Distribution Code Consultation Response Proforma

DCRP/21/02/PC: Distribution Code EREC G100 Issue 2: Technical Requirements for Customers' Export and Import Limitation Schemes

Stakeholders are invited to respond to this consultation, expressing their views or providing any further evidence on any of the matters contained within the consultation document. Stakeholders are invited to supply the rationale for their responses to the set questions.

Please send your responses and comments by **17:00, 9th July** to dcode@energynetworks.org and please title your email 'Consultation Response DCRP/21/02/PC DCode EREC G100 Issue 2. Please note that any responses received after the deadline may not receive due consideration by the Working Group.

Any queries on the content of the consultation pro-forma should be addressed to DCode Administrator on 020 7706 5105, or to dcode@energynetworks.org

Respondent	*Joe Warren*
Company Name	Powervault Limited
No. of DCode Stakeholders Represented	1
Stakeholders represented	*Powervault Limited*
Role of Respondent	*Manufacturer*
We intend to publish the consultation responses on the DCode website. Do you agree to this response being published on the DCode website? [Y/N]	Y

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	Question	Response
Q1	Do you agree with the general intent of the proposed modification? If not, please explain your views.	We appreciate the work that the ENA and DNOs are doing to support the installation of renewable technologies to the network. We agree with the overall intent of the changes G100 however we think there are several flaws in the implementation of it. Domestic and small commercial energy storage systems provide a significant (currently unrewarded) benefit to the distribution network. Currently G100 permits the system to operate on a common sense basis. I.e., provided that the system does not overshoot for more than five seconds, then it is acceptable to monitor for any extra export and ramp back inverting in the event that a load suddenly disconnects. Today this means that in theory, a customer with say, 2x3.68 kW systems (one solar, one energy storage) will occasionally export above the limit for a matter of seconds. This is within today's rules of a 5 second overshoot (although typically any overshoot is shorter). We are not aware that today's rules are causing any network issues. The new rules would mean that if the customer has a large load which regularly switches on and off, the system could potentially overshoot for many periods of < 5 seconds. Under the new rules, the system would have to disable itself until an engineer visits site. We think this is unreasonable. G100 has become overly focussed on controlling only small downside risks down to zero, without keeping in mind the very big benefits which these devices currently provide. G100 has been updated to facilitate the connection of larger devices (which we support), and indeed the one minute / three minute / eight minute timescales both seem very generous to these devices. However at the same time the "no more than three excursions in 24 hours" has the unintended consequence of heavily penalising faster acting devices in a domestic setting which many have a larger number of very short, harmless excursions, which in

	Question	Response
		total last much much less than eight minutes – usually each excursion being order of seconds, the total length being measured in seconds per day or low minutes occasionally. The text implies (and this implication is potentially a reasonably held belief among the authors), that controlling to a lower tolerance – for example, setting the export threshold to 3.5 kW rather than 3.68 kW will result in avoiding this overshoot. This would work very well where you have a large piece of plant and a large load that infrequently "fails" or "trips". However, in more of a domestic or small commercial setting, unfortunately while it is possible to limit the overshoot period to the minimum possible – order of single digit seconds – it is not possible to implement a threshold that will guarantee that overshoots will never happen, since the overshoot is governed by the size of a load. If you have a load such as a heat pump on a duty cycle, it will naturally create conditions where the demand changes by a significant amount. In our experience this is currently quite rare – most of our sites never overshoot, a small proportion might do so once every day or two – but there are sites with larger loads where these sites create negligible (or zero) risk or damage, but which would be caught by the criteria proposed to be implemented. The current G100 permits these sites to operate with (typically) seconds or low minutes of "overshoot" time **per week** – and it seems unfair that these would be treated as non-compliant after the new G100 is implemented (albeit G100 is not retrospective) while larger sites would be allowed to overshoot for 8 minutes per day without penalty. A simple way to address this would be to keep the "5 second" rule for type tested devices, derogating them from having to track all the potential non-compliances and switch off under a complicated set of sub-conditions. Furthermore, we think that the metering requirements are overkill for domestic properties, where the impact of any error is negligible. The requirement to meter voltage and current at the boundary is over-kill. Within a domestic or small commercial property, we think it is acceptable to measure the voltage at the energy storage device. In any case, the voltage must be higher at this location than at the boundary if export is happening from this device, which would mean that the system will in general over-compensate. We also think that the metering accuracy requirements are too stringent. We would suggest that 5% accuracy should be

