PR24

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POWER AND FLOOD RESILIENCE SUPPLEMENTARY INFORMATION

NES32A

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1. INTRODUCTION

2. In the draft determination, Ofwat removes all flooding and power resilience expenditure across the sector and replaces this with a sector-wide adjustment. We discuss this in our main response to the DD consultation, where we explain why this is not a sensible approach.

3. However, Ofwat also carried out deep dives into our flooding and power enhancement case – which identified some issues with the information we had provided. This raised concerns about the alternative options we had considered and the evidence to show the selected options were the best value for customers, including considering lower cost and operational interventions such as mobile generation. This also raised concerns about our build-up of costs and benchmarking, across both water and wastewater, and about the evidence that there were no overlaps with base allowances or previous funding. For power resilience in wastewater, Ofwat said that we were unclear what the baseline risk position is, by how much it is increasing, and why the proposed scale of investment is the right level to manage the increasing risk.

4. This document provides more evidence to show the need for this investment, the alternative options we considered, and why we selected the options we did to address the need.

5. These investments are needed to adapt to climate change – that is why we selected these risks as the ones we need to address first, and certainly in the 2025-30 period. As we set out in our main response to the DD consultation, we do not think replacing this with a sector-wide uplift is a sensible approach. However, if Ofwat were to continue with the same approach at FD, we would expect to spend this allowance on partly mitigating these risks – for example:

- Tackling flooding at sites with the highest future flooding risk first (such as Bay Bridge and Matfen WPSs)
- Tackling power resilience at the sites with only the highest NPV (such as Ormesby, Langford and Warkworth for water).
- Switching to alternative least cost options from our options assessment – such as upsized uninterruptable power supplies – where it is not affordable to adopt the best value option. This would have a more minor impact on whether the assets remain operational, particularly in extreme weather events where we see an increasing risk.
- Tackling power resilience where the impacts on customers would be particularly high (such as the UV plants at our largest WWTWs, Howdon and Bran Sands, where we would have greater operational risks because this could not be mitigated through alternative sites or storage).

2. NEED FOR ENHANCEMENT INVESTMENT

6. In PR24-DD-W-Resilience and PR24-DD-WW-Resilience, Ofwat explains that it has proposed a sector wide enhancement uplift for companies to prioritise their biggest climate change risks. However, Ofwat also sets out its assessment that would apply if they had not proposed this sector wide enhancement uplift. For water:

> "**Partial pass:** The investment partly meets the criteria for enhancement investment and additional customer funding. The company does not provide sufficient and convincing evidence that there are no overlaps with base allowances or previous funding.
>
> "The company provides some evidence of increasing resilience power and flooding risks. The company plan is to increase the level of resilience at water treatment works and pumping stations to help them operate in adverse conditions, such as extreme rainfall events and provide electrical equipment resistance. The company does not provide sufficient and convincing evidence that some of these risks could not have already been addressed through previous funding.
>
> "The company states that it has 'not included enhancement expenditure for any sites which have been funded under any other AMP8 base or enhanced funding' but provides no evidence to support this."[1]

7. And for wastewater:

> "**Fail:** The investment does not meet the criteria for resilience enhancement investment and additional customer funding. The company does not provide sufficient and convincing evidence that there is an increasing risk from hazards outside of its control. If required, the company should therefore be undertaking the investment within base expenditure allowances.
>
> "The company states that it is requesting investment for power outages associated with severe storm or wind events or repeat failures from the power distribution network operator, protecting against a third-party power failure both in normal operating conditions and extreme weather. The company noted that in extreme weather events many sites are impacted at once, and the company would not have enough mobile generation capacity to ensure critical site operation.
>
> "The company carried out a process to identify sites at risk from power outages from DNO events, considering that pollution events can occur when DNOs are meeting their own regulatory standards. The company mentions that the asset health of Northern Powergrid's electricity poles is worse than in other areas of the country, which can lead to longer duration of events before resolution, particularly during storms. The company developed a final list of sites for 2025-2030 by considering the 4Rs, technology

[1] PR24-DD-W-Resilience, NES Power & Flood sheet

and feasibility options, and cost benefit. This results in 77 sites to provide electrical generation equipment and 7 for a plug-in socket (84 in total).

