

Response to Open letter: Charging arrangements for embedded generation 29 July 2016

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## **Background**

There is currently between 1.5 – 2 GW of Triad avoidance, according to information presented at this summer's National Grid Operational Forum.

Results of the 2014 and 2015 CM (taking into account the fact that much of the 800MW of new build EG awarded contracts in 2014 would have been generating by 2015) would suggest approx 2 GW of flexible EG will exist for 2016/17.

This would support an estimate of approx 2.5GW of Triad avoidance for 2016/17 made up of both DSR and EG, with EG accounting for no more than 2 GW, or 4% of peak demand, and approx 500GW yet to be built, amounting to 5% of peak demand.

Generation (and/or DSR) to match the top 6% of demand is only required for less than 100 hours per year.

Peak demand has traditionally been associated with very high pricing, that has justified running what have been typically old, inefficient assets for the winter peaks, which are largely dormant for the rest of the year, and are otherwise out of merit. These are anyway closing down, and new peaking capacity is required from somewhere.

The introduction of new EG peaking plant has lowered prices for peak demand, and because it is highly flexible, it also participates in Balancing Services, where it has led to a sustained four-fold reduction in STOR costs, and downward pressure on other Balancing Services costs.

The reduction in STOR and peak pricing costs have been much greater than the additional cost of TNUoS benefits to the EG.

The consumer has benefited.

The mix of peaking is from DSR (approx 25%), diesel reciprocating engines (approx 25%) and gas reciprocating engines (approx 50%) [estimates based on industry knowledge]. Over the last two years, there has been a focus on primarily installing gas reciprocating engines because the market for the very high flexibility of diesel is mature, and gas is much more economic. The pollutants emitted by this modern equipment are much lower than the old generation coal it is replacing. Also, the life-time embodied carbon (and possibly other lifetime gross pollutants) is much lower than the alternative of new CCGT plant.

The environment has benefited.

## **Benefits of Flexible EG and other considerations**

If the 2.5GW of Triad avoidance were not available during the actual peaks, the equivalent of two large power stations would be required to replace it. These would be required for only 200 hours per year, and would therefore require massive subsidy. If the TNUoS benefit were withdrawn before these were built the system would fail. If CCGT plant were used it could not provide the flexibility of the current peaking EG mix, and therefore the current EG would still be required, but paid for through increased charges to Balancing Services.

A major reason for the future increases in the TNUoS residual is the EU cap on TNUoS charges to generators for use of transmission system. Now that we no longer are required to maintain this cap, it should be scrapped as part of BREXIT, as it is the key distortion in the charging methodology.

The value of EG in reducing costs of the transmission network is really related to the marginal costs of increasing capacity to the transmission network, not on the costs of the network itself. This is perhaps hard to assess, and using the maintenance and amortisation costs (the TNUoS residual) as a proxy is perhaps not that distorting. The main distortion is in fact occurring due to the cap on TG charging.

The location of EG is determined by two factors – costs of connecting to the distribution network, and benefits from the locational signal. The costs of connecting to the network are now dominant (generally in excess of £50/kw rising to over £200/kw), and this is distorting locational decisions. The locational signal is therefore not strong enough, and there is also a lack of parity between TG locational pricing and demand locational pricing. EG locational flexibility is a key strength of EG and the consumer could stand to benefit greatly from a review of these charges. The residual should be reduced in favour of increased locational charging.

EG is a high innovation, high investment risk activity. To pay for this innovation and encourage adoption of new technology a strong and stable element to income models is required. The CM does not provide this, as it only pays for capacity, and is in no way sufficient in value. To pay for flexibility purely through short term market actions will remove the certainty of this income stream for investment. The TNUoS benefit is therefore very useful, and not particularly distorting as a proxy for flexibility. If the total cost of transmission is rising, then so too should be benefit of avoiding those increases. An example of future innovation that requires investment certainty is demand shifting from storage. The benefit to consumers is estimated to be worth between £1 - 2bn in annual savings to the consumer by 2030 [1]. The TNUoS benefit will actually secure this, even though it is not a perfect driver. In other words, while reform is desirable for better targeting of investment, the distortion to the desired outcome is not that great.

EG also provides a massive benefit to the distributed network it is located in. This will become increasingly important with the electrification of transport and heating. The value of avoided infrastructure costs at the distribution network level is at least the value of the avoided TNUoS, particularly if a non-deterministic security of supply standard were adopted [2], yet there is no system for EG to be paid for this. Reform of TNUoS charging must proceed concurrently with an introduction of a new benefit that recognises the value of EG to the distribution network.

