

# Delivery Assurance Policy v4.1

## *Pertaining to the Accelerated Loss of Mains Change Programme (ALoMCP)*

### Introduction

The purpose of this document is to set out the procedures that will be followed by all distributors (DNOs and IDNOs) participating in the ALoMCP (“Participating Distributors”) to ensure that the works completed by providers of the accelerated loss of mains (LoM) change service (“Providers”) on their protection devices (relays, converter and inverter controllers, or otherwise) are completed to a satisfactory standard.

This document is referred to in the contract that governs the provision of the accelerated LOM change service (“ALoMCP Distributor Agreement”) between National Grid Electricity System Operator Limited (“NGESO”) and each Participating Distributor and in the contracts that govern the provision of the service between the Participating Distributor and each Provider (“ALoMCP Provider Contracts”). The terms of each ALoMCP Distributor Agreement require that the Participating Distributor and NGESO comply with the terms of this Delivery Assurance Policy and the ALoMCP Provider Contracts require the Participating Distributor and the Provider to also comply with the terms of this Delivery Assurance Policy.

### Governance

This document has been adopted by the delivery assurance workstream of the ALoMCP and adopted by all its members in accordance with the constitution of the Programme Steering Group and related Workstreams. Any changes to this policy are governed by the rules of the delivery assurance workstream, which all members have agreed to comply with in the Framework Agreement between NGESO and Participating Distributors.

The Delivery Assurance Workstream will monitor the assumptions that were used to define this policy, the delivery of the Participating Distributors against its elements, the degree of assurance it provides, and the issues associated with its implementation. The workstream will agree any necessary revisions to it according to the decision-making rules set out in the constitution.

### Version control

Version	Date	Status	Notes
1.0	23.08.2019	Final	
2.0	13.12.2019	Final	Improved proforma to clarify testing and compliance requirements
3.0	21.01.2020	Final	Requirement to provide inverter and relay models in the proforma and clarification that the use of G99 settings is acceptable
4.0	19.03.2020	Final	Requirement to specify machine types included. Minor changes to the process for sample site visits
4.1	30.06.2021	Final	Clarification that the policy applies to all power electronic converters and inverters.

## Approach

Due to the complexity of the project and the large number of sites affected, the approach to delivery assurance should allow a combination of auditing of processes and documentation, self-certification, witness testing, and sample site visits. The number of sites covered by each method should be defined such that:

- The whole process is economic and efficient,
- The risks to distribution systems arising from this programme are minimised,
- Systematic failures are identified and addressed throughout the programme.

To achieve these objectives, it is necessary to ensure that:

- The majority of the sites are covered by self-certification
- Sites where the scope of works is more significant should be subject to witness testing,
- The number of sample site visits is sufficient to provide assurance of how successful the delivery process is.

Further efficiency will be achieved by allowing Participating Distributors to waive the requirement to witness testing based on establishing confidence that the Provider or the contractor acting on behalf of the Provider has the necessary skills, processes and procedures in place to carry out the works satisfactorily.

To meet these requirements, the delivery assurance approach dictates:

- a) Witness testing at all sites where:
  - an existing protection device (relay, converter or inverter controller, or otherwise) is to be replaced by a new device, or
  - the loss of mains protection function of an existing protection device (relay, converter or inverter controller, or otherwise) is to be disabled,
 unless the Participating Distributor waives this requirement due to the works are being completed by a recognised contractor.
- b) Self-certification, supported by evidence, at sites where
  - only a protection setting change is required, and
  - sites where the requirement for witness testing has been waived due to the works being completed by a recognised contractor.
- c) Undertaking sample site visits at a percentage of the sites where witness testing was not conducted. For the avoidance of doubt this includes all sites where self-certification is accepted.

For the sole purpose of this document a 'recognised contractor' has the meaning given in Annex 2.

The treatment of a contractor as a recognised contractor will be for each Participating Distributor individually to decide based on their experience with that contractor. This may include for routine sample witnessing of recognised contractor at which witnessing event a recognised contractor may cease to qualify as a recognised contractor if issues are identified as provided in the relevant ALoMCP Distributor Agreement.

