Window 9 Report

Accelerated Loss of Mains Change Programme (ALoMCP)

The ALoMCP is an industry led project to accelerate compliance with the new Loss of Mains (LoM) protection requirements in the Distribution Code. It is delivered by National Grid ESO (NGESO), distribution network operators (DNOs), independent distribution network operators (IDNOs) and the Energy Networks Association (ENA). The purpose of this report is to provide a summary of the programme status following completion of the ninth application window.

Key messages

Sites representing 74% of the generation capacity within scope have either declared their compliance with G59/3-Ammendement 7 or are progressing through the ALoMCP to achieve compliance.

The remaining capacity at loss of main risk within the scope of the programme has fallen during this reporting period from 7.838 GW (29 September 2021) to 7.127 GW (13 January 2022).

Improved site protection data gathered by the programme and loss of mains changes delivered with programme support changes are already saving consumers £20m per annum. From 07 October 2021 onwards, ESO has reduced trading to the RoCoF trigger, and this has become a fallback position (for example if a Dynamic Containment auction fails) rather than policy. We expect to see a reduction in the ESO actions required to manage Rate of Change of Frequency (RoCoF) risk from 7.4 TWh to 0.2 TWh per year[1].

The capacity of successful applications in window nine doubled compared to window eight, coinciding with additional communications and engagement activity. However, 26% of capacity in scope of the Programme has not yet responded and there are now just six months remaining before the compliance deadline. The Programme continues to commit resources to communication and engagement activities, drawing on increasingly urgent messaging to persuade the large number of remaining generators to act.

The Distribution Code Review Panel has consulted on the proposed enforcement approach to be adopted once the G59/3-7 compliance deadline of 01 September 2022 has been reached and this is expected to be ratified in early 2022. The details of this will be communicated to generators that are yet to act as an additional motivation to ensure compliance is achieved by the deadline.

[1] 2021-22 Mid-Year Report Executive Summary https://www.nationalgrideso.com/document/215876/download and Evidence Report: https://www.nationalgrideso.com/document/215871/download

Summary

- A total of 623 applications were approved in window 9, for a capacity of 1,177 MW at a cost of £1.72m in payments to distributed generation owners.
- This brings the cumulative total approved applications to 8,845 sites, for a capacity of 14,917 MW at a cost of £29.01m in payments to distributed generation owners. Some approved applications have not proceeded through accepting the Programme's terms and conditions or have withdrawn. This attrition is illustrated in Table 2, leaving 7,451 sites with 12,679 MW capacity proceeding through the programme.
- 6,541 sites have declared completion of works at sites with a combined capacity of 11,083 MW. DNOs have validated completion of site works for 5,906 sites (9,393 MW) and 5,327 sites have now received payment[2].
- The programme has delivered 8.256 GW reduction in Vector Shift risk, with 8.968 GW remaining at risk. Peak Vector Shift risk is now 559 MW.
- For 0.125 Hz/s RoCoF risk, over the last quarter since the window 8 reporting period, the total capacity remaining at risk has reduced from 747 MW to 669 MW. Peak risk has fallen from 399 MW to 354 MW.
- For 0.2 Hz/s RoCoF risk, over the last quarter since the window 8 reporting period, the total capacity remaining at risk has fallen from 711MW to 536MW. Peak risk has fallen from 364MW to 278MW.
- The Future Proof Your Power communications campaign, launched in spring 2021, has continued to raise awareness of the programme and in particular help owners of smaller generation sites up to 1 MW capacity to understand what action they need to take to report their existing compliance or, where necessary, to apply for support to make the required changes to Loss of Mains protection.
- 77% of all sites with a generation capacity of 5 MW up to less than 50 MW within scope of the Programme have applied to the programme or declared their compliance to G59/3-7.
- 1,398 sites with a combined capacity of 6,401 MW have self-declared their compliance without Programme funding. The Programme has launched additional functionality on its online portal that provides a convenient and consistent format for these generators to provide details of their compliant protection settings.
- Window 10 opened for applications 10 November 2021 and closed on 08 February 2021.

