Smart Power, Smart Meters and Smart Batteries

It's time to break the protection racket of consumer savings

This week saw the launch of a new report entitled Smart Power, which investigates the future of our electricity supply. It comes from a new body – the National Infrastructure Committee (NIC), and highlights the hole in supply caused by the planned closure of two thirds of our existing power stations by 2030, providing recommendations on the changes that they believe are required to ensure security of supply.

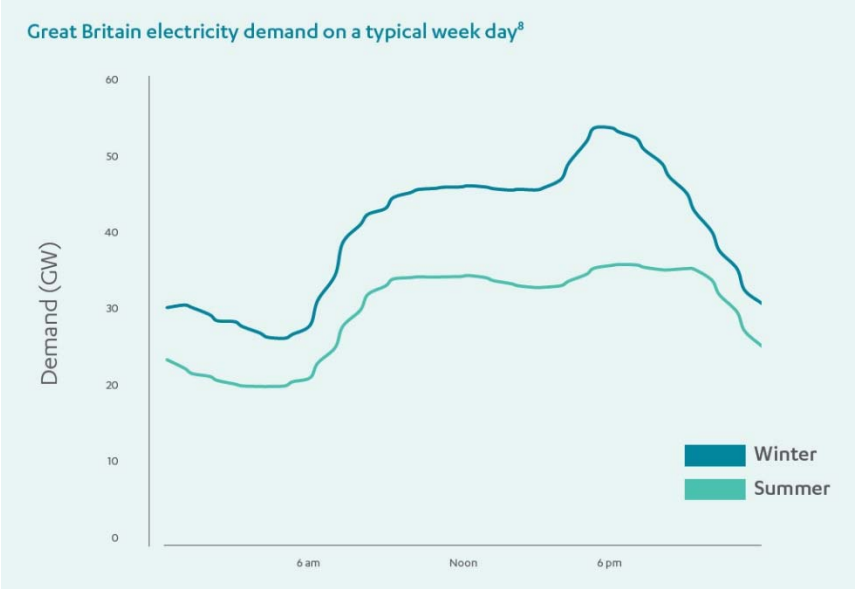
Unfortunately, it's promoted itself using the old trick of highlighting its major benefit as saving consumers money, with the headline press message suggesting it could deliver them savings of up to £8.1 billion per year in 2030.

I wish that the sector could get over its fixation with these spurious claims, so that we can focus on the real problem, which is the lack of a joined up energy policy. The "savings" in this report aren't what a consumer would expect a saving to be, which is lower prices, but instead a potential reining in of cripplingly higher prices which would result from doing nothing. In other words, if we spend a bit more to increase bills now, we might not have to spend a lot more as a result of a further decade of dithering. It reminds me of the protection rackets of gangster Chicago, where shopkeepers were forced to pay off mobsters to prevent having their businesses destroyed. Why the energy sector wants to continue with its amateur production of "The Resistible Rise of Arturo Ui" escapes me, but that's clearly who the commission's chair, Lord Adonis, is modelling himself on. Cauliflowers all round…