"The company was queried as it is unclear what the baseline risk position is, by how much it is increasing, and why the proposed scale of investment is the right level required to manage the increasing risk. Much of the risk described is existing risk (e.g. the poor asset health of Northern Power Grid assets). There is insufficient evidence of the level and scale of investment required to offset the increasing risk the company describes.

"Investment to maintain resilience is mostly through base expenditure. Historical base allowances have been sufficient for companies to maintain and improve outcomes and asset health metrics over previous periods and be resilient to climate change impact."[2]

8. In our response to query OFW-OBQ-NES-168, we explained that we could not have any method of quantifying the future risk, because Northern Power Grid is not able to estimate when, where, and how frequently service failures will occur. They have told us that they are aware that their asset health of their electricity poles is worse than other areas of the country, which can lead to a greater level of longer duration of power outages especially during storms.

9. This does not mean that "this is existing risk (e.g. the poor asset health of Northern Power Grid assets)". Although the underlying poor asset health of Northern Power Grid assets is clearly an existing risk, we see increasing impacts from this due to increasing wind storms – which we *have* shown is an increasing risk into the future, and a particular risk faced by Northumbrian Water. This is no different to other risks from climate change – for example, extreme temperatures have always been an inherent risk to water treatment processes, but this did not matter until we observed (or expected to observe) extreme temperatures happening in practice. In the same way, the underlying asset health of Northern Power Grid assets did not matter to us until we started seeing increasing service impacts from extreme weather.

10. Ofwat's statement that "investment to maintain resilience is mostly through base expenditure. Historical base allowances have been sufficient for companies to maintain and improve outcomes and asset health metrics over previous periods and be resilient to climate change impact" is not relevant to this enhancement case. It is very clear that this case is **not** about our own asset health metrics, and that this is entirely about external risks that are increasing due to climate change and the cascading impact of power failures on water and wastewater companies.

11. As we explained in our response to OFW-OBQ-NES-168, we would have preferred to be able to quantify these risks – as this type of quantitative analysis is helpful to explain and justify making these investments now.

[2] PR24-DD-WW-Resilience, NESPowerWW sheet

However, without consistent standards on power resilience and cross-sector regulation to allocate the risks of cascading failures, the information is not available to support this. This prevented us from undertaking a more detailed analysis than what we have provided in our enhancement case.

12. However, this lack of quantitative analysis should not prevent any investment being made. When considering resilience investments in their PR19 redeterminations, the CMA said that "while quantitative analysis of the kind Ofwat has described is often helpful and is widely used within the regulatory regime, we do not consider that its absence should result in an outright rejection of a proposed resilience scheme in all cases. Instead, this case falls to an exercise of judgement regarding the evaluation of the specific facts available, and their implications. This is consistent with the CMA's general approach to evidence assessment.[3]"

13. As one of their key considerations, the CMA considered if the "near misses" which Northumbrian Water suffered in 2016 and 2018 at Layer WTW represented reliable evidence of a supply risk in our water network. The CMA considered that actual experience of "near misses" represented strong evidence for a potential risk, which would support the need for intervention. They said that "when assessing the operational resilience of a network, an ex-post assessment of areas of actual failure (or near-failure) appears a straight-forward and effective approach to identifying sources of risk within the network"[4]. The CMA also noted that they had substantial concerns with an approach to allow investment to be deferred to the next price control to allow Northumbrian Water to develop its case – as this results in customers continuing to be exposed to the identified risk[5] . We describe similar "near misses" in NES32, including the impacts on pollution incidents from power failures at sewage pumping stations and the historic loss of power and the impact on customers (Table 40).

14. Ofwat has not described how they have considered this point explicitly in their assessment at DD.

2.1. FURTHER EVIDENCE IN RESPONSE TO DD

15. Since our response to query OFW-OBQ-NES-168, we received more information from Northern Power Grid. This shows that power outages are increasing and impacting our assets on both Low Voltage and High Voltage feeds (source NPg MPAN analysis). We show this in Figure 1 and Figure 2 below.

[3] CMA price determinations final report, paragraph 5.358
[4] CMA price determinations final report, paragraph 5.360.
[5] CMA price determinations final report, paragraph 5.366.

