

A Smart Flexible Energy System – a call for evidence

Response by Paul Massara – Ceo North Star Solar

North Star is one of the new entrants in the market which is seeking to build a business that brings the benefits of a smart grid to individual households and provides aggregated balancing services to National Grid. We are offering a range of products to consumers based upon our Home Energy Management System, which includes a battery, solar, LED lighting and smart thermostat. We are one of the leading startups in the battery storage space and therefore very much welcome this call for evidence.

Points of principle

- 1) We support a more flexible system where storage can be rewarded for its true cost the total system including balancing and connection flexibility.
- 2) We believe that the benefits to consumers (lower costs, lower carbon, and fuel poverty) are considerable but over and above these benefits, we consider that these learnings can be exported to many parts of the world, who will all face the same sort of issues. If we get this right it will stimulate growth and exports of knowhow to the rest of the world.
- 3) More flexible systems will deliver a cheaper, lower carbon and more secure electricity system for the UK and needs to be pursued as a matter of urgency.
- 4) System Operator services need to be adapted to allow multiple smaller domestic batteries to be aggregated without the same level of pre-bidding scrutiny. E.g. At the moment to bid into the EFR you need to show real time that you responded within 1 second. For the case of 1,000s of smaller batteries then there needs to be post event testing to ensure compliance.
- 5) Storage does not need subsidies to come to the market but they do a level playing field and a clear sense of direction from the Government
- 6) Government should support capex free models such as PAYs in order to help those most vulnerable to have access to new technology.
- 7) Ofgem and BEIS need to take a proactive approach to enable the changing market in terms of rules and regulation. As with any disruption, there are winners and losers and Ofgem need to ensure that existing players who may find their business models at risk do not unduly slow the reforms necessary.
- 8) Recover of sunk costs such as Transmission networks, need significant thought, as consumers are unlikely to go totally off grid and will require a backup service. The transmission network needs to be paid a fair rate of return of these new services but the exceptional returns that the transmission network has earned over the last few years should not protected.
- 9) There needs to be greater stacking of revenue sources so that storage can reflect their true benefit (and costs) to the system
- 10) In order to attract finance into the market there needs to be a clear framework for storage. We have already seen how storage can reduce costs and compete without subsidy (EFR and CM) and this will only continue as prices for storage fall, however with a clear framework and long term deals on off, the financing will become more accessible and cheaper, benefiting consumers.

- 11) Storage and solar will become the most competitive energy source over time and regulations need to make sure that any FITs or payments for green energy reflect the fact that i.e. solar or wind energy cycled through storage needs to retain any low carbon benefits. At the moment if solar is put into a battery and then exported it is no longer deemed as solar.

Enabling Storage

- 1) Yes we believe that issues have been identified and assessed.
- 2) Yes we believe that the issue have been identified and assessed however we think that more thought needs to be given the locational price signals for storage. It cannot be that all sites in the UK are equal in terms of the value that storage provides to the system yet under EFR there is no locational signals. In order to make the system as efficient as possible we need a locational element in the pricing for services, which reflects the true cost to the system. This may come with shorter balancing periods and locational pricing.
- 3) We support flexible storage connections which allow storage to stack revenue streams and offer full optionality to the system.
- 4) Yes we believe that network operators should have access to storage to support the system but we firmly believe that storage should not be owned by the regulated entities. We think they the regulated entities should be required to go to tender for storage services, thereby encouraging growth in the market. The risk of ownership in the regulated base would that an asset would be subsidized and would undermine free competition. We don't believe that there is any case for regulated entities to own storage.
- 5) We support the approach you have taken toward regulation. In terms of domestic storage you need to consider what registrations are required and need to ensure that the DNOs provide timely and cost effective connectivity. They need to be encouraged to adopt storage assets and a clear framework for access needs to be determined.
- 6) We support the ESN definition of storage.
We would support either options C or D, i.e. primary legislation that gives storage a clear legal position and allows it to have long term clarity. It should be possible to grandfather rights for existing "generation" storage. The important thing is that we get long term clarity but that we don't undermine its roll out.

The industry has a poor record of enabling code changes especially when they could threaten the business models of the existing players (suppliers, generators and distribution) and therefore we believe that Ofgem will need to take a strong proactive approach to regulation change.

