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Dear RIIO team

**Ofgem Call for Evidence on ED2 Business Plans**

Thank you for the opportunity to contribute to the Call for Evidence on the ED2 Business Plans.

Sustainability First is a think-tank and charity with a focus on social, environmental and economic issues in essential services and in particular energy and water. We have significant experience of the RIIO price control process through involvement in the Ofgem Challenge Group, Consumer Engagement Groups and Ofgem working groups. We have also carried out significant work on how regulatory models need to adapt to meet the challenges ahead including our Regulation for the Future report as part of our major Fair For the Future project.

There is a huge amount of material contained in the Business Plans and supporting Annexes and Appendices and we have therefore had to focus our attention on those areas where we consider we have most to add – essentially around the energy transition and the environmental action plans.

We have structured our response by starting with some high-level observations on the plans and how far they have progressed since ED1; we then pull out some of our key messages in terms of how we would like Ofgem to approach the draft determinations. We have then worked through providing comments on individual chapters / sections of the plans, with annexes providing more detailed assessments of the plans in two of the areas that we are particularly concerned about – losses and SF6.

We would of course welcome the opportunity to talk through any of these issues with the Ofgem teams if they would find that helpful.

**Overview of the Plans - Progress since ED1**

We would like to start by reflecting on the extent to which these ED2 Business Plans represent a significant step change on ED1, building on the clear direction that Ofgem has provided:

- The companies have all visibly embraced the net zero challenge both in terms of their role driving and supporting the energy transition and in terms of their own carbon impact;
- The companies have also all made a step up in terms of their approach to enhanced engagement with elements of co-creation, in particular working with stakeholders such as local authorities who also have a key role in the transition. There are some good examples of customer engagement and thoughtful approaches to triangulation of different forms of evidence. We hope that this is now business as usual in the companies and will be continued into ED2 (justifying Ofgem's decision to drop the stakeholder engagement incentive);
- There are also good examples of a much stronger focus on local communities, interest in supporting jobs and the regional economy and a wider social contract. This reflects the

themes that Sustainability First has been promoting through its Fair for the Future work which a number of the companies were involved in and wider thinking on a just transition;
- On vulnerability, our review was limited but the plans seem to build on the good foundations from ED1 but with questions around whether the plans go far enough in the light of the fresh challenges brought about by the pandemic and the energy and cost of living crisis.

While generally supportive of the substance behind the Business Plans, we faced a serious challenge in dealing with the materials produced. Understanding relative performance is one element in judging the ambition of the plans. We have sought to do this as best we can but our response has been hampered in places by the sheer difficulty in engaging with the material and hence in many areas we have not been able to provide a view on relative ambition levels in the way that we had hoped to.

As an expert (albeit small) stakeholder in this area, we consider that **the lack of readily comparable metrics** should give Ofgem cause for concern and raises questions around procedural justice and what meaningful accountability looks like in this context.

In particular, we would highlight:

- The sheer volume of material. While Ofgem had limited the page length for the Business Plans to 200 pages, in most cases it was also necessary repeatedly to cross-refer to detailed Annexes and the Appendices to the Annexes simply to be clear exactly what was being proposed. By our estimate the plans run to tens of thousands of pages combined and as a result it is possible that we may have missed some relevant information;
- The volume problem was exacerbated by poor readability in the design of some plans (especially when read electronically) plus weak signposting, broken links and some "locked" documents (SPEN) making it hard to pull extracts together for comparison;
- Critical cost-information is absent and often opaquely described for the main investment programmes - and some companies (eg SSEN) have redacted even the most basic cost information.
- Cost information is not presented in the plans on a consistent basis (eg what constitutes ED1 average). More generally across all metrics the ability to base-line and compare the companies is extremely difficult. While Ofgem may have set out tight definitions for the data to be included in the business plan templates (spreadsheets) these are not published and the summary figures presented in the plans are not necessarily taken from these templates. The strategic summary template that Ofgem developed as a one pager of key statistics could have been a helpful source but none of the companies apart from SSEN have published it.
- For key ED2 areas, there is a dearth of simple clear comparable tables – with all relevant information in a single place (measure, baseline, target, cost) **–** eg on EAPs, DSO, load growth
- NPG, SPEN and ENWL provide a clear summary list of their commitments – but not all companies do. This is important not just in assessing the plans but also in holding them to account for delivery in ED2 (where Ofgem is increasingly reliant on reputational measures).

In summary, while we welcome that the business plan process has become far more open and inclusive, it has arguably also veered towards "death by information". Our own experience on this is by no means unique.

Ofgem itself also faces a huge challenge in how to benchmark and compare across the plans but it is crucial that for Draft Determinations Ofgem presents information on a comparable basis across the companies in ways with which stakeholders can engage. We would also encourage Ofgem to consider any lessons learned for RIIO3.

**Key messages**

Aside from the vital need for comparable metrics as set out above, the key messages that we would highlight as Ofgem considers the plans and its Draft Determinations are as follows:

**Costs and overall bill impact**: Affordability is a critical customer issue, in particular at this current time. It is therefore vital that Ofgem should challenge unwarranted or poorly evidenced costs and set stretching efficiency targets. However, this focus on short term bill impacts should not lead Ofgem to cut back on necessary investment to improve resilience (an area where CCRA3 has identified that more action is needed in the energy sector and where recent experience with Storm Arwen has highlighted current issues) and to meet net zero. On the Environmental Action Plans there was extensive stakeholder testing – and considerable support from both consumers and wider stakeholders for DNO ambition on de-carbonisation and net-zero. Also, once you set aside oil and PCB compliance costs, the overall EAP spend is not that material compared to other parts of the plan.

**Losses is a neglected but vital area**: Losses cost customers £15-20 pa which is significant when viewed against the typical DNO share of the customer bill of c £100pa. They also account for around 1.5% of the UK's carbon emissions. We therefore have a significant concern about the very limited attention given to losses across the Business Plans and the way the DNOs' "net zero" targets often exclude losses. Given Ofgem's decision to remove any financial incentives from this area this is not a surprise. The plans read complacently: companies seem to have succeeded in persuading Ofgem that losses are outside their control and that the carbon impact will be addressed anyway as the grid decarbonises. However it is is clear from the Losses Strategies accompanying the plans that there are a wide range of actions that the DNOs could in practice take to help mitigate the impact of higher losses as grid utilisation increases. Our concern is that they currently have no incentive to pursue these initiatives in ED2 (beyond a "reputational" incentive which is wholly ineffective in a complex area like this). In our view this is a prime example of a whole-system issue where action (or inaction) by the DNO imposes wider costs on the system. Ofgem urgently needs to acknowledge and signal the importance of this issue and provide appropriate financial incentives or regulatory mechanisms to redress this balance. We have set out a number of proposals in our response (and more fully in a separate annex).

**SF6 Strategies are a material but neglected area for DNO asset-management given science-based targets and net-zero.** SF6 is a long-lived and highly potent greenhouse gas found in around 200,000 bits of equipment across the networks**.** DNO SF6 strategies - for dealing with SF6 leakage and ultimately replacing relevant equipment - are of highly variable quality. We consider company approaches to their long-run management of this potent green-house gas in a separate annex. As a priority, DNOs must put in place the common reporting methodology proposed by Ofgem. Otherwise, it remains impossible to fully understand the bigger picture - not just on leakage but also to gain a clearer view of the 200,000 equipment items that contain SF6 held right across DNO networks. On the basis of our own detailed look at DNO SF6 strategies, Ofgem reliance on reputational regulation alone seems wholly inadequate to the task of gaining assurance that the companies are managing-down their long-run future SF6 risk in ways that align with their commitments on science-based targets and net-zero. Ofgem must support a change of gear in ED2 on DNO SF6 Strategies through financial incentivisation. The companies must demonstrate long-run

cost-efficient approaches for tackling their SF6 holdings – right through from leakage, to future SF6 asset-management (including potential cost-impacts) and active engagement with the supply-chain.

