

Electrical Energy Independence for Ireland

We discuss some of the general questions raised on our forum in relation to Spirit of Ireland's Electrical Energy Independence Programme

How much electricity does Ireland consume?

Ireland needs about 70 GWh of electrical energy per day. The amount changes throughout the year and by the day of the week (between 60 GWh and 80 GWh). Annual consumption is around 26,000 GWh. This year the electricity consumption is less than in the previous year due to the effects of the recession. Power demand varies throughout the day and is obviously lower at night time.

Even non-technical readers will find it very interesting to look at information on Eirgrid's¹ excellent website at www.eirgrid.com. There is an almost live graph showing the power demanded during the day updated every 15 minutes. It's like looking into the heartbeat of our nation as we work and rest. It will be helpful to readers to look at this graph in the context of night and day time demands. There is also an interesting time of day graph showing outputs from existing wind turbine plants.

How much Electrical Energy can be stored by holding water in the reservoirs?

A very typical natural valley water reservoir would have a dammed lake area when full of 4 square Km – e.g. average 2Km x 2Km. However there is a small number of larger valleys that would have a lake area of 4km x 4km or greater. Based on studied shapes, depths and height from sea etc. two such reservoirs would deliver electrical energy storage in the range of 200 GWh to 600 GWh. This is truly massive energy store. Built many years ago, The very fine ESB Turlough Hill Hydro storage plant in Co. Wicklow can store only about 1.5 GWh of energy.

As we said earlier Ireland needs about 70 GWh of energy per day. So looking in a simplistic way with no inputs from wind farms or other sources we can see that two reservoirs in isolation could supply Ireland's total electricity needs for between 2 days and 8 days.

¹ Eirgrid PLC is the independent electricity Transmission System Operator (TSO) in Ireland and the Market Operator in the wholesale electricity trading system. EirGrid's role is to deliver services to generators, suppliers and customers across the high voltage electricity system, and to put in place the grid infrastructure needed to support Ireland's economy.

What does Spirit of Ireland mean by Energy Independence?

Spirit of Ireland does not propose to cut Ireland off from Europe's electricity systems. Nor would it be sensible to build a system that makes all existing fossil fuel generating plant redundant.

The plan is to quickly build large-scale wind farms and electricity energy storage so that Ireland hugely reduces cost to the country and becomes a net exporter of electricity (through interconnectors).

With this vision in mind, the Spirit of Ireland team would like to help Ireland achieve a position where the value of electrical energy sold to other markets meets or exceeds the value of fossil fuels imported to produce some of that electrical energy. We would then be cost neutral with respect to Electricity supply and €3bn per year would have stopped flowing out of the country. We would also be Energy Secure such that variations of cost or disruptions of supply have little effect on our economy.

Can Ireland export excess electrical energy produced during periods when wind is higher than normal?

Yes! This is a very interesting feature of both the wind turbine characteristics and the Hydro Storage solution. There are regular periods of high wind in Ireland when the combined wind turbine power outputs will produce more electricity than needed to fulfill even Ireland's daytime demands. Electrical Interconnectors already exist but more and higher capacity connections are planned to the UK and Europe. Daytime green stable electrical energy as offered by our reservoir and wind programme will enjoy a premium price for export from Ireland. In the first phase of the Spirit of Ireland project the net amounts exported would be modest, i.e. we would bring our total annual wind electricity export in balance with our annual import of fossil fuels for generation of electricity by existing power plants.

What happens if there are long periods of negligible wind?

Ireland will be connected to the grids of the UK and Europe through interconnectors. The medium term plan assumes that there will continue to be efficient fossil fuel plants.

If there are long periods of negligible wind, the remaining fossil fuel plants will be in operation and Ireland will import cheap night time electricity through the interconnectors, to fill the reservoirs and use this stored energy to power day time demand.

What about excess wind energy at night time?

On average the wind blows at night as much as it does in daytime but of course the country consumes much less electricity at night. One benefit of this is that our reservoirs keep being topped up, ready for daytime demands. There will be night time situations when the reservoirs are already full and the wind is still blowing hard. What do we do with this extra energy? It is a good question. Exporting energy at night time is theoretically possible but it may not be in demand internationally at this time. Wind conditions can be predicted with good accuracy a few days in advance, and the demand patterns are also predictable. One then needs to manage the inflow and outflow of energy

to ensure that the reservoir has enough energy stored and the import/export patterns are consistent with the daily demand and price fluctuations. Many operational scenarios are possible such as selling via interconnectors during the day and buying when prices are low.

How much storage capacity should we build?

There are many opinions, varying from 1 to 10 days of energy storage.

If there were no interconnectors and no fossil fuel plants, then many experts would suggest building enough storage capacity for all of Ireland's electricity needs for an unusually long calm period (10 to 14 days or 700 GWh to 1,000 GWh). This is also a consideration where strategic reserves are considered essential.

By using our most modern and efficient gas generating stations and interconnectors (built by Eirgrid and privately), we can generate locally and/or buy low cost night time electricity from the UK and Europe, so do not need to plan for full storage capacity for very rare exceptional scenarios.

If Ireland were to maximize profit on the building of Hydro Storage Units, then the answer is to build two facilities of 1GW (1000MW) power with at least 24 GWh storage capacity in the lowest cost location and trade the entire stock of energy on daily price fluctuation pattern. However, if we look at the national interest and not just profit, we may decide alternate operating scenarios are more valid.

Currently the Spirit of Ireland team is engaging with a number of organisations in the Irish Electricity industry to agree what works best for Ireland – our ideal scenario.

How much wind generation power should we build?

There are many options, varying from 2GW to 6GW.

If we were to maximize profit on the building of Hydro Storage Units, then the answer is to build 2 GW (2000MW) of capacity..

If there were no interconnectors and no fossil fuel plants, then the wind generators and storage would need to be sized to cater for peak winter demand (approximately 5GW currently needed, in addition to Turlough Hill).

If we wanted to minimize the amount of wind power not wasted on a windy night time in Summer, then we would build a much larger volume of storage. We could also then facilitate much more wind farming if there is an appetite for such energy harvesting around the country. There are many options to consider. This is being undertaken at present.