This approach is summarised in Table 1 below.

**Table 1: Summary of the Delivery Assurance Policy**

Scope of Works	Baseline approach	Revised approach for Recognised Contractor
Replacing an existing protection device by a new device	Participating Distributor witness testing	Self-certification with percentage of sites subject to a post event sample site visit at the rates specified in Table 2.
Disabling the loss of mains protection function in an existing protection device	Participating Distributor witness testing	Self-certification with percentage of sites subject to a post event sample site visit at the rates specified in Table 2.
Changing the settings of an existing protection device	Self-certification with percentage of sites subject to a post event sample site visit at the rates specified in Table 2.	Self-certification with percentage of sites subject to a post event sample site visit at the rates specified in Table 2.

## Assessment methods

### 1. Participating Distributor witnesses testing:

This is when the relevant Participating Distributor’s representative attends to site while the Provider or its contractor implements the change to witness testing of the protection devices and, where deemed appropriate, oversees the completion of the works.

For Participating Distributors, witness testing provides assurance that the works done by the Provider, or its contractor, do not compromise the safety of the Participating Distributor’s distribution system. It also informs a view of whether any Provider - or contractor acting on behalf of a Provider - has the skills, processes and procedures in place to undertake protection modification works at other sites without the need to witness such works or not, as defined in the “recognised contractor” approach.

For NGESO, witness testing provides some level of surety that the works done at this specific site are in line with the objectives of the programme.

Witness testing requires that the Participating Distributor makes sufficient resource available to:

- a) agree the date and time during which the works would be undertaken, and
- b) attend site to witness testing at the agreed date and time.

When at site the Participating Distributor's representative will witness the completion of some or all of the tests, as documented in G59<sup>1</sup> Sections 13.2 and 13.3, relevant to the work undertaken to implement the protection changes and provide signed copies of the commissioning documentation to the Participating Distributor's representative. In addition, and on all occasions the proforma (Annex 1) should be completed by the Provider and returned to the Participating Distributors.

A Participating Distributor's representative will be expected to record the occasions when they had to intervene either to provide guidance or to request that some errors are corrected. These records will be anonymised, collated, and shared by the Participating Distributor with other Participating Distributors and NGESO in order to inform the need for any further guidance, assurance, or changes to the process.

## 2. Self-certification:

Self-certification is the process whereby the Provider declares to the relevant Participating Distributor that the works have been completed as required and provide them with sufficient evidence to support their claim for payment.

The evidence required to support the Provider's claim is outlined in the proforma (see Annex 1).

The Participating Distributor will review the pro-forma and the evidence submitted for consistency and to confirm whether the information in the pro-forma and the evidence indicate that the Provider is likely to have completed the works required and that the G59 requirements on LoM protection are met.

For Participating Distributors and NGESO this provides an expedient way of processing a large number of applications with minimal resource requirement and low overhead costs. However, it will not capture any failure (systematic or other) in the process unless such failure is identified through the documentation submitted.

Participating Distributors will provide sufficient resource to assess the evidence submitted by Providers.

## 3. Post event sample site visits:

This is when the relevant Participating Distributor's representative visits the site following receipt of evidence that the changes required to the LoM protection have taken place.

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<sup>1</sup> Note – it is acceptable to commission new or reset protection to the requirements of G99 if the relays etc are capable of accepting G99 settings.

For Participating Distributors and NGENSO this increases the confidence in the delivery of the programme because it provides an efficient mechanism that identifies systematic failures in the process such that these failures can be addressed.

The Participating Distributor will coordinate sample site visits with the Provider for the Participating Distributor’s representative to attend at the agreed time and date.

When at site the person conducting sample site visits will:

- Choose an appropriate sample of LoM protection devices on the site.
- Ask the Provider to browse its settings and display the LoM protection type and settings
- Compare the relay and the settings observed to the records submitted by the Provider
- Identify and record any discrepancies,
- Where required, notify the Provider with any actions required.

The Provider may need to ensure that its appointed contractor attends site at the date/time of the visit to facilitate the sample site visit.