**The extent of anticipatory investment that Ofgem will allow is a key strategic issue** but the information provided in the plans does not allow the trade-offs to be understood or commented on by stakeholders. It is crucial that Ofgem sets out clearly the basis for the approach that it adopts at Draft Determinations. While it is hard to unpack the figures, our sense is that UKPN has taken a different approach to other DNOs with a focus on "maximum utilisation" with strategic investment downplayed in its baseline plans for ED2. In contrast NPG have argued that there is a need to invest strategically in ED2 to avoid an unmanageable bow-wave in subsequent periods. While we understand Ofgem's focus will be on minimising short term bill impacts, there has also been strong support at various times from the CCC, NIC and BEIS for more strategic approaches to investment to hit net zero cost-efficiently. Many regional stakeholders have clearly endorsed the approach that DNOs are taking on strategic investment. All DNOs are committed to a "flexibility first" approach to investment, so the key question is how that balance is struck in terms of the point at which one invests. We hope that Ofgem will make effective use of its own Net Zero Committee to help inform its decision on this balance in ED2, taking account also of the recent open letter from Kwasi Kwarteng highlighting the importance of strategic investment in supporting economic growth and resilience.

**Energy efficiency needs further thought**: One significant gap in the Business Plans is the failure to properly consider energy efficiency – and more specifically thermal insulation - alongside flexibility as an alternative to reinforcement, despite this being a licence requirement. Sustainability First had previously advocated the need for a beacon energy efficiency pilot in ED2 to build learning ahead of ED3 when heat electrification will take off at scale. This also has potential to contribute to a just transition. We would suggest that Ofgem looks across the elements of ideas in the Business Plans (including SSEN's Energy Efficiency CVP which has some merits but which we cannot support in its current form), to clarify DNOs' role in this space and drive more progress in ED2.

**Collaboration must be encouraged**: While we recognise that there is value in the competitive process that RIIO engenders in encouraging companies to be ambitious and creative, ultimately in many of the key areas that require fresh thinking across the sector we also see a strong need for greater emphasis on DNO collaboration as we move into ED2. This applies across the environmental action plans, DSO transition, workforce planning, vulnerability and beyond. As well as being important in terms of joint learning, improved benchmarking and efficient innovation there is an interest in this from stakeholders who interface with different DNOs and do not want to have to deal with different processes. While to date the ENA has provided a central resource in some of these areas none of the plans propose this as a key route for tackling the major challenges that are faced. We would like to see the importance of collaboration reinforced and would suggest Ofgem sets aside an element of funding for collaborative initiatives in key areas.

In addition, we would flag the need for:

- **Support for vulnerable customers** to be bolstered given the energy and cost of living crisis. In particular we suggest Ofgem reconsiders whether a use-it-or-lose-it allowance like that in GD2 is now needed for ED as well, to strengthen the individual company proposals.
- Consistent presentation of net zero targets, focused on the **SBTI accreditation** that Ofgem set out as a requirement in its Business Plan Guidance. Ofgem should align its approach to offsetting with the latest SBTi Standard for Net Zero Targets;

- **Biodiversity targets** to take account of the new legislative requirements in England under the Environment Bill (with equivalent legislation expected in Scotland) which require biodiversity net gain for all major infrastructure projects;
- The **cost of carbon** in Ofgem's CBA model to be updated in line with the latest figures from BEIS. Trebling of the cost of carbon is likely to mean that a range of projects would now be justified that were not previously. Ofgem should therefore consider how to reflect this in the baseline allowances that it provides. We suggest a new UIOLI mechanism to deal with this in relation to losses (and potentially more broadly);
- A stronger focus on **climate adaptation** as highlighted by the government in its recent Climate Adaptation report (which noted the particular challenges on energy). We note in the context of Storm Arwen that none of the plans included reference to increased winds as a climate risk that they needed to address (and which CCRA3 identifies as an amber risk for the sector);
- A clear, over-arching and consistent vision around the **role of the DSO**. This needs to be developed with a wider set of stakeholders not simply bilaterally between Ofgem and the DNOs through the ED2 working-group process;
- A stronger focus on **circular economy** principles: While all DNOs reference these – as required by the Business Plan Guidance – there is very little of substance to convince us that this is being taken seriously.
- More thought given to **the balance between financial and reputational incentives** including how to make reputational incentives effective. At present the EAP scorecard financial incentive risks dealing with only second order issues.

We hope that Ofgem will find our assessment of the plans of value and we would be happy to discuss any aspects that you would find helpful.

Yours faithfully,

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**Sustainability First Comments on the ED2 Business Plans by Chapter**

While all the companies have followed slightly different structures for their plans there is a level of consistency and we have organised our comments in line with the structure in Ofgem's Business Plan Guidance. As noted above, given the amount of material, we have focused our comments on the chapters that relate to the theme of accelerated progress towards a net zero world (covering both the companies' support for the transition and their environmental action plans). We also comment briefly on a few other areas.

The structure of our comments is as follows:

1. Delivering value for money services for customers
    - vulnerability
    - a safe and resilient network
    - an environmentally sustainable network (the Environmental Action Plans)

2. A smart, flexible energy system
    - digitalisation and DSO
    - DSO and flexibility
    - whole systems

3. Keeping customer bills low
    - forecasts and scenarios
    - uncertainty mechanisms
    - cost benefit analysis
    - overall bill impact

4. Financial information – asset lives
5. CVPs

Annexes on key elements of the Environmental Action Plans:

- Losses
- SF6

## 1 Delivering value for money services for customers

### 1.1 Vulnerability

*Summary: While the plans all include a strong focus on vulnerability it is not clear that this is sufficient in the context of the current energy and cost of living crisis. Ofgem should reconsider a standard UIOLI allowance (as used in GD2) to help with this. A wider debate is need on the boundary of the role of DNOs in ensuring no one left behind in the energy transition.*

As a charity with no core funding, we do not have the resources to explore this area of the plans in as much detail as we would wish given the volume of material, often with the relevant detail buried in Annexes.

Our sense is that the companies have built on a solid foundation of ED1 in terms of their approach to the PSR, provision of support during outages and advice through partners to those in fuel poverty.

However, we have a real concern that the level of support proposed will fall well short of what is needed given first the pandemic followed by the energy and cost of living crisis. While Ofgem may hope that the impacts are to some degree transitory, we note the geo-political risks and our view is that at best these crises have a long tail and will certainly still be an issue in the early part of ED2, if not longer.

We are also concerned about a potential postcode lottery in terms of support as different DNOs are envisaging different levels of spend. While at one level their plans should have been shaped through engagement with local stakeholders taking account of local needs, it is not clear that the engagement has been sufficient to clearly identify an appropriate level of support, recognizing that this is funded by customers.

In GD2 Ofgem set a standard UIOLI allowance across GDNs– which was increased post draft determinations to take account of the pandemic (with an uplift for Cadent who had some specific proposals). While Ofgem in its SSMD chose not to pursue a UIOLI approach for ED2 it is an option that might merit reconsideration given the level of hardship we can expect to see.

