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

National Grid ESO is the Electricity System Operator for whole of GB And offshore

Other IDNOs	
Eclipse	Fulcrum
Energetics	Harlaxton
Energy Assets	Leep
ESP Electricity	UK Power Distribution

Electricity Distribution

1 SSE

2 SP ENERGY NETWORKS

3 Northern Ireland Electricity

4 electricity north west — Bringing energy to your door

5 NORTHERN POWERGRID

6 SP ENERGY NETWORKS

7 WESTERN POWER DISTRIBUTION

8 UK Power Networks — Delivering your energy

9 SSE

10 ESB NETWORKS

gtc ...leading utility networks

Independent distribution network operators

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The Accelerated Loss of Mains Change Programme

The Requirements

LoM Protection: The Requirement

- 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.

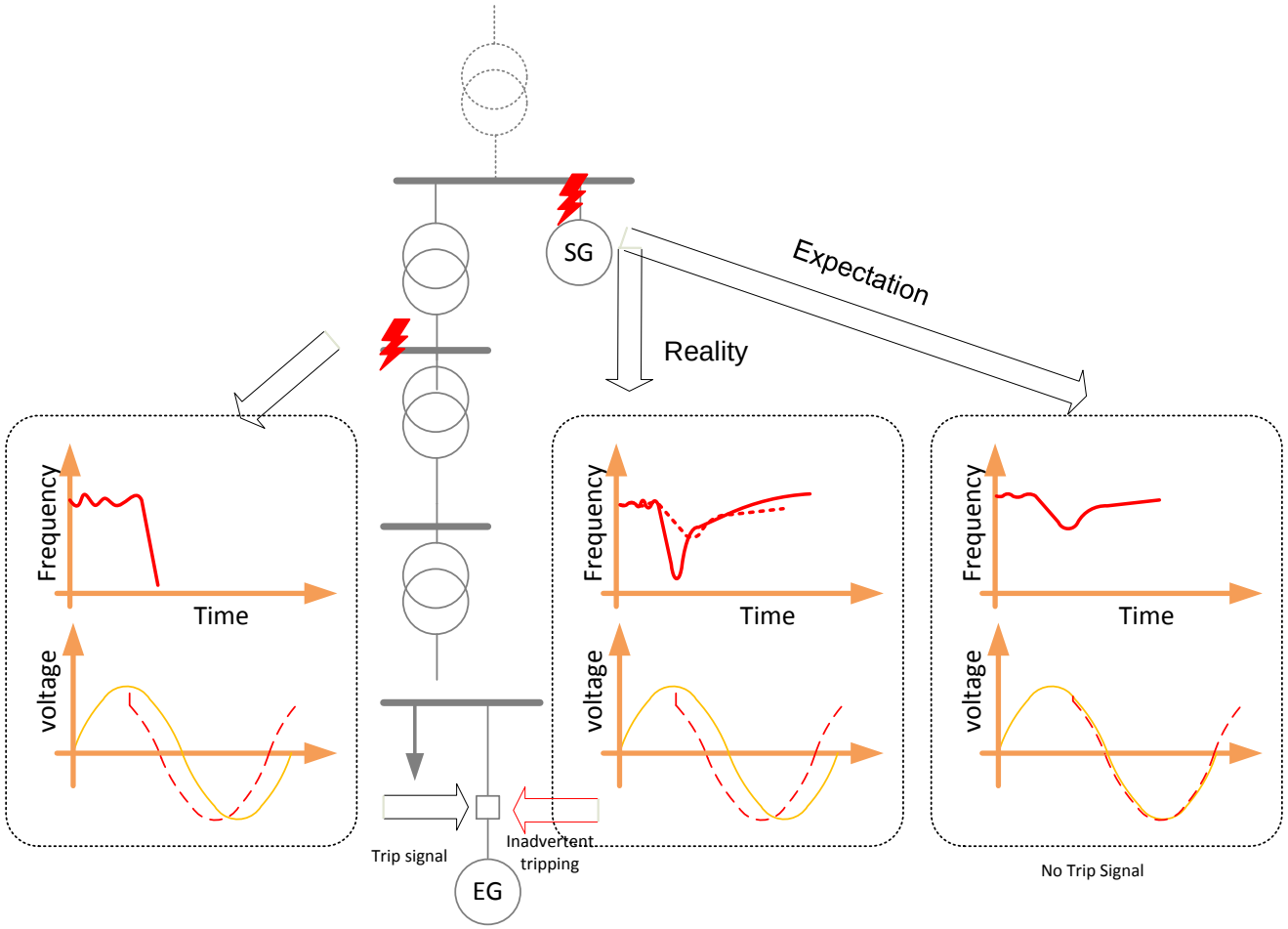
- Historically:

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

  VS relays were seen as an acceptable mean of provision of LoM protection.

