nationalgrid

Our energy insights

Electric vehicle announcement and what the papers say

8 August 2017

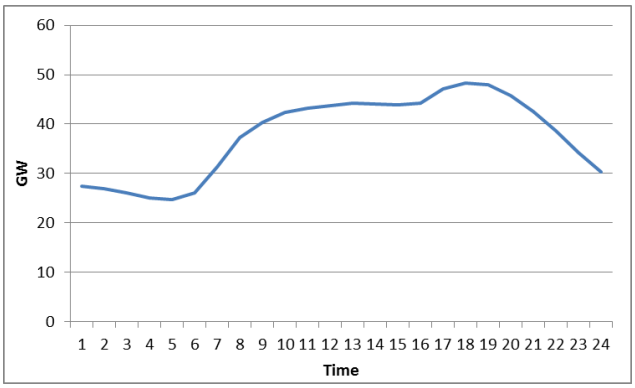
The Government's recent announcement that it will end the sale of all new conventional petrol and diesel cars and vans by 2040 has led to lots of speculation in the media regarding the effects on the energy system. Often National Grid's *Future Energy Scenarios* (FES), which is our analysis of future energy demands, has been cited incorrectly and sometimes out of context. This article is intended to clear up some of the mis-conceptions.

Figure 1 Future Energy Scenarios 2017

What is peak demand?

Peak demand is the maximum amount of electricity required at any one moment in a year. Currently this is about 61 gigawatts (GW). Today's annual demand is 330,000 gigawatt hours (GWh). To convert the annual demand into an hourly demand you have to divide the annual demand by 24 (number of hours in a day) and 365 (number of days in a year, usually) – or 8,760. So today's annual demand is equivalent to a steady 38 GW for every hour of the year. But, as have seen, the peak demand is 61 GW so demand is not steady it is variable and there are peaks and troughs within a day (see Figure 2), within a week and within a year.

Figure 2 The peaks and troughs in electricity demand throughout one winter's weekday



What has the media been saying?

There has been a range of reporting by various publications as to what they believe the impact of the government announcements will be and they have been citing National Grid numbers.

Examples being:
"National Grid said an extra 30 gigawatts of generating capacity may be required so Brits forced to go green can charge up millions of new motors" … "This would mean ten new nuke plants".

Or:

"According to a National Grid report, peak demand for electricity could add around 30 gigawatts to the current peak of 61GW - an increase of 50 per cent"… "The extra electricity needed will be the equivalent of almost 10 times the total power output of the new Hinckley Point C nuclear power station being built in Somerset."

Or even:
"Extra energy needed to power electric cars by 2040 30 GW per year."

What would be the peak demand for EVs in 2040?

Peak demand is when demand is at its highest, typically around 17:30 on a winter weekday evening when homes need light and heat before factories and offices have closed. There must be enough electricity available to meet this demand.

The Future Energy Scenarios are not forecasts however they are National Grid's set of four credible pathways of gas and electricity's demand and supply out to 2050. In each of the scenarios we have modelled the EV peak demand. The range we come up with is between 4 GW and 10 GW.

Which scenario is the best fit?

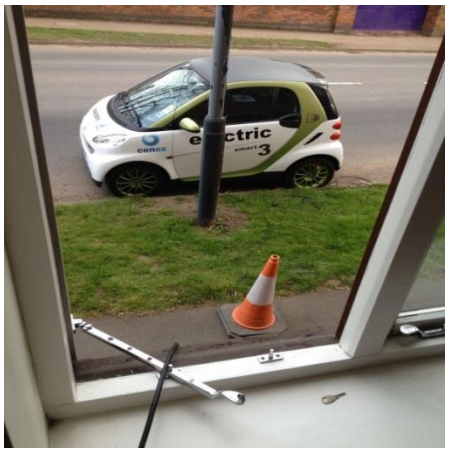
A recently announced government intention was for "nearly all new cars and vans to be zero emission by 2040"[1]. If this aspiration is met then it is likely that our Two Degrees scenario is the more probable. In this scenario most cars are EVs and few of those are hybrid EVs; only 6%. Hybrid EVs contain combustion engines which mean they are also emitters and so we have no new sales after 2040 in this scenario. By 2045 there will be only pure EVs for sale.