Discrepancies identified will be anonymised, collated, and shared with other Participating Distributors and NGENSO in order to inform the need for any further guidance, assurance, or changes to the process.

Sampling rates for post event sample site visits will vary depending on the site capacity, their generation technology, and their existing LoM protection settings. These rates are summarised in Table 2. The assumptions and the calculations that were used to determine these rates are included in Annex 3.

Each Participating Distributor is responsible for selecting which sites to visit to achieve the sampling rate required. In doing so, the Participating Distributor shall ensure that the selection is free from any systematic bias in relation to the objectives of the programme.

**Table 2: Requirements for sample site visits**

Site capacity	Site type	Sampling rate
1MW or above	<u>For Vector Shift (VS) protection</u> Solar sites	56%
	<u>For Rate of Change of Frequency (RoCoF) protection</u>	

	All sites excluding solar generation, diesel generation, and gas generation that does not form a part of a CHP system	
1MW or above	Other sites	31%
Less than 1 MW	<u>For VS protection</u> Solar sites <u>For RoCoF protection</u> All sites excluding solar generation, diesel generation, and gas generation that does not form a part of a CHP system	3%
Less than 1 MW	Other sites	2%

The rates in Table 2 will be reviewed by the delivery assurance workstream once a third of the sites within each of the four categories has been completed. The assumptions on the total number of sites are given in Table 3. Further reviews may be needed from time to time to account for any change in the assumptions that were used to determine such rates.

**Table 3: Number of sites after which the sampling rate will be reviewed.**

Site capacity	Site type	Assumed total number of sites	Assumed number of sites after which the sampling rates will be reviewed
1MW or above	<u>For VS protection</u> Solar sites <u>For RoCoF protection</u> All sites excluding solar generation, diesel generation, and gas generation that does not form a part of a CHP system	1620	540
1MW or above	Other sites	1620	540
Less than 1 MW	<u>For VS protection</u> Solar sites <u>For RoCoF protection</u> All sites excluding solar generation, diesel generation, and gas generation that does not form a part of a CHP system	23400	7800
Less than 1 MW	Other sites	23400	7800

## Independent Auditing

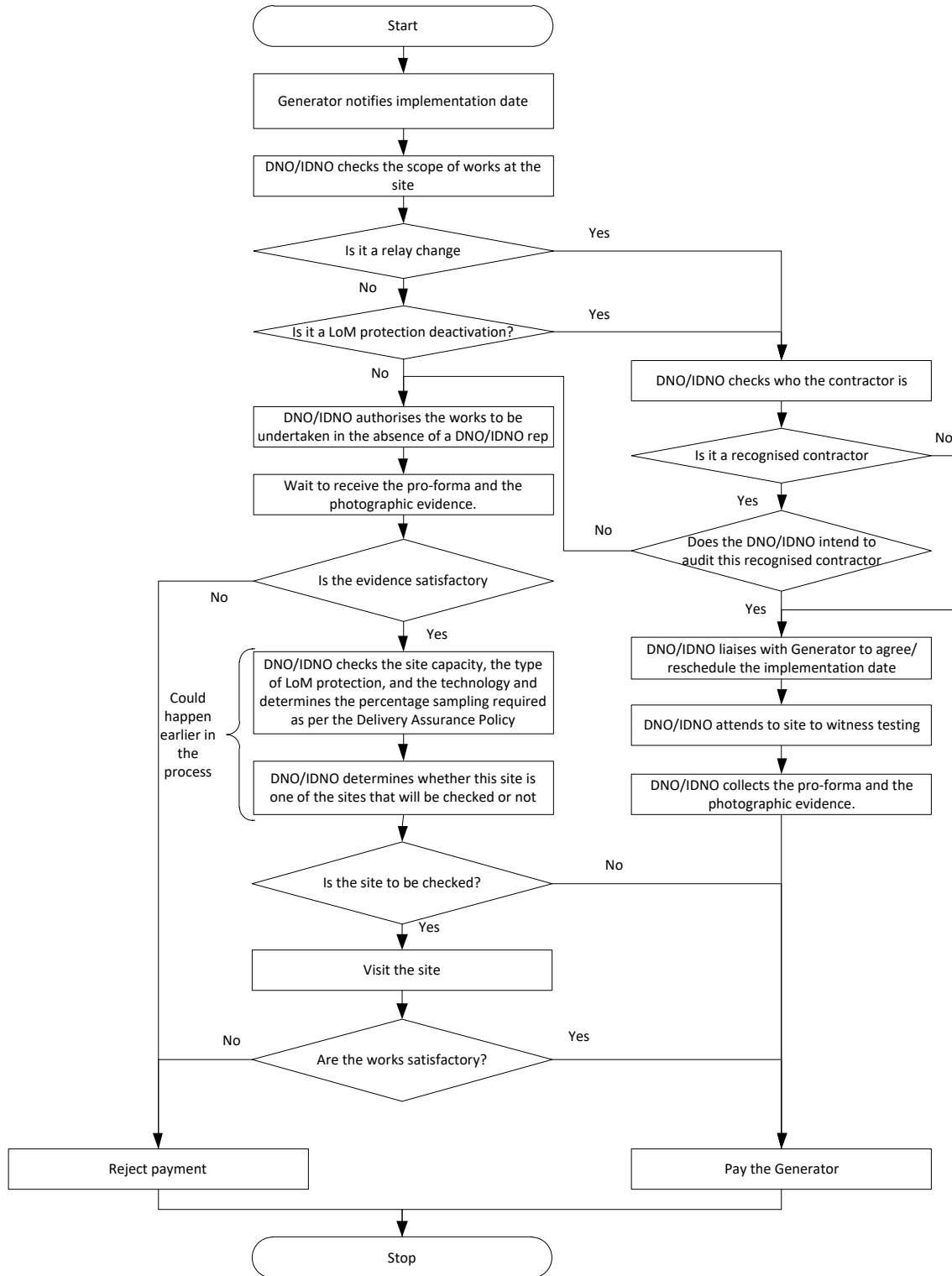
An audit of the programme overall may be undertaken to ensure that it is delivering its objectives and hence this audit does not form a part of this delivery assurance approach. However, it is mentioned in this document for completeness.