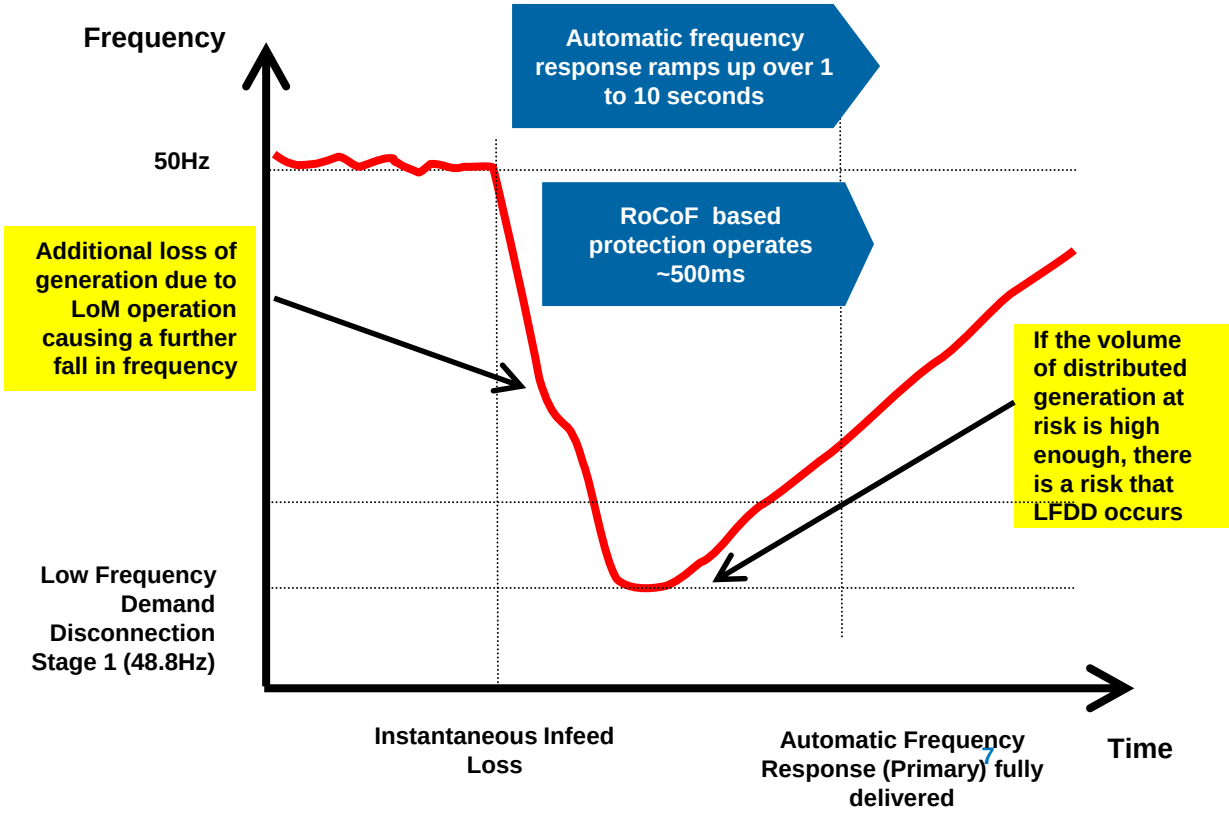
LoM Protection: The Risk

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



LoM Protection: The Risk

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.



