GC0117 Threshold Matrix (Draft for new connections)

Table 1- Threshold for embedded large at 10MW

10MW (Original Proposal)		
Advantages	**Disadvantage**	**Workgroup Comments**
Aligns to European codes including RfG (B/C) and maximises the options in the market for generators (noting that RFG only applies to generation).	Enduring NGESO resources would be required to assess the GCode (DCode?) compliance of new embedded generation >10MW Resource to fulfil the change initially and on enduring basis- connection agreements for example	**Mike Kay -** Is aligning to European Codes including RfG (B/C) an advantage – isn't it just incidental? Irrelevant for retrospective application – and assuming this threshold is driven to match Large in SHETL, it's more of a case that Type C was set to this limit rather than us now following it. **ESO response –** point noted, but still see as an advantage as it sets a starting point from the framework that we already have in place e.g., if the BC threshold, SHETL/Offshore boundary was 15MW then we would have looked to have used 15MW as a starting point. This also aligns with the thinking developed through GC0100 in RFG thresholds --- **Alan Creighton -** it would be good to clarify what "maximises the options in the market" means. **ESO response –** This means if you are a Type C PGM you must have the capability to provide frequency response but there is no mechanism to be paid for it. If the Large Power Station threshold is reduced to 10 MW it enables those parties to be compensated for that capability. **Mike Kay -** In which case it should be stated that the advantage is to generators **Graeme Vincent -** Isn't this the same as 'more generators in the BM' below? **ESO Response** – Yes at a time when there are high balancing costs it introduces more generators into the BM which will have the effect of reducing balancing **costs.** Note also comment

		above that parties that are mandated to have FR capability through RFG can be compensated for this capability by the market. **Mike Kay -** This is a different point to the answer the ESO gave to AMC's point – so it probably needs splitting out into these two points to be clearer. **ESO Response -** Alan has queried access to the market, Graeme has queried the number of parties in the BM, in short these are the same issues as more parties in the BM results in more market participants which should have the benefit of reducing costs.
Gives the ESO greater visibility of new generation (depending on retrospectivity) and requires more generators to be part of the BM	Impacts upon the ESO control room resources as the increased volume of MW units would require management	
This reflects the increase in embedded generation now and the aims through net zero	Costs to generators in SPT and NGET areas to: • Demonstrate compliance to NGESO • Install data collection and control systems as required by a BM Unit • Become a CUSC party • Having BCAs with the DNO and NGESO	
Lower system operating costs for the ESO and less use of emergency measures- could help reduce balancing costs	Additional administration costs in satisfying the requirements in the Grid Code and the D Code. Additional costs would fall on the DNO/TO's and Generators who would need to liaise with two parties. DNO costs would be connection design costs and enduring provision of information costs	**Mike Kay –** What are the D Code costs? **ESO response** – if the threshold is reduced to 10MW it would mean that for each new generator agreement with the ESO there would have to be a corresponding DNO agreement. Based on the number of generators coming to the market in the 10 – 50mw threshold (LEEMPS are already catered for) and knowing the average agreement costs for each it is possible to work out a DNO cost **Mike Kay -** I don't understand the ESO response. The DNO already has BCAs with generators. Or do you mean DNO/NGESO agreement? I don't think this is done now for

		Large power stations, is it? Why does there need to be a DNO/NGESO bilateral for embedded large – you have direct control of them. **Graeme Vincent -** Would more generators be entitled to constraint payments thereby increasing the balancing costs at times of high wind? **ESO response –** that depends if they were treated as BEGAs then the answer is Yes, however these would be treated as BELLAs with no TEC so that would not be the case. --- **Alan** Creighton – DNOs already have connection design costs and enduring provision of information costs. **ESO Response** – This is correct but if we reduce the threshold to 10 MW it means there will be a higher number of agreements. Except in the North of Scotland where the boundary is already set at 10 MW. **Mike Kay -** I don't understand what these new agreements would be. It would be true, I think for LEEMPS, but not for Large **ESO Response** – If the threshold is reduced to 10MW it would mean that each generator of 10MW or above in GB (even if embedded) would need to have a CUSC contract with the ESO which would result in more agreements.
Gives operational support at lower sizes than currently in SPT and NGET TO areas	Could there be additional data requirements	**Mike Kay -** The comment around operational support at lower sizes is essentially the same as row above but phrased differently. **ESO Response** – The point above refers to costs where this point relates to the ability to utilise the capability of smaller plants e.g., reactive capability for operation support purposes.