There is also an important question around the role that DNOs can play in ensuring “no one left behind” in the energy transition. While some of the DNOs came up with interesting proposals for how they could support vulnerable customers acquiring LCTs (SSEN) , ways of providing community level support (SPEN), and supporting those without access to off street charging (UKPN) some of these do raise questions around the boundaries of the DNO role (and the knock-on implications for a level playing field on flexibility). We would encourage Ofgem to open up a wider debate – including consumer and fuel poverty experts - on what is appropriate for DNOs to do in this space. This wider activity could then be included within the scope of a new UIOLI allowance as suggested above.

We would also like to see more emphasis placed on cross sector working on vulnerability and look to Ofgem to satisfy itself that the companies are looking ahead, to take account of eg long term covid impacts and growth in the numbers of elderly / long-term sick, in terms of the scale of support they may need to provide.

### 1.2 A safe and resilient network – climate resilience

*Summary: A much stronger focus is needed in this area based on CCC advice and the lessons from storm Arwen. There is also a need for a cross sector view.*

As Ofgem is well aware, Storm Arwen hit just as companies were submitting their final business plans and as most of the CEG reports highlight there is a clear need to revisit the requirements in the plans around resilience in the light of the lessons learned exercise that Ofgem is undertaking. This may point to a need for far more focus, for example, on vegetation management or the asset health of wooden poles.

More broadly, recent storms underscore the need for a stronger focus on **climate adaptation** as highlighted by the government in its recent Response to the CCC's Climate Adaptation Progress Report (which noted the particular challenges on energy). We note in the context of Storm Arwen that none of the plans included reference to increased winds as an explicit climate risk to address (although preparedness for high-winds is of course already well-integrated into operational planning). The CCC Adaptation Progress Report acknowledges that the evidence linking strong winds with climate change is less clearcut but advocates that companies monitor the emerging research and carry out early thinking on potential mitigating actions.

In Ofgem's Business Plan Guidance[1] there is a requirement for each DNO group to set out their climate resilience strategy, including plans for long-term adaptation with adaptation pathways, considering risks as set out by the NIC, government and CCC. Ofgem also expect the energy sector to coordinate with other sectors, including water, transport and local authorities, and for DNOs to consider the impacts of climate change in relation to 'cascading and escalating failures of infrastructure across independent sectors'.

Importantly however, Ofgem refrained from prescribing the structure or content of the climate resilience strategies and also stood back from explicitly requiring DNO coordination through a climate resilience working group. Possibly as a result it is not clear that the level of strategic focus and attention being given to this area is consistent with the emphasis that the CCC and the government have placed on it, recognising the very significant interdependencies across sectors that are reliant on the grid. The National Infrastructure Assessment (NIA2) placed a strong emphasis on climate resilience and the Kwasi Kwarteng open letter to the regulators[2] also placed a strong emphasis on resilience more broadly and the need for more cross-sector engagement.

The most comprehensive climate resilience strategies would seem to be SSEN's which looks at the risks by geographical area and includes some thinking around adaptative pathways and UKPN's which looks in more depth than the others at the impact of strong wind.

[1] September 2021. Paras 3.29 – 3.32
https://www.ofgem.gov.uk/sites/default/files/2021-09/ED2%20Business%20Plan%20Guidance%20-%20September%202021_1.pdf

[2] 31 January 2022.
https://www.gov.uk/government/speeches/strategic-priorities-and-cross-sectoral-opportunities-for-the-utilities-sectors-open-letter-to-regulators

While the climate risks do vary across regions it seems clear that Ofgem should revisit their earlier guidance and now place a clear coordinating action on the ENA as part of a collaborative effort, recognising that they have led much of the work in this area to date.

We would also ask that Ofgem reinforces the need for more cross sector working in this area. None of the plans suggest that there has been any meaningful engagement with other sectors. This is important in both understanding their needs around resilience but also how initiatives working with the water sector might provide an alternative approach to flood risk management, for example. This is just one example of the need for whole systems thinking spanning across sectors as set out in a recent Sustainability First Viewpoint on "Do water and energy mix?". The inter-dependencies with the communications sector also urgently need proper consideration.

### 1.3 An environmentally sustainable network (Environmental Action Plans)

***Overview***

We welcome the much stronger focus that has been given to this area through the requirement for an EAP and annual reporting through the AER.

On the scope and ambition of the EAPs, it seems clear across all the plans that potential costs and trade-offs were comprehensively tested with stakeholders and with consumers and that there was strong encouragement for companies to show real ambition in this area. This gives considerable assurance that there is widespread support for expenditure relating to net-zero delivery, business carbon footprint reduction, reduction of SF6 and losses, improvements in bio-diversity and pollution mitigation.

This is the area of the Business Plans that we have given most attention to. We have structured our comments below in line with Ofgem's EAP Baseline Expectations to cover Business Carbon Footprint; SF6; Losses; Embodied carbon / supply chain management; Resource use and waste; biodiversity; fluid filled cables; noise pollution (no comments) and PCBs. We also comment on the proposed EAP scorecard metrics that some DNOs include in their plans.

We note that some of the plans look more widely and also consider water efficiency (UKPN, ENWL), air quality (UKPN) and the use of VOCs in cleaning products (ENWL). We commend the companies for looking beyond the areas highlighted by Ofgem, drawing on expert stakeholder input. With rising expectations across all areas of the environmental agenda it is important that companies are looking to understand new and emerging risk areas, to stress test their plans against these and to operate in line with emerging best practice, not simply to follow Ofgem guidance.

On the downside – and in line with our comments on other areas of the plans - it is extremely hard to understand the costs associated with EAPs and / or compare these across DNOs. A single standardised EAP table is urgently needed to give a clear account of projected costs of ED2 EAP measures, ambition of ED2 targets baselined clearly against ED1 - and associated costs and proposed funding mechanism. ENWL do present this clearly[3] but for example SSEN have redacted all relevant cost information in their EAP making it impossible to judge either the scale or value for money of what is proposed. Others fall somewhere in between. For Draft Determinations, Ofgem must rectify this lack of relevant comparable information.

From the cost information that is presented it would appear that the cost of actions to address pollution measures for oil-filled cables and for statutory elimination of PCB are orders of magnitude greater than any of the costs associated with BCF targets. For example, UKPN's total EAP spend is £246m – of which fluid filled cables is £155m (ex ante) and PCB elimination is £45m (ex ante with a PCD). In contrast they are proposing to spend a mere £6m on reducing losses and £18m on decarbonising business transport. Given the real and immediate customer benefits from reducing losses and the relative scale within their carbon footprint this seems out of balance. Having a clear summary of the costs across all DNOs would be helpful in being clear where the balance of EAP expenditure lies to help stakeholders in judging the relative balance of priorities.

[3] ENWL EAP. Annex 13. Appendix F 'Overview of EAP deliverables/initiatives for RIIO-ED2

***Business Carbon Footprint***

*Summary: We strongly support the use of SBTi accreditation to provide a comparable measure and external expert validation. SSEN, NPG and WPD have targets accredited against a 1.5 degree target. UKPN has a "well below 2 degree" target and now needs to catch-up. ENWL and SPEN are in the process of getting targets accredited. In addition to these formal targets many of the companies also include in their plan headline "net zero" targets for ED2. We are concerned that these exclude losses (which account for around 90% of their BCF) and rely heavily on (an often unspecified level of) offsetting.*

*We discuss in turn the SBTi accredited targets, other "net zero" targets, offsetting, scope 3 emissions, actions to reduce operational emissions, SF6 and losses.*

*SBTi accredited targets*

We were pleased that Ofgem set out in the Business Plan Guidance that companies were expected to get their business carbon footprint targets accredited by SBTi. This use of external accreditation was one of the recommendations of our Regulation for the Future report and ensures a consistent approach, validated by experts in the specific area for issues that are outside Ofgem's core expertise.