Clarifying the Role of Aggregators

- 7) We agree with the perceived barriers to for aggregators as detailed. We think that they play a crucial role in reaching industrial consumers and partnering with battery distributors such as North Star and therefore need to be encouraged. We think they should have access to the full range of markets but also need to abide by the rules of those markets

- 8) We believe that aggregators should be able to contract with SO and DSO to provide flexibility across a range of markets but they should be required to sign a variation of a supply license (it maybe a lighter version) but the SO needs to know with certainty that the aggregators will turn with the flexibility promised and if not needs to pay the cost of not doing so.
- 9) We don't believe that a voluntary code of conduct is sufficient – there is plenty of evidence in the energy, financial and press markets that voluntary codes do not work and therefore we would prefer that they are licensed and meet consumer protection rules.
- 10) We disagree with the risk to the SO that individual consumers will adjust their habits in real time and thereby risk stress on the system. Much more likely is that aggregators of energy will sign customers up and then manage their load for them. This will mean that they can respond to the price signal from the market which should ensure an orderly market.
Clearly as part of an aggregator getting a license they should have a review of their systems to ensure that they are sufficiently robust for the activities that they are under taking.

System Value Pricing

- 11) We support the enablers detailed – specifically
 - a) Half hourly settlement which will help to price accurately the true cost of flexibility
 - b) Smart tariffs which will enable suppliers to create tariffs for consumers which reflect the cost of flexibility. The reality is that suppliers are likely to provide managed services for consumers – if you sign up to this tariff which enables us to reduce demand or turn it up – we will give you a rebate over the year of x.
 - c) Smart distribution tariffs – again it is important that the benefits for locational balancing and DNO balancing accrue to storage. One criticism of the current embedded benefits review is that it will result in a piecemeal change in benefits – it will reduce some benefits from storage without giving them the additional benefits that could accrue from DNO balancing. This may therefore disadvantage storage and therefore impede its adoption.
- 12) We are aggregating our batteries across 1,000 of homes and then providing those assets to an aggregator to manage. It is therefore essential that we have access to multiple revenue stream and are allowed to stack revenues. We are technically able to dispatch or charge our batteries within 1 second and therefore wish to provide all services that would pay for such flexibility.
- 13) We are not paid for the balancing that happens at the local DNO level – there are no mechanisms yet to reward storage for this function.
- 14) We believe that DSR and Storage should have equal access to all markets based upon their functional capability. For example is DSR or Storage can provide a 3, 5 or 10 year contract in the Capacity mechanism why shouldn't they be able to compete? At the moment the Capacity Mechanism discriminates against these technologies.

Over time we see the DSO and SO roles merging with multiple markets developing for system flexibility. Ofgem, the SO and the Government need to work together to encourage these changes.

Smart Tariffs

- 15) The government and ofgem should enable the market to work and send the right price signals for flexibility but should leave it up to new entrants and the retail market to respond and create new smart tariffs and service offerings.

The most likely changes to happen are that a) consumers will be given price signals and will change their habits on a one off move e.g. I can turn my smart wash machine or dishwasher to come on at midnight and b) that suppliers will offer a managed service for having access to DSR aggregation.

It should be noted that with solar and battery packages, the total electricity bill can be reduced significantly resulting in the energy only being taken from the grid at off peak periods (e.g. economy 10) This could result in suppliers offering fixed bills based upon a certain threshold of usage in a similar way to the mobile networks.

- 16) Government and ofgem should enable but not stipulate solutions. Now that the 4 tariffs rule has gone it is possible for suppliers to innovate and with over 40 suppliers in the market then the government should encourage and enable but nothing more.
- 17) There is evidence from Germany with things such as Sonnen Community energy (where energy is traded and stored between people who have Sonnen batteries and solar) and in Australia with solar and storage packages that may give example.

Again the widespread adoption of batteries and solar will mean that the future of the supply business will be under massive threat as some 30% of their demand is reduced to local embedded generation.

- 18) No I do not recognize the reasons – as new entrants, aggregators and data companies will enter the market if the conditions are suitable. We have already had discussions with 3 national suppliers about rolling out our HEMS product and think that as their market erodes they will have little choice but to adopt these new tariffs.

