# ORPS Methodology Webinar – Q&A

| # | Question | Response |
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| 1 | Nothing is mentioned about dispatching at lowest cost, and would that be fine with the new proposed pricing? | The current dispatch process is not within the scope of this project, only the review of the compensation mechanism. However, it should be noted that NESO have already embarked on a piece of work which aims to expand the dispatch systems to facilitate different pricing regimes. |
| 2 | Using the LCOE from DESNZ wouldn't be appropriate or fair as old and not variable by asset, and fuel costs will change based on market. | Using a single rate per technology, like a single rate for all technologies, results in a compromise in compensation; as even within a single technology group, size, age of asset, etc, a range of costs may result. DESNZ's LCOE data is considered fair and appropriate as it is well established, monitored and independently verified by third parties. It is regularly updated by DESNZ, and where a technology is not researched between reports, costs are aligned by indexing with GDP deflator. Additionally, there is no data available for old assets and the LCOE data is the most comprehensive data set available. Using LCOE has the advantage that Generation Developers and Service Providers can request DESNZ to refine their assessments. This provides flexibility and a channel to improve the accuracy of data in the future. |
| 3 | Why was the market-based option discounted as it could have included a price cap to mitigate liquidity easily using similar methodology? | It is not considered appropriate to employ a market-based solution for a Grid Code obligated service for system security, as it's not a voluntary service as procured through market mechanisms. Additionally, there would be low liquidity in some areas which is lack of competition hence would risk the higher price. Therefore, it is believed that the option would not lead to an economic outcome for the end consumer. |
| 4 | Why were the TSOs which were interviewed the ones selected for engagement? | The list was discussed and agreed between DNV and NESO, though there was a limit to the number of TSOs that could be engaged with in the time available, as well as some compromises based on the contacts available. Of the TSOs engaged with, three are directly connected to GB transmission network: ELIA, |

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| | | RTE and TenneT. The project team also aimed for a wide coverage of different TSOs practicing globally. Therefore, ERCOT in US and AEMO in Australia were also interviewed. |
| 5 | What thresholds were used to determine that a market-based mechanism would not provide enough liquidity in some areas? Is this a common issue or is there limited situation in the system where this might be present? | As per question #3, we do not believe that the mandatory ORPS service should be compensated through a market-based approach. NESO are also developing specific reactive power markets and where enough liquidity is identified then markets will be generated through that approach. |
| 6 | What is the precision of the original derivation of the 1% (not its use)? Even if the method is accepted then that could be from a figure between e.g. 0.5 and 1.5% or between 0.99 and 1.01%. This gives a significant change in the £. | Based on experimental research, the project selected several different generation plants in different capacity, running at different power factors. Experimental results showed that the additional fuel to generate a unit of reactive power is around 0.2 to 0.6% of the fuel. (i.e. generating 1 MVArh requires 2-6 kWh of energy) There are factors affecting the generation efficiency of different plants, for example age, so it is believed that 1% should be sufficient to cover the additional energy cost. |
| 7 | If the LCOE data gets updated every 1/2 years, will we have to run a CUSC mod each time to update the ORPS payment again? | It is not the intention to raise a CUSC modification each time the LCOE is updated. The approach would be that the methodology would include an agreed approach to incrementing the baseline rates over time to reflect changing costs for provision. Allowing for periodic rate changes as part of the model it wouldn't require a change to the CUSC itself. If a party wanted to change the model at some point in the future, that would require a CUSC change.<br><br>Additionally, the LCOE in the examples is dated from 2021. Implementation at some future date would include an agreed alignment process to year 0, after which the rates would then be indexed on a periodic basis. The current proposal being on monthly basis using CPI, with a periodic review/refresh if appropriate against any new LCOE data published. |