If and when required, the independent auditor may require additional site visits. In such case, NGESO will liaise with the Participating Distributor and the Provider to arrange sample site visits.

## Delivery Assurance Flowchart

A flowchart depicting the activities required by the Delivery Assurance Policy is shown in Figure 1.

Figure 1: Delivery Assurance Flowchart





## Charges and Allowances

Participating Distributors will not charge Providers for one successful visit, either for witness testing or to conduct a post event sample site visit, during normal office hours.

Participating Distributors will charge Providers for failed visits, visits out of normal office hours, and any repeat visits by the Participating Distributor to witness re-tests etc. The charges will be in line with the Participating Distributor's normal charges for witnessing tests of this type.

Participating Distributors will pay the Providers an allowance towards any additional costs they may incur to facilitate a successful post event sample site visit. This allowance is specified in the [Payment Process Specification](#). NGESO will reimburse Participating Distributors for these allowances.

Participating Distributors will charge NGESO for one successful visit, to either witness testing or to conduct a post event sample site visit, to sites where such visits are required by the Delivery Assurance Policy.

## **Annex 1: Pro-forma record of Loss of Mains Change Service**

The pro-forma must be returned completed and signed by the Provider, site operator, or any party acting on its behalf.

In addition to the information in tabulated proforma, Participating Distributors will require the following:

- Timestamped photographic evidence showing the LoM protection device and its settings both prior to and after the change
- Timestamped photographic evidence of any other relevant works on site (eg disconnected tripping circuits etc)
- Printouts, screenshots or other details of protection device settings or setting files
- Records of tests undertaken and/or any associated test certificates.