[2] Progress data to 13 January 2022

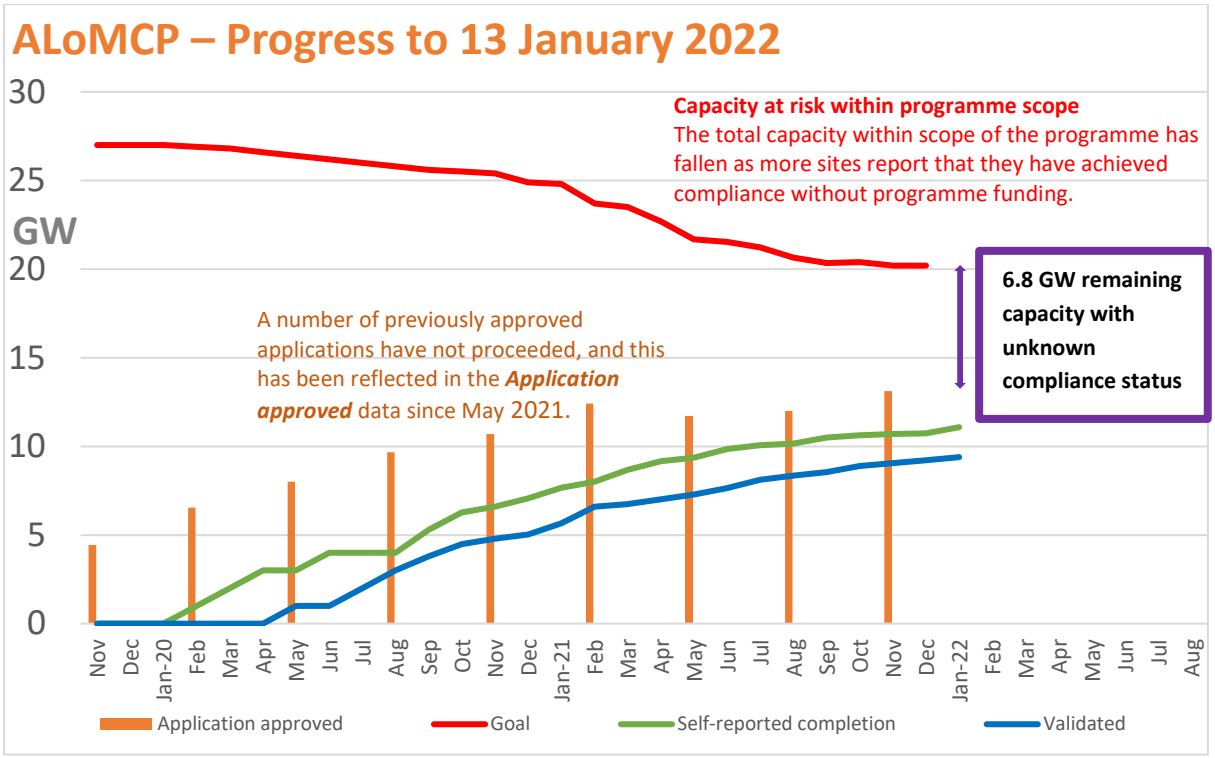

Figure 1: The progress of approved applications towards compliance by 01 September 2022 (Data at 13 January 2022)

Timeline

The schedule for window 9 is presented in Table 1. The application portal remained open for applications after the closing day for window 9. Applications received after that date will be progressed on or before the closing day for window 10.

Table 1 – Key dates for window 9

Opening Day	11.08.2021	Distributor Results Day	07.12.2021
Closing Day	09.11.2021	Provider Results Day	21.12.2021
Pre-qualification Day	23.11.2021		

Process performance

Table 2 shows the number of applications and their assessment outcome for each completed assessment window. For successful applications, it also shows their progress through each stage of the Programme. The data demonstrates that by 13 January 2022 that 6,541 sites (11.083 GW) have reported completion and have submitted evidence of their site changes. This evidence has been reviewed for 5,906 sites (9.39 GW) and payment made to 5,327 sites.

The number of sites applying to the programme in window 9 increased by 6% from window 8, whilst the generation capacity within successful applications more than doubled. During this period the number of sites reporting to the programme that their equipment was already compliant increased by 44% (bringing a 9% increase in generation capacity declaring compliance without programme funding). The remaining capacity at loss of main risk has fallen from 7.838 GW to 6.833 GW in the last period.

798 applications were submitted during window 9 and 729 of these applications passed initial screening by the DNOs for formal assessment by ESO, resulting in 623 applications being accepted for a total capacity of 1,177 MW (Table 2).

