The Accelerated Loss of Mains Change Programme

An industry led project delivered by National Grid ESO, Distribution Network Operators, and Independent Distribution Network Operators to accelerate compliance with new requirements in the Distribution Code

Stakeholder Event
April 2019
Agenda

1. Welcome and Introductions
2. Project partners
3. The Requirement
4. The Programme
5. Next Steps
National Grid ESO

Who's Involved

Other IDNOs

<table>
<thead>
<tr>
<th>Eclipse</th>
<th>Fulcrum</th>
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<tbody>
<tr>
<td>Energetics</td>
<td>Harlaxton</td>
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<tr>
<td>Energy Assets</td>
<td>Leep</td>
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<tr>
<td>ESP Electricity</td>
<td>UK Power Distribution</td>
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The Accelerated Loss of Mains Change Programme

The Requirements
Distributed Generation (DG) is required to be equipped with Loss of Mains (LoM) protection. In most cases this is provided by Rate of Change of Frequency (RoCoF) relays or Vector Shift (VS) relays.

This is intended to prevent the formation of power islands.

It should not operate for faults that do not result in islanding.

Historically:

RoCoF relays were set to operate for rates of change of frequency as low as $0.125 \text{Hzs}^{-1}$.

VS relays were seen as an acceptable mean of provision of LoM protection.
LoM protection should only operate in case of islanding. However, VS relays and oversensitive RoCoF relays could trip for transmission faults that do not result in islanding.
Disconnection of DG by LoM protection could cause/exacerbate a large frequency excursion trigger Low Frequency Demand Disconnection relays resulting in unnecessary loss of demand.

If the volume of distributed generation at risk is high enough, there is a risk that LFDD occurs.

Additional loss of generation due to LoM operation causing a further fall in frequency.
LoM Protection: Managing the Risk

- Options for Managing the Risk
  - Limiting the largest loss limits the rate of change
  - Increasing inertia by synchronising additional synchronous plant reduces the rate of change (displaces non synchronous generation)
  - Limiting the Rate of Change using automatic action
  - Changing or Removing RoCoF based protection
  - Changing or Removing VS based protection
  - Different LoM approach

Current practice
- Not currently feasible
- Some already done but not enough
LoM Protection: Managing the Risk

- Each option comes at cost

- Cost of limiting the largest loss/increasing the inertia in 2018 exceeded £100m

- These costs are funded by Balancing Service Use of System (BSUoS) payers and are borne by electricity consumers
LoM Protection: Resolving the Risk

**GC0035**

At **sites ≥5MW from Aug 2014 for new sites and Aug 2016 for existing sites**

RoCoF relay settings: 1Hzs⁻¹ with 500ms definite time delay, 0.5Hzs⁻¹ allowed at existing synchronous sites, VS unchanged

**DC0079 Phase 1**

At **non-type-tested generation sites <5MW connected from Feb 2018 onwards**

RoCoF relay settings: 1Hzs⁻¹ with 500ms definite time delay, VS disallowed

**DC0079 Phase 2**

At **type-tested generation sites <5MW connected from Jul 2018 onwards**

Specification of RoCoF and VS immunity levels

**Accelerated VS Change Programme**

**800 MW at 72 sites along the South Coast**

Replacing VS relays by RoCoF relays with settings of 1Hzs⁻¹ and 500ms definite time delay

**DC0079 Phase 3**

All **non-type-tested generation sites connected before Feb 2018**

RoCoF relay settings: 1Hzs⁻¹ with 500ms definite time delay, VS disallowed
The Distribution Code Requirements: New Sites

**VS Relays**

- Any capacity: Allowed
- Below 5MW: 0.125Hzs\(^{-1}\)
- Above 5MW: 0.125Hzs\(^{-1}\)

**RoCoF Relays**

- Below 5MW: 1Hzs\(^{-1}\) with 500ms time delay
- Above 5MW: 1Hzs\(^{-1}\) with 500ms time delay

