SUBMISSION FROM BRUCE MCINTOSH

I do not believe the targets as set out for 2020 to be possible in any realistic way. In particular the target of 100% of Scotland’s electrical needs being covered from renewable sources is ill advised in the extreme. Also in reality, there will be little or no saving in carbon emissions.

Electricity - Targets and the Costs – The next 10 Years.

If Scotland was a totally isolated country its main renewable power source would be hydroelectricity which could look after 10% to 15% of its own demand in a totally clean and reactive way. This has effectively been the case for many years. Biomass generated thermal/electrical power from wood and rubbish waste burning could look after 3% to 5% of our demand, but would be difficult to expand further without importing wood-chip, or energy crops grown elsewhere, which would adversely effect its green credentials.

Tidal, Wave and Solar power outputs are very small and experimental. Taken together they will contribute much less than 1% of our power for the foreseeable future.

Then we come to Wind power – the least understood of all the newer technologies. On the face of it, it seems that with 3 GW of capacity operational, Scotland could theoretically already provide 20% of the kilowatt hours that the country uses, but in practice this is not possible to use anything like this just in Scotland. No modern Grid system faced with the unpredictability and above all the concerted variability of wind energy as it is delivered by our weather, can cope with more than about 7% or at the very most extreme perhaps up to 9% of its electricity being sourced from wind.

So in real national terms a maximum of about 30% of our power requirement might possibly be predicted to come from renewables in 10 years time, compared with about 20% now, and most of that would still be from hydroelectric.

The trick of course is to count in exports of renewable energy (whether they have much value or not) and balance those against essential imports of conventional power required to keep the lights on. Having a very much bigger, cooperative neighbour, such as the rest of the U.K, is ideal in this respect.

Scotland has always done this very successfully with hydroelectricity, which is extensively used to cover short term peak demands in Britain as a whole, and because of its inherent flexibility, provides electricity at the right time and thus commands a high value per kilowatt hour. On average however it only represents about 2% of demand.
Wind power on the contrary provides, in commercial terms, very low value electricity, or in some cases electricity that has no value at all, and may have to be shut down for periods to avoid damaging the Grid.

In a recent article in the Herald (16/02/12 page15) Anne Johnstone puts it very well –

There is much casual talk “of an independent Scotland exporting its excess wind power to England. But how can we sell what you can’t predict and why should they pay more than their own marginal costs, especially if cheap French nuclear is nearer the epicentre of need?”

The situation however would be much worse than just getting low prices. On an hour to hour basis wind turbines in England, Wales and the North Sea would tend to be at their most active at exactly the same times as turbines in Scotland. Demand centres south of the border would certainly favour their own wind power sources first, and Scottish wind farms would often have to be shut down just when they were at their most productive. So low efficiencies as well as low prices.

If Scotland goes ahead with plans to shut down Hunterston B (nuclear) and the coal fired power stations at Cockenzie and Longannet over the next 10 years – a loss in capacity totalling 4.7 GW – the boot will be very much on the other foot. No matter how many wind turbines have been erected in the interim there will be at least a third of the hours in an average year when wind power will contribute little or nothing, and Scotland will then have to try to import large amounts of electricity from south of the border to cover the deficit. The price demanded for this will inevitably be high – many times the value per kilowatt hour of the electricity we will have been able to sell to the rest of the U.K.

Forgetting the economic difficulties of going flat out for wind power, were Scotland to install 10 GW of capacity by 2020, technical efficiency for the assembly as a whole would certainly fall from 24% now, to about 17% ( Ref 1). So theoretically this would represent about 46% of current Scottish demand, and a somewhat hollow claim could be made that Scotland was producing two thirds of its electricity from renewable sources – even though half of that was being exported effectively at a loss.

As to CO2 savings –These are largely illusory.
The continual surging and slumping of wind power requires the frequent under running of coal power stations, or the rapid deployment or withdrawal of open cycle gas fired power stations to keep the Grid in balance.

When the ‘tail’ of wind power is wagging the ‘dog’ of fossil fuel power stations, efficient operation suffers, and more carbon dioxide is emitted than would otherwise be the case, ending with no net reduction of emissions. This is certainly the experience of both Denmark and Germany (Ref2). They are about 10 years further down this particular road than the U.K., and are now stuck with
only 7% of their power derived from wind, and with no significant reductions in emissions from their power industry.

Who will bear the costs of trying to achieve a renewable way forward? Till recently this seemed to be simply answered – all U.K. users of electricity more or less equally, both directly with additions to their domestic electricity bills, and indirectly by paying more for goods and services originating in this country, all of which also use this more expensive electricity. Any degree of serious separation between Scotland and the rest of the U.K. however is likely to expose a very different situation. Currently about 90% of all investment in renewables is being made in wind power, and more than half of wind power developments are located in Scotland. If the Scots had to subsidise their own renewables, the cost to them would rise dramatically.