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

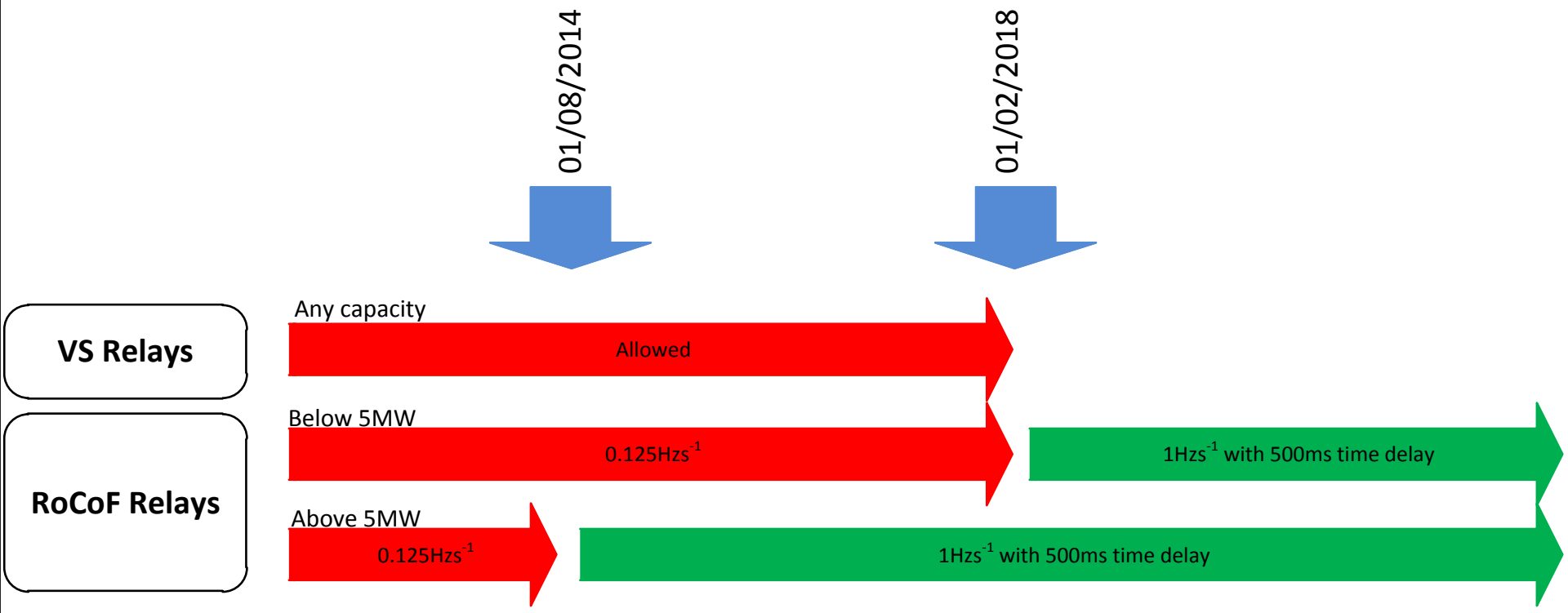
Accelerated VS Change Programme

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

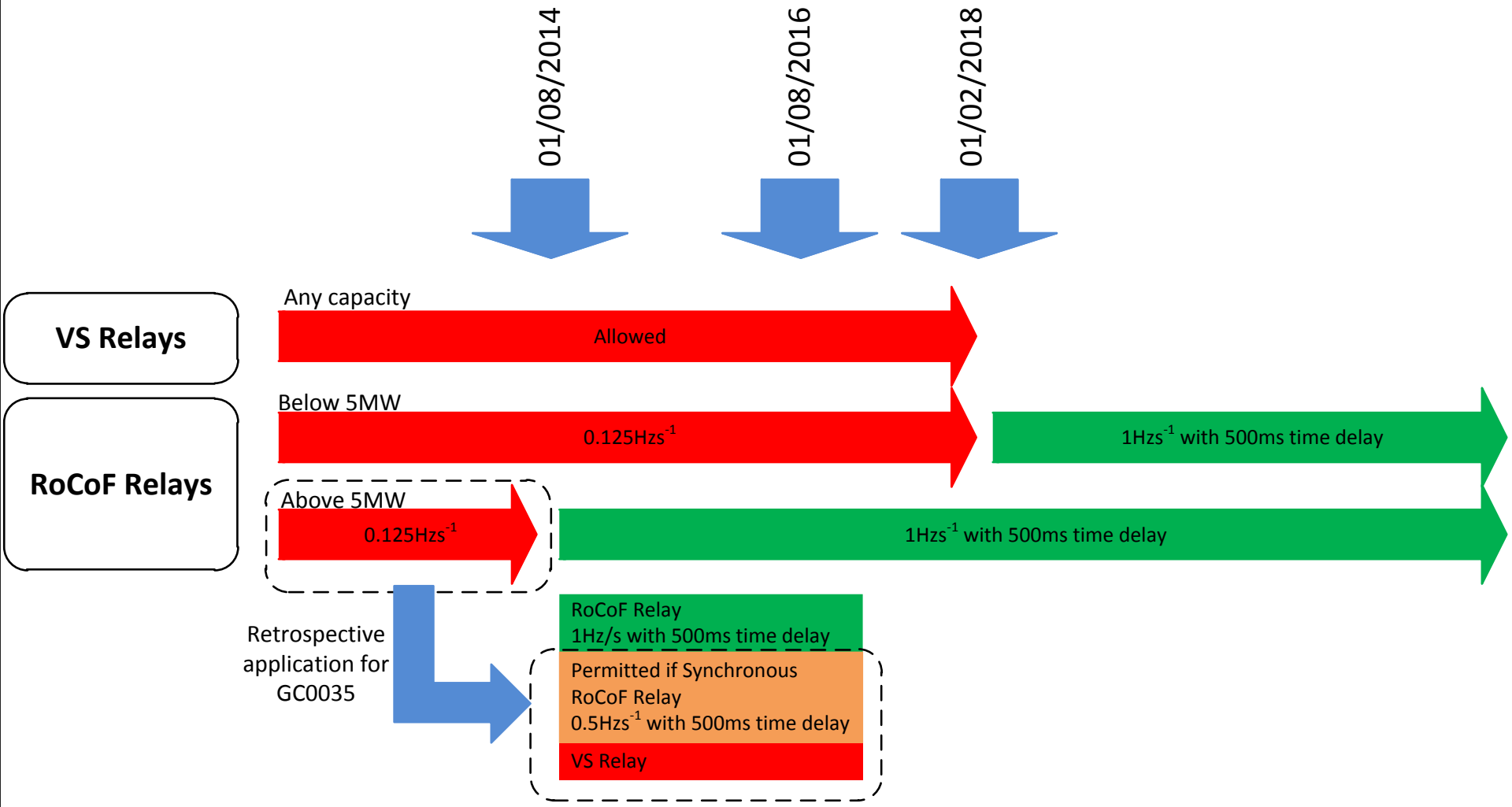
DC0079 Phase 3

All non-type-tested generation sites connected before Feb 2018
RoCoF relay settings: 1Hzs^{-1} with 500ms definite time delay,
VS disallowed