**Details of the Works Completed at The Site**

<b>Company Name:</b>	<b>Unique Site ID:</b>
<b>Site Address:</b>	<b>DNO/IDNO:</b>
<b>Post Code:</b>	<b>MPAN:</b>
<b>Contact Name:</b>	<b>Contact Details:</b> Email Phone
<b>Contractor (if applicable):</b> Name:  Company:	<b>Contractor Contact Details:</b> Email Phone
<b>Description of originally installed loss of mains and overfrequency protection:</b>	
<p>Please overtype this text with your site-specific information.</p> <p>For example – number of units, make and types of any device that provides a loss of mains protection function, overfrequency relays and what the settings for each device/relay are.</p>	
<b>Description of work undertaken to make the change</b>	
<p>Please overtype this text with your site-specific information.</p> <p>For example - what protection devices have been physically changed, or what protection devices have had new settings applied, or what protection devices have been physically disconnected and how.</p>	
<b>Description of the interface protection post the change being completed</b>	
<p>Please overtype this text with your site-specific information.</p> <p>For example – number of units, make and types of any device that provides loss of mains protection function in service and what their settings are. Also state if, where it is appropriate, loss of mains protection have been disabled/disconnected.</p> <p>Please include/attach time-stamped photographs of the relevant protection devices on site, showing the settings. Please include any other photographs of relevant works on site (eg disconnected</p>	

tripping circuits etc). Please attach printouts or other details of protection settings or protection setting files as appropriate.  
 Please include where possible in the photographic evidence to tie the photographs to the site and relevant devices, eg relay/device serial numbers, associated plant and equipment, etc.

<p><b>Name of person confirming the changes have been made:</b></p>	<p><b>Name of the person who undertook the changes (if different from the person confirming the changes):</b></p>
<p><b>Signature, and date of confirmation:</b></p> <p><b>Signed:</b></p> <p><b>Date:</b></p>	<p><b>Confirm that protection has been recommissioned and all relevant tests undertaken and test certificates has been submitted as attachments to this pro-forma.</b></p> <p>An example of an appropriate certificate can be found in EREC G59 section 13.3. See below for further guidance</p> <p><b>Y / N</b></p>

Any changed/new device shall be commissioned in accordance with the current issue of G59/3 (note that it is acceptable to use G99 settings and tests rather than G59).

Any changed settings shall be proved to be effective by testing in accordance with the current issue of G59/3 (or G99).

Any device that had its Vector Shift and/or RoCoF protection deactivated shall be proved to be stable by testing in accordance with the current issue of G59/3 (or G99) where it is feasible to conduct such tests. Where vector shift and/or RoCoF has been deactivated, the tests in G59/3 that would normally demonstrate the correct tripping should, in this case, show that the protection does not trip and the test reports etc should make this clear.

Where testing is not feasible, a statement of why such tests were not conducted would be considered sufficient.

**Summary of G59 protection settings on site**

					No of protection devices	No of generating units	Total generation capacity (kW/MW)
Settings of protection devices settings after completion of the ALoMCP works (please specify these and repeat this section for any additional set of settings)							
	Stage 1 (if present)		Stage 2				
	V	s	V	S			
Over voltage							
Under voltage							
	Hz	s	Hz	S			
Over frequency							
Under frequency							
LoM							
Settings of protection devices settings after completion of the ALoMCP works (please specify these and repeat this section for any additional set of settings)							
	Stage 1 (if present)		Stage 2				
	V	s	V	S			
Over voltage							
Under voltage							
	Hz	s	Hz	S			
Over frequency							
Under frequency							
LoM							
Please list any issue, eg a design that may prevent a generating unit on site from maintaining a stable output over the voltage and frequency range determined by its under/over voltage/frequency specified above							
Issue 1:							
Issue 2:							
Issue 3:							

## Summary of Works Completed at the Site

			Number	Comments
<b>Protection relays at the site (electromechanical/digital)</b>				
Total items at the site				
Items requiring no change				
Items replaced				
Items reset to RoCoF 1Hzs <sup>-1</sup> with 500ms time delay				
Items that had the LoM protection function disabled				
Items that required other modifications (please explain these)				
Items where a change would be required but is not technically feasible				
	Manufacturer	Relay Type		
Manufacturer 1 <sup>2</sup>				
Manufacturer 2				
Manufacturer 3				
<b>Converter or inverter control systems at the site</b>				
Total items at the facility				
Items already compliant				
Items reset to RoCoF 1Hzs <sup>-1</sup> with 500ms time delay				
Items that had the LoM protection function disabled				
Items that had firmware updated to prevent tripping/reduction of output for Vector Shift and/or RoCoF that is below 1Hzs <sup>-1</sup> .				
Items that required additional modifications (please clarify these)				
Items where a change would be required but is not technically feasible				
	Manufacturer	Converter/Inverter Type		
Manufacturer 1 <sup>1</sup>				
Manufacturer 2				
Manufacturer 3				

