



Scotland's Energy Future: the Claverton Group's response to the call for evidence

Claverton

The Claverton Group comprises professional energy specialists – scientists, power station and national grid operators, economists, bankers, academics, engineers etc., some of whom have been discussing energy policy and technology for over thirty years. It has grown to over two hundred participants from across Scotland, the UK, the EU, and further afield, and is intended to function as an Information Routing Group and to facilitate Interlock Research.

Introduction and key issues

This paper cannot be considered to be a shared or collective view; by its nature the Claverton Group is unable to provide such. It does however have wide support, in so far as many members don't *disagree* with it. The following will provide evidence and recommendation as to how Scotland can provide for its energy future in a sustainable, secure and cost effective manner.

Which energy sectors offer the best prospects for economic growth and reduced carbon emissions, and how should these be secured?

There is no single solution and all technologies are correct within context.

- Refurbishment and maintenance of existing technologies should be discussed with those companies which manufacture and operate them as a matter of urgency.
- Scotland should look to capitalise upon both existing and emerging technologies and techniques; such may include integration, micro renewables, fuel cells, waste and biomass gasification, tidal stream and tidal lagoons, offshore wind and wave power.
- Research should be targeted towards deployment timing and vice versa, ensuring that investment, in particular inward investment, is not wasted.
- Engagement of local communities in Scotland and the development of their potential for internal investment have not proceeded well to date.
- Concentrating upon those sectors where there is biggest potential for resource and skill development should bring dividends.

What are the hindrances to determining and developing Scotland's energy future?

- A broad approach will be needed, one that is both committed and consistent. Whereas UK policy has tended to lurch from one source of energy to another and from one policy to another over the past half century, this cannot be the case when utilising sustainable energy. Scotland, and Scottish waters, both territorial and those within UK jurisdiction, offer a vastly disproportionate percentage of the entire European sustainable energy resource.
- As has been observed with Enron at an earlier date and with npower recently, energy companies have looked to distort the UK electricity transmission market for their own ends. Additionally, the very different generation technologies projected for use in England may distort the overall market such that Scotland is disadvantaged. It may be that the Scottish Parliament should look to devolve control and regulation of energy to some extent.

What is needed in the short and medium-term, particularly from the Scottish Parliament and the Scottish, UK and other governments (such as the EU), to deliver Scotland's energy future?

- Full devolvement could include all primary and secondary energy sources: oil, gas, forestry, electricity and those waters managed by the Crown Estate, particularly those waters outwith the 12mile limit that are considered to be within UK jurisdiction.
- Partial devolvement should at least mean the gas and electricity markets – OFGEM – and then close co-operation with the Crown Estate, ensuring the potential for sustainable onshore and offshore electricity generation and transmission is maximised.
- For electricity and Combined Heat and Power (CHP), a Renewable Energy Feed-In Tariff would not reduce risk, but would remove uncertainty. A feed in tariff may be incompatible with the Renewables Obligation for larger projects, but should work well as a separate



entity for smaller projects on local scales, with the added advantage that individuals and communities will own and receive the benefit of them. It is not recommended that Scotland move away from the RO entirely; European FITs are intended to move towards an RO type system over the coming decades.

- A FIT may not be necessary in that a Supply Obligation, similar in concept to the MSO, would increase penetration of smaller sustainable projects, though perhaps without the increased benefit to communities unless it resembled a FIT in many respects.
- An alternative to an RO/FIT/SO would be to scrap the complexity of all existing emissions schemes and methods of funding. Each government mechanism would correct only one market failure, with a separate mechanism dealing with research, development and deployment. The interaction between the various mechanisms should then reveal the optimal solutions that take account of the various market failures. If understanding of a single market failure changes this can then be more easily taken into account.
- Scotland should not look to meet the UK's or Europe's energy needs at the expense of itself or remaining dependent on fossil fuels; collaboration should be sensible for all parties.
- A concept mooted at UK level is a personal carbon allowance. This effectively taxes fresh air, unfortunately not in the way proponents would like. It is recommended that Scotland does not consider such a measure.
- For thermal projects, it may be that grant funding is the only way to continue the rapid and vital progress which has been made to date.
- In the transport sector, EU directives on vehicle CO₂ emissions have been very effective, such that in the last year car manufacturers have introduced a raft of technological advancements, increasing fuel economy by an average of c10%. This does somewhat beg the question of why they did not do so beforehand.
- Learning from the transport example, it is important to note that legislation can prove a determining factor in levelling the playing field for companies; for reducing economic and competitive uncertainty where techniques and technology are already available yet are not presently used. This is of particular relevance to the building sector and is discussed more extensively in the following section.

