As I stated at the beginning of my evidence, the main points that the Engineering Institutions wanted to convey were that in developing Scottish generation policy we needed to ensure:

- Quantitative understanding of the various risks to delivery of the policy, particularly in the technical area
- Quantitative understanding of the impact of intermittent generation on security, reliability and emissions
- Skills associated with delivery of the policy were developed such that the Scottish economy would benefit, particularly in the world energy market

I referred to the issue of intermittency. During my evidence to the Committee we discussed the need to understand to what degree reduction of CO$_2$ would result through the deployment of renewable generation sources, particularly with reference to the need to provide balancing generation to cope with intermittency associated with some renewable resources. This balancing generation may be needed for varying periods, including short-term over hours, and longer term over a number of days or weeks.

At one extreme, if such balancing generation can be based on, for instance, stored energy generation, or hydro, there may be little or no extra carbon emission.

If intermittency has to be managed mainly by thermal generation using high carbon emitting sources, such as coal, without CCS, or gas generation plant operating at low efficiency, it is important we know and understand what the impact will be on reduced carbon targets. At the extreme, the resulting overall emissions from a combination of renewable sources and inefficient or high carbon sources deployed on the margin for balancing, it potentially could exceed those which might be generated from conventional carbon-based plant such as CCGT. However, it is unlikely that either extreme will be reached. It is important quantitatively to understand the potential outcomes, and that associated with the various policy options.

This applies obviously whether the balancing plant is located within Scotland, or is elsewhere, and if importing, the sources of the import generation understood as marginal plant on other systems are often the least efficient and may have higher levels of carbon emission.

In my evidence I was underlining these points referring to the need to have, and to develop, more detailed **quantitative** assessment for this balancing generation as the Scottish generation policy is implemented, to ensure expected targets are achieved.
I referred to a published paper by Udo which was a passing reference to a piece of work which illustrates one view of published data from the Eire system. It is useful in illustrating the type of debate that is on-going, but not necessarily definitive. There are also other views which suggest that Udo’s conclusions need to be looked at further.

Amongst other issues, we have discussed the issue of intermittency with the Office of the Chief Economic Adviser. We know that this is one of the issues that will be addressed in the near future, and the Institutions will work closely to provide such assistance as they can on points of a technical nature to ensure we arrive at the best available quantitative conclusion based on evidence and engineering.

We would like to thank you for the opportunity to provide evidence to the Committee. The professional Engineering Institutions look forward to continuing to work with you, to assist in providing engineering input to this complex debate.

Debate illustrations:–
Udo Report: http://www.clepair.net/IerlandUdo.html

Alternative Views:
http://www.awea.org/blog/index.cfm?customel_dataPageID_1699=9958