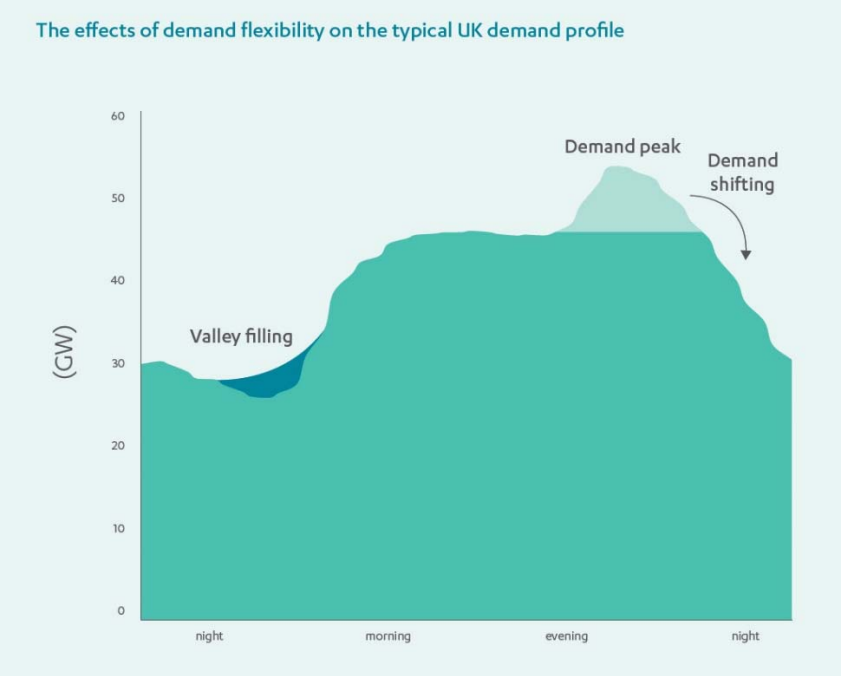
It's a shame they misrepresented the report in this way, as it has some interesting ideas, but it's not clear the authors have thought laterally enough. Part of that is probably a result of limiting their consultation. I missed the call for evidence, and it appears that many others did as well, as the bibliography, which includes the responses to the consultation along with research papers which were referenced, is limited to the usual suspects. It's all very Laurel and Hardy, with reports like this saying "Well, here's another nice mess you've gotten me into", but without realising that to get out of the mess it's helpful to ask advice from those who didn't create it in the first place. Unless they do that we're just going to continue down the route of an on-going comedy double act from DECC and OFGEM.

On the positive side, I was pleased to see a recognition of the importance of moving to a digital network and the value of data analysis in the grid, but this type of discussion needs a much wider constituency of expertise if it is to achieve the goal of placing the UK in a leading position in energy supply transformation.

The report comes to the conclusion that Smart Power – their vision for our future electricity supply, is based on three main principles; Interconnection, Storage and Demand Flexibility. As always, it's the domestic consumer who is called on to provide the demand flexibility, so let's start there. The report lays out its case with the standard graph of British electricity demand:

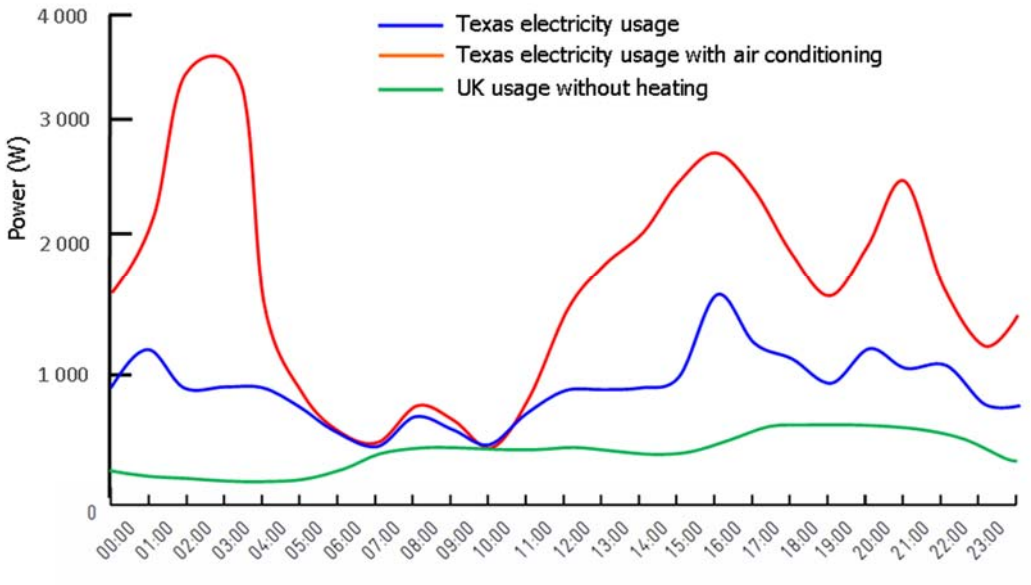


We're then shown the benefits of demand flexibility, where consumers are expected to shift demand away from peak periods by putting off their washing or cooking a meal for the benefit of the grid:



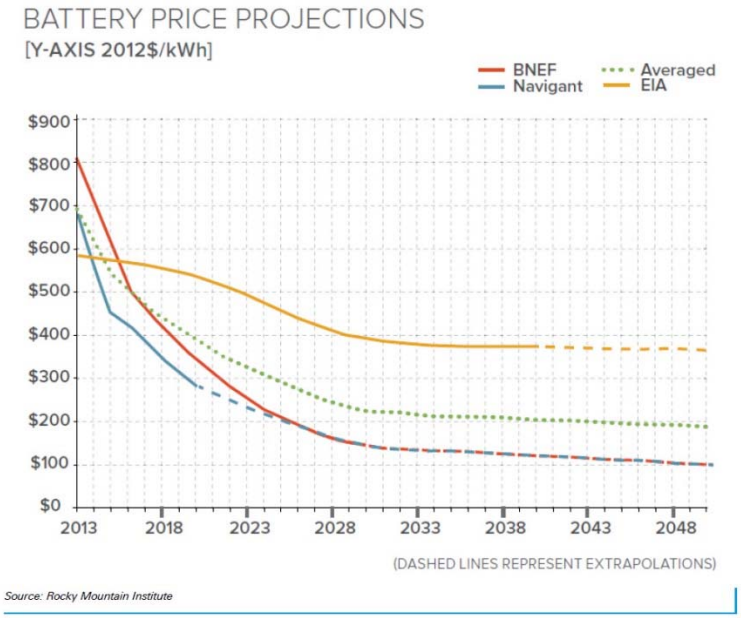
To try and persuade consumers that it's for their own benefit, we get the old story trotted out about using Time of Use tariffs as the stick and carrot, proposing that regulators allow energy pricing to be ramped up to help remind consumers of the excellent job they're doing for the grid by making their lives less convenient, whilst penalising those who won't.

This has been a popular mantra from US and Australian energy suppliers, who have been desperately trying to sell these tariffs to consumers. But, as I've pointed out before, they're living in a very different world. If we compare UK usage for a single home with that in Texas, our demand looks almost flat:

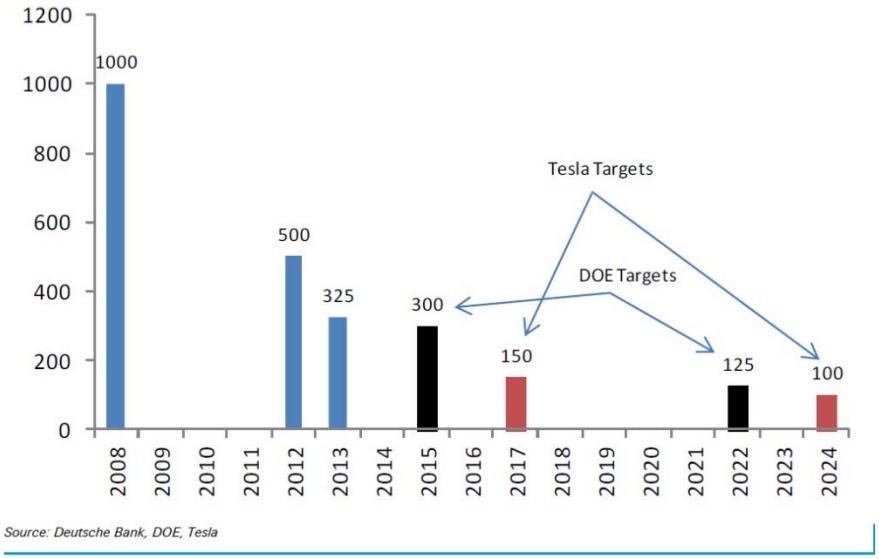


This is not to deny there is a problem to be solved, but it's not the same problem, so it probably doesn't require the same tools. Unfortunately, energy analysis rarely digs down into the detail, instead relying on headline numbers. In this case, the number the NIC has picked up is from the FERC's Assessment of Demand Response and Advanced Metering Staff Report for the US, which claims a saving of over 6% from demand response programs. That figure represents the total savings made, most of which come from industrial demand response. Residential usage only accounts for a reduction of 1.6%. In other words, if you want to use pricing to affect demand, you need to start with industrial and commercial customers. Making life hard for the consumer won't have a great effect on the security of supply, it will just make them even more resentful of their energy suppliers, which is not a positive outcome. But that doesn't stop the NIC report providing another headline claiming that if 5% of current peak demand was met by demand side solutions, consumers could benefit by £790 million. We're back to that Chicago philosophy - just pay the protection money, or the boys will be round with the concrete overshoes. (They've probably already overstocked on concrete for Hinckley C and don't know what to do with it.)

The report is positive about storage and makes some good recommendations. It points out that the cost of storage is falling to the point where it is currently less than $200 for 1kWh. Unfortunately in doing so they misquote a figure from a report by Poyry, which in turn misinterprets a Deutsche Bank report on Solar. Deutsche Bank are conservative in their view of the price of storage, showing the Rocky Mountain Institute's predictions (shown below), where that $200 price point doesn't arrive until 2025. This trick of taking figures out of context and never checking the source material is worryingly common these days. Sadly, it also seems to be the attitude of many of those making policy, who never check for evidence, but just form their opinions based on the soundbites in the executive summary, or, as in this case, the double spread of child friendly pictures which now inevitably seems to precede an executive summary. In that respect, this report pushes all of the dumbing down buttons that will make it appeal to a technically illiterate policy committee. But back to battery prices.



What potentially changes the game from the Rocky Mountain Institute graph above is the arrival of Tesla's Gigafactory, which should come on line next year, with the promise to hit a $150/kWh price point. They've already announced their Powerwall battery for home storage, which provides 6.4kWh at a price of $3,000 ($468/kWh). Organisations like the US Department of Energy have seized on this, predicting that battery costs will fall from their current price of $300/kWh today, to $125/kWh by 2022. (I'll leave you to do the math to work out where the NIC's $200/kWh comes from – how they got that is beyond me.)



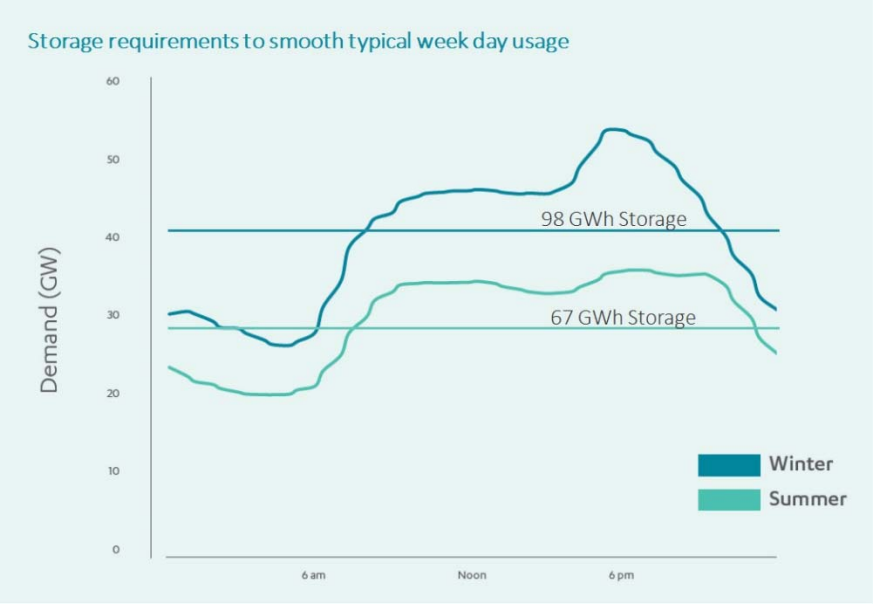
The Commission's third strand is for more interconnect – subsea cables which allow us to import and export electricity from other countries. Interconnect is good. We already have connections to Ireland and the Netherlands, and plans are underway for connections to France, Denmark and Norway. As long as we don't align our time zone with the rest of Europe both we and our interconnect partners can benefit from the misalignment of peak demand. But other proposed projects, such as the interconnect to Iceland seem far more tenuous, as that would require them to build generating capacity just to feed the link, which feels like unnecessary offshoring of generation.