FIGURE 1 - HISTORIC FAULTS AT NES HIGH VOLTAGE SITES

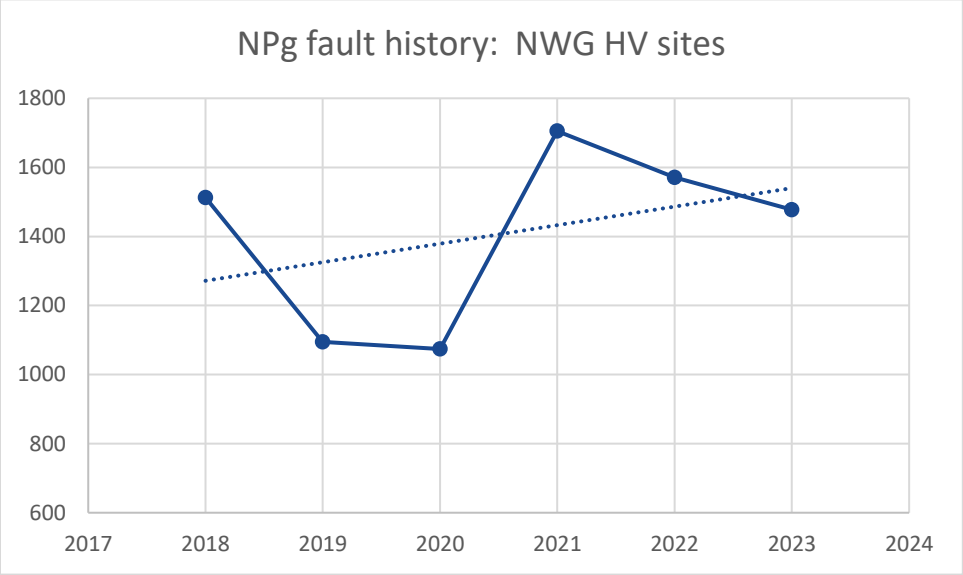
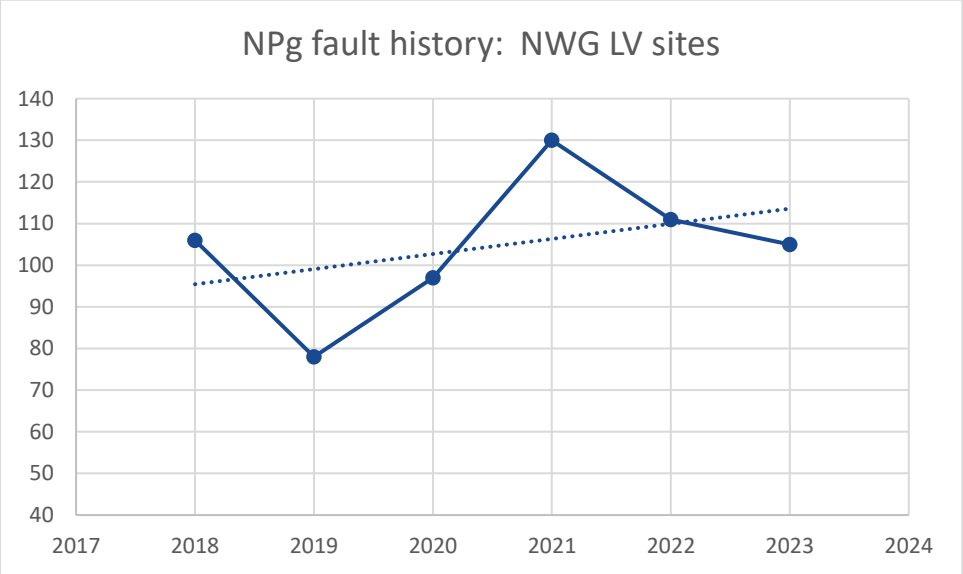
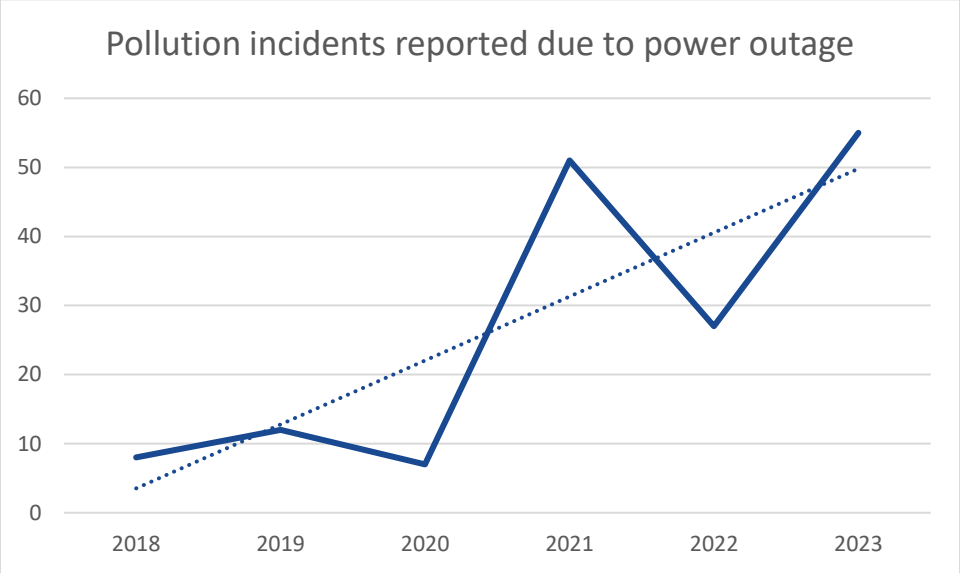