In our Two Degrees scenario we see the peak demand from electric vehicles alone being around 5 GW, about an 8% increase on today's peak demand value. In this scenario we make a number of assumptions as we do not envisage the world being as it is now. These assumptions are base around people and government having green agenda.

In this scenario people will be using smart chargers to charge up their cars. The smart element will be inbuilt into the chargers. This means that the chargers will be 'aware' of how much electricity costs every hour of the day, they will 'know' when you will require your car to be fully charged, they will be controlled via the internet, etc. Also we see time of use tariffs being introduced to a greater extent. This is where the cost of electricity will vary throughout the day – the most expensive time is likely to be around peak time. Therefore, with smart chargers, charging will be, where possible, undertaken away from peak time. Why would anyone needlessly use electricity when it is most expensive?

Home charging is probably not always going to be the best or only solution available in the future particularly if one does not have off street parking (Figure 3). Further, if diesel is banned what of lorries, trains, etc? We will be exploring these and other issues in our Thought Piece series.

Figure 3 Home charging may not always be the best solution



Where did a peak demand of 30 GW come from?

Within FES we produced our 4 standard core scenarios, but this year we also produced some analysis on more extreme, but possible, sets of circumstances. One

[1] https://www.gov.uk/government/news/government-gears-up-for-zero-emission-future-with-plans-for-uk-charging-infrastructure

of these is called ‘High EV’. It looked at what the effect would be if all tail-pipe emissions were to be banned by 2040 and EV prices were to fall dramatically. In this sensitivity there would be no petrol or diesel cars on the road by 2040 – and this included hybrid EVs too; their sales will have been stopped in 2025.

In this world there is little concern for broader environmental issues so, for instance, the Climate Change Act 2008 has been breached as global warming is of little concern. Also society is prosperous enough that 85% of people who could charge their cars at peak time, at peak prices, would do so.

Consequently we estimated that by 2046 the peak demand as a result of electric vehicles charging at peak time would be 30 GW. However, as we stress in FES, we see this as an outlier that is possible but not one of our core scenarios.

Would it mean we have to build “ten new nuke plants”?

One of the features of nuclear plants is that they give a relatively constant output. They cannot easily be turned on and off quickly. This means that it is more difficult and costly for them to be used in order to meet these short period peak demands. Ten nuclear power stations, each of 3.2 GW generation, could supply annually; nearly enough electricity to meet GBs current annual demand, or ten times what would be required for the annual EV demand in 2040 for our Two Degrees scenario, or about five times the 2040 annual EV demand in our High EV analysis.

In reality you would not build 10 nuclear stations just to meet the highest half hour of demand in the year. It is worth noting that in the High EV sensitivity, which is the one most often quoted by the media, there are no nuclear plants in 2050. The peak demand is met with a combination of more flexible electricity generation sources with the predominate one being gas.

For this sensitivity and each of our core scenarios we model the appropriate generation sources and these, and much more data, are available in our Charts Workbook.

In conclusion…

The recent government announcement on the ban of new conventional petrol and diesel cars and vans by 2040 has resulted in some of National Grids FES numbers being quoted out of context.

- The scenario which best fits the government’s statement is Two Degrees.
- The additional peak demand from EVs in that scenario is not 30 GW but more likely to be 5 GW.
- The 30 GW often quoted is from our more extreme, but possible, sensitivity called High EV.
- In this sensitivity there are no nuclear power stations by 2050 – and certainly not 10 as often quoted.
- Nuclear power stations would not be the best option for meeting peak demand.

If you have any questions or comments we would like to hear from you.

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