01/08/2014

01/02/2018
The Distribution Code Requirements: GC0035 Retrospective Application

VS Relays
- Allowed
  - Any capacity
  - Below 5MW: 0.125Hz/s
    - 0.125Hz/s with 500ms time delay
- Above 5MW: 1Hz/s
  - 1Hz/s with 500ms time delay
  - Retrospective application for GC0035

RoCoF Relays
- 0.5Hz/s with 500ms time delay
  - Permitted if Synchronous RoCoF Relay
- 0.125Hz/s with 500ms time delay
  - VS Relay

Timeline:
- 01/08/2014
- 01/08/2016
- 01/02/2018
The Distribution Code Requirements: DC0079 Retrospective Application

VS Relays

- Any capacity: Allowed
- Below 5MW: 0.125Hz/s

RoCoF Relays

- Above 5MW: 0.125Hz/s
- 1Hz/s with 500ms time delay

Retrospective application for GC0035

- RoCoF Relay 0.5Hz/s with 500ms time delay
- Permitted if Synchronous RoCoF Relay
- VS Relay

Retrospective application for DC0079

- RoCoF Relay 1Hz/s with 500ms time delay
- Permitted unless synchronous or DFIG
- No LoM protection

Dates:
- 01/08/2014
- 01/08/2016
- 01/02/2018
- 01/04/2022
# The Distribution Code Requirements: What Needs to Be Done

<table>
<thead>
<tr>
<th>Means of LoM protection</th>
<th>Synchronous or Doubly Fed Induction Generator units</th>
<th>Other units</th>
</tr>
</thead>
<tbody>
<tr>
<td>VS/RoCoF relay (Programmable)</td>
<td>Reprogram to use RoCoF with settings of 1Hzs(^{-1}) and time delay of 500ms</td>
<td></td>
</tr>
<tr>
<td>VS/RoCoF relay (Not Programmable or incapable of setting)</td>
<td>Replace with a RoCoF relay with settings of 1Hzs(^{-1}) and time delay of 500ms</td>
<td>Disable/disconnect LoM protection</td>
</tr>
<tr>
<td>Other</td>
<td>No action required</td>
<td></td>
</tr>
</tbody>
</table>

Note – existing generation commissioned pre Feb 2018 does NOT need to comply with G99
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The Accelerated Loss of Mains Change Programme

The Programme
The Need Case

Why we need the accelerated programme

- Risks to security of supply is significant
- Costs of managing the risk are very high
- Approximately 50,000 DG sites with total capacity of 15GW requires to be modified to meet Distribution Code requirements
- Risk of delays and additional costs if owners of distributed generation are not engaged and do not make changes by the deadline
- Successful Accelerated VS Relay Change Programme in summer 2018
The Programme

- Run by National Grid ESO and Network Operators (DNOs/IDNOs)
- Aims to accelerate compliance with the new Distribution Code requirements (assuming Ofgem approve April/May 2019)
- Commence in May 2019
- Will stop once the cost of accelerating any remaining changes outweighs the benefits achieved by these changes
- Funded by National Grid ESO through BSUoS
- Network Operators responsible for managing the direct relationship with the Generators
A multi-year programme is envisaged with regular decision points.

The ability to flex approach depending on performance and programme timing will be built in.

We expect to produce regular progress reports.

The programme will start with the payment process this summer. We will measure progress regularly and keep the need for further guidance and assistance under review.
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The Accelerated Loss of Mains Change Programme

Getting Involved
Summary

**What are the proposed changes?**

- Distribution Code is changing and many of the existing sites will be affected
- RoCoF relays: $1 \text{Hz}^{-1}$ with a definite time delay of 500ms
- VS relays: removed where used as LoM protection
- Removal of LoM protection where changes cannot be made without significant investment (except DFIG and synchronous)

**When?**

- No later than April 2022
- Preferably as soon as practicable

**Affected sites**

- 15GW of G59 generation across circa 50,000 sites connected before Feb 2018
- DG affected by this modification are sites that have their LoM protection provided by:
  - VS relays; or
  - RoCoF relays where the settings are more sensitive than the settings required by the Distribution Code