FIGURE 2 - HISTORIC FAULTS AT NES LOW VOLTAGE SITES



16. This increasing trend in third party outages correlates to an increasing number of pollution incidents because of such outages. Figure 3 shows how this has increased over time from very few incidents in 2018 to far more in the last three years – and that Storm Arwen (in 2021) was not unique.

FIGURE 3 - POLLUTION INCIDENTS DUE TO POWER OUTAGE OVER TIME



17. In our business plan, we carried out analysis with Mott Macdonald. This clearly identified how climate risks are expected to evolve in the future (NES52 and NES53). This report sets out the highest climate change risks which will impact our service provision:

Hazard	Magnitude of consequences	Future likelihood of the hazard	Future risk level	Comment
Pluvial/Fluvial/ Tidal Flooding	High	Greater	Very high	The risk is assessed as very high for Northumbrian given expected changes in peak flood flows and summer rainfall.
Wind	High	Greater	Very high	The North-East will see an intensification of winter windstorms like storm Arwen and Desmond
Soil moisture deficits	Moderate	Greater	High	The risk is assessed as high as decreases in summer rainfall and increases in temperatures are likely to be smaller than in Essex and Suffolk, leading to lower impacts.

Hazard	Magnitude of consequences	Future likelihood of the hazard	Future risk level	Comment
Wind	High	Greater	Very high	The risk is assessed as very high due to the projected intensification of windstorms and the possibility of cascading failures.
Soil moisture deficits	High	Greater	Very high	The risk is assessed as very high given that decreases in summer rainfall and increases in temperatures are likely to be greater than that in the North-East.
Pluvial/Fluvial/ Tidal Flooding	Moderate	Greater	High	The risk is assessed as high given the absence of wastewater assets. To note that the risk of coastal flooding is likely to be greater in the South-East due to higher increases in sea-level and the low-lying nature of the area.

18. The increasing prevalence of future windstorms is likely to further impact our ability to maintain service – because of the poor asset health of Northern PowerGrid's assets. We provided this information in our enhancement case. For example:

19. Ofgem's Final Storm Arwen Report (Storm Arwen Report | Ofgem) clearly identifies several issues in our region which increase the risk further of future power outages when considered in conjunction with an increasing risk of climate hazards:

- Ofgem confirmed that in the Northumbrian Water Operating region there are approximately 200,000 High Voltage and Low Voltage poles.
- Ofgem confirmed that of these 200,000 poles, 32% (approximately 64,000) are at the worst condition grade (HI4/HI5) and would be classified as in need of replacement. This is the 2nd worst in the sector.
- Ofgem confirmed that age of poles is likely to be more related to their susceptibility to failure in abnormal weather conditions than is currently understood.
  - 48% of HV poles in the Northumbrian Water Operating region are more than 50 years old (2nd worst in the sector).
  - 51% of LV poles in the Northumbrian Water Operating region are more than 50 years old (3rd worst in the sector).