	Question	Response
		acceptable – we are talking about 200W here on 3.68kW or 250W on 5 kW. Typically accuracy is better than this.
Q2	Do you agree that the revised EREC G100 should be included in the Distribution Code Annex 1 and included under Distribution Code governance in the future? And if not, why not?	Provided that all the changes in our response document are made, we don't have a strong opinion about this, but since it is still evolving, anything that would make it harder or slower to change and revise it, or harder to derogate from it if there are unintended consequences, would be a bad thing.
Q3	Do you agree that the proposed modifications satisfy the applicable Distribution Code objectives? If not, please explain your concerns.	No, because one of the distribution code objectives are to promote low carbon technologies. The rules could substantially curtail many renewable technologies – the deployment of more solar and more storage specifically. The clearly demonstrated benefit that small scale storage provides, noted above seems to be ignored for the sake of trying to avoid very short excursions for which there is no evidence of any harm ever having been caused. The rules as now proposed (particularly the removal of exemption for excursions of less than 5 seconds) currently favour the connection of (potentially) carbon generating technologies which take longer to ramp down and disadvantage technologies such as energy storage. There is potentially also a risk that the rules could stifle competition by favouring some technologies or manufacturers over others, for example, a preference to have one master CLS, and the removal of the 5 second rule.
Q4	Do you support the formal description of the modes of operation and the migration between them?	No. Specifically, the text says the following, **and we propose to amend it as follows**: *"4.3.1 Mode 1- Normal Operation* *This is the normal operating state of the CLS. In this state the CLS will be modulating the consumption and generation of the Devices it controls such that current flowing at the Connection Point remains within that required by the MEL or MIL as appropriate and that the voltage at the Connection Point remains within statutory limits . The CLS might be modulating the consumption and generation of the Devices continually in real time* **in which case it is acceptable to deviate beyond MEL or MIL for periods of up to five seconds as part of continuous modulation**. *Alternatively, if the behaviour of the Devices is balanced such that the current flow at the Connection Point is normally within the MEL or MIL, then only by exception*

	Question	Response
		should the balance be disturbed sufficiently such that the current flow at the Connection Point encroaches on the MEL or MIL **for more than five seconds**. *In this latter case the CLS will then need to actively modulate the consumption and generation of the Devices.* *4.3.2 From time to time conditions within the Customer's Installation could be such that the current flow exceeds the MEL or MIL* **for more than 5 seconds**. *This could be caused by the sudden failure or tripping of part of the Customer's load or generation equipment. Such events by definition will be rare, and therefore not considered as normal operation."* Without our modification, this statement is unlikely to be true, because large or even just medium sized loads can often switch on and off. If fed from say solar plus battery storage at the same time this could cause an issue. We think that it should be possible to have many multiples of excursions of less than 5 seconds and remain in Mode 1. We do not think that there is any common mode between such excursions, since they would only result from loads switching off. Weather changes – resulting in solar generation increasing or decreasing are likely to happen more slowly. We do think that the scheme is very complicated – keeping track of all the lockouts etc. It would be preferable in our view, to exempt systems from all these lock out requirements if they are typically tracking within 5 seconds – i.e. leave the current rules in place – for domestic and small commercial settings. This would mean that we would not have to keep track of all these modes, and perhaps just have to do substantially the same type tests that we already do.
Q5	Do you agree with the fail-safe approach, and with the excessive mode 2 operation criteria? If not, would you propose different criteria?	No. We think that mode 1 should permit short term (<5second) excursions as being "normal" – as is currently the case – and mode 2 operation should be for any excursion longer than this. Otherwise we think this will effectively cause storage to have to operate in the most conservative mode in small sites with larger loads. This seems particularly excessive since you are at the same time permitting some other systems to overshoot for minutes at a time. Keeping track of all the different modes will make the implementation and type testing of it more complicated.