It is also clear to us from the plans that those companies that have secured accreditation are more sophisticated in their approach to BCF in their plans – demonstrating the benefits of going through this rigorous process. We are pleased that all companies do now appear to be making progress towards accreditation. While the SBTi targets are not always clear in the plans we have summarised below our understanding of the current position drawing on the summaries on the SBTi website – as a definitive source. This table shows the DNO's SBTi scope 1 and 2 targets (with other "net zero" targets and scope 3 emissions discussed below). In line with the SBTi framework these targets must all include losses as a scope 2 emission, which we welcome.

| Company | Status according to SBTi website 7/2/22 | Comments in Business Plan |
|---|---|---|
| SSEN | **1.5 degree target**: to reduce absolute scope 1 and 2 GHG emissions 55% by FY2033 from a FY2020 base year. | |
| UKPN | **Well Below 2 degree target**: to reduce absolute Scope 1 and 2 GHG emissions 25% by FY2029 from a FY2019 base year. | Commit to updating to a 1.5 degree / net zero target by the end of ED2.<br>Plan talks about exceeding this 2 degree target. |
| SPEN | - | Plan talks about reducing scope 1,2 and 3 by 67% by 2035. Target to be accredited early 2022 |
| NPG | **(2022) 1.5 degree target**: to reduce absolute scope 1 and 2 GHG emissions 63% by FY2034 from a FY2019 base year. | Business plan refers (p86 EP1.2) to this being a target excluding losses which would be inconsistent with SBTi methodology |
| WPD | **1.5 degree target**: to reduce absolute scope 1 and 2 GHG emissions 63% by FY2035 from a FY2020 base year | |
| ENWL | Letter of commitment | Expect accreditation early 2022 (for a 2035 target) |

Although presented slightly differently the three companies with a 1.5 degree target are all committing to the same underlying level of ambition reflecting a reduction of 4.2% pa (although as noted below this creates a particular challenge for SSEN given their high levels of diesel generation). UKPN with a "better than 2 degree" target is only committing to 2.5% pa reduction.

Going forwards the SBTi has confirmed that all targets must align with 1.5 degrees. They have also recently introduced a new Net Zero Standard, including explicit guidance on the treatment of offsetting (discussed below).

While we are strongly supportive of SBTi accredited targets we note that one downside from a standpoint of DNO comparison is that targets tend to be set against potentially different years depending on when the process began – but seemingly most often a 19/20 baseline. While a common baseline is very helpful, we are also concerned that a historic perspective may also be lost against all of ED1 - which remains a very important context in judging ambition levels for particular BCF elements in ED2. We encourage Ofgem to ensure that historic performance is included in future reporting requirements.

One of the benefits of an over-arching emissions target is that encourages the companies to look at the most cost-effective ways of reducing emissions. In this context we found the SPEN concept of applying a carbon marginal abatement cost curve of great interest (A4C.3 – Ch6 p 83 – Fig 27).

*Other "net zero" targets*

While all the companies are committed to securing SBTi accredited targets (for their scope 1 and 2 emissions including losses), we have a concern that some companies continue to focus on a headline message around meeting net zero in ED2, using a measure which excludes losses which comprise over 90% of scope 1 and 2 emissions. Also, relatively short-term ED2 targets are likely to then rely on an often undisclosed level of offsetting. Longer term "net zero" targets are more likey to be aligned with SBTi but their status is unclear. These various targets are:

| | **ED2 near term targets (excluding losses and including offsetting)** | **Long term goals (unclear but assumed to include losses but with an element of offsetting)** |
|---|---|---|
| SSEN | | Net zero by latest 2045 |
| UKPN | Net zero on operations by end 2028<br>(Also - exceeding a 1.5 degree target for scope 1 and 2 excluding losses without offsetting) | |
| SPEN | Carbon neutral in 2023 for scope 1 and 2 (excluding losses) | Achieving net zero by 2035 |
| NPG | | "Carbon neutral" by 2040 (without offsetting but reliant on grid decarbonisation) |
| WPD | Net zero in their own operations by 2028 | Net zero (inc losses) by 2043 |
| ENWL | | Net zero by 2038 in their own operations (with offsetting) |

While these ED2 targets may be driven by a welcome desire to align with regional net zero ambitions, we would be concerned if this risked detracting from a proper focus on the most effective means of reducing overall carbon emissions over time – or of being seen as greenwashing. UKPN does provide an explanation of the different metrics that it is using and the reason for them whereas others do not to the same extent. There is rarely any explanation of how these ambitious headline "net zero" relate to their SBTi accredited targets.

As well as presenting a confusing picture with different definitions, in our view this focus on headline "net zero" targets excluding losses plays down the importance of losses which, as we set out below, is a crucial area that urgently needs more focus. In some cases it would appear that companies are more willing to include scope 3 emissions in their headline targets than they are to include losses - whereas in our view the company has more control over losses than it does over its supply chain emissions. While we support the companies working to reduce scope 3 emissions as discussed below, it would be a matter for regret if the companies used that to avoid action themselves on losses and SF6.

*Offsetting*

Another issue with these net zero targets is their reliance on offsetting where the companies all seem to take different approaches.

On the question of offsetting and more generally on net zero targets we would draw Ofgem's attention to the latest SBTi Standard for Net Zero Targets for corporate entities[4] which is clear that net zero targets need to cover all of a companies' emissions and that actions on offsetting should be separately reported. Their headline recommendations are:

- Focus on rapid, deep emissions cuts of scope 1, 2 and 3 emissions delivering 90-95% reductions;
- Set near and long term targets: making rapid emissions cuts now, halving emissions by 2030. By 2050, organizations must produce close to zero emissions and will neutralise any residual emissions that are not possible to eliminate;
- **No net-zero claims until long-term targets are met:** A company is only considered to have reached net-zero when it has achieved its long-term science-based target;
- Go beyond the value chain: The SBTi recommends Companies to go further by making investments outside their science-based targets to help mitigate climate change elsewhere. However, these investments should be **in addition to** deep emission cuts, not instead of them.

At present the levels of offsetting assumed in delivering the DNOs' "net zero" targets are not made clear, but in some cases would appear to be significant. For example, in the case of UKPN, emissions for offsetting to meet their "net zero" target would appear to be as high as 38% of their overall 2028 emissions. Also, different approaches are taken to ensuring that offsetting measures meet appropriate standards. For example, several DNOs highlight that they will follow the Oxford Principles on offsetting. SPEN also talks about removing or offsetting emissions in line with PAS2060. By contrast, NPG indicate that they do not plan to offset their carbon emissions at this stage in their path to net-zero operations (BP p 81) as their stakeholders did not support it.

[4] https://sciencebasedtargets.org/net-zero

SSEN in their proposals for reforestation and peat restitution appear to have taken account of the SBTi guidance on net zero targets. Their proposals recognise that reforestation requires time before it starts to capture carbon and they have set the level of reforestation they need to undertake to align with the residual emissions that they will not be able to deal with in the long term (ie in meeting their 2045 net zero goal) while recognising that reducing emissions has to be the priority.