20. The risk that Ofgem identifies is further increased when you consider historic maintenance activities in key resilience areas:

- Ofgem confirmed that Northern PowerGrid have proportional spent significantly less investment on overhead line clearance per HV/LV pole than other Distribution Network Operators (3rd lowest in the whole sector).
- Ofgem confirmed that Northern PowerGrid have proportionally spent significantly less (and are spending less than their regulatory allowances) on tree cutting (worst in the whole sector).

- Ofgem confirmed that of this expenditure, the primary reason for tree cutting was safety clearance and not resilience clearance.

21. We have continued to discuss these issues with Northern PowerGrid since the business plan in October 2023. They have confirmed that they now have plans to replace 25,000 poles by 2028, with 17,000 of these in Northumberland. Although this is helpful, only 22% of the sites that we have identified as part of our investment plans are in Northumberland.

22. Even if this investment by Northern PowerGrid on replacing poles in Northumberland removed risk to our sites, which they cannot and will not guarantee, then a further 78% of the sites we have identified will remain at significant risk due to the poor asset health of these third-party assets.

23. This risk will increase year on year as these assets continue to age and not be maintained at the rate needed to improve their asset health. Ofgem accepts extreme weather exceptions to performance standards for Northern PowerGrid, and expects energy companies to prioritise household supplies over sewage pumping stations.

24. The Environment Agency confirmed in a letter dated 29th November that all storm incidents in the annual Environmental Performance Assessment (EPA) will be reported without any discounting, stating that this reflected their expectation that water companies will have planned capability to prevent incidents, mitigate impacts that might occur and restore operation of affected assets.

25. We will continue to undertake detailed investigation and root cause analysis into every discharge from our assets and comply with all of our permit conditions. However, as we said in our enhancement business case for Pollutions (NES37, while a 30% improvement from current pollution forecasts will be more challenging for us to deliver than other companies not operating at the sector upper quartile, with the additional investment from our enhancement case for climate change resilience we should be able to meet the statutory requirement to deliver at least a 30% reduction in all pollution incidents by 2030 compared with current 2025 targets.

26. However, in practice we would need to reduce pollution incidents by much more than 30%. This was because of a change to the way the Environment Agency regulates pollutions, which will mean an increase in the number of reported pollution incidents and the cost of resolving them, compared to the 2025 baseline. This is due to a change in definition and reporting – we are complying with current guidelines and reporting our performance correctly. The new requirements are:

- New monitoring requirements from WINEP (see our WINEP monitoring enhancement case, NES30) which will mean we detect more pollution incidents which would previously have been invisible. These new monitors have not been a requirement until 2025, and we have not previously been funded to install monitors to do this.
- The Environment Agency is likely to move to retrospective reporting and to classifying all discharges in dry weather as pollution incidents. This will change the definition of pollution incidents.

- New guidance requires additional evidence to be collected in the form of site surveys, sampling, and analysis. We support this guidance, but as a new statutory requirement, this will require enhancement funding to implement.

27. Without the investment we have proposed for as part of this enhancement case we will not be able to meet this level of resilience outlined by the Environment Agency and will not be able to meet the stretching targets set out under WISER.

2.2. WHY IS THE PROPOSED SCALE OF INVESTMENT THE RIGHT LEVEL?

28. In our enhancement case, we described our approach and rationale for the scale of the investment to tackle this risk. In Table 29 of NES32, we set out our assumptions for the benefits from power resilience. This assumed that there would be more failures per year that were similar to Storm Arwen – a linear trend from 0.07 failures per year in 2025 to 0.17 failures per year in 2055. This was based on the climate evidence, which shows increasing wind storms through this period.

29. We then used this assumption to calculate the benefits expected from providing power resilience (of different types) at each site. Table 38 of NES32 shows that the preferred options have a positive NPV in almost all cases, showing that these would be appropriate investments to mitigate the risk. That is, these would be a cost-beneficial investment for customers under the predicted climate change impacts.