Table 2: Summary of applications by sites, capacity, process stage and assessment window, 13 January 2022

Window		1	2	3	4	5	6	7	8	9
Applications submitted to DNOs by the window closing day	Sites	2,031	1,403	1,011	793	818	1,394	1,039	773	798
	Total MW	5,484	3,383	2,774	2,752	2,160	2,615	1,725	908	1,630
Applications received by NGESO by the pre-qualification day	Sites	2,039	1,306	998	775	786	1,324	874	649	729
	Total MW	5,315	2,846	2,368	2,269	1,713	2,354	1,373	647	1,402
Applications approved	Sites	1,978	1,261	943	710	702	1,262	778	588	623
	Total MW	4,440	2,105	1,457	1,662	1,037	1,723	735	582	1,177
Sites accepting contractual terms	Sites	1,681	1,025	847	568	562	963	609	466	276
	Total MW	3,963	1,730	1,095	1,269	796	1,545	584	398	444
Sites self-reporting completion	Sites	1,678	1,023	844	565	553	879	537	411	51
	Total MW	3,962	1,712	1,090	1,266	720	1505	444	331	52
Evidence of completion verified by DNO / iDNO	Sites	1,662	950	819	544	483	754	423	258	13
	Total MW	3,849	1,429	981	1,208	555	875	292	199	4
Sites paid	Sites	1,621	916	774	523	434	616	314	126	3
	Total MW	3,733	1,254	825	1,168	434	609	203	62	0

Window 9 assessment led to 106 applications being rejected. The reasons for rejection and the number of instances of each were:

- Unclear LoM type / unclear RoCoF settings (83)
- Sites that do not pose any operational risk with RoCoF settings greater than or equal to 1 Hz/s, delay greater than or equal to 0.5s (19)
- Sites with a capacity of 5MW or above that failed to comply with GC0035 recommendations but are not an immediate risk (non-synchronous with RoCoF greater than or equal to 0.2 Hz/s, synchronous with RoCoF above 0.2Hz/s but below 0.5Hz/s) (3).
- Sites not directly connected to GB synchronous system (1).

No eligible applications sought a lead time to complete changes beyond the compliance deadline of 01 September 2022.

The Programme's delivery assurance workstream activities are designed to provide some insight on how the changes required are being implemented. So far, 5,906 sites (9,393 MW) have had their site changes verified by their DNO/IDNO and no major issues have been identified. Some minor issues were identified by DNOs when validating the evidence provided by customers and payments were withheld whilst the minor issues identified are rectified.

DNOs/IDNOs have undertaken 660 sample site visits and witnessed 341 protection changes. The majority of the changes witnessed, i.e., to validate the Loss of Mains protection changes made, have been observed remotely due to the pandemic. A small number of minor observations have been made through this process for sites to correct, but no substantial issues have materialised.

Value delivery

Table 3 shows the estimate of the total generation capacity that requires a change in their protection settings through the ALoMCP.

The initial estimate was informed by the standard planning data provided by DNOs (known as week 24 submissions) under the Grid Code, and some significant assumptions to cover for the uncertainty associated with legacy sites.

As programme delivery proceeds it has been possible to revise the estimates drawing on data from both applications to the programme and also from the knowledge gained through engagement with sites that require no change to their LoM protection through the programme. This resulted in:

- a reduction in the difference between the high estimate and the low estimate for the total risk, and
- a reduction in the high estimate for each of the two risk components.

The figures will be reviewed as more knowledge is gained.

Table 3: Estimates of total generation capacity at risk of tripping due to inadvertent operation of LoM

		Original estimates	Revised (Oct '20)	Revised (Jan '21)	Revised (Mar '21)	Revised (July '21)	Revised (Oct '21)	Revised (Jan '22)
High estimate	Total (GW)	24	24	25.3	23.7	21.4	20.7	20.4
	VS component (GW)	22	21	21.8	20.0	18.1	17.7	17.5
	RoCoF component (GW)	2	3	3.5	3.8	3.3	3.0	2.9
Low estimate	Total (GW)	20	22	23	21.9	20.1	19.7	19.6
	VS component (GW)	10	14.5	15.2	14.8	14.2	15.3	15.3
	RoCoF component (GW)	10	7.5	7.9	7.2	5.9	4.4	4.3

The RoCoF estimates in Table 3 include all generation capacity with existing RoCoF protection that requires updating. Some of these sites will have low RoCoF settings, e.g., 0.125Hz/s and 0.2Hz/s, that require that their risk of tripping is managed in real time. Others will have higher RoCoF settings, e.g., 0.5Hz/s. Our estimates for the most critical RoCoF risk are shown in Table 4.