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	Question	Response
Q6	Do you agree with the proposed approach to resetting the limitation scheme and recovering from mode 3? In particular do you agree that it is appropriate to distinguish the capability to reset the CLS between domestic and commercial/industrial installations? An alternative would be to make a distinction between fully type tested CLSs and those which are not fully type tested; the WG would be interested in views on this.	We think that the arrangements for domestic and small scale installs with fully type tested systems are acceptable, subject to our other points – i.e. provided that the "5 second rule" is re-instated and the metering rules are relaxed to permit metering voltage elsewhere than at the site boundary, and to permit a wider tolerance on accuracy, etc.
Q7	Do you agree with the design limits? Do you support the thresholds proposed?	We disagree and we add in a proposed change below. *"The limitation on the capacities of **Customers' Devices** is set by mode 2 operation. In mode 2 operation, the **MEL** or **MIL** is breached* **for more than five seconds** *and the resultant high current flows can lead to a number of undesirable or even dangerous situations. In general temporary high currents can be tolerated provided there are appropriate caps on their magnitude and duration, and on consequential effects such as voltage rises or dips."* We think that for small domestic installations this significantly overstates the risk, especially when compared to the enormous benefit of not exporting energy for hours and not importing energy at peak time. What you are saying is – the possibility for this device to export over the limit for a few seconds more than three times in a day outweighs the hours of benefit it provides reducing export during sunny times when too much energy is entering the network from distributed generation and reducing import from customers at peak times, whereas it is o.k. for a larger device to overshoot twice for a total of up to 8 minutes every 24 hours. We understand that your drafting is designed to widen market access which we support but we think that the removal of the existing 5 second rule has this unintended consequence. *"For **Domestic Installations**, the effect of the **Customer's** loads can be significant, either because they are very small, or where they are significant they could be subject to sudden cessation or tripping. Therefore, for simplicity the default approach for all*

		*cases should be to ensure that the aggregated **Current Rating** of all generation **Devices** is less than the limit of mode 2 operation."* This might be a drafting error as we don't understand how the effect of Customers' loads can be significant because they are very small. The limit of mode 2 operation doesn't appear to be clearly defined – it looks like a number based around the 1.25 x 100Amp fuse limit of a domestic property – in which case this suggestion would be fine. However, we can't have a situation where the Current Rating of all generation Devices is less than, say 16Amps or even 32 amps – it really would be a big step backwards when we are trying (with the ENA and DNO's support) to raise this limit through G99 fast track. We should also avoid a situation where these limits have to be calculated by the DNO for every domestic or small commercial situation. We need to try wherever possible to move away from engineering judgement being needed to each situation and towards type testing. We propose modifications to the text **as follows**: *"4.5.1.3 Excessive Mode 2 Operation* *Although mode 2 operation is expected, it is not expected to be frequent. Accordingly if a CLS breaches any of the following criteria, it shall enter mode 3 operation immediately (ie within 5s).* • *The total time in mode 2 operation in any 24 hour period exceeds 8 minutes;* • *There are more than three excursions (each of **more than 5 seconds and** less than 5 minutes) into mode 2 operation in any 24 hour period; or* • *The time between any two consecutive mode 2 excursions **(each of more than 5 seconds and less than 5 minutes)** is 10 minutes or less (measured from the time of re-entry into mode 1 operation from mode 2 operation following the first excursion).* • **Excursions of less than 5 seconds shall not be counted as part of mode 2 operation.**

