PART A REQUEST FOR A REQUEST FOR INFORMATION (RFI)			
Description of the services	Request for Information on Grid Forming Technologies		
Deadline for submission	31 August 2026	**At (South African Standard Time)**	10:00 AM
Tender Office address	Tenders are uploaded via NTCSA Tender bulletin site on the NTCSA E-tendering page.		
RFI are to be submitted electronically via Eskom E- tendering site by the stipulated closing date and time. ***Please note it is the responsibility of the supplier to ensure that RFI submission is submitted before the closing date and time***	Suppliers are not allowed to submit physical files to NTCSA Tender Offices. Please note it is the responsibility of the supplier to ensure that RFI submission is submitted before the closing date and time.		
Electronic Submission of RFI	The tenderer must upload the tender via NTCSA Tender bulletin site on the NTCSA E- tendering page. All documents need to be submitted in a PDF and Excel format (The limit is 50MB per file and total submission of 900MB per submissions). No Zip/condense files can be uploaded No hard copy will be accepted If for some reason you resubmit your RFI, then the latest version of the RFI submitted will only be accepted and all previous submission/s will be null and void. Please ensure that the submission status is indicated as complete. Supplier Help Manual guide and video can be found on NTCSA E-Tendering page		

E-tendering Help Manual for supplier	Refer to the attached E-tendering Help Manual for suppliers

National Transmission Company South Africa SOC Ltd ("NTCSA") invites you to submit an:

- **Request for information (RFI)** to submit information on Grid Forming Technologies for NTCSA.

NTCSA has delegated the responsibility for this **RFI** to the signatory of this document, whose details can be found below.

We look forward to receipt of your response.

Yours faithfully

Name	Designation	Signature	Date
Claire Sennelo	Asst Officer Procurement		24 August 2026
Telephone number	011 800 8111	**Fax and/or e-mail address**	Sennelcg@ntcsa.co.za

PART B **RESPONSE SHEET IN TERMS OF REQUEST FOR INFORMATION** **To be completed by the supplier**			
To	NTCSA SOC Ltd	**Date**	
Attention	Claire Sennelo		
Tel no		**Fax no and /or e-mail address**	
From ***[the registered full legal name of the company]***		**Address** ***[the business address of the company]***	
Address ***(the physical address of the company)***			
Sender			

[insert the full name of the sender at the company]	
Description of the services	Request for Information on Grid Forming Technologies

Please find below our response to NTCSA's questions:

No.	Question	Please indicate your response in this column
1.	Contact name and contact details	
2.	Company registration number	
3.	Do you manufacture or provide grid-scale GFM BESS?	
4.	What is your definition for GFM BESS and to what technical standard does that definition refer?	
5.	Kindly substantiate why you consider your technology to be grid forming and provide your definition of inertial response?	
6.	How may GW/GWh of GFM BESS have you supplied which was procured specifically for GFM capabilities as the primary requirement?	
7.	Do you have a traceable track record of providing grid-scale GFM BESS to power utilities across the world?	
8.	How long have you been supplying GFM technologies?	
9.	Please provide a list of power utilities and quantities of direct GFM orders fulfilled as well as the purpose for which the GFM was procured	
10.	Is the GFM BESS capable of forming its own voltage and angle?	
11.	Which tests have you performed to prove that the GFM BESS can form its own voltage and angle? Kindly provide documentation.	
12.	To which internationally recognized codes and standards do the tests conform to prove that the equipment can form its own voltage and angle? Kindly provide documentation.	
13.	Under which conditions can the GFM BESS provide this function (e.g. voltage ranges, system strength (SCR), temperature, altitude, etc.) and what tests have been performed to prove this (Own tests/Internationally recognized tests if any)? Kindly provide documentation.	