Table 4: Estimates of generation capacity with RoCoF protection at risk of inadvertent operation of LoM

	MW	Original Programme estimate	04/01/ 2021 estimate	05/04/ 2021 estimate	01/06/ 2021 estimate	13/10/ 2021 estimate	10/01 2022 estimate
Generation tripping for RoCoF exceeding 0.125Hz/s but remaining below 0.2Hz/s	Total generation capacity	1714	1328	1183	1059	1034	739
	Peak risk	755	865	687	627	602	572
	Risk prevailing 50% of the time	349	321	286	258	248	230
Generation tripping for RoCoF exceeding 0.2Hz/s but remaining below 0.5Hz/s	Total generation capacity	1286	997	1093	1121	1043	866
	Peak risk	566	649	592	606	556	470
	Risk prevailing 50% of the time	262	241	238	246	225	195

Table 5 shows how the volume at risk of disconnection due to RoCoF and Vector Shift (VS) protection will reduce as the sites with applications approved through each window implement the changes required.

Table 5: Projected RoCoF and VS risk reduction[3]

Window	Delivery Milestone Risk reduction	Dec 2019 - 23Jun 2020	24Jun 2020 - 22Sep 2020	23Sep 2020 - 22Dec 2020	23Dec 2020 - 10Mar 2021	11Mar 2021 – 22Jun 2021	23Jun 2021 – 21Sep 2021	22Sep 2021 – 21Dec 2021	22Dec 2021 – 22Mar 2022	23Mar 2022 – 21Jun 2022	22Jun 2022 - 31Aug 2022
Previous windows	Projected RoCoF risk reduction (MW)	366.1	68.4	158.9	88.1	331.1	183.4	149.3	42.5	11.7	0.0
	Projected VS risk reduction (MW)	4,520.1	1,319.7	1,620.1	1,596.8	551.4	823.1	454.9	128.9	200.3	59.8
	Projected total risk reduction (MW)	4,885.2	1,388.2	1,778.9	1,717.1	960.7	1,174.8	746.1	320.7	221.7	60.2

[3] Original forecast timing of the delivery of changes, prior to any time extensions agreed as a result of the Covid-19 pandemic response

	Delivery Milestone Risk reduction	Dec 2019 - 23Jun 2020	24Jun 2020 - 22Sep 2020	23Sep 2020 - 22Dec 2020	23Dec 2020 - 10Mar 2021	11Mar 2021 – 22Jun 2021	23Jun 2021 – 21Sep 2021	22Sep 2021 – 21Dec 2021	22Dec 2021 – 22Mar 2022	23Mar 2022 – 21Jun 2022	22Jun 2022 - 31Aug 2022
Window Nine	Projected RoCoF risk reduction (MW)								176.7	63.7	21.8
	Projected VS risk reduction (MW)								332.5	240.9	238.0
	Projected total risk reduction (MW)								611.1	304.8	260.7
Overall	Projected RoCoF risk reduction (MW)	366.1	68.4	158.9	88.1	331.1	183.4	149.3	219.2	75.4	21.8
	Projected VS risk reduction (MW)	4,520.1	1,319.7	1,620.1	1,596.8	551.4	823.1	454.9	461.4	441.2	297.8
	Projected total risk reduction (MW)	4,885.2	1,388.2	1,778.9	1,717.1	960.7	1,174.8	746.1	931.8	526.5	320.9

With many sites indicating completion of the works and progressing through the delivery assurance process, NGESO is modelling the risk reduction delivered by the Programme when securing the system in operational timescales. The assumed risk reduction values are shown in Table 6. These values will continue to increase as more sites indicate completion of the works and as the delivery assurance activities progress.

Table 6: Assumed RoCoF and VS risk reduction

Delivery Milestone	July 20	Sept 20	Jan 21	Mar 21	Jun 21	Oct 21	Jan 22
RoCoF risk reduction (MW)	82	124	216	814	1,055	1,230	1453
VS risk reduction (MW)	1,847	3,789	4,885	5,555	6,520	7,905	8,256

The effect of the revised baseline given in Tables 3 and 4 and risk reduction that has been achieved through the programme mean that the estimate for real time VS risk and the most critical RoCoF risk have been progressively falling as shown in Table 7. As described in the Window 8 report, the Vector Shift baseline was recalculated in September, increasing from 12.5GW to 18.2GW. That increase was expected as there is a reverse correlation with the RoCoF baseline which was reviewed in January and has since been dropping. The risk level reflects the improved knowledge of the embedded generation fleet and includes a margin to cover uncertainty. January 2022 analysis calculates that this has reduced to 17.5GW and as further knowledge is gained, and as uncertainty drops, the level is likely to drop further. The programme estimates that 8.26GW reduction in Vector Shift risk has been achieved, through validation of reported site protection changes and modelling for the uncertainty associated with reported completion of required works. As a result, 9.233GW is remaining at risk of tripping due to Vector Shift events as presented in Table 7. Peak Vector Shift risk is now 559 MW.