30. This makes some assumptions:

- Two sites do not have a positive NPV – these are the UV plants at our largest treatment works, Bran Sands and Howdon. We explain why we included these sites in section 3.3.2 of NES32 (see also section 3 of this document).
- We assume that the power resilience for Northern PowerGrid does not change over the period 2025 to 2055.

31. We asked customers about when they wanted to address this risk, and we described this in section 2.12.1 of NES32. This involved some detailed and complex discussions with customers about how we should adapt to climate change, with customers supporting investment in power resilience now because there is a high likelihood that climate change will have an impact on our services in the short or medium term (under any future climate change scenario); and this has an immediate impact on service. We described the impact of pollution incidents from sewage pumping stations, and customers wanted to address this risk.

32. So, we could not understand why Ofwat thinks that there is not enough evidence to show why this scale of investment is the appropriate level – we have used climate evidence to set the trajectory of expected power failures from extreme weather events; we have then used this to plan investments at all sites which would have a positive NPV; and we have based the long-term plan for climate change adaptation on customer research and independent challenge.

3. BEST OPTION FOR CUSTOMERS

33. Ofwat raised some concerns about whether the investment is the best option for customers. For both water and wastewater, they said:

> "The company considers a narrow range of alternative options but does not provide sufficient and convincing evidence to demonstrate that the chosen options are best value for customers.
>
> "The company has considered a number of options and range of intervention types. However, many are screened out early before progressing to more detailed assessment. The company provides detailed cost benefit appraisal between different two options and provides cost information, including whole life cost information and references made to multi-capitals value.
>
> "Lower cost and operational interventions, such as mobile generation (in house or via contracts) are not fully explored or justified."[6]

34. In our enhancement case, we considered a wide range of options – 15 in total - as set out in Table 21 of NES32. Some of these solutions were carried forward for further investigation, because it was not clear that these could provide the resilience that was required.

35. We considered working with other power suppliers that might be more resilient, or with the regional electric companies to identify specific vulnerabilities in power lines that could be addressed. This might be possible in the future, but there are no examples yet of other power suppliers providing resilience in extreme weather events (and these are more likely to be available for vulnerable households first). A regional strategy could identify power network vulnerabilities, but there is no requirement for NPG to engage with this and – as we describe in our main response to the DD – there have been very limited efforts to agree investments for resilience across sectors. We still do not have any definitive options of this type. We also considered redundancy, through dual HV supplies, but this relies on the same power supplier and would need a regional strategy to be confident that they are not co-dependent.

36. We considered alternative power supplies including battery storage, solar panels, wind turbines, and hydro turbines. All of these are site specific and there could be scope for this in future. At the moment, battery technology is not sufficient to provide the resilience needed and we have found no commercial offerings that would provide this resilience. Alternative power supplies would be significantly more expensive than generators due to the nature of this need – that is, generators have a lower capital cost but higher operating costs due to fuel, but very little fuel is needed as generators are only required for a small proportion of the time; whereas alternative power supplies have higher capital costs and very low operating costs. However, we carried this forward for

[6] PR24-DD-W-Resilience, NES Power & Flood sheet

investigation in delivery as this could be possible if there were already other investments nearby that allowed for more innovative solutions – we do not know of any opportunities to do this yet, but this could move quickly.

37. We considered uninterruptible power supplies and concluded that these would not meet the requirements under extreme weather. However, we costed these options anyway with a small proportion of the benefits to test how this compares to doing nothing. We considered two options which we took forward as base expenditure – improved critical spares storage; and upgrading single phase sites.

38. Across all of these options, it is not clear how we could have progressed these to more detailed assessment – either there were no specific opportunities identified in each case (and so there was no specific scope on which to base costs or benefits), or it was not clear that this would deliver the benefits needed in practice (and so the need would not be met).

39. We assessed the costs and benefits in full for four options – fixed standby generators, mobile standby generators, plug-in generator sockets, and UPS. All but two of the of the sites proposed as part of this enhancement case returned positive NPVs, meaning that the investment proposed was cost beneficial.

40. As part of our enhancement case, we used a range of available evidence to compile a long list of sites including site criticality; current availability of fixed backup power generation; history of site outages, especially during recent severe weather events; and a stakeholder review with operational team.