It is difficult to calculate exactly, but assuming a current annual figure of about £3bn for Britain’s support of the renewable energy business in all its forms, from all U.K. and E.U. agencies; this equates to £50 per person (or £200 per family.) Were Scots made to support their own renewables this would have to rise six fold to £300 per person or £1200 a year for each Scottish family. A figure which will only increase over the next decade if current plans are followed. Could such an escalation be justified politically, or perhaps more importantly, would investors and the market believe that such high cost would be repaid in the long term?

The Technological Way Forward.

1- Wind Power
In most respects on-shore wind power is a fully developed technology. This, together with the piecemeal nature of its development across parts of the countryside (where low population densities have ensured a relatively easy passage through the planning system), has meant that it has up to the present devoured the lion’s share of investment.

The fact that many politicians and the public at large don’t really understand its limitations is really the only aspect that should see progress over the next few years, leading almost certainly to a moratorium on more building. Ideally this should happen sooner rather than later with Scottish installations capped at about 4GW, and the rest of the U.K. at about 2GW.

Properly off shore wind power however is in the development phase, with much more to be learned about larger blade sizes, component reliability in hostile environments, and the realities of servicing turbines ten miles out at sea. Capacity here should be encouraged to grow steadily up to the 4GW level, and be carefully monitored over a ten year period. World technical leadership might then be gained, providing a platform for valuable exports.
With a combined on shore and off shore input of 10GW by 2020, wind power would probably represent about 4% of the U.K. electricity requirement, and be at a level of penetration could probably be handled by the Grid without too many losses in efficiency.

2- **Tidal / Wave/Ocean flow Power.**
An important area for new innovation with the prospects of developing equipment that produces power in a totally clean and predictable way, and which would be firm renewable capacity, that could genuinely replace conventional power stations.

3- **Energy Storage.**
The one technology which would do most to assist intermittent and unpredictable sources of energy such as are derived from our wind would be electrical energy storage. This would have a large ecological impact on the Highlands since pumped water storage together with a massive increase in power lines across some of the most scenic areas of Scotland is currently technically the best option. (Ref 3.)

4 – **New Atomic (let's call it renewable!)**
The issues with nuclear power are not really technical they are mainly concerned with links with nuclear weapons, and the preoccupation with safe operation. As has been confirmed by a parliamentary enquiry - 90% of our current stockpile of high level waste is derived from the making and decommissioning of nuclear weapons not civil nuclear power. (This is not widely publicised because we're understandably reticent about talking about our WMDs!).

Safety is also not a real problem. The technical safeguards built into modern reactors are scientifically rigorous with many levels of duplication. The record of the industry worldwide over its full 50 years of operation, and especially for the new designs and modes of operation developed over the last 25 years is unrivalled. It has proved itself to be by far the least damaging way, in terms of personal injury or death, or ecological damage, of providing significant amounts of electrical power.

Many environmentalists formally hostile to the concept of nuclear power have in the last 10 years come reluctantly to accept that this is true, and that a major part of a carbon clean way forward lies with new atomic power (let’s change the name back!)

Scotland has the ex-nuclear sites, and the scientists and technologists capable of bringing the new atomic power into reality. Whereas in the past all civil nuclear plants had as part of their remit to provide and support a nuclear weapons programme, this time round Scotland could choose reactors which has no such possibility. Integrated fast reactors (IFRs) for example fed in a closed cycle with former nuclear weapons waste could be argued to be the ultimate reuse/reduce
green approach for dealing with existing quantities of nuclear waste (Ref 4.). If reusing our rubbish to provide heat and power can be classed as renewable, so can reusing and making safer our nuclear waste.

5 – Tourism

Call it tourism or call it the country’s environment – what it has to offer that is different. There is no doubt that the decisions made on renewable energy options will deeply influence how Scotland is perceived in 10, 20 or 30 years time. From all points of view, on shore or close to on shore, wind power developments will have, if unrestrained, a very bad effect on Scotland’s environment.

Every different way forward will have some physical consequences, but there is no doubt that large wind turbines located on shore in the numbers, with the back up required in terms of gas fired power stations and pumped storage to make a significant contribution to our power requirement will be many thousands of times more evident than any other option, which would achieve a similar end.

Visitors and friends from Northern Germany, and Belgium – well used to the sight of wind farms in many parts of their countryside which is already partially industrialised - have expressed their amazement to us that we are degrading our wild and beautiful landscapes in the way that we have stated to do.

Conclusions for the next 10 year period.

1 On shore wind power developments need to be limited.
2 Off shore wind turbine technology has to be carefully expanded.
3 Serious work on tidal flow/wave options needs to be resolved.
4 Serious consideration need to be give to new ‘renewable’ Atomic Power.

Targets for 2050.

Almost anything is possible by 2050, but we’ve made a very expensive, piecemeal and poorly thought out start to date, so the sooner we change direction the better.

A probable trebling in demand by 2050 for electricity, with the demise of oil for propulsion and gas for heating, means that even if we wanted to covering the land and sea with wind turbines would fall far short of a solution and would ruin our visual environment.

There is a small place for hydro, wind, biomass and solar, but the future must be given over to reliable tidal and new long term atomic energy solutions for which as a country we are ideally suited to achieve.
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