14.	Confirm whether your GFM BESS satisfies voltage-source behaviour expectations in leading GFM guidance (for example, NGESO GB grid-forming guidance and AEMO's Voltage Source Behaviour capability), including operation without reliance on a PLL in weak grids.	
15.	Confirm whether the inverter remains in grid-forming mode across its whole operating envelope, including under faults and disturbances, and identify any operating states in which grid-following behaviour is used instead.	
16.	Provide test results and studies demonstrating stable voltage formation for specified voltage and phase-angle steps at different SCR values (for example, SCR ≤ 2) and state the associated response times (rise time and settling time).	
17.	What range of SoC (for both charging and discharging modes) will these functions not be available for response?	
18.	Is the GFM BESS capable of providing system strength?	
19.	Which tests have you performed to prove that the GFM BESS is capable providing system strength? Kindly provide documentation.	
20.	To which internationally recognized codes and standards do these tests conform to prove this capability? Kindly provide documentation.	
21.	Under which conditions can the GFM BESS provide this function (e.g. voltage ranges, system strength (SCR), temperature, altitude, etc.) and what tests have been performed to prove this (Own tests/Internationally recognized tests if any)? Kindly provide documentation.	
22.	What impact does the provision of system strength have on the expected lifetime of the BESS? Which tests have been performed to prove this?	
23.	What is the impact (on system strength provision) of connecting your GFM close to other GFM sources and what tests have been performed to substantiate this?	
24.	Kindly provide the capability curves pertaining to system strength provision of your equipment.	
25.	What is the level of fault current in p.u. that the equipment can provide? What is the start time and duration of the fault current provision.	
2.	To what extent should the installation be oversized to provide the required value above 1 p.u, and what is the mechanism to increase the fault current above 1p.u.?	

27.	What is the overall % increase in cost to provide the current fault above 1 p.u. when compared to the unit that is not oversized?	
28.	State the minimum short-circuit ratio (SCR) at which your GFM BESS has been validated to operate stably while providing system-strength support, and indicate whether these tests align with UK, AEMO, Nordic or any other weak-grid use cases. Refer to Table 1, provide prototype tests if available.	
29.	Provide capability information such as Q–V and P–δ characteristics and virtual impedance or admittance settings that demonstrate contribution to local voltage stiffness and support of nearby inverter-based generation.	
30.	Provide any tests and studies performed with multiple GFM units operating in close electrical proximity and summarise the observed interaction behaviour and damping of converter interaction modes.	
31.	Is the GFM BESS capable of providing inertial response? Provide a technical description of this inertial response.	
32.	To which internationally recognized codes and standards do these tests conform to prove this capability? Kindly provide documentation.	
33.	Under which conditions can the GFM BESS provide this function (e.g. voltage ranges, system strength (SCR), temperature, altitude, etc.) and what tests have been performed to prove this (Own tests/Internationally recognized tests if any)? Kindly provide documentation.	
34.	What impact does the provision of inertial response have on the expected lifetime of the BESS? Which tests have been performed to prove this?	
35.	What is the impact (on inertial response capability) of connecting your GFM close to other GFM sources and what tests have been performed to substantiate this?	
36.	Kindly provide the capability curves pertaining to inertial response provision of your equipment.	
37.	Confirm whether your GFM BESS has been validated against formal inertial or fast-frequency response capability definitions (for example, AEMO's Inertial Response and Frequency-Domain Response capabilities). Provide prototype test.	
38.	What is the level of active power in p.u. can the equipment provide?	
39.	To what extent should the installation be oversized to provide the required response above 1 p.u, and what	

	is the mechanism to increase the active power above 1p.u.?	
40.	What is the overall % increase in cost to provide the active power above 1 p.u. when compared to the unit that is not oversized?	
41.	Is the GFM BESS capable of damping oscillations over a wind band of frequencies?	
42.	Provide step and RoCoF test results showing active-power response to frequency changes (for example, a 0.5 Hz step and RoCoF up to 2–3 Hz/s), including headroom reserved for this service and time to reach 90% of the requested response.	
43.	Indicate any limits on emulated inertia (such as maximum effective inertia constant or maximum MW/s rate of change) and explain how these limits interact with current limits, state-of-charge management and battery lifetime.	
44.	What range of SoC (for both charging and discharging modes) will these functions not be available for response?	
45.	Which tests have you performed to prove that the GFM BESS can perform the damping function? Kindly provide documentation.	
46.	What impact does the provision of the damping function have on the expected lifetime of the BESS? Which tests have been performed to prove this? Kindly provide documentation.	
47.	To which internationally recognized codes or standards do these tests conform to prove this capability? Kindly provide documentation.	
48.	Under which conditions can the GFM BESS provide this function (e.g. voltage ranges, system strength (SCR), temperature, altitude, etc.) and what tests have been performed to prove this (Own tests/Internationally recognized tests if any)? Kindly provide documentation.	
49.	Specify the frequency bands (for example, 0.2–0.8 Hz and 0.8–2 Hz) over which your GFM BESS can actively contribute to damping electromechanical oscillations and provide indicative damping ratios achieved in representative system studies.	
50.	What is the impact (on the damping function) of connecting your GFM close to other GFM sources and what tests have been performed to substantiate this	
51.	4.7.7. Kindly provide tests indicating the level of damping provided by your equipment and whether it can deal with multiple oscillations simultaneously	