	Question	Response
		The implementation of the necessary counters and timers in the CLS must be done in non-volatile memory so that they are not reset if power to the CLS is lost. *4.5.2.1 Internal Failures and Excessive Mode 2 Operation* *For internal failures, and excessive mode 2 operation, the Customer, following resolution of the cause of the failure, should be able to reset the CLS back to normal operation as follows:* • *For CLSs installed in Domestic Installations, 3 resets will be allowed in any 30 day period. If this criterion is breached the CLS will remain locked in mode 3 pending further investigation and resolution of the issues causing the CLS to be locked-out in mode 3. The Manufacturer or Installer will propose how lock out in mode 3 can be resolved.* • *For CLSs installed in non-domestic installations any excursion into mode 3 operation shall not be capable of being reset within 4 hours of the start of mode 3 operation."* If we completely exclude from section 4.5 excursions less than 5 seconds in domestic and small scale installations then I think we could live with these two sections above albeit a simpler method would do away with the modes and leave the existing "5 second" rule in place. Otherwise, the numbers are too restrictive and massive overkill. We can't see that the device is really malfunctioning or indeed creating any harm, if it cannot prevent a very short excursion from a normal load being switched off in the house. We cannot see any evidence to suggest that such short excursions will create significant harm even if relatively frequent – and it has been standard practice under G100 previously with no issues that we are aware of.
Q8	Do you support the approach to communication media? Do you agree with the suggested approach to cyber security? Given this is a developing area we would	Regarding cyber security, in situations where the CLS is implemented locally and without needing any interaction with the cloud to operate, then we think a pragmatic approach should prevail in relation to cyber security. We are talking about locally

	Question	Response
	particularly like to hear from manufacturers and installers on this point.	implemented, local control systems. Provided there is a generally acceptable level of cyber security protecting these that should be adequate for G100.
Q9	Do you have any comments on the requirement to monitor the integrity of the secondary circuit of the current transformers used?	The more pragmatic and simpler the standard can be, the better. Additional requirements to monitor the integrity of components will make it more complicated and should be avoided where possible.
Q10	Do you support the approach proposed for multiple limitation devices installed in a single premise?	*"If it is not possible for a **CLS** to be confirmed as a master for the installation, suitable overload protection shall be fitted at the **Connection Point** and arranged to trip either the whole site, or appropriate **Devices**, within 1 minute (or 3 minutes for appropriate technologies and no other limitation on voltage rise – see **Error! Reference source not found.**) to ensure a **Fail Safe** arrangement as described in **Error! Reference source not found.**. The **Customer** will agree with the **DNO** the exact arrangements and record the design approach in the **Connection Agreement**."* We disagree with this part of it. We think that at small sites with multiple devices set to limit G100, the most likely outcome is over compensation therefore this should not be required. Some manufacturers have proposed (and we strongly disagree with this proposal since it obviously stifles competition) that it is a requirement that all devices are supplied by the same manufacturer. We don't think this would work unless there is a requirement for all manufacturers to agree and adhere to an interoperability standard (which we think is overkill). Since each device will be "seeing" the aggregate export, and each limiting if the export exceeds it, in practise if multiple devices are going to be backing off if one causes an overshoot, and we think, more likely to be erring on the side of caution.
Q11	Do you have any comments on the proposals for domestic installations?	We welcome the suggestions for domestic installations subject to all other comments above/below. We think it should be made completely clear which sub-sections of section 5 do **not** apply to domestic, as otherwise it could be ambiguous and for example, sections 5, 5.1, 5.3, 5.4, 5.6 may be requested by DNOs.
Q12	Do you have any comments on the proposed type testing regime?	You need to modify the whole document to permit <5s excursions to still be a pass as is the case under the current G100. As noted above, it may be best to allow small domestic / small