How can demand for energy be reduced in Scotland?

Building stock has a turnover of half a century at least. It is difficult to stress just how important decisions taken now could be; implementation of best practice not exceeding excessive cost in this area could have profound implications in the coming decades.

- Private firms operating in this sector naturally look to maximise profit, therefore by setting the highest standards of planning and implementation, particularly in domestic dwellings, the Scottish Government can provide a level playing field while ensuring maximum energy conservation and minimising the increasing problems associated with fuel poverty.
- Space heating accounts for c60% of domestic energy use, c20% of all Scotland's energy use. Developing the EU transport example above, the Scottish Parliament should implement a domestic standard such as the German Passivhaus, suitably modified for our climate.
- Once established as a standard, projections for housing stock turnover would allow the Scottish Government to incorporate projected emissions into existing and future targets.
- Passivhaus is given as an example since it is widely used, well known, and requires almost no space heating. If a similar standard were to be a Scottish requirement, price increases to newly built homes could and should be limited to less than 10% across the industry.
- Such costs would be initially associated with training; during the current global economic hiatus firms may welcome the opportunity to offer core staff or new apprentices additional skills (particularly were this to have specific funding).
- For the home owner and/or occupier, the intrinsic value of a property which requires no space heating is obvious, particularly in volume housing and housing for the elderly.
- The comparative value may increase very rapidly in the coming decades, as detailed below.





How can the energy sector deliver the kind of reductions in greenhouse gas emissions that the Scottish Government wants to see?

Please note that this section deals *only* with greenhouse gas emissions.

- It must be noted that the European Pressurized Reactor, if ordered in the correct configuration, can be 'throttled'; controlled to provide variable output, in much the same way as Longannet or Cogenzie. This is not the case with Hunterston B or Torness, and may be an important consideration if the grid is not of sufficient strength to cope with intermittent sources of energy, or if significant extra demand, such as heating or more immediately transport, were to be placed upon existing infrastructure. An alternative 'load balancing' strategy is detailed below.
- Equally, it must be noted that the use of nuclear fission (to some extent) may be the only way to provide enough energy for Scotland's needs, in a way that is acceptable to the Scottish people, as transport and heat energy move towards sustainability.
- The rapid development of Battery Electric Vehicles and of Plug-In Hybrids (internal combustion or fuel cell), occasioned by advances in battery technology, may put additional strain on the electricity grids. Penetration of these technologies will come with a very welcome benefit however. Sustainable electricity deployment requires the need for more complex load balancing than at present, for which a large amount of BEVs and PIHs, connected to properly adapted charge/discharge points, would be eminently suitable.
- 'Smart' meters, combined with 'smart' appliances, offer the same opportunities for load balancing from the demand side only. They would complement charge/discharge vehicle points very well, and may be deployed faster, although their impact is far lower.
- Carbon Capture and Storage – CCS – for coal is currently available only as part of the Integrated Gasification Combined Cycle generating process. Post-combustion capture, such as would seem to be needed in Scotland, is still being researched. Coal consumption using CCS increases by at least 20% due to the associated parasitic losses. While development of CCS may proceed well and at pace, it is recommended that at present neither energy nor emissions policy in Scotland be based on uncertain assumptions.

How can energy supplies be secured at a price which is affordable?

A standing joke in the energy industry is that post-privatisation investment in infrastructure moved from 'down-sizing' to 'right-sizing' to 'cap-sizing'. The implications of this humour and the volatility and uncertainty in fossil fuel prices lead to the conclusion that during the next decade we may have to redefine what is considered affordable.

