that takes into account all costs - whether direct or indirect, difficult to quantify (such as environmental impacts) or, critically, within the remit of another administration. For instance, transmission costs and system balancing are under UK remit but are critical to Scotland. One of the key problems with energy policy is that some aspects are under UK remit and others are controlled by the Scottish Government. Nowhere is this more apparent than in decision-making about energy power plants.

For example, Muaitheabhal is a consented wind development in some of Scotland’s wildest land and will be constructed almost entirely on peatland habitats, which act as a valuable store of carbon. Disturbance to the peat will be widespread and substantial, involving construction of over 18km of access roads and 39 turbines, 145metre high. The Scottish Government intention is for several large developments like this to be consented on the Western Isles so that Ofgem will consent to the construction of a subsea cable to the mainland. Professor Andrew Bain made the point at Inquiry that the cost of transmitting electricity from remote wind farms to their markets is so high as to make wind farms in the Western Isles, if they are dependent on a new interconnector to the UK mainland, uneconomic in real terms. However, there is a disconnect between the different governments. The island communities might well benefit most from decentralised community-scale energy projects, addressing energy conservation and a mix of appropriately-scaled renewable projects – but that isn’t on offer.

**Inadequate cost-benefit analysis by Ofgem and DECC, as well as Scottish Government**

The planned expansion of the UK transmission grid is a key example of this disconnected cost-benefit analysis. The grid expansion could now cost £8.8bn to upgrade the UK’s electricity network to meet its renewable energy and climate change targets, according to a report by the UK government’s Electricity Networks Strategy
Group (ENSG). This is almost double the £4.7bn estimate put forward by the same group in 2009 (ENDS Report, March 2009).

The doubling of estimated costs of transmission come as no surprise to the Trust following the doubling of the costs of the Beauly-Denny 220 mile, 400kV transmission line – from a claimed £350 million at Public Local Inquiry to £600 million, even before the first pylon was up. Ofgem inadequately analysed the cost-benefit evidence when giving its consent to the cost of Beauly-Denny and evidence from Sir Donald Miller and Professor Andrew Bain which showed this was disallowed at Public Local Inquiry. This evidence is now being proven to be correct.

Challenges
(a) Technology
Q. Is the technology to meet these targets available and affordable? If not, what needs to be done?
A. The contribution that specific technologies can provide needs to be looked at for each individual technology - We should not talk about “renewables” but about “onshore wind”, “hydro”, “biomass”, etc. Each has completely different characteristics so “100% equivalent” electricity coming mainly from onshore wind has a completely different set of challenges to the same production from a balanced mix of different technologies.

Q. Are electricity generating or heat producing technologies compatible with the need for security of energy supplies?
A. Regarding wind production
If electricity and heat is to be supplied mostly by wind capacity, then the evidence is that there will be decreased security of supply due to intermittency of supply – see the Stuart Young report, Analysis of UK Wind Power Generation November 2008 to December 2010, which the Trust supported. Taking first-hand data, the report showed that windless conditions can and do occur for several days at a time in winter. It showed that at each of the four highest peak electricity demands of 2010 wind output was low being respectively 4.72%, 5.51%, 2.59% and 2.51% of capacity at peak demand.

How big a challenge is balancing the grid?
Example of risk situation with wind generation – sudden drop in production on 3rd January 2012
This record from BM Reports, in graph below, shows a very high average wind production that day. At 12.30am on January 3rd, the forecast and the actual production

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6 ENDS Report 29th February 2012
8 N.B. The wind production data and graph which are used here is from National Grid monitoring and comes from the BM Reports NETA website. It gives the output of a very significant proportion of all major wind generators in the UK - about two thirds of UK installed wind capacity and includes about 80% of Scottish wind output. Most onshore wind generation in England & Wales is not monitored by the Grid as there the transmission grid voltage is 275kV or 400kV, unlike Scotland where the transmission grid includes 132kV.
were closely matched at 2680MW. But the data also shows how quickly and dramatically wind production can drop. Such swings can cause a risk to grid stability. Also, the difference between the output which has been forecast, and used to plan grid arrangements, and actual wind production can be massive - as was demonstrated around settlement period 17 (i.e. 0830hrs).