Table 7: Real time Vector Shift and the most critical RoCoF risk

	GW	Original estimate	Jan 2021 estimate	Apr 2021 estimate	Jun 2021 estimate	Oct 2021 estimate	Jan 2022 estimate
Generation tripping for RoCoF exceeding 0.125Hz/s but remaining below 0.2Hz/s	Total generation capacity	1,714	1,116	991	840	747	669
	Peak risk	755	734	553	476	399	354
	Risk prevailing 50% of the time	349	280	243	212	173	142
Generation tripping for RoCoF exceeding 0.2Hz/s but remaining below 0.5Hz/s	Total generation capacity	1,286	837	931	865	711	536
	Peak risk	566	551	492	461	364	278
	Risk prevailing 50% of the time	262	210	202	190	155	124
Highest VS Only risk	Total generation capacity	12,510	7,696	7,024	6,208	10,312	9,233
	Peak risk	1,197	618	501	477	578	559
	Risk prevailing 50% of the time	353	280	261	237	261	244

The costs of delivering the programme to reduce Loss of Mains risks are significantly lower than the cost of managing LoM through other system actions that ESO takes. The cost of managing LoM risk was £144m in 2018-19 and £201m in 2019-20. In 2020-21 the cost was £345m as a result of high levels of asynchronous renewable generation, low levels of inertia and the impact of the Covid-19 pandemic response on electricity demand. Once the Programme is complete, the commercial cost of managing the issue will be significantly reduced, saving hundreds of millions per year for the end consumer.

The original forecast cost of the Programme is £100m, which will be charged through BSUoS over the relevant timeframe. The cost is included within our BSUoS forecasts alongside the cost of the balancing actions which are expected to be taken to manage this issue before it is resolved. To date, Programme costs include £29.0m allocated to approved applications from embedded electricity generators to make LoM protection changes and £4.1m expenditure in programme administration and delivery.

Since the end of 2020, the changes that the programme is making to Loss of Mains protection for 'Vector Shift only loss' risk are sufficient so that these risks are fully covered by ESO's minimum inertia policy. This has eliminated the risk of Rate of Change of Frequency (RoCoF) protection being triggered due to a Vector Shift loss alone so ESO does not anticipate the need to take actions to manage this. We have been calibrating VS risk forecast tools against the outcomes of VS events to confirm the percentage of generation tripping following an event. A recalibration of the tool confirmed that the increase in the Vector Shift risk baseline reported here is accompanied by a decrease in the percentage

of generation tripping. Hence, no review of operational policies and procedures will be required as a consequence of the increase in VS baseline. The projected saving in the balancing costs is £20.0m per annum.

Compliance reported from sites without Programme support

A summary of the progress in identifying generation capacity that has self-reported its compliance with the LoM protection requirements in G59/3 amendment 7 without support from the Programme is shown in Table 8. This demonstrates that engagement activity to raise awareness of the programme and encourage applications for support to make LoM protection changes continues to provide increased visibility of sites that believe that they are already compliant. The Programme is implementing a sampling approach in 2022 to verify the compliance status of these sites.

Table 8: Sites self-reporting compliance without Programme support

	Pre-existing compliance – cumulative						
	July 2020	Oct 2020	Jan 2021	Mar 2021	June 2021	Sept 2021	Jan 2022
Sites identified	34	97	223	429	634	968	1,398
MW	450	1,422	2,782	3,846	4,698	5,895	6,401

Cost reporting

The projections of site-related costs are shown in Table 9. These projections cover the costs associated with the implementation of site changes (based on the data provided in the applications) and estimates of the costs required to cover delivery assurance activities. The table forecasts timely completion of the works, completion of delivery assurance activities, and payment.