	Requirement for a generator to have two connection agreements – one with the DNO and one with the ESO.	
	Change impacts generators in NGET and SPT areas	**Graeme Vincent -** Only adding as one of the advantages below is no change in E+W **ESO response** – to be discussed at WG but we believe that this is reference to table below in Option 2

Table 2- Threshold for embedded large at 100MW

100MW (Alternative Request 2)		
Advantages	**Disadvantages**	**Workgroup Comments**
Reduction in costs to embedded small power stations, particularly in SHET and SPT areas	Does not reflect the increase in smaller power stations and generators connecting to the system. If this option was adopted going forward there will be a large increase of Power Stations in the 10 – 100MW so if the threshold is set at 100MW the ESO will become blind to these additional Power Stations that could result in a significant volume of MW which cannot be controlled and therefore push up balancing costs.	**Mike Kay -** How or in what way is this a disadvantage? AMCs words in the equivalent box below are better. **ESO Response –** Going forward there will be a large increase of Power Stations in the 10 – 100MW so if the threshold is set at 100MW the ESO will become blind to these additional Power Stations that could result in a significant volume of MW which cannot be controlled and therefore push up balancing costs. **Mike Kay -** So these points are what should be in the box- the existing text is too summarized. **ESO Response -** Noted and updated.
No changes to E&W	Reduction in system support in SHET and SPT TO areas	**Graeme Vincent -** Not sure this advantage is true – doesn't this option remove Medium Power Stations in E+W? **Mike Kay -** Maybe – I think so far, it's indeterminate – nothing to say that Medium could not persist in E&W. But we need to be clear.

		ESO Response – Not withstanding the retrospectivity issue, Options 1 & 2 would remove the concept of Medium Power Stations because going forward there would only be small and large Power Stations.
Reduced admin costs/resource	Higher balancing costs	**Mike Kay –** Is this advantage the same as the first row, or do we mean someone else's costs? **ESO Response –** This refers to lower costs for not only Generators (covered in Row 1), but also the DNOs and ESO as there are fewer agreements to process. It should be noted that while admin costs will be reduced it would not result in lower system operating costs. **Mike Kay -** OK – not sure I agree yet on the agreements point
Aligns with Licensing requirements	Less visibility to NG as ESO than currently	**Graeme Vincent –** Not sure if this would be an advantage or not? **Mike Kay** - It doesn't anyway. The threshold for licence exemption – which means an application for exemption – is 50MW. **ESO Response –** It's a mandatory requirement to have generation licence for plants with 100MW or above. Agree that licence exception can be sought for plants between 50 – 100MW but we feel that this is still a valid point. In Scotland again plants less than 100MW (e.g., BELLAS) are licence exempt. **Mike Kay -** Most generation in E&W below 100MW is licence exempt too – but it has to be applied for – and where the ESO can apply its requirements. I'm still struggling to see this as other than incidental.
	Doesn't align with RfG	

Table 3- Threshold for embedded large at 100MW with Scotland thresholds aligned with England and Wales (WAGCM1)

100MW (WAGCM1)		
Advantages	**Disadvantages**	**Workgroup Comments**
Reduction in costs to embedded small and embedded medium* Power Station owning Generators, particularly in SHET and SPT areas as those Generators would not: • need to liaise with NGESO or the appropriate TO, • incur the costs of becoming a CUSC party, • need to provide the additional data and control systems associated with being a BM participant.	Does not reflect the impact that an increase in number of smaller power stations connecting to the system may have on the Total System.	**Graeme Vincent -** Don't think the need to liaise with NGESO or the appropriate TO is strictly true. The statement of works process would kick in for embedded due to the relative size of the generation connecting compared with TO/DNO interface substation capability (and the generator may want transmission access) and the larger 'small' generators would invariably need to be transmission connected. This liaison would be needed to allow the Transmission Licensees to plan and develop their network. Also does this assume that all services will be contracted via the DNO and then the DNO to the ESO? **Mike Kay -** I think you're making a Scottish point? Nothing <100MW needs to be connected to the T system in E&W? Or have I missed the point? **ESO Response –** Comment above noted. The word "embedded" has been added before "small" and "medium" power stations. --- **Graeme Vincent -** In theory, not incurring the costs of becoming a CUSC party would mean they have no transmission access either. But they don't anyway if BELLA…I think?? **ESO Response** – This is correct, but a BELLA will still need to sign the CUSC and meet the requirements of the Grid Code but because they are not a BEGA, they will not have transmission access rights. Any embedded generator less than 100MW can have a BEGA (TEC) if it so wishes but this is not mandatory.