Between 0800 and 0900 on 3rd January, output was a third of what had been forecast, having dropped to 1087MW whereas the forecast for this period was 3480MW. The explanation for this massive drop is likely to be that the storm meant wind turbines all over the country had to be switched off, for safety and engineering reasons. This generally happens above 56 miles per hour (25metres/sec).

Note that, during a period between period 9 and period 37 (i.e. 14 hours) when the forecast was for high production in a fairly stable pattern, actual production dropped from approximately 2700MW to approximately 1000MW. This was about 2400MW lower than the forecast around period 17. Production then rapidly rose again, although not to forecast levels.

Problems of sudden loss of wind power
The Committee may wish to invite evidence from the actual System Operation engineers “at the sharp end” who balance the grid as to the extent of the challenge that unexpected 2400MW shortfall was. This sudden drop in wind production results from turning off turbines for safety and engineering reasons in high winds. Were any of the power outages on the 3rd January 2012 due to sudden fluctuations on the grid, as a result of powering down a very significant proportion of wind production?

Is a high level of wind production a risk?
At the other extreme, the challenge of coping with exceptionally high levels of wind generation during high winds was recognised by RenewableUK who commented on 6th January 2012, “As we’re generating increasingly large amounts of electricity from wind, feeding those large volumes of power into the system represents an engineering challenge to the National Grid – a challenge we are pleased to see they met over Christmas.” RenewableUK media release 6th Jan 2012. This seems to imply that
there was some doubt within the industry about the ability of the grid to cope with the current - never mind future - fluctuations and variable generation.

Will Ofgem’s preferred grid expansion deal with the problems?

**Inadequate cost-benefit analysis by Ofgem regarding transmission**

Ofgem recently announced their preferred option of a £7 billion spend on Scotland’s transmission grid – when they said, “Fast-tracking of SP Transmission Ltd (SPTL) and Scottish Hydro Electric Transmission Ltd (SHETL) cuts red tape and enables a focus on delivering efficient services for consumers”. This, unfortunately, puts the cart before the horse by assuming the results of the consultation on this spend that they were announcing! Massive re-inforcement of the grid can address some of the intermittency problems but it has been inaccurately portrayed as addressing the problems of power cuts in storm conditions, such as occurred in January 2012. Many of the faults in storms are due to distribution system faults, which this spend will not address.

The John Muir Trust understands that the transmission (high voltage) grid needs to be looked at and some substantial work will be needed. However, the Committee may wish to consider whether it is financially appropriate to justify transmission reinforcements based on an assumed power output from wind generation higher than the probable median value i.e. on over-inflated estimates of grid capacity need. Whilst this is a UK regulatory matter – the results of poor decision-making will impact on Scotland with regard to our environment and economy, including tourism.

Q. *Are our universities and research institutes fully geared up to the need for technological development, innovation and commercialisation?*

**A.** There is little incentive to bring innovative development forward under the current Renewable Obligation Certificates (ROCs) system. It encourages mature, fairly inefficient wind developments - contrary to the intention when ROCs were introduced as a method of getting new technology from R&D into commercial-scale production.

**(b) Supply chain and infrastructure**

Q. *Is the supply chain in Scotland in place to meet the targets?*

**A.** Due to size of turbines and scale of wind developments, most turbines will be manufactured abroad. So any jobs are in construction. There are few jobs in operation – as one landowner said, it’s “employment-lite”.

Q. *What further improvements are needed to the grid infrastructure or heat supply networks both at a national and a local level? Additionally, are we confident that the necessary infrastructure can be developed and financed so that Scotland can export any excess electricity generated to the rest of the UK and/or the EU? What is the role for the Scottish Government here?*

**A.** As stated above, the Trust does not believe over-engineering the grid will achieve an efficient and economic electricity system and it will excessively burden the country. Asking the transmission industry whether £7 billion must be spent on transmission in Scotland by 2021 is like asking a road haulier whether a motorway to John O’Groats is
needed - explaining that the cost will be taken indirectly off consumers; the asset of the road will be handed over to the haulier’s company and he will receive revenue from others using the road. In both cases, the answer will be “yes”.