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| 8 | The LCOE report is used ostensibly for making policy decisions and not setting prices (e.g. CFD strike). What other cost data did DNV consider? | DNV interviewed a number of service providers asking for the operation cost data, and it was found that those providers interviewed didn't measure the cost data as they believed it to be minimal / insignificant. DNV also performed a review of the various data available on the market (including NERL publishment, literature/institutional publishment) and found DESNZ's LCOE data to be the most appropriate. It is reviewed independently, covers many technologies with actual operational data submitted to DESNZ, has extensive cost breakdown and set of assumptions. No other cost data were considered appropriate because there is nothing else suitable and matching the wealth of information in the LCOE report. Additionally, that the LCOE data is used for policy making doesn’t prevent it being used for other purposes when its structure (i.e. cost breakdown explicitly covers variable O&M cost) and depth of supporting data is also applicable to the purpose of ORPS. The LCOE data set has been identified as the most appropriate data source to fit the selection criteria. Industry will be welcome to suggest alternatives to this methodology as part of the CUSC process, but this would need to meet the same criteria and be supported by analysis to be considered more appropriate than the source proposed. |

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| 9 | Doesn't the CUSC require the method to reflect the quadratic nature of the additional cost (i.e. I^2 R losses)? Does the proposed method follow this, since changes to the CUSC are out of scope? | The proposed ORPS unit rate contains 2 major variable cost components.<br><br>a) the variable O&M cost which is the labour, wear and tear cost for operating the machine, inverter, transformer, tap-changer, etc. This Variable O&M cost is directly linked to the apparent power MVA (not just the real power MW). Therefore, the Variable O&M Cost in the LCOE report focuses on MWh (real power) which is the pure unit cost when the machine is operated at unity power factor 1 when the apparent power = real power. In order to consider what would be the incremental O&M cost for generating reactive power (i.e. increasing the apparent power), we need to consider the increase of the apparent power and how the cost is increased as a ratio of real power at different power factor scenario. Having considered the average operating power factor (lead or lag), then the Variable O&M Cost in MWh is proportionally converted to the MVArh basis.<br><br>b) the extra fuel losses due to high apparent current and associated I'^R heat loss is the 2nd component of the unit rate. To supply this extra heat loss, based on the experimental research (refer to question 6 above), around 2-6kWh would be used to generate 1 MVArh (i.e. 0.2-0.6%). Therefore, in the proposed pricing methodology, 1% of the fuel cost (MWh) is assumed as the additional cost of the heat loss for MVArh. Since most of renewable generation (i.e. Wind, Hydro, Solar, etc) have zero "fuel cost", this fuel cost conversion is only applicable to those thermal generation and pumped hydro. In summary, the I^2 R losses has been considered in the pricing methodology.<br><br>Additionally, the payment methodology is within the scope of this project, along with a CUSC mod (CMP457); and heat losses have been considered (i.e. re schedule 3, appendix 7, para 1.1,) though no mod is required in respect to this part of the CUSC. |

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| 10 | Recent MVArh data doesn't support 50% leading and 50% lagging. Import MVAr need has increased in recent years. | Please see question #11 |
| 11 | NESO usage of lead/lag is not evenly split, there is a much higher usage of lead capability so this should be reflected in the ratio between lead/lag - why was the decision made to do 50/50 split? | Lead and lag are treated in the same manner because ORPS is a mandatory requirement which therefore requires equal access to both the lead and lag capability and the design reflects this. Additionally, as a mandatory service, ORPS should reflect the cost-of-service provision and not the needs of the system. |
| 12 | Why are you using a 50/50 assumption for lead/lag - real system is tending heavily more towards lead | Please see question #11 |
| 13 | Roughly 80% of the instructed ORPS is LEAD and 20% LAG. Why does the example assume 50/50? Can you please provide examples using historic data per technology? | Please see question #11 |
| 14 | Does the design account for the fact that PF requirements under the grid code differ between European connection conditions (ECC) and the original connection conditions (CC), and that there is also a subtle difference on the measurement point for Scotland? | It is correct that the reactive power capability requirement in the CC clause refers to reactive power capability at the terminals of the machine (for synchronous machines), while for the ECC clause the reactive power capability refers to the grid entry point for synchronous machines (i.e. after the Step-up Transpower at the HV Side).<br><br>The ECC clause has a symmetrical pf range of +/- 0.92, which in this design equates to a conversion rate of 25.29%, while the CC clause has an asymmetrical pf range of -0.95/+0.85 which equates to a slightly higher conversion rate of 27.25%. However, the recommended ORPS design does not include this level of granularity. Although the power factor range is only slightly different, the higher conversion rate value of 27.25% is proposed to ensure the variable costs of SP are compensated. For non-sync machines the conditions are similar between the CC and ECC clauses the capability requirements are the same for both CC and ECC |