The way for consumers to benefit is for rational efficiency to prevail. Sadly, political intervention often prevents this, for example with Hinkley C. The DECC letter earlier this year introducing this review was clearly motivated by an ill-informed political intervention, targeting diesel engines.

Note that diesel engines running for limited hours are the most environmentally beneficial method over their lifetime of providing very high flexibility in generation. Their embodied carbon is 1.7x lower than gas reciprocating engines, and this differential is not exceeded by a 30 year lifetime from the increased carbon contribution of diesel, if the engines are run for less than 50 hours per year (Triad avoidance). The current investment case for running for more hours as a peaking plant that also avoids Triads would choose gas reciprocating engines. There is no problem here with diesel. It has a place in the mix as the lowest cost, lowest carbon technology to provide the highest flexibility response. It actually facilitates all the low carbon, intermittent technologies, without materially increasing emissions.

In April 2014 a review by National Grid was published that looked at the very same complaints by the same vested interest group that is proposing these changes [3]. The National Grid review came to the clear conclusion that the system did not need either rapid nor deep structural change, and that in practice the lifetime costs of TG connection were lower than EG connection, due to the huge initial costs charged to EG for upgrading the distribution network. That in fact the “playing field” was favouring TG. Since then, connection costs for EG have risen considerably, more than matching the increase in benefit from the TNUoS residual.

## **Comments on Letter**

There are statements and views within the letter that we take issue with, and feel that overall the view and tone of this letter is unbalanced. While “no decision has been made” the conclusions arrived at seem firmly in favour of the change proposals, without properly considering the EG case, and fall short of the requirement for Ofgem to be impartial in its regulation of the industry. Supporting commentary for this conclusion is presented below, with further elaboration of the role EG is actually playing in the evolution of the electricity system.

*The connection of an increasing amount of sub-100MW EG to the distribution system logically cannot help to avoid sunk/fixed costs of developing and maintaining the transmission network.*

If this were true then the same should be said of all the locational costs. To say that increasing EG doesn't affect the fixed costs of DEVELOPING the transmission network is an obvious falsehood. This statement is therefore incorrect in logic and highly pejorative in tone.

The intention of this assertion is to make the point that incremental EG does not change existing infrastructure costs. This is true, but the existing EG did affect existing infrastructure costs, and the incremental EG does avoid the need to further increase the transmission network, and helps cope with the massive changes in location of generation due to renewables. This is what EG is being paid the benefit for.

The argument would therefore be that incremental EG should be paid at the new marginal rates of infrastructure development. Clearly this could actually increase the value of EG above current levels, since TNUoS charges have increased primarily due to the higher cost of the newer infrastructure development.

*The approach for transmission charging for generation has been only to charge generators directly connected to the transmission network and over-100MW EG.*

On the basis that TG are the actual users of the transmission system, the approach is still correct. If it weren't for them, the transmission system could be a lot smaller, and used only for balancing

power flows. The argument is less clear cut for >100MW EG, but such large EG are more likely to cause reverse power flow at BSPs.

*The approach to allocating transmission charges (both TNUoS and BSUoS) among demand- side users has been based on net demand in a Grid Supply Point (GSP) Group 11 (which is gross or total customer demand on the distribution network less any generation output from sub-100MW generators embedded on the distribution network within each GSP Group).*

Which is again, entirely correct as it charges for actual use of the transmission system.

*TNUoS demand charges are allocated to suppliers on the basis of their average net demand over the triad periods – these are the three half-hour periods of highest system net demand during the period November to February, separated by 10 days.*

Using only 3 half hour periods should be reviewed. It creates a high stakes lottery for EG that increases investment risk, and this encourages super safe behaviour from some providers, such as running for every peak irrespective of demand, or a strategy of switching off after a very high peak, which can cause an unexpected shortage of supply at relatively high demand times.

*The embedded benefits we have identified include both the payments that EG can receive for helping suppliers to avoid transmission demand charges and the avoided transmission generation charges that sub-100MW EG does not pay 13.*

This is a highly pejorative statement. The embedded benefits are solely the payment of avoided transmission demand charges, which have been earned by avoiding demand! EG should never have been liable for charges for use of a system it does not use. The issue here is really that >100MW EG is being unfairly disadvantaged, because it is almost certainly helping to avoid some demand.

The question of size and statistical likelihood of despatch are clearly interrelated here, as very large EG is unlikely to actually avoid transmission infrastructure, as this would need to be designed for the case that the large EG were not available. However, for small EG, the number of units is very high, and therefore a large proportion of capacity will be available with a high level of statistical confidence.