WPD talk in their EAP about stakeholders having shown support for offsetting to meet net zero and note their intention is to "develop a portfolio of UK based offsetting [in their licence area] including habitat creation eg tree planting, peatland and seagrass restoration and eg solar panels for schools". While this holistic approach is positive it is not clear that they have thought through issues such as the time required for nature based solutions to deliver carbon reductions. There can also be tensions between "high quality offsets" (which require a high level of validation) and supporting community based schemes which a number of the companies say they want to explore. This suggests that the planned approaches to offsetting are still relatively immature and there would be merit in a more consistent approach across DNOs underpinned by the SBTi net zero guidance.

***Scope 3 - Embodied carbon / supply chain management***

In thinking about their carbon emissions, it is right that the DNOs think also about the impacts from their supply chains. In the SBTi framework these "scope 3 emissions" do not have to be included in the company targets but voluntary targets can be set. According to the SBTi website, both SSEN and UKPN have set scope 3 targets but these are very different in form – SSEN's relating to the % of suppliers with SBTi targets and UKPN's being a target reduction in their scope 3 emissions (reducing in line with their scope 1 and 2 by 2.5%pa). NPG has similarly set an internal target for its scope 3 emissions to reduce in line with its scope 1 and 2 (ie by 4.2% pa). ENWL and SPEN both have internal targets around suppliers signing up to SBTi targets.

While SBTi is seen as the gold standard in relation to emissions target setting it has come in for some criticism on its approach to scope 3 emissions (which has been criticised for being too soft). They have committed to issue updated guidance on scope 3 emissions by the end of the year. Clearly this is an evolving area and it is important that Ofgem's own approach is flexible to take account of changes to what is seen as best practice.

Scope 3 emissions can be difficult to track and most companies will simply be using sector-based conversion factors (tCo2/£ spent) to set baseline figures. We would therefore encourage caution in respect of any headline targets around reductions in scope 3 emissions at this stage – looking instead behind the figures at what is actually being done.

Importantly this is another area where we would hope that Ofgem will press for clear baselining and more standardised reporting over the course of ED2 given the very different metrics that are being proposed.

We have not reviewed the detail of DNO proposals on scope 3 and embodied carbon but each commits to work closely with their major suppliers, indicating a variety of cooperation schemes for liaison, information, encouragement, a target-setting process and monitoring of supply-chain performance to reduce scope 3 emission reduction (eg NPG Responsible Procurement Charter, SSEN supplier school). Targets for the proportion of the supply chain that are signed up to SBTi targets will also help provide a way of managing scope 3 emissions and we would support them provided this is not simply a way of passing the buck.

The SBTi guidance makes clear that embodied carbon is strictly an element of scope 3 emissions (a point also made by SPEN and UKPN in their Business Plans) but it is one that is often separated out given the difficulties in measurement. SPEN's thinking seems relatively well developed in this area. Like several others they commit to introduce a measurement tool for embodied carbon and other capital carbon emissions, to establish a baseline and set a target to reduce carbon on new projects during RIIO-ED2. However they also describe at length their **Capital Carbon Approach** (looking at the emissions associated with the creation, refurbishment and end of life treatment of an asset) and their use of external standards – including PAS 2080 Carbon Management Infrastructure Management. They have also incorporated an assessment of embodied carbon into their CBAs for infrastructure investment using the Carbon Trust framework.

The fact that none of the companies seem to have yet got a baseline for their embodied carbon is another reason to be cautious about headline scope 3 reduction targets.

Again, we would emphasise that this must be a priority area for industry collaboration given significant commonality in the DNO supply chain. There would also be value in collaboration across sectors (eg with water) as they are grappling with many of the same issues around embodied carbon. A clear signal from Ofgem about the importance of collaboration in this area would be very helpful.

Overall, these sections highlight how difficult it has been to compare company SBTi and net-zero targets, given different approaches to time-periods and target-setting, the inclusion / exclusion of losses plus varying treatments of both scope 3 emissions and offsetting. In developing the AER Guidance we hope that Ofgem will provide a tight and clear structure for the companies to report progress towards SBTi and other BCF targets. Well-founded comparison will be an important regulatory requirement for this area going forward.

**Scope 1 and 2 - Actions on operational emissions**

While reiterating that the focus should be on the full BCF including SF6 and losses (which are discussed separately below) our comments on the key steps that companies are taking on their operational emissions are as follows:

**Replacing operational vehicles with EVs**: Our starting position is that these targets should simply be based on the natural replacement cycle for vehicles (5-7 years). While we can see merit in the argument put forward by many stakeholders that DNOs should lead by example, we also believe that this would need strong justification to demonstrate this to be an effective use of customers' money compared to other ways in which they might reduce their carbon footprint. Companies like SSEN that have differentiated their programmes by size of vehicle have clearly given the issue more thought. It is also often unclear how the costs split between vehicle purchase and the installation of charge points at depots and whether the reduced running costs of EVs (including any tax benefits) have been properly taken into account.

**Reducing vehicle emissions**: While ICE vehicles continue to be used a focus on promoting measures to reduce emissions is welcome. ENWL also outline a comprehensive ED1 'Colleague EV Incentive Scheme' (EAP p 21)

**Reducing diesel generator emissions**: This is a particular challenge for SSEN given their extensive use in the Scottish islands and is an example of where their SBTi commitment has forced them to engage properly with this issue in a way that others do not seem to have yet done (despite indications that they plan to). This is clearly an area for innovation and collaborative effort.

**Building efficiency**: This ought to be a cost-effective action for the companies to undertake as part of BAU. For example, ENWL set out their 'energy hierarchy' for non-operational sites – including a one-a-year net-zero site show-case plan. We note that a number of DNOs claim to address building decarbonisation through the use of green tariffs. While this is acceptable as part of the SBTi framework, we would caution against too much reliance being placed on REGO backed tariffs given the issues highlighted by BEIS in their recent consultation on this topic[5]. SPEN are unique in using PPA backed tariffs which is generally considered a better approach.

**Substation energy efficiency**: This "own use" energy is included within losses and again there should be an obvious cost-effective set of actions that could be implemented. However, as substation use is unmetered there is no effective way of measuring the impacts of actions in this area (and indeed no internal business case for what would otherwise be cost effective action). We are surprised and disappointed that no DNO plans to introduce at least some meters to monitor energy use at the substation level – although UKPN do mention the idea in their losses strategy. While we understand the underlying cost-benefit questions, installing some substation metering could be a way to support improved management of losses. We also note that some DNOs have concluded that regulatory restrictions preclude them from installing solar PV at substations and would hope that Ofgem could clarify if this is indeed the case or whether de minimis exemptions might apply.

***SF6***

We recognise the particular long-term challenges faced by DNOs on SF6 asset management given the need to align with their science-based targets and net-zero. Distribution leakage rates (as reported against the total "bank" of SF6 on the system) are low relative to transmission. However it should be noted that in England and Wales 132kV is a distribution voltage while it is a transmission voltage in Scotland. As well as control of leakage from higher voltage equipment – the main focus of DNO SF6 ED2 commitments and spend - DNOs also have a very significant long-run SF6 asset-management challenge, especially as SF6 banks will continue to grow for some years yet with installation of new SF6 equipment. Collectively, across their networks DNOs hold >200,000 items of equipment that contain SF6, many but not all in small sealed units. Aside from leakage prevention, SF6 units need continued containment throughout life and also arrangements for safe-disposal at end of life. Suitable replacements at every distribution voltage are also presently problematic.