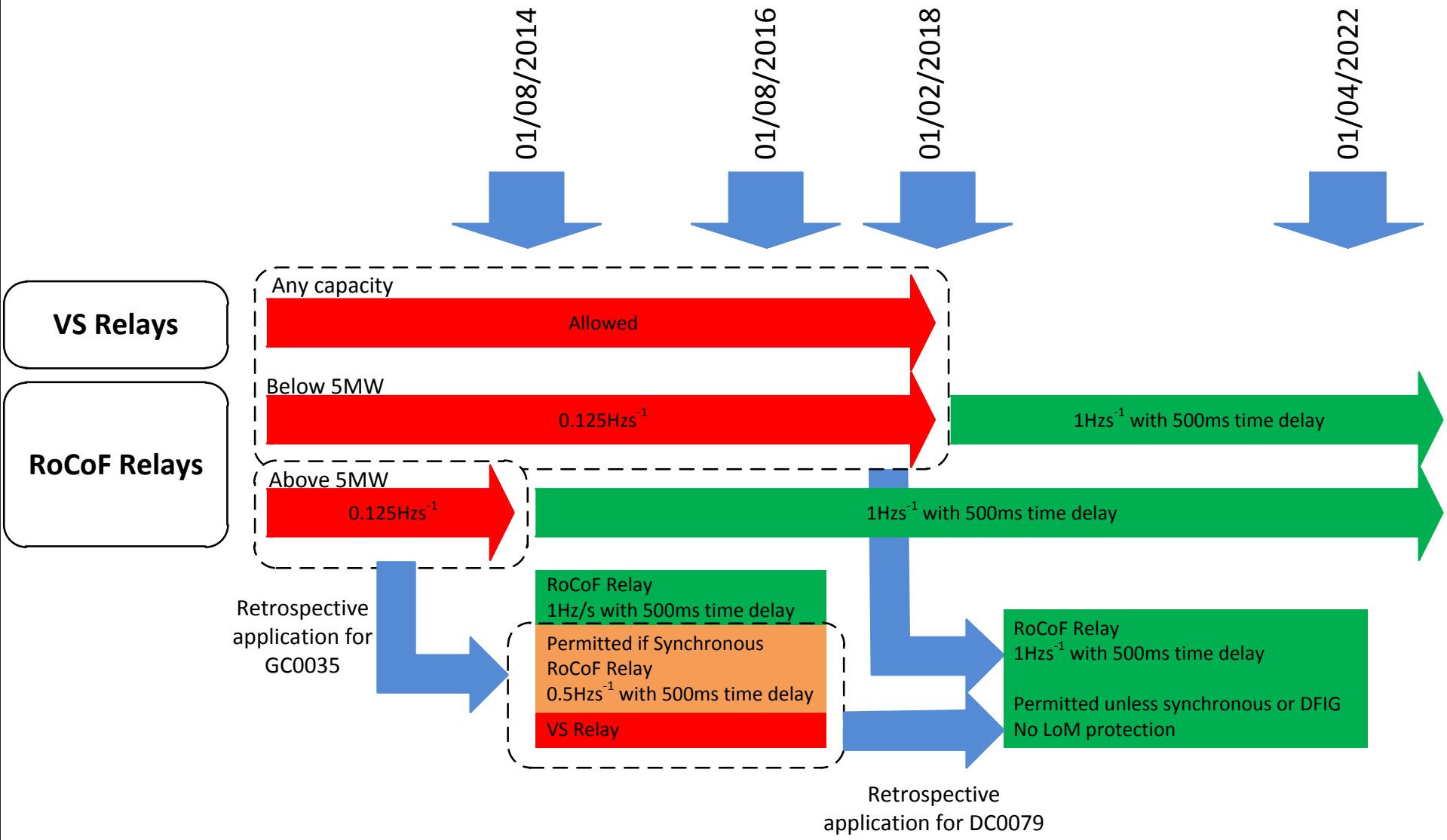
The Distribution Code Requirements: New Sites



The Distribution Code Requirements: GC0035 Retrospective Application



The Distribution Code Requirements: DC0079 Retrospective Application



The Distribution Code Requirements: What Needs to Be Done

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

Note – existing generation commissioned pre Feb 2018 does NOT need to comply with G99

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The Programme

The Need Case

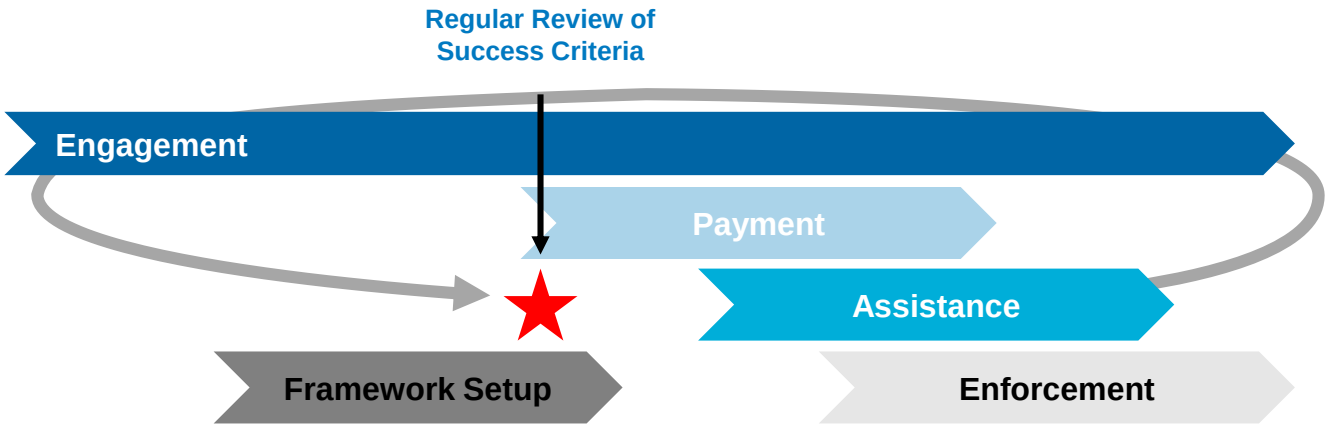
- Why we need the accelerated programme
  - Risks to security of supply is significant
  - Costs of managing the risk are very high
  - Approximately 50,000 DG sites with total capacity of 15GW requires to be modified to meet Distribution Code requirements
  - Risk of delays and additional costs if owners 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

The Programme

- 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:1Hzs^{-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