It's probably about as likely to happen as a Kickstarter campaign to build an interconnect with volcanoes at Mordor. Although on second thoughts, I could see that getting funded.

There is quite a bit I like about this report, but it is just another report from another Non Departmental Public Body who are thinking small about big problems. At the end of the day it feels like they're still just rearranging deckchairs on the Titanic. Taking a culinary analogy, most of these recommendations are at the stage of tarting up a British Rail sandwich with a piece of limp lettuce and half a tomato. What the energy sector needs is the transformational thinking of a Heston Blumenthal. Or at least a Jamie Oliver. But there's no sign of any naked mandarins at DECC – other than the 1960s canned orange segments which they bring out to garnish each tired policy they dish out.

So let me offer some more radical thinking based on the NIC report. This may be fantasy, but it could make sense. I'll start with that DOE prediction that battery storage could cost just $150 / kWh next year. Will it happen then? I don't know. But when it does, it becomes a game changer. Moreover, if we plan on how to use storage at that price now, then it will almost certainly be a reality by the time we come to deploy batteries at scale, so let's assume that we can purchase storage at that price.

Once you accept that, you see how timid the National infrastructure Commission suggestions are. If you look back at the demand shifting and valley filling of their demand response graph above, it's only the tip of the iceberg, where they're merely shaving the peak rather than getting rid of it. I sat down and calculated how much storage you'd need to flatten out the energy demand completely.



For the summer demand it's around 67 GWh of storage capacity, and for winter it's 98 GWh.

Rather than deploy this as large storage sites, let's go for a distributed approach and spread this across the UK's 28 million homes. That allows us to make smallish, smart storage batteries at scale. To give us 98 GWh of storage, that would mean a 3.5kWh battery in every home, which is just over half the size of Tesla's Powerwall. That means it's perfectly feasible in terms of size.

If you believe the DOE $150/kWh figure, then the batteries would cost around £350 per home. Add a casing, an LPWAN or NB-IOT wireless link and some metering circuitry and the total unit cost is probably not going to be much more than £410. So if every home in the UK were to have one of

these it would cost about £11.5 billion. For that price, peak demand would be a thing of the past. I'm proposing that this starts with mass deployment in domestic homes, as that would allow the same unit to be made and deployed at scale. Industrial customers can do their own thing on the back of that, based on return on investment and the storage industry would naturally turn to a wider range of commercial offerings once the domestic deployment is complete. Getting the 98 GWh distributed storage out first is the priority.

There are some major challenges in doing this. The batteries need to be connected, so that they can act together as distributed storage. It means they need reliable comms so that they can be remotely controlled. But the UK is good at that. We will also need some advanced data analytics and AI to manage the storage network. Which is another thing that the UK is very good at. Once we've added that to the batteries we get some nice benefits, one of which is low latency metering information, which is something that the our current relatively dumb smart metering programme won't give us. In other words, smart batteries replace smart meters. It also plays to giving network control back to the grid system operator rather than the current fragmented metering approach of leaving it to suppliers and the DCC.