Table 9: Projections of site-related costs

Delivery stage	Dec 2019 - 24Mar 2020	25Mar 2020 - 23Jun 2020	24Jun 2020 - 22Sep 2020	23Sep 2020 - 22Dec 2020	23Dec 2020 - 10Mar 2021	11Mar 2021 – 22Jun 2021	23Jun 2021 – 21Sep 2021	22Sep 2021 – 21Dec 2021	22Dec 2021 – 22Mar 2022	23Mar 2022 – 21Jun 2022	22Jun 2022 – 31Aug 2022	Total
No of sites completed	1,066	1,298	1,272	930	857	1,011	825	544	215	147	13	8,178
No of sites witnessed	150	95	17	75	69	81	30	42	16	12	1	588
No of sites sampled	0	183	241	251	171	158	110	100	30	25	3	1272
No of sites self-certified	733	962	1004	684	630	744	600	500	169	110	9	6145
Provider payment £m)	3.72	5.23	4.34	3.51	3.0	2.59	2.0	1.8	0.7	0.4	0.0	27.29
DNO cost (£m)	0.15	0.22	0.21	0.26	0.19	0.12	0.06	0.02	0.02	0.02	0.01	1.28
Site-related total cost (£m)	**3.87**	**5.45**	**4.55**	**3.77**	**3.19**	**2.71**	**2.06**	**1.82**	**0.72**	**0.42**	**0.01**	**28.57**
Site-related cumulative cost (£m)	**3.87**	**9.32**	**13.87**	**17.64**	**20.83**	**23.54**	**25.60**	**27.42**	**28.14**	**28.56**	**28.57**	

The actual numbers of sites declaring completion, witnessed, sampled, and self-certified are given in Table 10 alongside programme costs. Programme costs are presented as DNO administration costs and site-related costs. Site costs include payments to electricity generators (providers) successfully completing approved changes through the Programme as well as DNO costs witnessing changes and undertaking sample site visits.

Table 10: Actual costs and progress to date

Delivery stage	Dec 19	Dec 2019 - 24Mar 2020	25Mar 2020 - 23Jun 2020	24Jun 2020 - 22Sep 2020	23Sep 2020 - 22Dec 2020	23Dec 2020 - 10Mar 2021	11Mar 2021 - 22Jun 2021	23Jun 2021 - 28Sept 2021	29Sept 2021 - 28Dec 2021	Total Cost (£m)
No of sites completed	77	1,079	817	1,382	703	602	857	592	432	
No of sites witnessed		108	21	88	39	12	17	30	26	
No of sites sampled		0	85	109	97	77	94	66	128	
No of sites self-certified		548	282	949	669	1426	788	717	527	
Provider payments (£m)	0	0.05	1.49	3.28	3.62	3.30	2.25	1.74	1.17	16.90
DNO costs (£m)	0	0.01	0.03	0.10	0.08	0.05	0.07	0.02	0.05	0.40
Total site-related costs (£m)	**0**	**0.05**	**1.52**	**3.38**	**3.70**	**3.34**	**2.32**	**1.77**	**1.22**	**17.30**
DNO administration costs	0.04	0.11	0.41	0.57	0.39	0.53	0.66	0.43	**0.56**	**3.70**
DNO costs not yet categorised[4]	0	0	0.05	0.12	-0.12	0	0	0	**0**	**0.05**
TOTAL by Quarter (£m)	**0.04**	**0.17**	**1.98**	**4.06**	**3.97**	**3.87**	**2.98**	**2.20**	**1.77**	
TOTAL cumulative (£m)	**0.04**	**0.21**	**2.20**	**6.25**	**10.22**	**14.10**	**17.08**	**19.27**	**21.05**	**21.05**

Most of the site owners used recognised contractors to undertake the site works. Therefore, the number of sites where DNOs undertook witness testing of the LoM protection following the completion of the works continues to be below the projected estimates.

Total invoiced costs to the end of December 2021 totalled £21.048m. This is comprised of:

- £16.900m in payments to providers that have implemented changes at their sites.
- £0.400m for witness testing and sample site visits.
- £3.703m in DNO programme administration and delivery costs.
- £0.046m in costs not yet classified into the three categories above.