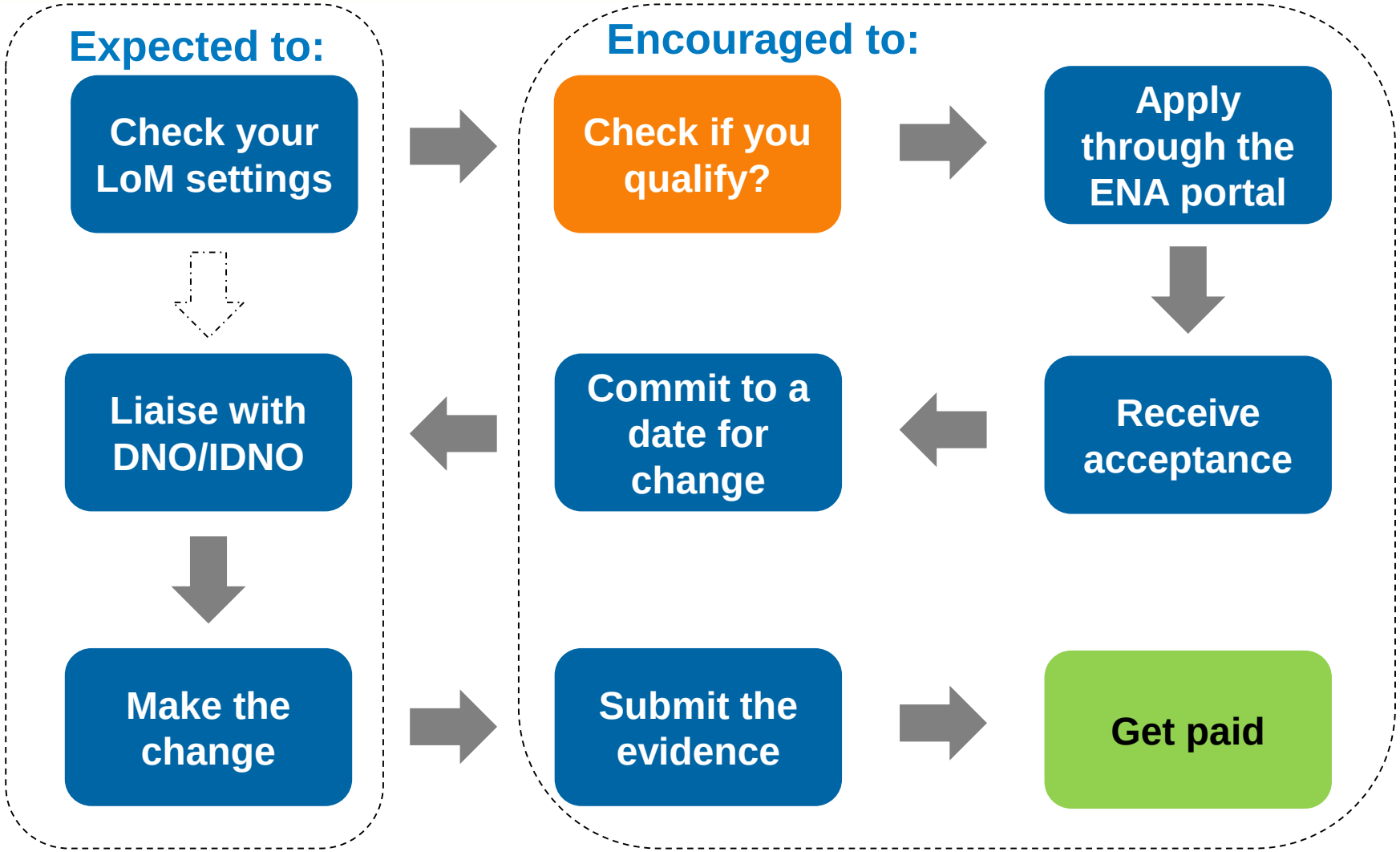
Eligible sites must be

- 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



Delivery Assurance

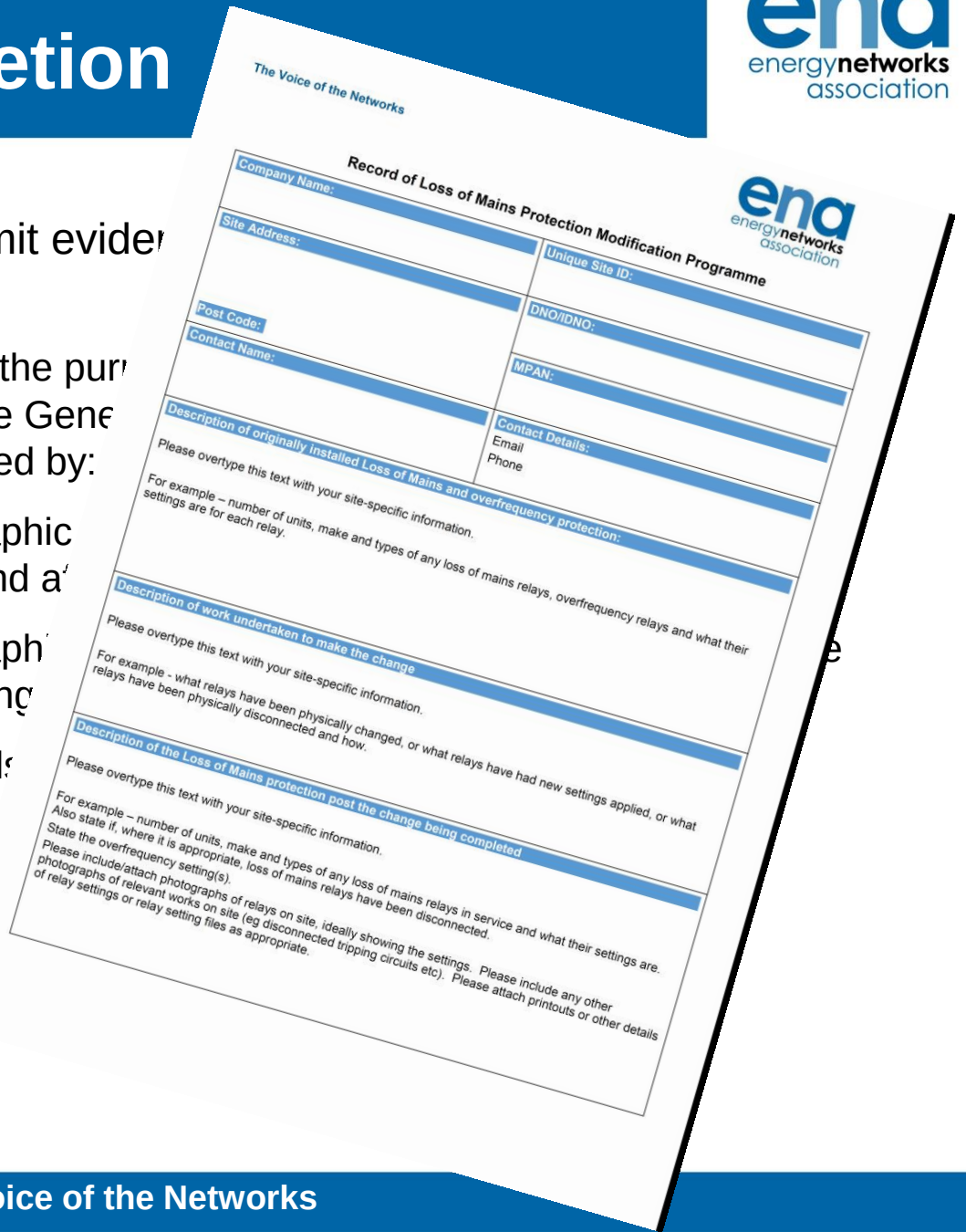
- National Grid ESO and DNOs will need in many cases to confirm that the correct changes have been made.
- DNOs will witness the recommission of LoM protection as follows:

Scope of Works	Baseline Approach	Approach for a "Certified Contractor"
Replacing an existing relay with a new relay	Network Operator witnesses testing	Self-certification
Disable an existing relay	Network Operator witnesses testing	Self-certification
Change settings on an existing relay	Self-certification with a %ge (tba) subject to post change sample check on site	Self-certification

- DNOs will not charge for witness testing (assuming a single visit)

Records of Completion

- Generators will need to submit evide
  completed:
  - The pro-forma provided for the pur
    populated and signed by the Gene
    their behalf and accompanied by:
    - Timestamped photographic
      settings both prior to and a
    - Timestamped photograph
      (eg disconnected trippin
    - Printouts or other detail
      appropriate, and where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Record of Loss of Mains Protection Modification Programme

Company Name:	Unique Site ID:
Site Address:	DNO/IDNO:
Post Code:	MPAN:
Contact Name:	Contact Details: Email Phone

Description of originally installed Loss of Mains and overfrequency protection:

Please overtype this text with your site-specific information.

For example – number of units, make and types of any loss of mains relays, overfrequency relays and what their settings are for each relay.

Description of work undertaken to make the change

Please overtype this text with your site-specific information.

For example - what relays have been physically changed, or what relays have had new settings applied, or what relays have been physically disconnected and how.

Description of the Loss of Mains protection post the change being completed

Please overtype this text with your site-specific information.

For example – number of units, make and types of any loss of mains relays in service and what their settings are. Also state if, where it is appropriate, loss of mains relays have been disconnected.
State the overfrequency setting(s).
Please include/attach photographs of relays on site, ideally showing the settings. Please include any other photographs of relevant works on site (eg disconnected tripping circuits etc). Please attach printouts or other details of relay settings or relay setting files as appropriate.

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.

Can you help?

Trade Associations/Distributed Generation Stakeholders

- 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

Disseminate the message

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.

Provide feedback

- 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

Stay engaged

- Volunteer to actively participate in the delivery of the project by joining the Project Team.