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		commercial systems to pass all tests if they can respond within 5 seconds, so that they don't have to keep track of a long list of failure modes and conditions, to keep things simple and to allow devices that are already G100 compliant to remain G100 compliant; this would reduce the amount of testing required considerably, back to what we currently do.
Q13	Is there the right balance of principle and detail in Section 5 on testing? Do you have any detailed comments on how testing should be prescribed?	You need to modify the whole document to permit <5s excursions to still be a pass as is the case under the current G100. As noted above, it may be best to allow small domestic / small commercial systems to pass all tests if they can respond within 5 seconds, so that they don't have to keep track of a long list of failure modes and conditions, to keep things simple and to allow devices that are already G100 compliant to remain G100 compliant; this would reduce the amount of testing required considerably, back to what we currently do.
Q14	If you have any detailed comments on the proposed drafting, please provide those comments in the proforma provided, or by marking up the consultation draft of G100.	For domestic and small business G100, we do not think it is appropriate to add additional responsibilities for energy storage and solar devices to have to control import, as there are currently no regulations requiring import limitation for homes. We do not think that enough thought has been put into using G100 import for small properties, and therefore this should be the subject of a future consultation. We believe that it is not the intention for G100 import limitation to apply to domestic properties at this stage, however, the G100 standard should be clarified so that there is no expectation for energy storage systems to have to comply with it until more time has been allowed to put in additional consideration. For domestic and small business G100, it is massive overkill to require a Appendix A and Appendix C form to be completed. There will already be an application under G99 fast track or G99. This would be a barrier to deployment of clean energy technologies. If really required, add relevant questions to G99 fast track or G99. Please avoid creating more form.

Please provide comments relating to the specific technical content of the proposed modifications[1]

[1] Add more rows if required

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Page / line No	Clause/ Subclause	Paragraph Figure/ Table	Type of comment (General/ Technical/Editorial)	COMMENTS	Proposed change	OBSERVATIONS OF THE SECRETARIAT on each comment submitted
p12	4.2			See above.	*The maximum permissible tolerance for the CLS's measurement and control of current is ± 2% of the greater of the MEL or the MIL and for the measurement of voltage is ± 1% of the nominal voltage of the Connection Point. These tolerances shall, as far as possible, take account of sensing and/or measurement errors, processing errors, communication errors and control errors. Consideration shall also be given to environmental factors (eg the expected ambient temperature range). For example, where the MEL is zero and MIL is 400A the maximum acceptable tolerance for the measurement and control of current is ± 2% of 400A = ± 8A and where the nominal voltage is 230V phase-neutral the maximum acceptable tolerance for the measurement of voltage is ± 1% of 230V = ± 2.3V.* ***For domestic and small commercial settings where the export is < 32 Amps a tolerance of 5% is acceptable.***	

p13	4.3.1			See above.	*4.3.1 Mode 1- Normal Operation* *This is the normal operating state of the CLS. In this state the CLS will be modulating the consumption and generation of the Devices it controls such that current flowing at the Connection Point remains within that required by the MEL or MIL as appropriate and that the voltage at the Connection Point remains within statutory limits . The CLS might be modulating the consumption and generation of the Devices continually in real time* **in which case it is acceptable to deviate beyond MEL or MIL for periods of up to five seconds as part of continuous modulation**. *Alternatively, if the behaviour of the Devices is balanced such that the current flow at the Connection Point is normally within the MEL or MIL, then only by exception should the balance be disturbed sufficiently such that the current flow at the Connection Point encroaches on the MEL or MIL* **for more than five seconds**. *In this latter case the CLS will then need to actively modulate the consumption and generation of the Devices.* *“*	

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p13		4.3.2		See above	*4.3.2 From time to time conditions within the Customer's Installation could be such that the current flow exceeds the MEL or MIL* **for more than 5 seconds**. *This could be caused by the sudden failure or tripping of part of the Customer's load or generation equipment. Such events by definition will be rare, and therefore not considered as normal operation.*	
P14		4.4		SEE ABOVE	*"The limitation on the capacities of* ***Customers' Devices*** *is set by mode 2 operation. In mode 2 operation, the* ***MEL*** *or* ***MIL*** *is breached* **for more than five seconds** *and the resultant high current flows can lead to a number of undesirable or even dangerous situations. In general temporary high currents can be tolerated provided there are appropriate caps on their magnitude and duration, and on consequential effects such as voltage rises or dips."*	

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P14		4.4		SEE ABOVE. We're not sure the first sentence makes sense.	*"For **Domestic Installations**, the effect of the **Customer's** loads can be significant, either because they are very small, or where they are significant they could be subject to sudden cessation or tripping. Therefore, for simplicity the default approach for all cases should be to ensure that the aggregated **Current Rating** of all generation **Devices** is less than the limit of mode 2 operation."*	