In ED2, for the first time, DNOs are required by Ofgem to have an SF6 Strategy. However, in the BPs and EAPs, the SF6 Strategies are extremely variable in quality. Some DNOs simply commit in ED2 to developing a strategy, whereas others set out a full strategy in their EAP – or in a separate Annex. The best are SPEN and SSEN (both EAP and EAP Appendix (SSEN)). SSEN is the lead DNO on SF6 for the ENA. Both SPEN and SSEN reflect a considered process for SF6 management – from basic inventory, to monitoring, measuring, leak-detection, replacement (including supply chain involvement). As well as holding DNOs to the requirement for an SF6 strategy for ED2 we would like

5 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1011032/carbon-content-energy-products-cfe.pdf

to see Ofgem stressing the importance of collaborative work in this area, in particular on long-term solutions, working with the supply chain. The upcoming F-Gas reviews (both EU & DEFRA) are relevant – and SSEN is actively engaged for the ENA on behalf of other DNOs.

DNOs report their leakage rate relative to their total bank to Ofgem on an annual basis (back to 2013-14) – but in practice provide little additional information. DNO SF6 leakage will of course vary subject to their own asset-mix and asset-condition. But, in looking at individual DNO targets for SF6 leakage reduction in ED2 EAPs, it has proved extremely hard (1) to properly understand individual DNO ambition for ED2 baselined against ED1 and (2) to meaningfully compare across DNOs about their relative ambition levels on leakage reduction. As a priority, DNOs must put in place the new SF6 common reporting methodology proposed by Ofgem. Otherwise, it remains impossible to fully understand the bigger picture - not just on leakage but also to gain a clearer view of the future SF6 asset-risk attaching to the 200,000 DNO equipment items containing SF6.

Given the importance of tackling SF6 and for alignment with science-based targets and net-zero we believe that DNO SF6 Strategies should be explicitly financially incentivised – either as a part of the balanced score-card ODI-F or separately. The strategy output delivery incentive (S-ODI) approach provides a model for rewarding / penalising performance against their strategies.

See Annex 2 for a detailed look at DNO EAP material on SF6

***Losses***

We were disappointed with the limited ambition from the DNOs on losses, which in our view reflects the way that Ofgem have de-prioritised the issue in ED2 compared to previous price controls, at a time when the focus on carbon emissions and the cost of energy should mean they are more - not less -important. They are the prime example of a whole systems issue and need to be treated as such.

In cost terms the analysis underpinning the price cap announcement showed that the cost of losses is £15-20 (varying by region). Set against the average distribution network charge of c £100 this clearly merits more focus from a cost perspective. In terms of carbon emissions, losses make up around 90% of the companies' scope 1 and 2 emissions but the companies seem typically to rely on grid decarbonisation to deal with the impacts (with the exception of SSEN that has the additional challenge of diesel on the Scottish islands and hence seems to have a more strategic focus on losses). And from an energy transition perspective, with losses expected to increase as demand rises and more use is made of flexibility, this will increase the requirements in terms of renewable generating capacity if we are to meet net zero. For all these reasons losses needs to be treated as a priority issue.

One reason for Ofgem down-playing it in ED2 is the argument that the DNOs have made – and which comes through strongly in the Business Plans and EAPs – that losses are outside their control. However a review of the Losses Strategies reveals that there are a huge number of initiatives that the companies are exploring (prompted by the ED1 Losses Discretionary Reward) which puts paid to the idea that losses are uncontrollable. There is also a clear commitment across DNOs to over-size equipment when it is replaced for other reasons, which we welcome as addressing losses as well as helping "future proof" the network.

Obviously we recognise that the DNOs do not have full control over losses and that they can be expected to increase going forwards with the uptake of LCTs. However someone has to take responsibility for these emissions (which account for 1.5% of total GB carbon emissions) and we can

see no alternative to this being the DNO - which is in line with the SBTi determining that losses fall within their Scope 2 emissions. Moreover, as part of their shift to DSO the companies are increasingly working on how they can use flexibility to help manage peak loads – and in our view managing losses should be an integral part of this.

In Annex 1 we set out these arguments in more detail and also review the range of initiatives that have been identified in the Business Plans. We then outline the strengthening of the regulatory framework that we consider is needed to ensure that the commitments made are delivered and that there is an appropriate incentive to pursue the full range of opportunities identified. Given the complexity of these issues we do not believe a reputational incentive is adequate.

Specifically we argue for:

- a means of Ofgem holding companies to account for the commitments they have made around the use of low loss equipment and early replacement of some high loss equipment (which could be either through a PCD or the inclusion of avoided losses in the EAP scorecard – or possibly a new engineering standard);
- a UIOLI pot (or other financial incentive) for companies to progress initiatives that were not included in their plan but would be justified with BEIS's new higher cost of carbon (that aligns to net zero);
- a financial incentive to help drive forward innovation and the work to better understand losses – based on an annual assessment by Ofgem of company performance (similar to the reputational incentive SPEN propose but with financial teeth);
- a consistent basis for reporting avoided losses and a 5-10 year projection of overall losses to help inform wider system planning.

***Resource use and waste***

In the Business Plan Guidance Ofgem requires the companies to set targets from avoided waste to landfill and for resource use / recycling. The companies have all complied with this basic requirement while noting that waste from streetworks (and other potential contaminated waste) needs to be treated separately.

We do however have a concern that for most companies the focus is on their "zero waste to landfill" target and that in general they will be looking to achieve this through increased use of "energy to waste". As the CCC highlight in their report on Waste, emissions from energy to waste are growing and there needs to be more focus on circular economy principles – thinking about resource use from the beginning of the procurement cycle and aiming to reduce waste as a first step even before thinking about reuse and recycling. While all DNOs reference circular economy principles – in line with the Business Plan Guidance (to "Update procurement processes to embed Circular Economy principles") – there is very little of substance to convince us that this is being taken seriously.

We would like to see the companies being required to report in their AERs on a broader set of metrics that reflects efforts to reduce both resource use and waste and then also covers the full range of routes that can be taken for dealing with (including explicitly identifying the amount sent to energy from waste).

***Biodiversity***

As we flagged in our response to the Business Plan Guidance this is an area where there has been a very significant increase in focus in the UK since Ofgem produced its Sector Specific Methodology Decision in December 2020. In particular we have seen the Dasgupta Review and the passing of the Environment Act which includes (for England) requirements to comply with biodiversity net gain requirements on significant new infrastructure that involves planning. Government have also committed to halt biodiversity loss by 2030 as mentioned in the Kwasi Kwarteng open letter. Similar obligations are expected to be introduced in Scotland shortly. As such Ofgem's baseline requirements in this area fall some way short of where wider policy requirements and expectations now sit. Only UKPN explicitly link their biodiversity targets to these new legal requirements (committing to go further than the obligations).

One feature of the Environment Act is that the obligation around biodiversity net gain will be measured in terms of *biodiversity units* using a methodology set out by Defra. As such there would seem to be a strong case for all DNOs to adopt that methodology (unless devolved nations ultimately adopt a different approach). Doing that would then allow commitments to be expressed in terms of biodiversity units (as eg SPEN already does) rather than simply the number of sites improved (where 'improved' is a very vague term).

One issue linked to biodiversity but only touched on briefly by a couple of the DNOs is the implications of their tree-cutting programmes for biodiversity and carbon emissions. As part of their safety obligations, and to comply with engineering standards, the DNOs all undertake major programmes of tree cutting. However for the most part they do not make the connection between that and their efforts on biodiversity or carbon emissions. SPEN and SSEN make the link – which we welcome - but in both cases they are only just starting to work through the implications. We would like to see Ofgem encourage all networks to consider the wider impacts of their tree cutting programmes and how to mitigate these while meeting their safety obligations.