Compliance is required of everyone in scope

A Payment Scheme is available with the aim of accelerating compliance
Qualification Criteria for Payment

Eligible sites must be

- Distributed Generation running in long-term parallel mode
- Connected prior to February 2018
- Have not received any previous payment to modify their LoM protection; and
- Have their LoM protection provided by either
  - VS relays; or
  - RoCoF relays which have settings that are more sensitive than the settings required by the Distribution Code.
The Payment Sum

- Fixed Payment Sum per relay
- Two levels of payment: one for setting change and relay disablement another for relay replacement
- Payment rates will be fixed before we open for applications
  - Set based on bottom up assessment of costs
  - We will assume that work can be planned
  - Intended to strike a balance between costs to electricity consumers and programme success
  - Indicative range for setting change is £1,000 and £1,500
  - Indicative range for a relay change is £2,500 and £4,000
Generators and Site Operators

Expected to:
- Check your LoM settings
- Liaise with DNO/IDNO
- Make the change

Encouraged to:
- Check if you qualify?
- Commit to a date for change
- Submit the evidence
- Apply through the ENA portal
- Receive acceptance
- Get paid
Delivery Assurance

- National Grid ESO and DNOs will need in many cases to confirm that the correct changes have been made.

- DNOs will witness the recommission of LoM protection as follows:

<table>
<thead>
<tr>
<th>Scope of Works</th>
<th>Baseline Approach</th>
<th>Approach for a “Certified Contractor”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replacing an existing relay with a new relay</td>
<td>Network Operator witnesses testing</td>
<td>Self-certification</td>
</tr>
<tr>
<td>Disable an existing relay</td>
<td>Network Operator witnesses testing</td>
<td>Self-certification</td>
</tr>
<tr>
<td>Change settings on an existing relay</td>
<td>Self-certification with a %ge (tba) subject to post change sample check on site</td>
<td>Self-certification</td>
</tr>
</tbody>
</table>

- DNOs will not charge for witness testing (assuming a single visit)
Generators will need to submit evidence completed:
- The pro-forma provided for the purpose populated and signed by the Generator and accompanied by:
  - Timestamped photographic settings both prior to and after the change,
  - Timestamped photographs (e.g., disconnected tripping)
  - Printouts or other details appropriate, and where
Qualified Businesses

- A list of businesses/individuals willing to undertake the works on behalf of site owners/operators will be made available.

- Let us know if you or your business are willing to be added to this list.
We encourage you to take actions to ensure that parties represented by yourself are aware of the new requirements and of the payment scheme.

This is to facilitate that they:

- remain compliant with the Distribution Code
- take advantage of the payment scheme while it is open
- are not at risk of having actions taken against them for non-compliance

Raise any issues and concerns.
All Interested Parties

- Provide feedback, raise any concerns, offer suggestions, and advice on how we could engage with you or with parties represented by you.

- Attend a series of stakeholder events that will be held throughout the project to allow them to monitor delivery on the objectives set out and compliance with the methodology publicised; and

- Volunteer to actively participate in the delivery of the project by joining the Project Team.
The Payment Process Timeline

**Objectives**
- Encourage early action
- Get valuable information
- Manage implementation cost

**Features**
- Time limited offer of fixed fee
- Published methodology
- Regular reporting and review
Applications


- Data to be provided by owners of distributed generation is:
  - Capacity
  - Generation type
  - Existing Loss of Mains (LoM) relay type and setting
  - Relevant Network Operator
  - Lead time for change
  - MPAN

- Data privacy and access restrictions will apply.
The Payment Process Detail

The Application Process
(Runs Quarterly)

- Prioritise
- Application
  - Verify
  - Assess
  - Accept
  - Report

- DNO/IDNO to verify the application
- NGESO to assess the application
- DNO/IDNO to issue acceptance email

- Generator submits application
- Generator notified (if accepted)
- Acceptance deadline (as notified)
- Advise Implementation Date
- Arrange Witnessed Testing (if necessary)
- Submit evidence
- DNO/IDNO verifies the evidence and pays Generator
- Implement the change
- Payment made (reasonable endeavours)

The Implementation Process
Procurement Assessment

Applications will continued to be accepted until the cost of accepting this application is less than the cost of other alternatives.