P18		4.5.1.3			*"4.5.1.3 Excessive Mode 2 Operation* *Although mode 2 operation is expected, it is not expected to be frequent. Accordingly if a CLS breaches any of the following criteria, it shall enter mode 3 operation immediately (ie within 5s).* • *The total time in mode 2 operation in any 24 hour period exceeds 8 minutes;* • *There are more than three excursions (each of* **more than 5 seconds and** *less than 5 minutes) into mode 2 operation in any 24 hour period; or* • *The time between any two consecutive mode 2 excursions* **(each of more than 5 seconds and less than 5 minutes)** *is 10 minutes or less (measured from the time of re-entry into mode 1 operation from mode 2 operation following the first excursion).* • **Excursions of less than 5 seconds shall not be counted as part of mode 2 operation.** *The implementation of the necessary counters and timers in the CLS must be done in non-volatile memory so that*	

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					they are not reset if power to the CLS is lost."	

P20		4.8		See above.	**4.8 Access to DNOs' Current and Voltage Signals** In general **Customers** will not have access to the **DNO's** current transformers, and where the **Connection Point** is at **LV Customers** will generally be able to provide appropriate voltage signals themselves. For the purposes of G100 Rogowski coils are an acceptable substitute for conventional current transformers. The provisions of Distribution Code DPC6.7.8 shall apply for access to current and voltage signals from the **Connection Point**. For voltage signals where the **Connection Point** is at **HV**, since the voltage signal is used for determining the direction of power flow determination, and for measuring the **Connection Point** voltage, it might be possible to use an **LV** supply within the **Customer's Installation** provided it is derived from a lightly loaded transformer electrically close to the **Connection Point**. **It is accepted that for small domestic and commercial sites, the voltage may be measured at a different location to the current, for**	

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					example at the inverter being controlled.	

P20	4.10			SEE ABOVE	**4.10Multiple CLSs in a Single Installation** In some installations **Customers** might want to install more than one **CLS** controlling separate sets of **Devices**. In such cases the sum of all the **Current Ratings** of generation and storage (in export mode) **Devices**, and/or the sum of all the capacities of loads and storage (in import mode) **Devices** must be less than the respective mode 2 limits for that installation. Ideally one **CLS** should be configured to act as the master **CLS**, and all other **CLSs** configured to harmonize with it. ***It is deemed acceptable for multiple Fully Type Tested CLS to be installed in a domestic or small commercial setting without a master for the installation needing to be confirmed****.* ***If it is not possible for a*** *non-fully type tested CLS* ***to be confirmed as a master for the installation, suitable overload protection shall be fitted at the*** *Connection Point* ***and arranged to trip either the whole site, or appropriate*** *Devices****, within 1 minute (or 3 minutes for appropriate technologies and no other limitation on voltage rise – see*** *Error! Reference source not found.****) to ensure a*** *Fail Safe*	

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					arrangement as described in *Error! Reference source not found.*. ***The*** *Customer* ***will agree with the*** *DNO* ***the exact arrangements and record the design approach in the*** *Connection Agreement****."***	
P21	4.11			SEE ABOVE	**4.11 Domestic Installations** The principles and requirements of this EREC G100 shall apply in full to **Domestic Installations**. It is expected that generally **Domestic Installations** will comprise **Fully Type Tested CLSs**. **Domestic Installations with Fully Type Tested CLSs will not be expected to complete Appendix A and Appendix C forms.**	
21	5 Appendix B			SEE ABOVE	**5. Application and acceptance** **<WE HAVE NOT DRAFTED SPECIFIC CHANGES, HOWEVER THE 5 SECOND RULE SHOULD B BROUGHT BACK. CONSIDERATION SHOULD BE MADE AS TO WHETHER TEST THROUGH ALL THE MODE 2 VARIANTS IS REALLY APPROPRIATE FOR FULLY TYPE TESTED SYSTEMS OPERATING UNDER THE 5 SECOND RULE AND IF NOT, REMOVE THE MODE 2 TESTING FROM THE TYPE TEST>**	
20	4.10			SEE ABOVE		