The benefits of smarter tariffs will also come with more accurate billing, quicker switching, and lower costs on prepayment meters and new IoT devices all of which should provide benefits to consumers.

Distribution Tariffs

We believe a wholesale review of distribution charges is required to reflect the enormous changes that will occur with more embedded generation and storage. This will raise fundamental issues such as how the Transmission Network should recover its revenue as less MW uses it. How the fixed cost recovery of sunk assets should be fairly spread over users including the Fuel Poor who may already be facing rising bills associated with decarbonisation of the heat networks.

- 19) We believe that the distribution charges are not fit for purpose in the new world and need to be revisited. If they are not they risk blocking new renewable generation and storage, and/or creating a death spiral for the networks, where incremental storage is encouraged to join the system as prices per mw increase.

We think that the DNO should move to a TOU volumetric charges which better support the overall smart grid system and pay the right price for connection at the right time of day. These changes will encourage new types of flexible assets such as storage and DSR offerings to customers. These signals and rewards are not present today which reduces the incentives for these types of products.

- 20) See above

- 21) The issue is there today at small scale, but will grow rapidly in the next few years as more embedded generation and storage comes onto the system. This needs to be addressed now in order to send the rights signals to the system

Further changes – over times we see more embedded generation and storage coming on the system, as they combine to give the cheapest form of base load energy. This will have implications for the Transmission network and DNOs, and hence we see the need for a review of distribution charge recovery. In addition we see the SO and the DSO, having to work much closer so we think that the SO needs much greater independence from National Grid, with at a minimum a separate Board and governance structure and potentially a full ISO.

In addition we would challenge the logic of going to longer term regulated periods (7 years) at a time when the industry is going through such a huge transformation, we believe that the transmission system has earned a higher rate of return than it should have previously and that in new world with less usage that return needs to be reduced significantly.

Smart Distribution tariffs

- 22) Yes we think that the changes are likely to be substantive and we see the need for TOUS volumetric charges.
- 23) Yes they can send both short and long term signals. Short term signals will underpin an understanding of the value of flexibility and hence encourage longer term investment in assets.
- 24) We clearly see the need for TOUs charges to work across the whole system from capacity to distribution. There needs to be joined up thinking so that it does not set up perverse signals.

Other Government Policies

- 25) Examples how the existing government policies can hinder a transition to a smart energy future would include:

- Capacity market that does not allow storage and DSR longer auction periods even though both technologies may have longer asset lives.
- The government is still allowing on shore wind, which is cheaper than off shore wind due to political reasons
- The government needs to give longer term clarity over the direction of travel for smart grids and investment, which has been damaged by changes in policies e.g. rapid FIT reductions. In the case of coal closure we welcome the decision and the clarity that this gives.

26) The CM should allow DSR and batteries to bid in to a range of offerings 1, 3, 5, 7 year tenures. If the parties are contractually obliged to deliver the capacity and the underlying asset have been approved then this makes sense. A battery which has a life of 10 years currently can only get financing based upon a 4 year contract and therefore the price it can bid into the EFR is limited. This applies equally to the CM.

27) We believe that rapid deployment of storage will reduce the total cost to the system and the carbon foot print of the UK. This has been well evidenced now by the Smart Grids work by Aurora. Imperial College, National Infrastructure Commission etc. Therefore policy should err on the side of encouraging new storage solutions.

Smart Appliances

28) Yes

29) We favour Option b – regulating smart appliances. The reason is that consumers will be confused by what Smart really means. That is already the case today with a range of Smart thermostats on the market which vary considerably in their offerings. E.g. are they smart because they allow Wi-Fi access and control or because they have a learning algorithm that helps the customer manage their bill. In addition we are concerned that some basic rules around privacy protection and protection around hacking is built into the system. We have already seen how certain IoT have been used to by third parties in an illegal manner.

30) In looking at which appliances should be prioritized then I think BEIS should look at a) the potential savings that can be achieved and b) the likely consumer habits. A fridge, freezer or battery is likely to be managed by a third party and have little disruption to a consumer whereas a washing machine requires greater interaction (loading and unloading). A central heating system or cooling system can be adjusted remotely at times of peak with little or no discomfort for the customer if managed correctly.