No changes to E&W, so the vast majority of power stations in GB would not be affected.	Reduction in system support in SHET and SPT TO areas from new generator connections (depending on the retrospectivity).	**Mike Kay -** Is the reduction in system support a given? Is it true for new generators? They would be type C so would have frequency response and some measure of operational metering. And for retrospective application, existing generation in Scotland has the capability – it may choose to provide contractually what it provided previously anyway? **ESO Response –** Under G99 new generators would have this capability but there is no mechanism for that capability to be utilised unless they have a commercial agreement, or they are a CUSC party and the ESO can instruct them for ancillary services. **Mike Kay -** So it is not wholly one thing or the other – it depends on the market. If it's attractive, such generation would choose to accede to the CUSC. ESO Response – This is the generators choice for embedded plants between 50 – 100MW there is the option to opt for licence exemption (LEEMPS) or be in the BM via a BEGA
Reduced admin costs/resource as Generators would only need to liaise with the DNO, and DNOs wouldn't need to increase the current level of engagement with NGESO as part of the connection process.	Lost opportunity to reduce the balancing costs as smaller number of generators would be in the BM and could lead to increase costs to balance the system.	**Graeme Vincent -** Again not entirely comfortable with this advantage. There will be a point when the DNO will need to discuss the connection implications for the transmission interface. Then this also assumes generator doesn't want TEC **Mike Kay -** As above – this assumes BELLA – so is probably, broadly right? **ESO Response –** If there is no agreement between the ESO and generator then any transmission reinforcement is picked up by the Statement of Works process. --- **Mike Kay -** I'm still unclear about this disadvantage – BELLAs don't appear to actually participate in balancing, do they? **ESO Response –** BELLA's are in the BM and the ESO have visibility of them and can instruct them but it is correct to say

		that the data available and ability to instruct whilst possible is more limited than a full BMU unit. --- **Graeme Vincent -** Balancing costs are likely to increase **ESO Response –** Agree and added to comments
Generators wouldn't need a BCA with NGESO.	Reduced visibility of generation in Scotland to NGESO - note Scotland has relatively high volume of generation under 100MW for new generation (depending on the retrospectivity) subject to being addressed by the Open Networks WS1B P6 work.	**Graeme Vincent -** They would need a BCA with NGESO if they required Transmission Access **Mike Kay -** Why would they (say an 11MW generator) need transmission access? **ESO Response –** It is not mandatory and would be the generators choice if they wish to have TEC and hence a BEGA. --- **Alan Creighton –** It would be good to see the data in relation to high volume of generation in Scotland under 100MW **Mike Kay -** Yes, relatively high volume of what? **ESO Response –** This would be scheduled and real time data which would be lost under this option. **Mike Kay -** I don't think it is appropriate to cite the ON WS1B here without citing it in Table 1 too. **ESO Response** – Open Networks are not considering the issue of Balancing which is why this is an issue
Generators would retain the option in E&W to become a BM Unit. Generators in Scotland would have a new option to become a BM Unit	Doesn't align with RfG – but there are no material implications of this for new generation as the technical requirements in RfG are harmonised across the GCode and DCode. Existing generation already has the capabilities.	**Graeme Vincent –** Not sure I understand the statement around generators in Scotland having a new option to become a BM Unit? **Mike Kay -** I understand it -but I don't see it as an advantage. So maybe I don't understand it **ESO Response** – At the moment Scottish generators above 10MW (SHET) and above 30MW (SPT) would have to be in the BM as a generating unit (i.e., a BELLA has to meet the requirements of BC1 and BC2). Going forwards with a

		100MW threshold this would no longer apply but an embedded generator would have the option to apply for TEC and a BEGA if it so wished.
	May cause issues for Scottish TSO's and the ESO associated with the loss of visibility and control for new generation connections (depending on the retrospectivity) subject to being addressed by the Open Networks WS1B P6 work.	**Graeme Vincent -** and the ESO. The ESO is the system operator for the NETS as a TO we don't not 'control' the generation under normal operating conditions **ESO Response –** Agree, and added
It preserves the business arrangement and model of the DNOs in England and Wales and allows the industry to continue to evolve to DSO operations. As the evolution to DSO must satisfy NGESO needs then these would be equally satisfied in Scotland in the long run.	System operation is more complex particularly in Scotland due to the high volumes of generation connected	**Alan Creighton –** It would be worth why system operation would be more complex. **ESO Response –** The ESO will have fewer generators to instruct and have visibility of which will result in higher operating costs, as you will have a small subset of generators against which to operate the system. In other words, if you consider you have to operator 100% of the system but you only have 50% control over the generation it becomes much harder to control the system in an economic manner. **Mike Kay -** So more expensive and higher risk, but possibly simpler rather than complex. Would be good to be clear what/why complex as opposed to expensive/risky. **ESO Response –** This is both complex and more expensive/risky because the system in Scotland is very different to that in E&W. In Scotland the demands are generally lower, but the volumes of generation are (especially at an embedded level) are significantly higher which has a great impact on the operation of the Scottish system which needs to be taken into account.
Aligns with the emerging thinking from Open Networks WS1B P6 i.e., that data flows from smaller generation should be		

routed to the DNO for their use and then passed to NGESO.		
Change is just for new generation connections in Scotland	If retrospectivity is not applied, it would mean those plants in Scotland who already are caught by the requirements in the GC would not have an obligation in the future to provide these requirements so potentially this could be an issue.	**Graeme Vincent -** Depending on any retrospectivity? **ESO Response –** retrospectivity is not an issue in Scotland as we already have the data**.** **Mike Kay -** But you might not have in future if not retrospective **ESO Response –** Disadvantage section updated to reflect this.

*Medium would be a new threshold for Scotland