<sup>2</sup> Please continue on a separate sheet if necessary

Other means of provision of LoM protection at the site		
Total items at the site		
Items already compliant		
Items replaced		
Items reset to RoCoF 1Hzs <sup>-1</sup> with 500ms time delay		
Items that had its LoM protection function disabled		
Items requiring additional modifications (please clarify these)		
Items where a change would be required but is not technically feasible		

The presence of items, whether these are protection relays, converter and inverter control systems, or any other device, that could not be changed to prevent it from responding to Vector Shift or RoCoF below 1Hzs<sup>-1</sup> indicates that the works required by the ALoMCP agreement may not be complete and is likely to affect your payment. The impact will depend on the justification provided and will take into account any prior agreements with the DNO/IDNO in relation to this specific change provided that such agreement has been authorised by NGESO.

**Summary of Generating Units at the Site**

	Number	Comments
Total number of Synchronous Generating Units		
Total number of Doubly Fed Induction Generating (DFIG) Units		
Total number of other forms of generation (e.g. full converter, asynchronous)		
Number of protection devices that have been replaced where such protection devices are not used to protect Synchronous/DFIG units.		
Date at which the application first submitted		

For applications made on or after the 1<sup>st</sup> of February 2020, payment rates applicable to Protection Replacement Works will only be made available where the protection device is used to protect a synchronous generating unit or a DFIG unit. Otherwise, payment will be made on the basis of Protection Function Deactivation.



### **ALoMCP Compliance Checklist**

	Yes/No
Are there any devices (protection relays/converters/inverters/otherwise) that use Vector Shift as means of provision of Loss of Mains protection?	
If yes please explain/comment:	
Are there any devices (protection relays/converters /inverters/otherwise) that use RoCoF as means of provision of Loss of Mains protection with settings that are not 1Hzs <sup>-1</sup> with time delay of 500ms?	
If yes please explain/comment:	
Are there any generating units or converters/inverters that are at risk of tripping/reducing their output in response to detection of <ul style="list-style-type: none"> <li>- Vector Shift and/or</li> <li>- RoCoF of less than 1Hzs<sup>-1</sup></li> <li>- RoCoF of 1Hzs<sup>-1</sup> or above lasting for a duration less than 500ms. And/or</li> <li>- Frequency settings within the 47.0Hz to 52.0Hz range.</li> </ul>	
If yes please explain/comment:	

Answering any of these questions by 'Yes' indicates that the works required by the ALoMCP agreement may not be complete and is likely to impact your payment. The impact will depend on the justification provided and will take into account any prior agreements with the DNO/IDNO in relation to this specific change provided that such agreement has been authored by NGESO.

## **Annex 2: Guidance on Specification of Recognised Contractor**

A Participating Distributor may maintain a list of recognised contractors. This list will include engineers who fulfil the following criteria:

- They have been previously witnessed on site by the Participating Distributor on sufficient occasions – not necessarily as a part of this programme – undertaking generator protection commissioning activities and found competent on these occasions in terms of their skills, processes, procedures and ability to resource the work effectively;
- Are happy to provide the Participating Distributor with further evidence of their competence and of their ability to maintain this competence, eg process documents and safety procedures, if the participating distributor requires them to do so; and
- Will continue to demonstrate competence in any occasion when the Participating Distributor elects to audit their work.

Participating Distributors must notify the details of recognised contractors to NGESO but will not share information regarding recognised contractors. Each Participating Distributor will maintain its own policy for the recognition of, and interaction with, recognised contractors.

### Annex 3: Determination of the sampling rate for post-event site visits

In order to determine the sampling rate, sites will be categorised into four (4) groups to account for their contribution to the risk due to capacity and likelihood of operation when the risk is high. This categorisation and the initial assumption on the number of sites on each category are shown in **Table 4**. The assumption on the number of sites within each category will be revised as the need arises.

