

1. This response concerns electricity transmission and the likely changes in requirements arising from remote and variable renewable generation. The response relates principally to questions of capital expenditure for new grid development, but also to rationing of grid capacity between generators.
2. New renewable generation in Scotland is variously estimated from 6GW capacity upwards. A National Grid spokesman is quoted: “the queue for grid connections is now 10 years long” and “we are dealing with is an extra 16GW of connections, or 200-250 requests”.
3. The transmission implications of such new renewable capacity (mainly wind) are substantial. The Beaulay - Denny 400 kV double-circuit line is likely to be the first of many such lines which would be needed through much of the length of Britain. I estimate about five such lines (or the equivalent) would be needed by 2020 on stated assumptions (details available on request).
4. The size of this transmission problem, and the environmental questions it raises, is exacerbated by the variability of wind power. The grid must cater for capacity, but average power generated is reduced by a capacity factor owing to variability. That is likely to be about 0.25 (by latest DTI historical figures) or perhaps over 0.3 (by unproven wind industry claims).
5. The balance is to be provided by bulk back-up, mainly from fossil fuel, with the net effect of seriously limiting the potential of wind power to reduce greenhouse gas emissions, and possibly, in the event of replacing nuclear power, actually to increase them compared with what they otherwise would have been. While Ofgem may be constrained by government energy policy, it should be aware of these limitations when having regard to environmental factors (both local and global).
6. The problem for transmission arising from generation variability could be overcome, at a cost, by wind power being used partly for generation and partly for producing hydrogen to be used as back up. Transmission charges may be a means to encourage such a move.
7. One way of moderating the excessive demands of wind power on transmission would be a form of rationing the allocation of grid capacity. Typically 10 GW of Scottish wind generating capacity might produce 2.5 GW to the grid, yet on rare “good-wind” days it may exceed 9 GW which would create unusual, uneconomic and excessive demand for grid capacity. If wind generators were constrained so that the total wind generation in a geographic zone (such as the north of Scotland) were limited to, say, 50 % of their combined capacity, this would reduce the extra grid demand by almost half. At the same time individual wind farms would often be able to produce nearer to capacity, while also having an incentive to produce their own benign back-up.
8. My over-riding concern is that the TPCR should be cost-reflective, and not further subsidising remote wind farms. It is not in the interests of consumers or the environment to have “stranded assets” arising from speculative or uncertain grid development.
9. Chapter 4 discusses cost and the interaction between the three electricity transmission companies. In the course of the Beaulay - Denny proposals, the prospect of undersea DC cables from the Hebrides to the Mersey falls between the parties. It would be in the UK interest that these ideas, once heralded by Energy Minister Brian Wilson, are properly and thoroughly considered, taking

full account of transmission losses. In such consideration of cost, such an undersea cable should be compared, not with alternative connection of wind power in the Hebrides to the nearest point of the grid in Scotland, but with the full implied reinforcement of the grid from northern Scotland to (roughly) central England. As it is, it seems there has almost been a comparison of deep with shallow grid reinforcement, which would obscure the financial advantages of long distance undersea DC cable to the longer term reinforcement of the whole grid. The price control needs to find a way of overcoming this issue being lost in fragmentation into three companies.

10. Ofgem may be aware of the widespread concern over the environmental impact of the Beaulieu - Denny proposed upgrade. Chapter 4 mentions considering costs and environmental benefits. This is a difficult comparison, particularly with regard to the unknown impact on tourism and on the unique quality of the Highlands and Islands. I am not sure a simple cost-benefit analysis could be very helpful. It will be important to consider the scale of potential development in the medium to long term (2020 to 2050) when considering the approach to price controls in the short term, and particularly the prospect of undersea cables providing some alternative in the broader picture.

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