31) Batteries may make the whole DSR less important as it sits between the appliances and the meter and can be managed for maximum benefit for the household. Aurora's model shows a reduction in DSR with batteries.

32) The government should ensure that capex free financing models are available for poor and vulnerable customers, who could gain considerably from these devices. North Star is targeting

its smart offering to councils as they is a large market there with the potential for added value services – such as data monitoring and alerts.

Low Emission Vehicles

We believe that the electric vehicles will become the largest part of the new car market in the next 5 – 10 years. There remains however, considerable uncertainty as to how the future grid will interface with these cars and the model that consumers chose. For example

- New technology means that range may increase rapidly with a single charge therefore impacting frequency and location of battery charging
- We think that with capacity utilization of cars below 10% there is likely to be an uber style rent a car market – this would means that cars are charged at a central location and then rented fully charged.
- With solar and more embedded generation it is likely that there could be a mid-day low energy price and hence cars maybe charged then rather that a night.
- Telsa 's car with a solar roof which charges during the day may also be an area of interest.

We are less convinced by the idea that a market will develop for recycled car batteries into storage as we think a) by the time that there is sufficient second hand batteries available the prices of new storage will fall so fast that they will compete with second hand storage b) that second hand storage has added costs of handling and degradation, that need to be managed.

- 33) Government should enable EV to take off by supporting legal frameworks, insurance and research. There is added work on smart charging and blockchain that should be researched and may well provide an export leadership role for the UK.
- 34) Once TOU price signals are set for the capacity and networks then the market should be allowed to optimize the best time to charge or not charge. Given the uncertainty of the business models it seems best to create the market and allow individual companies to compete.
- 35) No comment – except that the scale of investment in Lithium iron battery technology is likely to mean that it will be the dominant fuel for cars.

Consumer Engagement for DSR

- 36) Our interaction with councils seem to indicate that there is still more that could be done to involve businesses into this market. If changes are made both in terms of pricing flexibility and allowing a market to develop (e.g. in the Capacity Mechanism) then more businesses would get involved. It is also hoped that as prices fall for the equipment necessary, that more of the market will get involved.
- 37) Yes

- 38) Power Responsive is a useful initiative but more needs to be done by suppliers and aggregators to educate customers. Ofgem could do more to educate and encourage the development of the market.
- 39) As the DSR market takes off then prices will fall and then it will be worth engaging with smaller businesses, that is some 3+ years away.

Consumer Protection and Cyber security

- 40) Social impacts/informed consumers – it is a fact that the poorest in society are also predominantly on SVT and are less engaged in switching in the market. It is therefore important that they are informed and engaged in the changes as smart meters and products are rolled out. Consideration should be given to trusted local agencies to educate and inform consumers about these changes.

Data and privacy – The data from smart meters and smart IOT appliances has the potential to save the customer and the system both money and carbon. However it is important that we ensure that consumers actively consent to their data being used by companies and that their data is not shared without consent.

- 41) Cyber security – as noted previously the recent hack of lot remote cameras, because their passwords had not been changed since being purchased is an example of how cyber security can be misused unless protections are in place. In this case the IOT devices were used to bombard another system to create excess demand and thereby crash the system.
- 42) See above

Roles and Responsibilities

As stated previously we see the need for greater independence of the SO given the changes that are likely to occur both to DNOs, becoming DSOs and the revenue impact on transmission networks from more embedded generation. We support a market based approach to price signals, constraints and connections as detailed in the paper.

- 43) Yes we agree
- 44) No
- 45) Yes we agree that more co-ordination is needed between DSO and SO. B) Yes we agree it is necessary and possible. C) Unsure.
- 46) We support the market based approach detailed as it sends the right signals for investment and actions by all market players.

Innovation

- 47) As one of the new innovative companies in the battery storage space we would say that the most important thing is to create a market where new innovative companies can easily access. This means changing the regulations on storage, connections, and stacking of revenue streams

etc. We question whether the funding should be directed to the DNOs via the LCNF rather than more generally to the market and thereby foster more innovative models.

- 48) The price of Lithium iron batteries are likely to fall so quickly that others short term storage options will find it hard to compete. Ofgem should not be in the business of picking winners but should look to create the rules that enable new players to enter. There may be a case for looking to support research on longer term storage where the market is less developed and the gain to system would be considerable.