41. We also completed a site vulnerability assessment which considered the following factors:

- Frequency of power outages in past five years.
- Impact of power outage on site functionality.
- Presence of any current site controls to mitigate the effects of power outage.
- Potential time each site would be out of service in the event of an outage / potential restoration time.
- Population served by each site and the proportion of that population likely to be impacted in the event of an outage.

42. These assessments helped populate a resilience scoring exercise which appraised the level of resilience that all of the options would provide. We used information as part of the cost benefit assessment we completed across all options considered in this enhancement case.

43. Our enhancement case NES32 shows the comparison in NPV between the different options, with fixed generators being the selected option in most cases. In practice, providing permanent fixed generators at our sites was identified as the preferred option from this assessment as this was the only solution where we could guarantee resilience of our assets during storm events and third-party outages to reduce the risk of discharging flows to the environment or flooding customers properties. We estimated that a portable generator would achieve only 50% of the benefit for sewage pumping stations (because there is not much storage at these sites, so it would take more

time to effectively mitigate a site with a portable generator located elsewhere); and 70% for a sewage treatment works.

44. Our recent experiences during storm events, for example Storm Arwen provides a further indication about why this solution is the best option for customers in practical terms.

45. During Storm Arwen, our wastewater sites were significantly impacted, with more than 60 affected by power cuts caused by the storm. Our response to the storm involved planning to mitigate any impacts to wastewater treatment processes and the potential for any emergency discharges to the environment because of the power cuts and the subsequent lack of pumping capabilities.

46. We deployed resources working through the night to inspect our sites, putting in place standby generation, arranging to 'tanker' the contents of certain sites to different locations wherever possible. However, this was affected by the difficulties, hazards and health and safety concerns in travelling across our region, particularly before daylight. Examples of the typical conditions we experienced in travelling to our sites are shown in the photographs below (taken by our teams during storm Arwen):

47. During Storm Arwen, we hired a number of mobile generators at short notice to support our response. However, mobile generators are generally of smaller power capacity and often two or more are needed to operate in parallel to provide the required power output. Higher power mobile generators are typically physically larger pieces of equipment and may require bases/plinths on which to be placed in order to operate. As such, there are a number of challenges in deploying mobile generators.

48. In addition to this, at many sites - particularly sewage pumping stations - the time before discharge when complying with our permitted conditions, particularly during extreme wet weather can be as little as a few minutes. So, there is very little time for us arrange standby generation or alternative solutions such as tankering.

49. In these cases, the provision of permanent fixed power generation with “auto-start” is the only practical solution to maintain service during extreme weather. The resilience offered by this solution is also effective in severe weather when operational response capability can be severely hampered by flooding, snow, and windthrown trees or power poles – that is, it would not matter if we lost some access to the site.

50. We do not understand why Ofwat says that we did not consider the option of mobile generation – this was one of the four options we took forward for the NPV comparison. Although this can be lower cost (although not in all cases), it is not better value.

4. COST EFFICIENCY

51. Ofwat raised some concerns about whether the investment is efficient. For water, they said:

> “The company does not provide sufficient and convincing evidence that the proposed costs are efficient.
>
> “The company provides a description of the costing methodology and benchmarking activities. However, the description is still lacking on how the specific costs have been built up or benchmarked. The document identifies power generation benchmarking for five wastewater sites but doesn’t explain why this is then relevant for all sites (including water treatment). For flooding, no evidence is provided (the two cases are combined in a single document).
>
> “The company states that 'We have not been able to benchmark the costs of the solutions for flood resilience" and adds a qualifying statement that 'these are all minor items which may be directly delivered and therefore do not form part of our costing partner’s data set'.
>
> “The company has not provided sufficient and convincing evidence on benchmarking and third party cost assurance.
>
> “For the power resilience claim see the WW-Resilience model for more details on our significant concerns with regard to cost efficiency of proposals.”[7]

52. For wastewater:

> “The company provides very limited evidence to demonstrate cost efficiency.
>
> “The company states that 5 power sites have been benchmarked against cost curves from other companies, showing efficiency of direct costs. The company states that costing has been carried out by

[7] PR24-DD-W-Resilience, NES Power & Flood sheet

> its costing partners using their own cost models. It states that they have then been benchmarked against external cost database and independently assured and internally audited.
>
> "The company states that it has not benchmarked indirect costs as there may be a lower level of cost due to this being a "low design" item. The overall cost (direct and indirect) unit rate appears to be inefficient at ten times the direct cost (fixed generator cost in table 2 is £60k-£82k, whereas scheme cost is 10x this amount). An 80% efficiency has been applied to account for an oncost in line with other proposals."[8]

53. We do not recognise Ofwat's calculations for the overall cost. We think Ofwat has assumed that the direct costs in Table 32 of NES32 include all the costs of this scheme – the costs of fixed generators in this table are around £70k, compared to a unit cost of around £700k for each site.