Forecast site-related costs to December 2021 (£27.42m) were £10.5m greater than actual site-related costs (£16.9m). The reasons for this variance include:

- A time-lag between completion of works (used to forecast the timing of costs) and the actual costs being logged. For actual costs to be recorded in Table 11, generators must have completed works; submitted evidence of completion to their DNO; the DNO to have

[4] DNO costs not yet categorised in previous quarters has been reduced from £443k to £46k in this report following resolution of some uncategorised costs. As a result, the categorised costs have been adjusted by the same amount in some quarters.

reviewed and assured the evidence; the generator to have invoiced their DNO for the agreed costs and the DNO to have invoiced ESO for reimbursement of these costs.

- Some approved applications have been registered within the programme's forecast costs but have subsequently not proceeded through agreeing the programme's terms and conditions and delivery the required changes.

Communication and engagement

The Programme continues to review, refine and deliver communications and engagement activity to reach those sites that have yet to apply or declare their compliance.

Window 9 saw a small increase in successful applications (623 versus 588 in application window 8), but a doubling of the generation capacity (1,177 MW versus 582 MW in application window 8), which suggests that the Programme's direct engagement with sites with a generation capacity of 1 MW up to less than 50MW has been more successful this quarter. However, 26% of generation capacity within scope of the Programme has yet to apply of confirm that they are already compliant. This emphasises the importance of continuing to raise awareness of the Programme to eligible customers whilst funding is still available and before 01 September 2022 when sites must be compliant with G59/3-7.

Communication and engagement activity also sought to encourage compliant sites to notify their DNO and provide details of their protection settings. This has resulted in an additional 500MW of generation capacity declaring compliance without programme funding during this reporting period.

The programme's communication and engagement strategy continues to focus on two themes:

1. direct engagement by DNO customer support teams', particularly for customers with an installed capacity of 1 MW up to <50 MW, and

2. to deliver a multichannel communication campaign to reach sites with an installed capacity up to 1MW.

Highlights of each of these activity areas are presented below.

Direct engagement

Distribution Network Operators (DNOs) customer support teams continue to directly contact customer sites with an installed capacity from 1 MW up to 50 MW to encourage participation in the programme or to provide details of their existing compliance to G59/3-7.

Almost 3,300 sites fall within this capacity range. 59% of these sites have now applied, with a further 13% declaring that their sites are compliant. It is estimated that 910 sites with a capacity of 1-50 MW are still to confirm their compliance status.

The latest baseline capacity at risk within these sites is 24.259 GW. 51% (12.370 GW) of this capacity has applied to make changes through the Programme and a further 5% (6.05 GW) has declared compliance without Programme support. 5.836 GW of capacity within 1-50 MW generation capacity sites has yet to advise the Programme of their compliance status.

DNOs Customer Support Teams' have continued to contact these remaining sites directly through email, letters and telephone as well as working with colleagues within other business functions to reach out to those customers that have not yet engaged with the programme. The Programme has implemented an additional initiative to share best practice and insight across Licensees within the Programme to reach the most challenging sites (where no response has been received despite multiple attempts). This engagement has also identified where lack of information on what action is required is delaying customer action. For example, it is taking a significant amount of time for the Programme to clarify the loss of mains protection status of specific wind turbines from the manufacturers, and we are working with Renewable UK to highlight the urgency of resolving this.

Communications campaign

Our analysis shows that tens of thousands of electricity generators with site capacities below 1MW are still to apply to the Programme or report their existing compliance. This represents 5% of the original total baseline of capacity within scope of the Programme. This represents a particular challenge as the smaller the generator the higher the likelihood that the owner is not a specialist electricity generator. Many of these sites, for example, are owned by farmers, local authorities, universities, healthcare, waste, water and other commercial and industrial organisations.

We have continued to deliver the refreshed communication campaign, with support from the agency Greenhouse PR with the objective of driving both more applications for funding into the Programme and also to encourage declaration of compliance and submission of evidence for those sites believing themselves to be already compliant.

On the user-friendly landing page (www.futureproofyourpower.co.uk), information about the ALoMCP is explained in a simple way. Customers can go to the application portal, sign up to receive a step-by-step guide for applications by email and read through the FAQs about the programme. Where electricity generators determine that no loss of mains protection changes are required to achieve compliance, the Programme's portal provides a process to register this information with the Programme and provide appropriate details of protection settings.

Digital communications have included social media messaging and adverts; advertising on relevant internet search terms; and advertising on relevant websites. Messaging has emphasised that there is less than one year remaining before the 01 September 2022 compliance deadline and also 10 May 2022 being the final application deadline to seek funding from the Programme to support making the required changes to loss of mains protection.

