

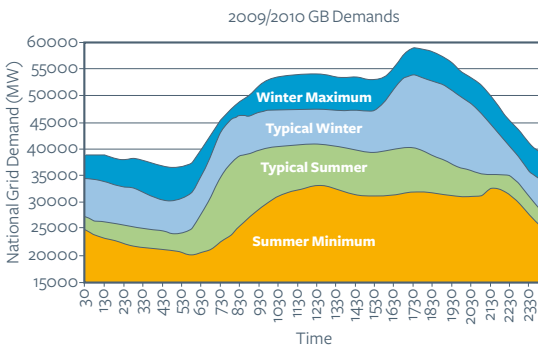
Please don't buy
an Electric car.
Electronic and
Electrical Engineering

Did you know that if 1/3 of us changed our current petrol cars for comparable electric vehicles and plugged them in to charge overnight, then the electricity supply network couldn't cope and we'd either have power cuts or may be told to switch everything off?

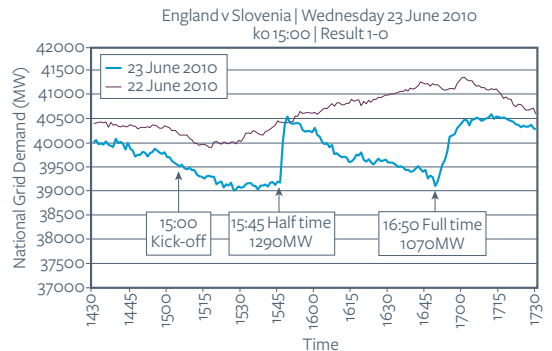
Everyone seems to think that electric cars are the 'green solution'. They don't pollute like petrol and diesel cars and seem so clean. But there's a problem. Currently all our power stations, working flat out, can generate about 70 GW electricity (that's 70,000 million watts) and this figure is dropping as older and less efficient stations are closed down. On a very cold day we sometimes get close to this limit and Ofgem believes that the spare generating capacity available to cope with peaks and troughs in power demand will fall from the current level of 14% to just 4% as early as 2015.

Future electric cars with the performance, capacity and range to be comparable with today's petrol and diesel vehicles will take a lot of electricity to charge (about 8kW each). Imagine 10 million cars all charging at the same time – that's already 80,000 million watts – more than we can generate. We'd have to switch off everything in our houses and keep the power stations all on full power!

Typical Electricity Demand



This graph shows how our demand for electricity changes day by day. The maximum we can generate using all our power stations is about 70 GW (70,000 million watts)



This graph shows how our demand for electricity changes minute by minute and the power stations have to increase or decrease the amount of electricity they are generating to keep up – we can't make extra and store it to use later. Most of this is generated using fossil fuels – coal and gas mainly.

Data supplied by the National Grid.

Can we ever wean ourselves off fossil fuels and generate all our energy from green resources?

This shows how much energy you use each day, ignoring long range transport – a total of 110 kWh. National Grid estimates that if we want to meet all our energy needs from sources that don't emit CO₂ into the atmosphere, we must do ALL of the following things:

- Build 5 new nuclear power stations
- Build 60,000 wind turbines – most of them offshore
- Half of total roof area in UK covered with solar panels
- Re-insulate almost all homes & turn down thermostats
- 1000km of wave machines along the coast
- Flood the Severn Estuary
- 25% of UK's food-producing land to energy crops.



The average energy we each use per day measured in kWh (kilwatthours)

How many wind turbines would it take?

We need 60,000 wind turbines

If we build at 5 per day

This makes 1500 per year

This will take 40 years.....too long!

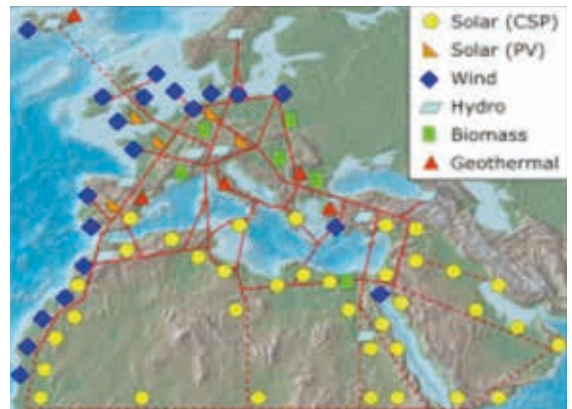
To put up 60,000 by 2025 we need to build 15 per day -> 1 per hour!

The Super grid

This shows how the whole of Europe could be linked to sell electricity generated from solar panels, wind power, hydro-electric and other green forms as the only way to satisfy our demands if we are to wean ourselves off fossil fuels. The problem is that we need thousands of miles of undersea cables to connect all these sources with all the customers.

Engineers at Southampton are currently working out how this could work, including the effect of the cables on the environment and how better cables could be manufactured using new materials. This research will underpin the Super Grid and make a green future possible.

The costs of this sort of major international scheme to remove our current dependence on fossil fuels will be considerable. The Stern Report, published in 2007, estimated that stabilising at a CO₂ level that is as much as 40% above current levels will equate to an annual expenditure of about 1% of global GDP!



<http://virtualcafe.ecs.soton.ac.uk>