(c) Planning and consents

Q. *Is the planning system adequately resourced and fit for purpose?*

Environmental assessment of transmission projects - a duty split between Scottish government & Ofgem

A. The Trust does not believe the National Planning Framework 2 (NPF2) or Scottish Planning Policy have delivered a system which is fit for purpose in relation to energy and transmission projects.

There is a serious problem with the NPF2 regarding the assumption that “need is assumed proven” if a development is included in the National Developments in NPF2. Worse still, in the case of transmission all eleven transmission proposals in Scotland (as provisionally agreed by Ofgem), were included as one National Development. Lumping all transmission into one proposal and because, at that time, the proposals were extremely sketchy led to a very minimal Strategic Environmental Assessment of these grid developments. Now, however, the “need” for them is assumed to have been proven – despite any changes in the interim in economic and technical considerations, and with almost no significant environmental scrutiny. It is now not competent to make a substantive challenge to planning consent. So Ofgem was almost the sole arbiter as to whether these projects proceed. This is unacceptable.

Ofgem has both an economic and environmental duty. There is little sign of Ofgem having done the required environmental assessments for the transmission projects in the NPF2 National Development - although it has a specific duty under the Electricity Act. Whether Ofgem’s attention to all aspects of its role as regulator is adequate is a question which needs significant UK parliamentary scrutiny but it is also very important to Scotland. Despite these omissions, when such projects come to be consented by the Scottish Government, there will be no ability to interrogate the assumptions behind these projects. The combined Electricity Act and planning process system of consent tends to downgrade the planning role for energy and transmission projects.

Q. *How can national priorities be reconciled with local interests?*

A. National targets can be used to over-ride almost any other material consideration – and they are. It is the John Muir Trust’s assessment of the planning system that decision-making continues to grossly over-estimate the contribution to GHG reductions; over-estimate the economic and social benefit and under-estimate the national and local environmental adverse impacts, when assessment is made as to whether to consent large-scale onshore wind developments.
(d) Access to finance

Q. Will sufficient funds be available to allow investment in both the installation and the development of relevant technologies? What can the Scottish Government do to influence this?

A. In the end, this money comes from us – the UK consumers. To spend excessively on energy infra-structure is like saying, “we’re going to spend another x billion on NHS” – it isn’t good news but is more of a burden on consumers and taxpayers. Often it is reported that foreign companies are “investing” millions in Scotland but how much of that is UK public money leaking abroad and a proportion coming back?

Q. What will the impacts be on consumers and their bills?

A. The reason that the Minister for energy can say about energy policy costs that “it’s only £15 per household” and others can say “it will cost £15 billion in 2020” and they can both be true is that the costs are going to stack up heavily in future years and are spread amongst many, opaque subsidies and taxes, split between business and households throughout the UK.

(f) Energy market reform and the subsidy regime

Q. Are the reforms of the energy markets and subsidy regimes at both UK and EU level sufficient to meet the challenge of the Scottish Government’s renewable targets?

A. This presupposes they are aiming in the right direction which the Trust does not accept.

Conclusion

Need for a National Energy Commission

Many engineering bodies, e.g. Institute for Engineers and Shipbuilders In Scotland and the Institute of Mechanical Engineers, are calling for an independent National Energy Commission to look at the technical and economic aspects of current UK and Scottish policy and to consider the viability and costs of both energy production and transmission.

The UK has a system which is called a competitive market but which is heavily subsidised in a number of ways which skew decision-making. The Renewable Obligation encourages speculative applications for very large onshore wind power developments in sensitive, remote, environmental areas and diverts resources from better alternatives. It has led to energy companies farming subsidies rather than running an efficient business.

The current system of electricity supply and Ofgem’s regulation may not adequately protect Security of Supply and will also excessively increase consumer bills. This will, in turn, impact on the economic performance of the UK.

Helen McDade, Head of Policy
John Muir Trust
2 March 2012