*We are concerned that the elements in the table above are preventing a level playing-field between sub-100MW generation connected at distribution level and all other generation.*

Is the purpose of this review to “level the playing field” or to ensure correct outcomes for customers and security of supply? We are concerned that the former is actually the key driver, given this and other language in the open letter. If we are really to “level the field” then it should be recognised that the two types of generation do not participate on the same field at all. EG must pay huge costs towards the reinforcement of the distribution grid, that TG avoids all together. EG distributes through the local grid, and pays for it, TG distributes through the national grid, and pays for it.

*With the increase in overall TNUoS charges and the rapid increase in the volume of EG , the size of TNUoS demand residual payments has grown as has the number of parties receiving them. This creates a large benefit to connecting to the distribution network rather than the transmission network*

There are two diversionary statements in the above that again create a pejorative tone. First, by far the main increase in EG has been PV, which cannot benefit from Triad avoidance, and the next largest EG contributor is wind, which only partially benefits – and generally does not, since the existence of embedded wind depresses the demand spikes, and therefore the Triads tend to occur when there is little wind. Secondly, what does it matter about the number of parties receiving the benefit? This seems to be a complaint direct from a large generation company that there is now troubling competition from lots of little upstarts who have no right to be in the generation club. The actual size of the generation involved in Triad avoidance is still relatively small – approx 2.5GW, much of which is true demand side response.

[Market “Distortions”]

*leading to an inefficient mix of generation by encouraging investment in smaller distribution connected generation (which can take advantage of the embedded benefits revenue stream) over potentially more efficient larger transmission connected generators (TG) or over-100MW EG (which do not have that revenue stream);*

Why is it an inefficient mix? This is a wholly unjustified assertion. The future energy scenarios all call for a large increase in peaking plant, which cannot be achieved efficiently by very large generation. While plant efficiencies for small units are not as high as for large units, this is partially compensated by lower transmission losses, and fully compensated by the lower installed costs. Building a hugely expensive (per MW) high efficiency plant, and then running it at 10% of design output is as inefficient as it gets, and leads to massive increase in system costs.

*leading to TG exiting because it cannot compete;*

TG is not exiting because 2GW of peaking plant, running less than 1000 hours per year has been installed, that would be ridiculous. It is exiting because its business model has been disrupted by PV and wind, and baseload has shrunk. The peaking plant is what allows the system to operate with renewables in a cost efficient manner. TG has now been dealt a massive blow by Hinkley being given the go-ahead. Hinkley will take all the remaining baseload and export power regardless of demand, leading to great distortions in the normal running of the system.

*distorting dispatch by dampening prices at peak times when EG dispatch out of merit 15 to generate in the triad periods;*

So consumers should be paying more for peak prices? Maybe – but how does that help TG? It would merely shift the TNUoS benefit into recovery of costs for EG via higher peak prices. TG would still not be able to compete in this market because it cannot react quickly enough. The current system is probably leading to LOWER consumer prices because the certainty of Triad benefit allows EG to access lower cost financing.

*distorting the outcome of the capacity market (CM) by holding down prices since smaller EG can bid in at significantly lower prices than larger EG and TG; and*

Please point to a CM where the price was set by new EG! In both cases it was the existing TG that set the price, if you took out all the new EG it wouldn't have made any difference.

*distorting innovation in the market towards parties who can best capture this large payment.*

Now EG is being too innovative! The paltry sums of money being spent on EG peaking plant innovation pale into insignificance compared to even just the CSS concept alone. This surely is a

bankrupt argument from an industry that has failed to invest or focus sufficiently on innovation, while its market is disrupted by developments that have no stake in Triad benefits. Without innovation from peaking and storage providers we cannot continue to invest in renewable generation. These EG providers are the complement to the EG renewables, and trying to kill innovation by removing what is a fairly sensible level of “subsidy” (or compensation for having to pay for upgrading the distribution networks), perceived or otherwise, will potentially derail the decarbonisation process. Let’s not forget that this is for the good of society as a whole.

*To put this into a market context, the size of the current TNUoS demand residual is £45/kW which is over double the 2015 CM clearing price 16 . This is forecast to increase in four years to £72/kW. This payment is for operating in three half hour (triad) settlement periods. Since triad is defined after the event, EG have to generate in around 20 periods with a current value of £2,267/MWh. For the three triad periods only, the value is £30,220/MWh, over ten times the value that electricity users attribute to security of electricity supply (Value of Lost Load).*

The CM pays for capacity. The EG under discussion provides both capacity and flexibility, and the value of flexibility is not properly remunerated within the current system. The TNUoS charging regime actually subsidises Balancing Services, and the effect of reducing it would be to merely shift costs into Balancing Services.