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| | | clauses, that is +/- 0.95 at Grid Transformer HV Side<br><br>For the avoidance of doubt, the recommended ORPS design will not affect the grid code compliance and the registration of the machine's reactive power capability. |
| 15 | What about synchronous compensators - not a new technology, but not included in the rates? | It is correct that Sync Comps are not currently listed in the Levelised Cost of Electricity data. However, Sync Comps are not obligated to provide reactive power and hence are not obligated to receive ORPS payments.<br>It is noted that Network Services (formerly known as Pathfinder) contracts facilitate a payment for reactive power capability that is linked to ORPS rate. NESO will be undertaking further analysis to determine a suitable rate for these contracts, which will be communicated out once identified. |
| 16 | You assume NESO or DESNZ can determine if a rate should change with updates. But any CUSC party would be able to raise it as a modification | We intend that the output of the project is the beginning of the CUSC modification process, which is open governance. During the working groups, code participants will be able to input into the process, challenge, and suggest amendments to the suggested approach or  baseline values in the form of alternatives to the modification proposed by NESO ( WACMs), which if voted in by the WG/panel, can be submitted to OFGEM for consideration / approval. If /when a revised approach is approved by Ofgem, the new methodology and associated rates would be implemented to the code and the rates for compensatory payments would be maintained in line with the revised methodology. |
| 17 | I also struggle with use of LCOE numbers. For synchronous plant the MVAR capability is very little to do with underlying build costs for the plant, | The design uses LCOE as its baseline data as it differentiates between variable O&M costs and fixed O&M costs (CapEx). It is believed that the use of |

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| | e.g. building a dam or nuclear reactor. It is about the generator, gen transformer etc. | variable O&M costs aligns directly with the CUSC charging principles. |
| 18 | It is uncertain if having different payment rates for each fuel type is the right approach, and it may also create challenges. | ORPS is an obligation for providers to contribute to a secure and stable network, upon which they rely for their business and the cost of which is borne by the consumer. The intent is to appropriately compensate them for their contribution at a fair cost to the consumer. Therefore, the requirement of the project is to have a methodology which is cost reflective for the service provider, and the fairest and most transparent way to achieve this is by technology type. It was also acknowledged that a single tariff does not reflect the range of costs incurred by the various technologies which provide ORPS. However, there is also a degree of compromise when adopting a rate per technology. Even with a group of technologies, for example OCGTs, there may be different operating costs due to asset age and usage. To re-iterate, it's about finding a compromise while also addressing the project goals of being fair to service providers and consumers. We are keen to understand the impact on providers if implementing the different rates, please feel free to reach out to us or provide more information about any specific difficulties. |
| 19 | For synchronous plant, the technical impact of lagging MVARs (stator current) is different to leading MVARs (flux patterns and core end issues). | This is related to the fuel cost. The assumption of 1% is based on an experimental study which was carried out and covered a different range of power factors, including leading and lagging mode. These are aspects which were considered in the experimental measurement DNV carried for the project that are used as a baseline to set the 1%. Additionally, since the conversion ratio Q/S considers the extreme power factor (that is not likely to be used operationally), the conversion ratio can be seen a favourable to SP to cover the extra wear and tear. |