52.	4.7.8. What other functions are curtailed while providing this service?	
53.	Provide RMS and/or EMT study results that demonstrate improved damping of oscillatory modes in weak, low-inertia grids, and describe how the controller avoids creating poorly damped inverter interaction modes when multiple GFM units are present.	
54.	To what extent should the installation be oversized to provide the damping function	
55.	4.7.10. What is the overall % increase in cost to provide the damping when compared to the unit that is not oversized?	
56.	Indicate which control structures or functions (for example, power-oscillation damping loops or virtual inertia tuning) are used to deliver oscillation damping and whether these can be tuned to meet jurisdiction-specific requirements.	
57.	What range of SoC (for both charging and discharging modes) will these functions not be available for response?	
58.	What impact does the provision of the black start function have on the expected lifetime of the BESS? Which tests have been performed to prove this? Kindly provide documentation.	
59.	Is the GFM BESS capable of black start? i.e., can the GFM BESS be used for multiple consecutive attempts at providing auxiliary power to a tripped coal generator specifically, including managing the inrush currents of any loads required for restoring a typical large coal generator?	
60.	What GFM BESS size/storage capacity (in MVA, MW & MWh) have you typically installed for black-start provision?	
61.	Which tests have you performed to prove that the GFM BESS can perform black start? Kindly provide documentation.	
62.	Which internationally recognized codes and standards do these tests conform to for the purpose of proving that the equipment can provide black start? Kindly provide documentation.	
63.	Provide tests and studies on transformer and line energisation, cold-load pickup and block load steps that the GFM BESS can support during restoration, including maximum MW per step and associated voltage and frequency performance.	
64.	What other functions are curtailed while providing this service?	

65.	To what extent should the installation be oversized to provide black start?	
66.	What is the overall % increase in cost to provide the black start when compared to the unit that is not oversized?	
67.	Describe the black-start and system-restoration use cases for which your GFM BESS has been designed and/or tested, referencing any alignment with UK, AEMO or Nordic guidance on restoration using grid-forming inverters.	
68.	State any specific oversizing, headroom, or auxiliary equipment requirements to provide black-start and restoration services and indicate how these affect cost and battery utilisation.	
69.	What are the maintenance implications of repeated black start attempts? Are there limits on the number of consecutive black-start operations before intervention is required?	
70.	What are the GFM BESS dynamic response capabilities during black start (e.g., frequency and voltage control under large disturbances)?	
71.	Can the inverter maintain stability under weak grid conditions during restoration?	
72.	Are there recommended settings or communication protocols for interoperability with other black-start units/islands during system restoration?	
73.	Can the GFM BESS ride through faults without tripping during energization of large transformers and lines?	
74.	What range of SoC (for both charging and discharging modes) will these functions not be available for response?	
75.	If utilised in a microgrid where the GFM BESS is initially the only power source, can it provide sufficient stability to allow the reconnection of a GFL resource, and what settings changes on the GFL are required to allow stable connection with the GFM BESS?	
76.	Stipulate whether your GFM BESS SoC management system can dedicate a portion of the battery capacity (to ensure a 12 hour guarantee: certified power x 12 hours) specifically for black-start provision whilst the remainder can be utilised by the facility under normal operation, and elaborate how this black-start provision can be achieved with the equipment and management features of your GFM technology. Also indicate to what extent rated power can be customised during the utilisation of the dedicated battery capacity provision for black start.	