The team continues to review opportunities to reach different audience types to raise as much awareness as possible and drive generators engagement with the programme. This has included presenting at sector-specific conferences and exhibitions where the Programme has identified a significant number of electricity generators still need to act. The Programme team presented and engaged stakeholders at the Universities and Healthcare Estates Innovation conference and the Farm Business Innovation Show.

Focus Areas

The number of applications is now sufficiently high to allow us to infer the baseline RoCoF risk with an adequate degree of confidence. This will allow the actions taken by the ESO to reflect the actual level of risk on the network. Risk baseline reviews have been undertaken throughout 2021 to reflect any

change in the applications and any information gathered from sites that are found to be compliant outside of the ALoMCP.

There is growing evidence that the RoCoF/VS risks are not limited to where they were originally thought to exist. Examples of this are:

- Some generation sites of capacity of 5MW or above seem to have RoCoF protection still set to operate at 0.125Hz/s and 0.2Hz/s.

  To address this, the ALoMCP sought guidance from the Authority to include sites with 5MW or above with low RoCoF settings in the Fast Track scheme whilst it operated to allow a timely reduction in the RoCoF risk.

- Many inverters have their own LoM protection algorithm built in within the inverter controller:

  To address this, the ALoMCP is continuing to engage with inverter manufacturers to gather information on the inverter based LoM protection and how to update it to ensure compliance. Information gathered is published on the ALoMCP portal.

- Some wind turbines seem to have an additional element of LoM protection built in within the turbine.

  To address this, the programme is engaging with wind turbine manufacturers and some generators with large site portfolios to assess the extent of the risks and the scope of the works required to mitigate it.

Additional analysis of Feed in Tariff-registered generators is underway in order to provide an updated view of the number of generation sites and the total generation capacity of these <1MW generation sites, which was not available when the original programme baseline was established. Further analysis may be required to establish the degree of compliance within these additional sites.

The application process and the delivery assurance process are sufficiently robust to ensure that these issues are identified and addressed. Timeliness of the provision of evidence of completion of site works is a focus area for the Programme and there are examples of delays in receipt of this information. DNOs are following up with customers to ensure this is provided. This is information is essential to validate the changes. It also substantially increases our confidence in loss of mains risk levels. As well as demonstrating protection changes, this evidence also provides confirmation of the pre-change protection settings, which is valuable in reviewing and refining the accuracy of our risk modelling.

The current priority is to maximise participation in the programme to ensure that a significant degree of compliance is achieved by September 2022 prior to the commencement of any enforcement actions by DNOs.

A significant number of sites have achieved compliance with the new protection requirements outside of the ALoMCP. The Programme previously collated this information through direct engagement and has now improved this by providing an opportunity for generators to declare their compliance via the programme's online portal. This approach requires sites to provide the data and the evidence

required for their DNO to confirm this compliance. The Programme is applying an assurance process to these self-declarations to increase our confidence in the data provided.

As detailed within the Communications and Engagement section, the Programme is focussed in the remaining six months before the compliance deadline on engaging the 26% of generation capacity within scope of the Programme that has yet to apply or confirm their compliance. With time running out Programme messaging is increasingly emphasising urgency. The Distribution Code Review Panel is also consulting on an enforcement process and once the outcome of this is clarified we will communicate this to the remaining generators who are yet to act.

As summarised earlier in this section, we continue to seek manufacturer confirmation on whether their products provide LoM protection functionality or not, the type of protection (if it exists) and how their equipment would need to be reprogrammed to meet the requirements. We are also engaging with manufacturers we have identified that have products with other forms of protection, e.g. under frequency protection that could cause unnecessary tripping of generation. The Programme's online application portal includes a knowledge base of inverter manufacturer information[5], where this has been provided and it also highlights where relevant information is still outstanding. Additional information has been secured since the last report from inverter manufacturers, though it is disappointing that several manufacturers are yet to provide a satisfactory response despite the Programme's efforts. The requested information will enable owners of inverter-based generation to understand what action they need to take in order to achieve compliance. The Programme will continue to pursue this information and will consider what further action may be required.

Future applications

Applications can continue to be submitted for assessment via the registration portal (**http://www.ena-eng.org/ALoMCP**). The schedule of closing dates for application windows beyond window 9 is presented in Table 11.

Table 11: Schedule for final application windows

Application window	Closing date for applications
10	08 February 2022
11	10 May 2022 Final closing date

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[5] https://www.ena-eng.org/ALoMCP/mankb