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| 20 | Bit like the BM, I think effort would be better focussed on tackling root cause leading to high volumes not the price. We should be looking at lower voltage levels on DNO networks and use of reactive capability on DNO connected gens. | This project is mainly focused on the payment methodology for obligatory reactive power service to compensate the cost of providers, and its key purpose is to ensure the methodology can be better reflective of cost of reactive power provision; so it's not the work to review how much reactive power should be utilised. Agree that the volume is another important element contributing to the total reactive cost and there are other projects / work ongoing to look at how the voltage requirement on the transmission network can be optimised. |
| 21 | Does Nuclear fuel cost take account of defueling/decommissioning costs? | According to the CUSC payment principles for ORPS, only the variable costs directly related to the provision of the ORPS should be compensated. For nuclear technology, the decommissioning/waste handling cost is a fixed cost in nature. It is not covered in the variable O&M costs in the 2016 LCOE report. |
| 22 | Why do you use fuel cost as a proxy for the cost of pumped storage pumping, but no equivalent for BESS charging? | In terms of comparison with BESS there is a slightly different mode of operation. BESS typically provide reactive power using their Power Conversion System (PCS). It doesn't include charging, so you could disconnect the battery, and the PCS would be able to provide reactive power independently. Therefore, the provision of reactive power is not linked to the charging and discharging of the battery. For pumped storage the rotating plant is driven by water in order to produce reactive power. |
| 23 | The DESNZ LCOE values represent new power stations as they inform CfD activities. How is the varying cost for older power stations going to be accounted for in this proposed solution? | It is challenging to find data which includes a granular breakdown of technology costs. However, we believe the proposed granularity is sufficient while also acknowledging that its use involves a compromise. As mentioned in question #2, both a single rate per technology and a single rate for all technologies result in a compromise. A practical line must be drawn on the granularity that is achievable with the data that is available. |
| 24 | Am I right in thinking that there would be no change to the main body of the CUSC but there would be change(s) to CUSC Schedule 3, at least Appendix | The formula, which is contained in Schedule 3 Appendix 1, would be the part of the CUSC that we envisage would change. It's not the intent to change the main body of the CUSC because that's not |

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| | 1 which contains the payment formula? | impacted by the formula changing. The Schedule defining the methodology for calculating and applying the compensation rate for a mandatory reactive power is the focus of the modification. This is dependent on the outcome of the CUSC change process as industry have the opportunity to introduce additional change if they believe it represents a better improvement to the baseline CUSC. |
| 25 | What happens to long term contracts (e.g. stab pathfinders) that are tied to ORPS. | Providers with long term contracts may be paid the current ORPS rate for their reactive power provision, according to the terms of their specific contract. The actual reactive payments, if paid as part of that contract, may well then be dependent on a new ORPS rate, or as in answer to question #15, whether there's a different technology currently not listed, contracts will be reviewed on a case-by-case basis to identify a suitable rate. For those providers who have long term pathfinder contracts, it is recommended they review the terms of contract. NESO Contracts teams will happily discuss this further. |
| 26 | Over what timeframe are the costs of service provision being evaluated? Short run costs versus long term maintenance requirements? | DNV's understanding of the LCOE report is that the assessment time span covers the whole project until end of operating life.<br><br>For Fixed O&M Cost:  Costs incurred in operating the plant that do not vary based on plant output<br><br>For Variable O&M Cost: Costs incurred in operating the plant that vary based on plant output. Note that in our analysis this includes Balancing Services Use of System charges |
| 27 | The proposed changes do not cover CCGT synchronisation costs, though I appreciate it may be out of scope of the project. | We agree that the CCGT synchronising cost is another element contributing to the overall reactive power expenditure, there are ongoing work to explore and develop any other more economic solutions, when necessary, e.g. through reactive markets etc. This project is mainly focused on the payment methodology to compensate the cost of reactive power provision, where the providers have an |

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| | | obligation to provide reactive power when synchronised to the system, rather than developing the alternative option to reduce the overall reactive power cost. |
| 28 | What are the next steps for this process? Will NESO/DNV be changing the proposal to account for feedback or is this going straight to CUSC mod? | We will go through the feedback received from the webinar and publish the responses to all the questions through this Q&A doc. This feedback will be considered by DNV to complete the final project report with its recommendation, and then progress into the CUSC code modification process, where there will be an opportunity for work groups to assess the solution and whether it is sufficient. The final report will be available to industry and the solution will be presented to the CUSC workgroups, with the opportunity to feedback and input further into the modification process. If the workgroup feedback identifies a major omission in the proposed approach that requires amendment, this would be included in the subsequent CUSC proposal. |
| 29 | It would be good to do a poll after this with views from industry on the proposal that can then be used in the CUSC group | Since this change will be managed through Code Mods, there will be plenty of opportunities to discuss the proposed solution further with industry representative through Code Mods process (polls, work groups, etc). For anyone interested in becoming a workgroup member please feel free to contact cusc.team@neso.energy . Once it is time for nominations for workgroup members, the Code governance team can advise further. |