77.	What impact does the island mode operation have on the expected lifetime of the BESS? Which tests have been performed to prove this? Kindly provide documentation	
78.	Is the GFM BESS capable of island mode?	
79.	Which tests have you performed to prove that the GFM BESS can operate in island mode? Kindly provide documentation.	
80.	Which internationally recognized codes and standards do these tests conform to for the purpose of proving that the equipment can operate in island mode? Kindly provide documentation.	
81.	What range of SoC (for both charging and discharging modes) will these functions not be available for response?	
82.	What other functions are curtailed while providing this service?	
83.	To what extent should the installation be oversized to enable island mode?	
84.	What is the overall % increase in cost to provide enable island mode when compared to the unit that is not oversized?	
85.	Indicate the range of island sizes (in MW) and load-generation imbalances (in percent) over which your GFM BESS has been validated to maintain stable island operation, and reference any alignment with UK, AEMO or Nordic islanding test cases where applicable.	
86.	Provide results from studies or tests showing transitions between grid-connected and islanded operation, including any restrictions on switching sequences or fault scenarios.	
87.	Kindly provide the capability curves pertaining to voltage deviation response of your equipment.	
88.	Is the GFM BESS capable of providing voltage control?	
89.	Which tests have you performed to prove that the GFM BESS can provide this function?	
90.	Which internationally recognized codes and standards do these tests conform to for the purpose of proving that the equipment can provide this function?	
91.	Under which conditions can the GFM BESS provide this function (e.g. voltage ranges, system strength (SCR), temperature, altitude, etc.) and what tests have been performed to prove this (Own tests/Internationally recognized tests if any)? Kindly provide documentation.	

92.	What impact does the provision of this function have on the expected lifetime of the BESS? Which tests have been performed to prove this?	
93.	What is the impact of connecting your GFM close to other GFM sources on this function and what tests have been performed to substantiate this?	
94.	What range of SoC (for both charging and discharging modes) will these functions not be available for response?	
95.	What is the level of reactive power in p.u. can the equipment provide?	
96.	To what extent should the installation be oversized to provide the required response above 1 p.u, and what is the mechanism to increase the reactive power above 1p.u.?	
97.	What is the overall % increase in cost to control reactive power when compared to the unit that is not oversized?	
98.	Is the GFM BESS capable of operating during severe voltage depressions or spikes?	
99.	Which tests have you performed to prove that the GFM BESS can provide this function?	
100.	Which internationally recognized codes and standards do these tests conform to for the purpose of proving that the equipment can provide this function?	
101.	Under which conditions can the GFM BESS provide this function (e.g. voltage ranges, system strength (SCR), temperature, altitude, etc.) and what tests have been performed to prove this (Own tests/Internationally recognized tests if any)? Kindly provide documentation.	
102.	What is the overall % increase in cost to control reactive power when compared to the unit that is not oversized?	
103.	What impact does the provision of this function have on the expected lifetime of the BESS? Which tests have been performed to prove this?	
104.	What other capabilities are curtailed while performing this function?	
105.	What is the impact of connecting your GFM close to other GFM sources on this function and what tests have been performed to substantiate this?	
106.	Kindly provide the capability curves pertaining to active power control of your equipment.	
107.	To what extent should the installation be oversized to provide the required this function?	

10.	Explain how obligations to maintain active-power output under voltage deviations are balanced against other services such as inertia and oscillation damping, especially when battery state of charge or thermal limits are approached.	
109.	Describe how voltage-control performance is affected when multiple GFM units and grid-following IBRs are connected nearby, and how your design mitigates adverse interactions.	
110.	What range of SoC (for both charging and discharging modes) will these functions not be available for response?	
111.	Under which conditions can the GFM BESS provide this function (e.g. voltage ranges, system strength (SCR), temperature, altitude, etc.) and what tests have been performed to prove this (Own tests/Internationally recognized tests if any)? Kindly provide documentation.	
112.	Is the GFM BESS capable of providing voltage ride through function?	
113.	Which field tests have you performed to prove that the GFM BESS can provide this function?	
114.	Confirm that the GFM BESS can comply with relevant LVRT/HVRT and fault-ride-through envelopes while maintaining stable voltage control in grid-forming mode and provide supporting test or study evidence.	
115.	What impact does the provision of this function have on the expected lifetime of the GFM BESS? Which tests have been performed to prove this?	
116.	What other capabilities are curtailed while performing this function?	
117.	What is the level of reactive current injection in p.u. can the equipment provide? And state the associated response times (rise time and settling time).	
118.	Is the GFM BESS capable of operating during severe voltage depressions or spikes?	
119.	Confirm that active-power recovery after fault-ride-through is compatible with the expectations of major grid codes for grid-forming plant (for example, recovery times and ramp rates) and supply representative field test and study results.	
120.	What other capabilities are curtailed while performing this function?	
121.	What is the level of reactive current injection in p.u. can the equipment provide? And state the associated response times (rise time and settling time).	