Join the team

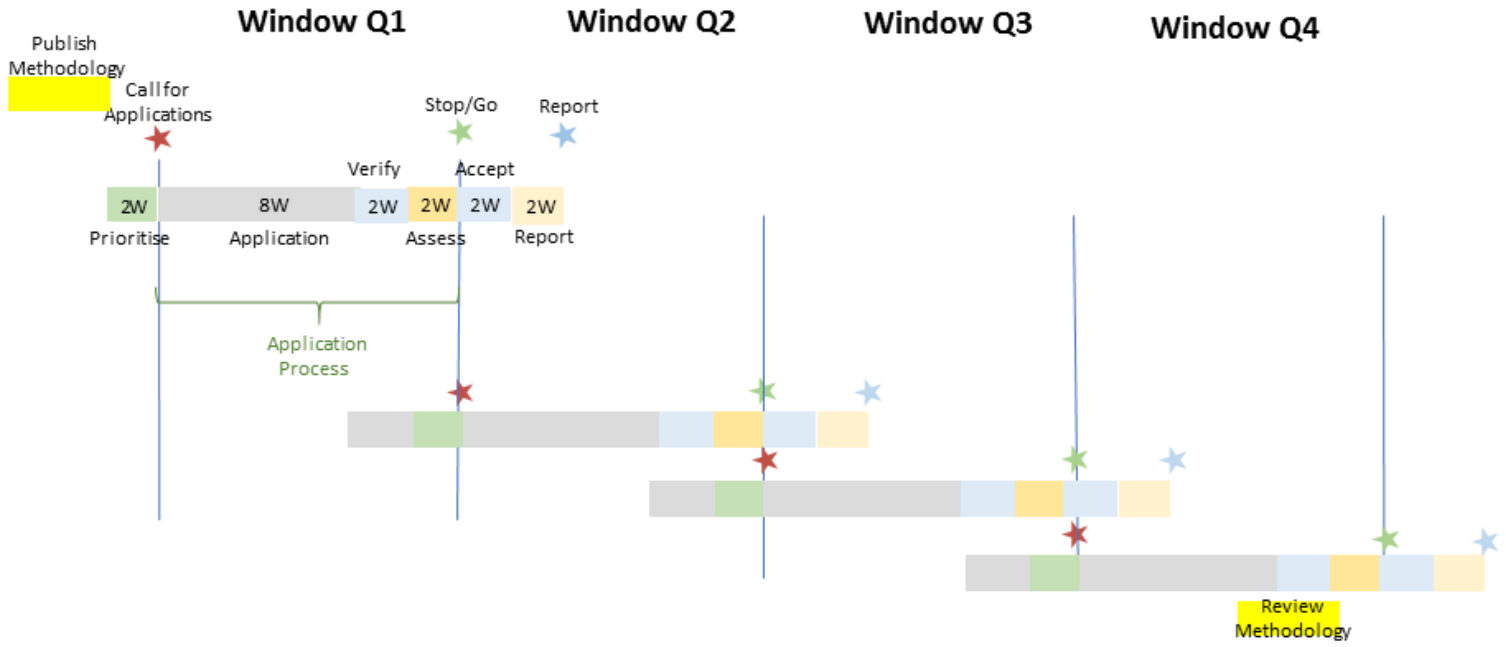
The Payment Process Timeline

Objectives

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

Features

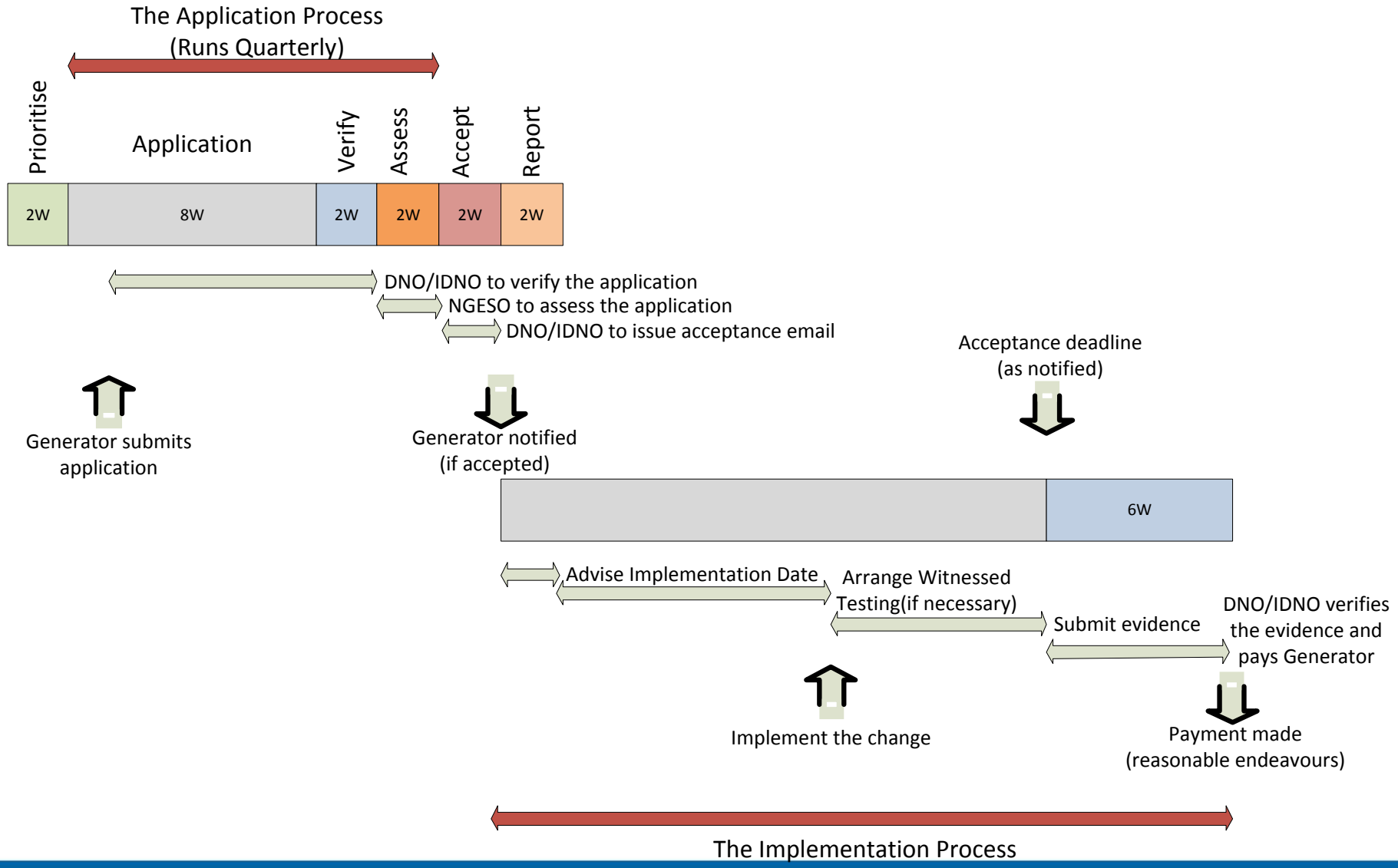
- Time limited offer of fixed fee
- Published methodology
- Regular reporting and review



Applications

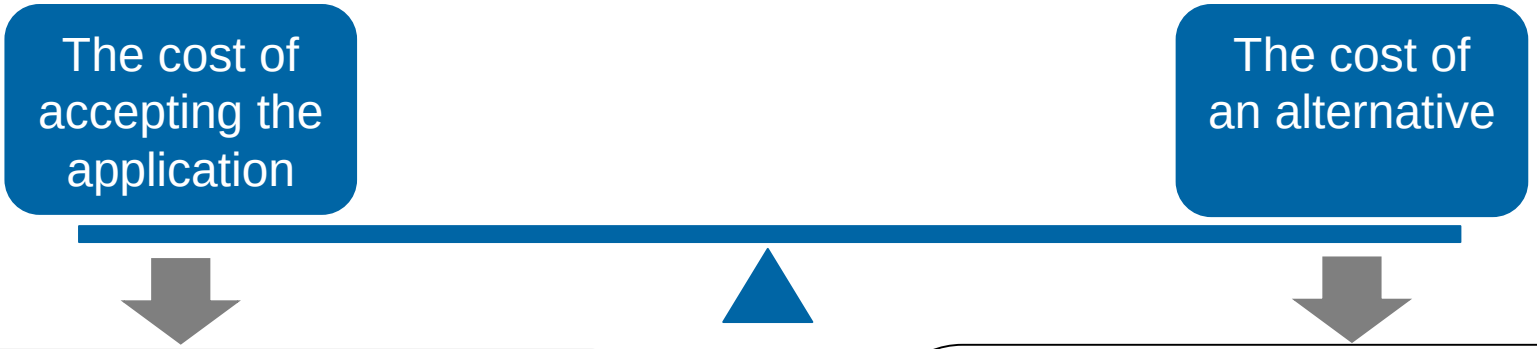
- Online portal accessible from the websites of all Distribution Network Operators, Independent Distribution Network Operators, National Grid Electricity System Operator, and Energy Networks Association.
- Data to be provided by owners of distributed generation is:
  - Capacity
  - Generation type
  - 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



Procurement Assessment

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



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.