Instead of spending £10.9 billion on a smart metering programme that probably won't do anything other than raise bills, we could spend £11.5 billion on a distributed storage system that eradicates peak demand, gives us a real metering solution fit for the 21st century and give UK plc the chance to take the lead in distributed energy storage and earn that £11.5 billion back by selling the smart batteries and distributed management software to the rest of the world. That feels like a much more enlightened policy. We might not even have to spend £24.5 billion on Hinckley C.

If it is so obvious, you have to ask why it hasn't been included in any previous report? A large part of the reason is that almost all of the analysis of domestic battery storage has been based around its use with domestic solar generation. The companies who are attempting to deploy domestic storage at scale – notable Tesla and Varta, both wrap it into solar packages, aimed at countries with generous solar subsidies or a lot of sun. In an industry which has a very closed mindset, lateral thinking is not the order of the day. Almost nobody has looked at pure domestic storage, although that is a solution which is highly relevant to many geographic areas where solar is never going to cover full home requirements. The UK could very easily take the lead with that.

Critics may say I've not included the future demand forecasts from the NIC report which add in the effect of electric vehicles and more electric heating. That's true, as I think they can be managed independently. Electric vehicles are a storage solution in their own right. Today they impose a peak demand, but that's because their batteries need charging over many hours. That's changing as fast charging capabilities are being developed, which means they can be quickly repurposed between energy sources and energy stores. Those developments will make it easier to plan when a vehicle is charged, so that electric vehicles could become another factor which will smooth peak demand rather than exacerbate it, adding even more distributed storage into the picture. Heating is much less of a problem – in fact it provided the very first demand response solution with Economy 7, in effect being a less efficient method of storing energy.

The only issue with putting these batteries into every home will be finding space, as they are physically larger than a meter, but that's a simpler problem – our utilities are already very good at digging holes, of both the physical and metaphorical variety.

Let me be absolutely clear about what I'm proposing. We stop installing smart meters, because they're expensive and an outdated, 20th century approach to the problem. Instead we put money

into developing smart batteries (which include metering) and then install them in every British home. The overall cost of the two approaches will be about the same. The difference is that smart batteries are an important part of a 21st century smart power solution. Smart meters are not. Will it work? I don't know. But the industry needs to start looking ahead, rather than continuing to look behind.

There are obviously risks in this approach. The NIC report cites a report from UCL and Cambridge University on Delivering future-proof energy infrastructure. It points out the value of "the growing amount of data that is becoming available to system operators (which) can be used to develop innovative energy management platforms that would enhance system condition awareness and facilitate a shift from the current redundancy-in-asset to intelligent-operation-based delivery of security", but warns that "Deployment of new technologies inevitably creates significant risks for the system operators. Risks associated with the application of new technologies and solutions are not fully recognised by the current regulatory framework, and stronger incentives may be needed to make their introduction worthwhile." Or, in plain, non-academic English, "It won't be easy". The biggest risk is leaving this to the incumbents. The current smart metering programme demonstrates their lack of understanding about modern technology and IT. If this approach is to succeed, it not only needs lateral thinking from those planning it, but also those constructing it. It also needs to be secure. A very worrying omission from the NIC report is any mention of security. They talk about security of supply, but that's just having enough generating capacity to keep the lights on. They fail to mention cybersecurity for a digital network, which is an omission so serious that it almost renders their report invalid.

This might be a mad scheme, but it's nothing compared to the madness which has got us to the edge of the energy cliff where we stand today, staring down at an uncertain future of supply. We need to stop putting out soundbites about fictional consumer savings and engage with other industries to see how we might solve the problem we're facing. I'm not a tax-payer funded Non Governmental Public Body rehashing old industry research, I'm just a worried tax payer who thinks we deserve better in our energy policy. These suggestions in this article come for free. Although if anyone wants to raise my status to NGPB and bung me a few million, I'll be happy to provide my bank details. I'm just hoping the lights don't go out while I'm waiting…

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