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Briefing

Pylons and Power



**Cyfeillion
y Ddaear
Cymru**
**Friends of
the Earth
Cymru**

Friends of the Earth Cymru has commissioned research demonstrating that underground electricity connections can be made to mid Wales wind farms far more cheaply than suggested by National Grid. There would be very little change in performance from overhead lines. This means that Friends of the Earth Cymru supports the principle of placing underground much or all of the electricity transmission works to proposed wind farms in rural Wales.

Pylons and Power in rural Wales

Rural parts of Wales have long had more than their fair share of electricity transmission infrastructure. Until 2010, Snowdonia National Park, for example, had the unenviable status of hosting more high-voltage overhead power lines than every other National Park put together. Most of this infrastructure has been in place since the 1950s, when the Central Electricity Generating Board had a carte blanche to install intrusive infrastructure in almost any location in order to transmit electricity as cheaply as possible.

Although times have changed and there is far greater institutional awareness of the importance of landscape to people and communities, National Grid has demonstrated a dogged reluctance to move away from its inherited practice of using large, highly visible infrastructure. The landscape impact of transmission infrastructure relates particularly to the transverse nature of overhead lines: they run in long sections across the landscape and are supported by large metal pylons at irregular intervals.

But there is an alternative: placing transmission lines underground. Friends of the Earth Cymru has commissioned research that shows that National Grid typically over-specifies the transmission links that connect electricity generating infrastructure to the grid. This in turn raises the cost of placing these links underground and renders them much less attractive in a traditional cost-benefit analysis.

Friends of the Earth Cymru supports the principle of placing underground much or all of the electricity transmission works to proposed wind farms in rural Wales.

In relation to the current wind farm proposals in mid Wales, the capital and life-time costs of an underground link could be reduced from around the £600 million estimated by National Grid in their initial consultation to £300-390 million.

The technical detail

Examining data from a group of wind farms in southern Scotland, we have shown that the link to mid Wales wind farms proposed by National Grid is an over-specification that would result in several hundred million pounds of unnecessary expenditure. Given the relatively high costs for the under-grounding of

transmission links Friends of the Earth Cymru suggests that cost reductions of the order estimated could facilitate a decision to place underground much or all of the transmission links. National Grid should conduct a thorough reappraisal of both the options for placing transmission lines underground and energy storage.

National Grid propose two circuits, both exceeding the installed capacity of the wind farms, which results in very high link costs - particularly for the underground options. The high-voltage, direct current (HVDC) option is specified at 2 GW (2 x 1 GW circuits). Yet this 2 GW link, estimated to cost in excess of £600 million, would connect about 700-870 MW of schemes at most whose output would average about 240MW over a typical year. So the 2 GW HVDC link capacity option specified by National Grid would be at least seven times greater than the average output of the wind farms. A relatively small percentage of energy produced by wind farms annually is generated at high outputs (it may be that less than 10 per cent of annual production would be generated at more than 66 per cent of installed capacity, or above what one circuit might carry).

Similarly, the costs for installing alternating current (AC) underground cables (e.g. 2 x 1 GW circuits) would also be high and presumably even pylon capacity may be over-specified to a degree that significantly changes the scale, height, cost and visual impact of overhead lines.

Our research indicates that a 1 GW HVDC link (2 x 500 MW circuits) could transmit all of the power generated by 870 MW of wind turbines. Failure of one circuit in this two-circuit 'link' (of combined capacity just exceeding the installed capacity of the wind farms) may not result in a significant reduction in power transmission, depending on the reliability of the technology and duration of the outage. An outage would not directly affect the electricity supply to consumers as the link affected would be to the grid. If one of the circuits were to fail for a period of four weeks, we have estimated the value of 'lost' production for an 870 MW wind generation supply to be about £1.2 million, or £30 million over 25 years. The overall cash saving during this time period over the option suggested by National Grid is £220 million.

Integrating an electricity storage facility into the transmission link could help reduce lost production during circuit outages. Even if the storage facility cost as much or more than the value of the lost production (£30m over 25 years) the benefits to the system such as demand-responsive power and supply smoothing could help justify the investment. Some commercial storage technologies are available for wind energy storage, and several storage schemes are in operation at wind farms globally.

In this instance the storage facility would require a very large capacity to capture more than a few hours' worth of electricity at any one period of stronger winds in an outage period which may last days, and it would therefore be expensive. However, the benefits of having a very large facility available to the national grid would then also be great, in terms of technical aspects and hence potentially valuable.

We have also considered the possibility of a triple 250 MW link. This may be a more cost-effective option because even if two of the circuits were to fail, one link would be sufficient to transmit nearly the average output of the wind turbines in the proposed developments.

The above-ground HVDC sub-stations are highly compact and visually less intrusive than AC equivalents. With some innovative design the facilities could be made to look for the most part like farm sheds with a road access.