- Sustainable energy is not sustainable on price at present; higher fossil fuel costs mean that prices to the customer in some sectors are converging rapidly.
- The least expensive sustainable electricity and energy option is forestry in Scotland, but its use comes with some extremely important caveats given its limited nature and its propensity to even greater price volatility than fossil fuels if used unwisely.
- Nuclear fission, used in certain ways, can be considered sustainable. Both fission and onshore wind could be said to have similar overall costs, though not similar economics.
- Onshore wind should be developed as quickly and as widely as possible while offshore projects falter. Engagement of local communities is vital.
- Offshore technologies are presently limited by the ability to deploy them – this is very much an EU wide problem, and somewhat ironic given Scotland's expertise. At present such expertise could only be employed with the co-operation of companies – Shell, BP, GE, Vestas etc. who may wish to use expertise from elsewhere, or choose not to invest at all.
- Further, there is a geographical division between rural and urban areas in Scotland, more pronounced than for most of the UK population. Energy use – fossil or otherwise – is different in both instances, and must therefore be addressed differently
- In any area without mains gas it is already less expensive to consider sustainable fuels for space and water heating; overall it is not yet less expensive including capex.





Rural	Urban
<ul style="list-style-type: none"> • Biomass is an inexpensive but extremely limited resource that must be used with great care. High efficiency thermal systems are available for use in rural areas, and are to be preferred to power stations unless they are used for CHP. It is recommended that any such CHP stations have a significant mandatory heat output • Depending on the colour of diesel appropriate for the vehicle, local biodiesel manufacture and use may offer significant savings. This can be easily facilitated either individually or by means of a co-operative • Micro renewables are appropriate, especially since the housing stock in rural areas can have a very diverse mix of new and very old property 	<ul style="list-style-type: none"> • Biomass systems should not be used directly – at least in any numbers – within urban areas due to particulate emissions • District heating schemes, using gas CHP and piped hot water, may be considered • Micro renewables, providing heat, electricity or both, may be appropriate, though effective sites are less common • Local biodiesel manufacture is easier in urban areas due to the proliferation of waste oil sources. Paradoxically it is less likely due to acceptance issues and lower pump prices for fossil diesel • Infrastructure for energy distribution within urban areas is highly developed, it is also more expensive to upgrade • Efficiency can be the least expensive option

- It is evident that the quantity of energy is not so much of an issue within the Holyrood remit, but rather getting it to where it can be used by the majority of the population within Scotland, the UK and elsewhere. This implies necessarily high infrastructure investment.
- Please note that the above assumes the continued availability of natural gas at bearable prices. The UK will be importing 90% of its natural gas requirements by 2020, potentially leading to security of supply and balance of payment issues.
- Replacing natural gas will (eventually) mean looking towards building far greater sustainable generating capacity (forestry and other biomass would be insignificant in this instance), and then either one of two things – shifting supply to the electricity grid or conversion of the energy to hydrogen or CH4 and then using a modified or existing gas distribution network. At that point in time any investment already made in buildings' energy efficiency will necessarily be paying for itself many times over, hence its importance right now.
- A Scots biologist – J.B.S. Haldane – detailed the first ideas of the sustainable 'hydrogen economy' in 1923. In fact the energy carrier or storage medium is not important, whether it be batteries, pumped hydro, hydrogen, methane, ammonia, methanol, butanol etc.

How can economic benefits from Scotland's energy industries and the development of clean technologies be maximised?

- It is the system – both technical and commercial – that makes things work rather than individual components of such a system.
- Market economics work well and have their place; it is likely that the sustainable production and use of energy will lead to greater use of co-operative and/or semi co-operative models as specific localities look to benefit from their own resources.
- Specific energy technologies don't matter so long as they are used correctly; rather it is the people who use, own, design, build, operate and maintain these technologies.
- Develop the people; enable those people to develop the necessary technology and industry.

Conclusions

The Claverton Group cannot, by its nature, provide a response which everyone agrees with. Putting more than 200 energy industry people into a (virtual and occasionally real) room leads to only one guaranteed outcome – argument. Thesis plus antithesis should equal synthesis; occasionally it leads to a flaming row. This paper is, so far as is possible, synthesis. Equally, some of the points and recommendations may seem familiar. Brief perusal of the Claverton members list will show that it would be surprising if this was not the case.

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