- The cost of accepting the application
- The cost of an alternative

Influenced by the scope of works including:
- number of relays
- whether it is a setting change or a relay change
- etc

One or more of:
- Accepting another application
- Dispatching additional frequency response
- Increasing inertia
- Curtailing the largest loss
- Additional bids/offers
- Any other feasible alternative
Procurement Assessment

In addition, the following factors will be taken into account during the assessment:

- Protection type
- Protection setting
- Timescale to implement change
- Capacity
- Location
- Load factor during risk periods
Market Information

- Published regularly on the National Grid ESO website.

- Quarterly updates on the total number of generators and capacity (MW) which applied and which were accepted by each Network Operator.

- Quarterly updates on Network Operators’ costs.

- A summary of an annual audit.
The Payment Process

- **Application period** – Applications may be submitted in the first year. An extension will only be granted if further value could be delivered.

- **Early Applications** – Applying early maximises the opportunity of being accepted.

- **Applications that could not be verified by the Network Operator** - If reasonable, Network Operators can work with generators to resolve any issues.

- **Applications that are not accepted by National Grid ESO** - Verified applications that are not accepted will be automatically reassessed.

- **Works not complete by the implementation deadline** – Generators failing to complete the works by the Implementation Deadline will be disqualified and will have to reapply.

- **Independent Auditing** – Further site visits may be required for the purpose of independent auditing.
The change to protection settings procured through this Programme is a balancing service (a constraint management service for stability) that National Grid ESO intends to procure from Generators via Network Operators.

This service will be procured in line with our the over-arching Procurement Guidelines as prescribed in Standard Licence Condition C16 of National Grid Electricity System Operator’s electricity transmission licence.

The procurement methodology is made up of:
- Procurement principles,
- Procurement process (covered in previous slides),
- Procurement assessment, and
- Market information

### Procurement Principles

**Clear and Transparent Requirement**
- Technical requirement developed through Distribution Code governance
- The volume required to be delivered (no of sites and total MW capacity) will vary depending on which Generators apply and when they apply. Quarterly progress updates will be published to ensure transparency.

**Enabling competition where appropriate**
- Payment offered through a competitive process with a transparent assessment methodology. Payment will only be made available until it is no longer economic to pay for any further change.
- Payment Scheme with clear and simple structure

**Not to unduly discriminate against technology type**
- The generation technology will be used to determine the correlation between the site output and the level of risk.
- This correlation will be used in the assessment methodology as a measure of the contribution of the site towards the risk.
- Should any Party believe that this assumption will unduly discriminate against them they should highlight this in their application and explain any alternative factors which should be considered to determine this correlation.
The Delivery Team

- develop the engagement plans including the activities, tools, and platforms required for their implementation. It will also oversee the delivery of these engagement plans.
- Develop and deliver the customer support model,
  - Deliver DNO/IDNO actions required by the project
  - Procure and manage third party activities.
  - Prioritise implementation of the Assistance Programme
  - Deal with customer requests
- Define the process, the documentation, and verification procedures.
  - Monitor the delivery on these requirements.
  - Define the success criteria and KPIs
  - Quantify and track the value delivered.
  - Develop a transition plan
  - Drive the prioritisation process
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Next Steps
Next Steps

Applications accepted
Apply as early as you can to maximise opportunity for approval

- Feedback received
- Portal available & first call for application
- Early April
- 26th of April
- Final methodology published
- Early May
- Mid May
- Approval for the first patch of sites
- Mid August
- First call for application
- Portal available & first call for application
- Early April
- Applications accepted
- Apply as early as you can to maximise opportunity for approval

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Questions and Answers