Procurement Methodology

- 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.

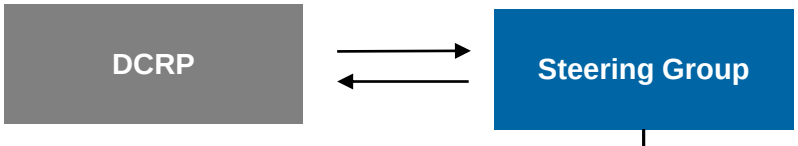
Enabling competition where appropriate

- 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



Stakeholders

- develop the engagement plans including the activities, tools, and platforms required for their implementation. It will also oversee the delivery of these engagement plans.

Customer Support

- 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

Delivery Assurance

- Define the process, the documentation, and verification procedures.
- Monitor the delivery on these requirements.

Value Assurance

- Define the success criteria and KPIs
- Quantify and track the value delivered.
- Develop a transition plan
- Drive the prioritisation process

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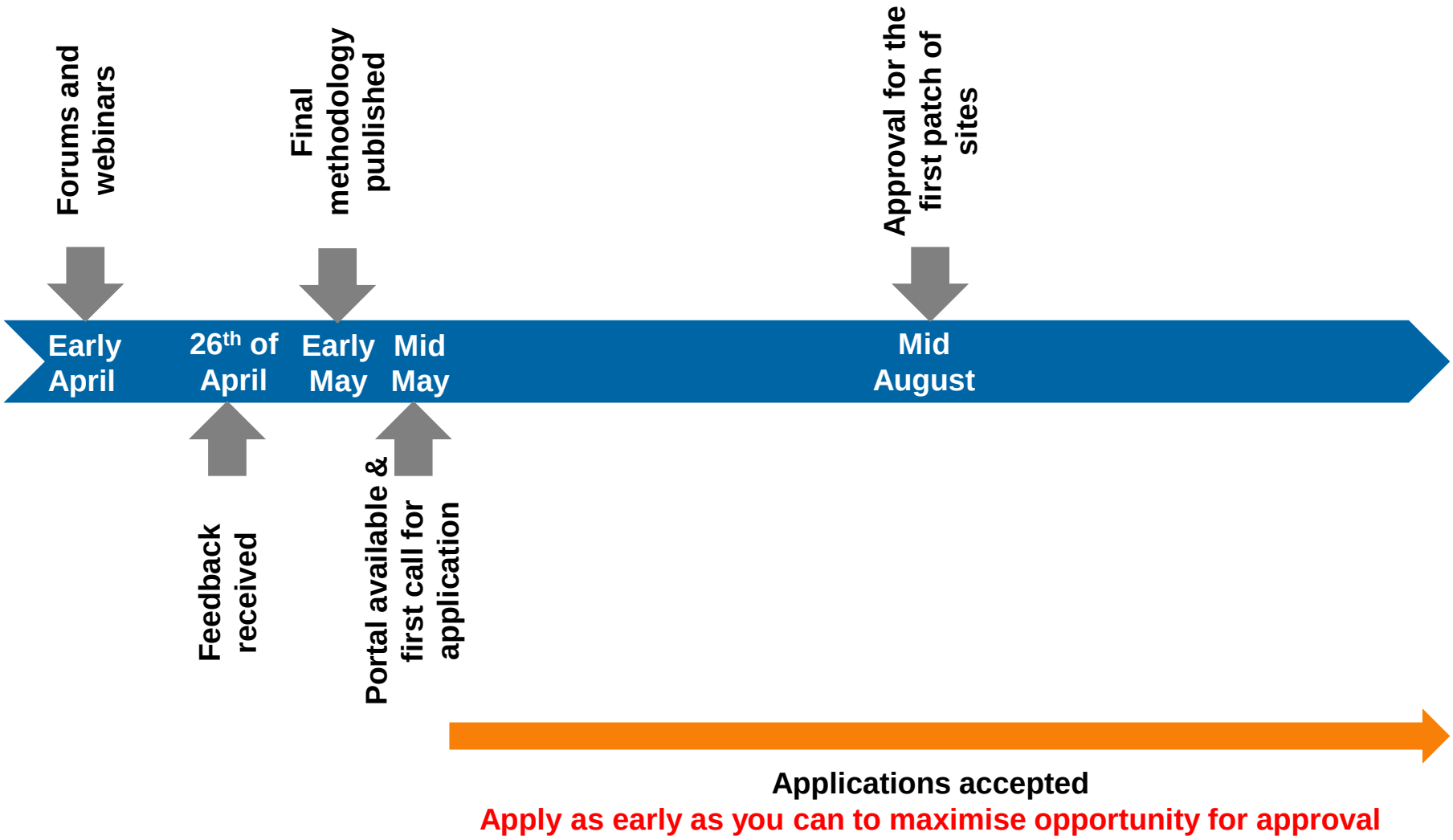
Next Steps

Next Steps


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

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Questions and Answers