More broadly we would highlight the importance of companies looking holistically at the actions they are taking to address biodiversity together with the carbon impacts and wider societal benefits (in terms of recreation, air quality etc). We would highlight SSEN's focus on restoration of native woodlands as part of its carbon emissions management and its seagrass CVP as examples of this holistic approach.

***Fluid filled cables and PCBs***

ED2 spend - both on oil-pollution and PCBs - is relatively very high compared to other EAP spend. While spend in both areas is a compliance matter and necessary, we would expect DNOs to demonstrate a more strategic approach to both these programmes right through from inventory, to detection, remediation, replacement and safe disposal - including making clear linkages with their wider investment programmes. Innovation should have a part to play in reducing the need for replacement of oil-filled equipment. Replacement of PCBs provides an opportunity to move to low loss equipment.

Given the very high levels of spend involved, Ofgem should ensure that activity on oil-leaks and on PCB elimination is delivered as bid for in business plans (through a price control deliverable for example) and that the approaches taken provide value for money for customers.

***EAP scorecard, ODI-F and Annual Environment Report***

*EAP Scorecard / ODI-F*

A number of the companies have set out proposals in their plans for how they see the EAP scorecard financial incentive working and we have also participated in the Ofgem working group on this topic.

While we are supportive of the concept of a financial incentive in this area – emphasising the importance of the environmental agenda – we have real concerns that as proposed it is focused entirely on second order issues, a point also made by the ENWL CEG for example.

This is critical to get right in terms of sending the right signals without over-rewarding companies. A balance is needed between financial (ODI-F) and reputation (ODI-R) incentives. This balance has not been appropriately struck in our view.

In terms of the scope of the proposed balanced score-card incentive by ignoring the largest sources of carbon emissions – losses and SF6 – and by ignoring the highest cost elements in the EAP – oil filled cables and PCBs – the scorecard and associated financial incentive is left dealing purely with second order issues. Moreover, some of these (such as the number of EVs) are easy for stakeholders to understand and hence if anything would be more susceptible to a reputational incentive than the other more complex measures.

One reason for the narrow score-card focus seems to be a desire to limit the incentive to quantified metrics only. We have argued previously that having established elsewhere the model of a strategic delivery incentive including qualitative assessments (eg for DSO), we can see no reason why this same model cannot be applied also to the EAP scorecard. As highlighted above on losses there are a range of steps the companies could take and their progress on innovation, building an understanding of losses and sharing learning could very valuably be included as a qualitative element in the scorecard (drawing on the approach that SPEN suggest for a reputational losses incentive). Even if Ofgem is determined to stay with quantified metrics it would be possible to create metrics around avoided losses, SF6 leakage and bank, and oil filled cables and PCBs that could be used to hold companies to account for the commitments they have made – including some relatively high cost commitments - and encourage them to go further in terms of the outcomes in this area.

In terms of the scale of the scorecard incentive at least one DNO proposes that the value of the ODI-F should be up to 0.25 % of base revenues. This is a very considerable sum (payable annually). It must be a clear principle that the level of reward is linked to the benefit delivered (eg linked to the cost of carbon) in line with the approach taken in T2.

*Reputational Regulation (ODI-R) and the Annual Environmental Report*

Where Ofgem is relying on reputational incentives it needs to have a much clearer view of how this mechanism is expected to work. As we set out (in some detail) in our response to the SSMD consultation in September 2020[6] this involves ensuring comparative data is readily accessible to enable benchmarking within / beyond a sector; reflecting on the sources of reputational influence (and how best to strengthen them) and making a link to the regulatory framework. Stakeholders will expect Ofgem to know what is happening in the sector and see Ofgem as a trustworthy source of information looking across the DNOs.

[6] https://www.sustainabilityfirst.org.uk/images/publications/consultations/Sustainability_First_-_ED2_SSM_Submission_-_250920_-_final.pdf

These are all vital considerations in the design of the Annual Environment Report. It is therefore vital that Ofgem provides prescriptive guidance to ensure that information is presented on a consistent basis – but equally that Ofgem is clear who the audience is for these reports. They must be accessible to key environmental NGOs for example. As highlighted in our cover letter there are real lessons to be learned from the approach to the Business Plans themselves which are completely inaccessible despite ostensibly being transparent and open. We see a potential role here for the ENA in producing an annual environmental summary report which draws on the DNO AER materials, including good-practice examples.

We would also actively encourage Ofgem to commit to producing an annual environmental report which benchmarks the DNO AERs. To be worthwhile, this would need to be more comprehensive than the current Ofgem annual reports on other aspects of the networks performance.

Finally, we note again the benefits of accreditation by external expert bodies as a simple way for external stakeholders to be assured on a company's performance. We have highlighted above the important role of the SBTi accreditation on carbon emissions and would also flag the role of ISO140001 as evidence the companies have a certified environmental methodology to drive improvement. Five out of six of the DNOs already have this, some already for many years. SSEN are aiming for certification by the end of ED1. We also note that SPEN have adopted PAS 2080 on carbon capital which would seem a positive step.

## 2 **A smart, flexible energy system**

### 2.1 **DSO Transition and digitalisation**

*Summary: There is significant variation across business plans in the DSO vision. Through its ongoing work on the DSO role Ofgem will need to work towards a more consistent view of the DSO role, bringing in a wide range of stakeholder voices. Specific deliverables and costs are hard to identify in the plans which span digital strategies and DSO development, as well as asset monitoring. We also see a crucial role for the DSO in better losses management, which is neglected in the DSO plans.*

**There is a significant variation across the plans in the 'DSO vision' and how a future DSO is expected by Ofgem to sit and develop in each business**. Beyond the BP process, the DSO role needs an extensive and very open debate as a matter of priority - with consumer, citizen and system efficiency interests and design principles at the heart. Such fundamental thinking goes far beyond development of the DSO role in the BPs through bilateral 'local' stakeholder engagement (although that is of course helpful). For stakeholders working across DNO regions a consistent approach is vital.

Correct national framing and facilitation of the DSO role will be a defining factor for a just transition and for achievement of net-zero. It is important that Ofgem's DSO governance review adequately take forwards this fundamental debate but to date we are concerned that many wider voices are missing. The debate must be open, inclusive and non-technical. It must also be made far clearer how Ofgem and BEIS thinking on DSO is expected to integrate with their current consideration of the scope and role of the FSO. While the ENA Open Networks project can play a role – including in supporting wider engagement – there clearly is a crucial role for Ofgem in setting the over-arching framework.

So far, DSO baseline expectations and metrics have been developed in Ofgem / company working groups. These are fundamentally shaping the 'common core' of what progress towards DSO will look like for the next five years. This process of shaping key measures around what the DSO is – how it performs and how it will evolve - is far too important to leave to effectively 'closed bilateral discussion'. This must be opened to much wider stakeholder input by both BEIS and Ofgem.

At a more detailed level across the plans there are fundamentally different start and finish points on a range of topics - LV monitoring, network modelling, separate / independent DSO. We hope that Ofgem will look closely at what the companies are doing in each of these areas and set this out at draft determination. As things stand it is very hard to compare DSO models (including costs) in any meaningful way.

**At the core of future DSO capability is effective and extensive low-voltage monitoring plus 21st century digital & data capability** (modelling & AI, operational integration, skills). We fully support investment in this area which also needs whole-hearted Ofgem support. We are aware from the CEG reports that many of the plans do not adequately justify the investment proposed in this space but that the CEGs typically view this investment as critical – a view we share. There must also be first-class checks and balances in place on digital spend via board-level governance / external assurance.