122.	Is the GFM BESS capable of operating during severe voltage depressions or spikes?	
123.	Confirm that the GFM BESS can comply with relevant LVRT/HVRT and fault-ride-through envelopes while maintaining stable voltage control in grid-forming mode and provide supporting test or study evidence.	
124.	Provide active-power versus voltage performance curves for severe voltage depressions and over-voltages, indicating the range over which active-power delivery is maintained and the conditions under which current limits reduce active-power output.	
125.	What range of SoC (for both charging and discharging modes) will these functions not be available for response?	
126.	Provide the capability curve and type tests during faults and disturbances for: Voltage ride through capability 4.12.12.2. Reactive current injection (response times) 4.12.12.3. Active power recovery post fault (Post fault recovery time)	
127.	What range of SoC (for both charging and discharging modes) will these functions not be available for response?	
128.	Provide field tests and studies results equivalent to the angle-step tests used in leading grid-forming guidance (for example, instantaneous MW response to a defined angle step, current-limiting behaviour and time to re-stabilisation).	
129.	Is the GFM BESS capable of withstanding phase jumps? What is the maximum phase angle change that your equipment can withstand?	
130.	Which tests have you performed to prove that the GFM BESS is capable of this?	
131.	Which internationally recognized codes and standards do these tests conform to for the purpose of proving that the equipment can withstand phase jumps?	
132.	Under which conditions can the GFM BESS provide this function (e.g. voltage ranges, system strength (SCR), temperature, altitude, etc.) and what tests have been performed to prove this (Own tests/Internationally recognized tests if any)? Kindly provide documentation.	
133.	What impact does the provision of this function have on the expected lifetime of the BESS? Which tests have been performed to prove this?	

134.	What is the impact of connecting your GFM close to other GFM sources on this function and what tests have been performed to substantiate this?	
135.	Kindly provide the capability curves pertaining to maximum phase jump angle.	
136.	To what extent should the installation be oversized to provide the required function?	
137.	What is the overall % increase in cost to incorporate this capability when compared to the unit that is not oversized?	
138.	State the maximum phase-angle step (in electrical degrees) that your GFM BESS can withstand while remaining stable and maintaining grid-forming behaviour, including any dependence on SCR or pre-disturbance loading.	
139.	What range of SoC (for both charging and discharging modes) will these functions not be available for response?	
140.	Describe how the controller avoids adverse interactions or loss of synchronism when multiple GFM units experience phase jumps or rapid angle changes in the wider system.	
141.	Are you willing to provide the controller module for software control in loop testing when required to do so?	
142.	Provide static and dynamic models for the purpose of simulating your GFM in a template that will be agreed with by the System Operator or the Network Service Provider (e.g. PSSE, PowerFactory, RSCAD and PSCAD)? Please indicate whichever is possible.	
143.	4.14.2. Are you willing to provide the inverter controller module with the necessary inputs and outputs for the purpose of hardware in the loop testing when required to do so?	
144.	Please provide field test results for FRT capability for both charging and discharging state while in GFM mode.	
145.	Confirm that EMT (for example, PSCAD) and RMS (for example, PSSE) models of the GFM BESS are available with sufficient detail and editable parameters to support the standardised grid-forming test programmes used in the UK, AEMO and Nordic studies.	
146.	4.14.5. Indicate whether your models have previously been accepted by transmission system operators or grid operators in jurisdictions with formal grid-forming requirements and list any such projects where this information is not confidential.	

147.	4.14.6. Confirm your willingness to support NTCSA in performing jurisdiction-style grid-forming validation tests (for example, voltage-source behaviour, weak-grid operation, fault-ride-through, inertia and damping) using these models, and in hardware- or software-in-the-loop environments where required.	

Yours faithfully

Name	Designation	Signature	Date
Telephone number		**Fax and/or e-mail address**	