**Table 4: Groups and initial assumption on the number of sites in each group.**

		Likelihood of operation at high risk periods	
		High Solar sites with VS Relays and all sites with RoCoF relays excluding solar generation, diesel generation, and gas generation that does not form a part of a CHP system	Low Other sites
Capacity	≥1MW	1,620	1,620
	<1MW	23,400	23,400

An initial assumption of 50% variability will be made. That is equivalent to 50% of the sites failing to undertake the works correctly. This assumption will be revised twice. This is after the works are complete at:

- 33% of the sites; and
- 66% of the sites.

The sample size will be determined by the delivery assurance workstream such that the error of margin due to sampling is limited to the values given in **Table 5** with a confidence level of 95%.

**Table 5: Margin of error for each group**

		Likelihood of operation at high risk periods	
		High	Low
Capacity	≥1MW	3%	5%
	<1MW	5%	7%

The initial sample size that is necessary to achieve the above objectives for the first 33% of the sites in each group is given in **Table 6**.

**Table 6: Initial sampling rate**

		Likelihood of operation at high risk periods	
		High	Low
Capacity	≥1MW	56% (302 sites in total)	31% (169 sites in total)
	<1MW	3% (238 sites in total)	2% (123 sites in total)

The total number of sites visited by the time works are complete at 33% of the sites will be 833 sites (5% of sites where the works are complete).

As knowledge of the actual variability rate is gained, the sampling rate required to achieve the same confidence level and error margin will drop. This is illustrated by Table 8 for a set of potential variability rates.

**Table 7: Initial sampling rate**

		Likelihood of operation at high risk periods	
		High	Low
50%	≥1MW	66% (359 sites in total)	42% (225 sites in total)
	<1MW	5% (366 sites in total)	2% (191 sites in total)
		6.8% (1141 sites in total)	
60%	≥1MW	66% (354 sites in total)	41% (219 sites in total)
	<1MW	5% (350 sites in total)	2% (184 sites in total)
		6.6% (1109 sites in total)	
70%	≥1MW	62% (337 sites in total)	37% (202 sites in total)
	<1MW	4% (310 sites in total)	2% (161 sites in total)
		6.1% (1011 sites in total)	
75%	≥1MW	60% (323 sites in total)	35% (188 sites in total)
	<1MW	4% (278 sites in total)	2% (144 sites in total)
		5.6% (933 sites in total)	
80%	≥1MW	56% (302 sites in total)	31% (169 sites in total)
	<1MW	3% (238 sites in total)	2% (123 sites in total)
		5% (833 sites in total)	
90%	≥1MW	42% (225 sites in total)	20% (110 sites in total)
	<1MW	2% (136 sites in total)	1% (70 sites in total)
		3.2% (541 sites in total)	
95%	≥1MW	27% (148 sites in total)	5% (64 sites in total)
	<1MW	1% (72 sites in total)	0.5% (37 sites in total)
		1.9% (321 sites in total)	

As clarity on the number of sites that are likely to be operating at period of high risk increases, the assumptions on Table 4 will change. The range of variation and its impact on the number of sites visited and the percentage of sampling is summarised in Table 8. In all cases, the number of sites visited by the time 33% of sites have declared that they have completed the works will be within the range of 627 to 834 sites. That corresponds to a range of 3.76% to 5.0% of the sites where the works have been completed.

**Table 8: Sensitivity on number of sites and its impact on sampling for the first 33% of sites.**

		Likelihood of operation at high risk periods			
		High		Low	
		From	To	From	To
≥1MW	Total sites	2,916	324	324	2,916
	Sites covered at initial stage	972	108	108	972
	Sites sampled at initial stage	401	93	75	196
	% of sampling	41.3%	86.5%	70%	20.2%
<1MW	Total sites	42,120	4,680	4,680	42,120
	Sites covered at initial stage	14,040	1,560	1,560	14,040
	Sites sampled at initial stage	242	213	116	124
	% of sampling	1.7%	13.6%	7.4%	0.9%