54. For the sites highlighted in Table 32 of NES32, the total capital project costs from our business plan are:

- Amble STW: £0.347m
- Cramlington STW: £0.344m
- Low Wadsworth STW: £0.281m
- Browney STW: £0.331m
- Hendon STW: £0.3m

55. We can show that Table 32 captures only the direct generator costs by looking specifically at the costs for one of these sites - at Amble STW. The total cost (£0.347m) includes:

- Generator cost: £0.082m
- Building modifications costs: £0.015m
- Site access modifications costs: £0.009m
- Project and contract overheads: £0.141m
- Risk and uncertainty: £0.1m

56. We recognise that this was not clear from the benchmarking section of our enhancement case, which we can now see was not particularly extensive. So, we asked Aqua Consultants to look again at this – including all sites, not just those that were included in the prioritised NES32. We attach their report to this appendix.

57. This report shows that the costs in total – including estimating uncertainty – would be **3% below** the benchmark mean for STW schemes, and **1% above** the mean for SPS schemes. This also shows the individual costs of each scheme.

[8] PR24-DD-WW-Resilience, NESPowerWW sheet

58. We note that for example the most expensive scheme at Bran Sands is many times the cost of the smallest schemes – so, these are not well represented by a unit rate, as there are different needs. This explains why the costs for the schemes in NES32 were around £280k to £350k, rather than the £700k unit rate implied by the total costs.

59. The Aqua report shows **higher costs** than the total costs of the schemes highlighted in Table 32 of NES32. As a comparison for these sites, the report has the following costs:

- Amble STW, at £0.597m
- Cramlington STW, at £0.594m
- Low Wadsworth STW, at £0.548m
- Browney STW, at £0.585m
- Hendon STW, at £0.562m

60. These are higher costs than Table 32 of NES32 because the Aqua benchmarking exercise identified a small error with one of the costing spreadsheets where a selection of STW building yardsticks were incorrectly identified as $20m^2$ whereas their yardstick should have been $200m^2$.

61. This would have added a much larger building cost. For those affected sites in our business plan, this error equates to a total cost of £5.79m.

62. As this was an error we made in our costing, we have not revised our total costs in our business plan. However, since the Aqua report shows that we are broadly efficient at the higher costs, this helps to show that our (original, lower) business plan costs are significantly more efficient than the baseline.

63. We already provided cost assurance for these costs as part of our business plan, in NES68. This cost assurance note explains how Mott MacDonald provided independent assurance to confirm that the cost estimation and benchmarking at PR24 was robust. Since then, we followed this with internal cost assurance based on the original scopes (this is normal practice for developing our delivery plans).

64. As part of our DD response, we asked Aqua Consultants to provide some further cost assurance on projects for power resilience. We attach these reports – which include both benchmarking and assurance - for water (**NES32A1**) and wastewater (**NES32A2**) to this appendix. This includes demonstrating that we used a similar approach for both water and wastewater power cost benchmarking, and that overall these costs are efficient.

65. Figure 4 shows the costs for the whole programme (that is, for all sites where we identified a need) against the low, medium, and high benchmarks developed by Aqua. Our costs are close to the “low” benchmark, and significantly below average.

FIGURE 4 - SUMMARY OF COST BENCHMARKING

Scheme name	Total cost	Low	Mean	High
STW	£88,719,976	£75,543,150	£119,451,693	£151,429,854
SPS	£197,120,178	£180,862,734	£254,541,405	£310,993,585
Water	£44,306,593	£38,336,126	£40,598,009	£42,485,475
Total	£330,146,747	£294,742,010	£414,591,107	£504,908,914