

Heat Smart Orkney: Demand response valuation exercise

Why is energy being curtailed?

Orkney is connected to the GB via a 40 MW cable connection through which the balance of local generation and local demand is imported/exported. As renewable generation capacity is much larger than average load, Orkney is a net energy exporter. If the net difference between local load and generation exceeds the capacity of the interconnector, then exported power is constrained by the network to be only that which can be carried by the cable. Currently, in such situations, local generation is curtailed so as to balance the Orkney system. Generators are chosen in for curtailment in reverse commissioning order (i.e. the newest first) and, as wind generation is relatively new to the isles, this always consists of wind generators. Curtailment currently represents a significant loss of revenue for the owners of many of Orkney's wind turbines.

Is there a better way?

If we can control demand, we may be able to use it to balance the system instead of curtailing generators. This could provide a number of benefits:

- it would reduce wastage of renewable energy and thus increase the fraction of energy generated by renewables within the UK;
- it could provide access to cheaper energy for local consumers on Orkney, reducing fuel poverty and linking locals to the benefits of wind turbine development on the isles;
- it would increase the revenue of generators close to the top of the curtailment order and therefore improve the business case for building new (marginal) generators;
- it could help to avoid more costly network capacity upgrades, which would be an alternative solution to the curtailment problem.

The proposition of the HSO trial is to test if residential DR can be used to conduct local system balancing and thus reduce wind energy curtailment. The DR to achieve this is provided via the control (switching on) of residential devices in order to consume the energy that would otherwise have been curtailed. Kaluza's role in this trial is to supply the technology to control residential devices.

Is this sustainable?

During the HSO trial programme, residential consumers who participate will be fully reimbursed for the energy that their Kaluza controlled devices consume. This means that any avoided curtailment will be delivered to wind generators at their normal wholesale value (so effectively for free).

This is obviously not a sustainable solution for the long run as it would not work without significant subsidy. However, if the technology can be proved reliable, there may exist a future where the value of avoided curtailed energy can be split between the three parties involved: the residential consumer, the wind generator, and the DR solution supplier (though the details of such a hypothetical deal are outside the scope of this text).

For such an arrangement to be viable, there must be sufficient net value (after deduction of implementation costs and inefficiencies in the system) to be attractive to all parties involved.