In order to hit the three Triad periods EG must run the 20 periods, and even running 20 periods is an incredibly high risk venture – and not a number that anyone outside of DSR (where there is a competing cost due to opportunity loss) would recognise. Typically most EG peaking plant would run for a minimum of 75 periods, and very often around 400 periods.

The VoLL adopted by the UK government for all EMR related analysis is £17,000/MWh. The TNUoS benefit is clearly much lower in practice than this value for anything other than a spurious assertion that anyone could actually predict the exact Triads. If EG did not dispatch for the Triads (except in very warm winters), the system would not cope. Therefore the level of remuneration does seem to be appropriate.

The balance of the letter outlines various work streams, and acknowledges some of the complexities of the situation. This is at odds with much of the tone, which has already formed a strong enough view to repeat sparsely disguised pejorative assertions of another segment of the industry.

## **Conclusion**

Given the tone of the presentation of “evidence” it is clear why the conclusions of the letter amount to:

- TNUoS payments must change as they are harming the system
- They must change now, and transitional arrangements should be short or non-existent
- Due process (i.e. SCR) should not be followed

The actual evidence presented does not justify such conclusions, and the situation is far more nuanced. While there is prima facie evidence that the current system does not offer the best and most rational outcomes, there are currently very low levels of actual distortion from what is required for a modern, flexible and high renewable content generation mix. The fact that TNUoS is rising relatively quickly could, in future, lead to some distortion, but we are in danger of inflicting permanent, gross inefficiencies though a knee jerk reaction to emotive issues of “dirty diesel”



coupled with strong lobbying from the established sector of the market, seeking to hold back the tide of change.

Any changes need to be considered in the round, and some of these will require a long period, and most probably an SCR. For example there is currently no market mechanism by which EG can assist the DNO with voltage regulation or security of supply, yet the EG infrastructure currently being built will, in future, do just that, and if it is not made available by the market, such infrastructure will need to be paid for separately by DNOs and passed onto consumers.

It is in the consumers interest that current investment is not jeopardised, that a vibrant and innovative EG market exists, and that seamless transitions to efficient capital and operational markets are followed. The current charging regime was setup for a system that no longer exists, but it is actually incentivising relatively appropriate behaviour. It is right to review and to modify, but not at the cost of that appropriate behaviour.

The key benefits of the current system are:

- There is a strong driver to install very flexible generation that has low capital cost – note that the CM does not drive the installation of flexibility
- The upgrading of the distribution network to accept the generation is paid for by EG, it can only afford to do this by receiving pseudo-guaranteed income from the TNUoS benefit.
- The system gains resiliency and future proofing against expected changes in generation mix and increases in demand from EV and electric heating
- There is a strong capital pricing signal to even out the miss-match between peaks in generation and demand that is driving the introduction of storage
- Infrastructure necessary for low cost Balancing Services, that is highly adaptable to evolving conditions, is being installed on the basis of the pseudo-guaranteed income from the TNUoS benefit. This has given the UK one of the strongest, and lowest cost, responses to a high renewable content grid. The alternative would require much longer, and more expensive, bespoke service contracts that would generally be put into place only after problems in supply are apparent.

Potential short term improvements over the current arrangement are:

- Spreading the TNUoS peak demand signal over many more peaks so that the value of benefit to EG explicitly represents VoLL
- Increasing the proportion of demand locational pricing to drive more EG into areas that require it
- Removing the TG pricing cap to balance the costs of using the transmission system more fairly, which will remove a large part of the driver to future TNUoS increases

Over the long term the TNUoS benefit to EG could be reduced as markets are developed that explicitly reward flexibility and contributions to operating the distribution networks. Even capping the benefits at 2018 levels would still protect current investments, and is in-line with the projected benefit of flexible EG from those future markets. However, this would be a compromise to removing the generation cost cap, which is the real cause of the elevated residual.

Reduction of the benefit without concurrent reform in other markets would be harmful to the long term security of the system and lead to increased consumer costs. The benefit to TG is minimal, as peaking EG was not the cause of their problems in the first place.

1. Strategic Assessment of the Role and Value of Energy Storage Systems in the UK Low Carbon Energy Future, Energy Futures Lab, Imperial College London
2. Options for future development of distribution network planning security standard, Energy Networks Association
3. Review of the embedded (distributed) generation benefit arising from transmission charges, National Grid 15 April 2014