**While all DNOs place an emphasis on increased visibility of network loads at the LV level they differ in the role they see smart meter data playing in this (and more widely).** Some DNOs reference making use of smart meter data to support operations, planning (e.g to pin-point locations to install LV monitoring - UKPN), voltage regulation (NPG etc). The £11bn of consumer-funded investment in smart metering should be leveraged by DNOs and Ofgem should be wary of funding

extensive additional LV monitoring costs until DNOs have clearly addressed how far smart meter data can help with that task.

Moreover, in line with Sustainability First's PIAG recommendation – now endorsed by the Energy Digitalisation Taskforce - we would like to see DNOs starting to make use of de-personalised smart meter data as part of their commitment to make more system data available to third parties (eg via Network Development Plans and wider work on their Digitalisation and Data Plans). Given this data provision is seen as a key strand of the DSO role we would ask Ofgem to set out this expectation more clearly at draft determinations, noting the gap in the plans as they stand. We are aware from our PIAG work that this might require Ofgem to revisit the company privacy plans but would like to see a clear commitment to this as a way forward.

**In ED2, there must be a strong focus on the DSO driving both operational- and investment-level efficiency of distribution losses** – including via greater integration of voltage regulation, approaches to balancing loads across the system – and also through greater efforts to promote demand reduction generally. For all these areas improved LV visibility is also crucial. We have highlighted elsewhere the need for a much stronger focus on losses and see this as integral to the DSO role in a way that is entirely neglected in the plans. A first step would be to drive performance in all these areas more explicitly in the DSO baseline metrics.

More generally we would like to see greater focus on DSO performance in driving reduction of carbon and other green-house gases in the proposed baseline metrics.

### 2.2 **DSO Transition, flexibility and electricity demand reduction**

Sustainability First strongly supports the emphasis that has been placed on encouraging the use of flexibility services and sees this as a key role for the DSO. All companies are committed to a "flexibility first" approach which in our view should mean that flexibility is always considered as an alternative to reinforcement. It does not mean that it is always a better solution. As such we support the use of the ENA Common Evaluation Methodology to ensure tradeoffs are made on a fair and objective basis. This methodology needs to evolve to ensure that it is properly valuing the losses associated with running the networks harder but also the real option value associated with using flexibility. Ofgem must urgently review the ED2 CBA modelling approach to carbon price, wholesale electricity prices, asset lives and discount rates to ensure that tradeoffs are being made appropriately.

Another significant gap in the Business Plans is the failure to properly consider energy efficiency – and more specifically thermal insulation - alongside flexibility as an alternative to reinforcement, despite this being a licence requirement (SLC 31E). As Ofgem is aware we had advocated using ED2 to carry out one or more beacon thermal insulation pilots that would allow learning ahead of the real uptick in heat electrification in ED3. SPEN has adopted a cost benefit methodology for their ED2 load-related expenditure which assesses energy efficiency alongside flexibility across all proposed new projects (BP Commitment 3 plus pp 41 & 46) but also indicate that no such project has so far made-the-cut on cost-benefit grounds. UKPN also plan an energy efficiency flexibility product with six- monthly tenders starting in 2023. Despite these two statements of intent, we have not seen any real detailed ED2 proposals on how to make thermal insulation work as a meaningful tool for avoided network investment. The SSEN energy efficiency CVP starts to explore the issue but is not sufficiently focussed for us to be able to support it at this stage.

We also note the request from Kwasi Kwarteng for Ofgem to set out how its regulatory framework will deliver on net zero for 2050 and the interim carbon budgets. Ofgem needs to be clear that deferring investment in ED2 is not creating an undue workload in subsequent controls, adding to costs and risks for future consumers. Given that this is a long-term programme Ofgem needs to have some view of the likely demands through to ED3 which only one or two of the companies currently provide (although their ten-year network plans should give this).

On our reading of the plans the companies have taken very different approaches to anticipatory investment and it is vital that at Draft Determinations Ofgem clearly sets out its own thinking on the tradeoffs on 'spend-to-save'.

### 2.3 **Whole systems**

The companies vary in how they see the whole systems role evolving. However a common strength is the strong focus placed on working with local authorities on their local area energy plans which should integrate thinking around heat and transport. Perhaps inevitably there are differences in the approach that the DNOs propose taking in each of these areas which could be difficult for individual authorities that span more than one DNO area. With this work at a relatively early stage it may be hard to identify a single best model but Ofgem should ensure that there are arrangements in place for the DNOs to collaborate and share learning to move to a more consistent offering to local authorities through ED2. We hope that Ofgem will support the funding that is needed for DNOs to build the resources they need to effectively support local authorities in this area. In this regard we particularly note that SPEN has a Just Transition Strategy, and puts forward a business plan proposal for a £30m UIOLI Distribution Net Zero Fund of which almost half would be set aside for community-led projects.

The other point that we would make on the whole systems front is that losses should be viewed as a prime example of a whole systems issue but very regrettably losses are not addressed in those terms in any of the plans. What is clear is that actions by the DNOs (on operations and investment) have a significant impact on the amount of generation required – adding to cost in both the short and long term. This "blind spot" on losses in whole systems thinking needs to be addressed. NPG talk about not taking steps that would add to losses at transmission level but not about the impact that increasing losses will have on the need for increased transmission investment.

## 3 **Keeping customer bills low**

### 3.1 **Forecasts and scenarios**

*Summary: The focus on local area forecasts is welcome but the different approaches to uncertainty make the plans hard to compare. Ofgem will need to make clear the assumptions underpinning its Draft Determinations and continue to test the companies on their practical ability to flex. The design of the uncertainty mechanism in this area is key.*

All of the companies have developed local versions of the FES (DFES) and in our view this is a crucial step in building a more granular understanding of the potential growth in their regions, recognising that for DNOs it matters where the growth happens as well as how fast it happens. The DFES have typically been developed in close collaboration with local stakeholders and are a key step towards the development of local area energy plans, led by local authorities with strong DNO support. As highlighted above we see this as one of the successes of ED2.

In contrast the scenarios themselves have served to simply muddy the water. At one point in developing the ED2 methodology, Ofgem had indicated that they could set a central scenario that the companies should build their plans around (with variants from that forecast to be explained and justified). While this may have been problematic in 'top-down' terms it would at least have aided comparability. In the end Ofgem did not do this but simply required the companies to show how their plans could flex to accommodate uncertainty as reflected in any of the FES or CCC scenarios. The companies have done this but they all take different approaches as to what they use as the central scenario. This makes it impossible to compare across plans. Indeed, the companies even differ in how they interpret the impact of particular scenarios with UKPN seeing consumer transformation as the lowest cost scenario (as it would point to greater uptake of flexibility) while others view it as high cost (with more EVs and heat pumps). We hope that Ofgem will find a way to effectively compare the plans as it moves to draft determinations with a clearer view of what it considers a reasonable baseline scenario to be.

We would also question how effectively the companies have demonstrated that they could indeed flex to accommodate alternative scenarios. While all have focussed on the need for uncertainty mechanisms, with quite some difference in thinking on what form these should take, there is limited discussion in most of the plans about the practical implications of dealing with such a huge range of uncertainty. We would like to have seen evidence that the companies were moving to a more "adaptive" approach in how they think about their investment programmes.

### **3.2 Uncertainty mechanisms**

As set out in our Regulation for the Future paper and presentation on adaptive planning and regulation, the use of uncertainty mechanisms by Ofgem is an important element of adaptive regulation and being able to respond in a timely way to a fast-changing external environment.

Probably the most fundamental element of the ED2 control in this area is the way that the uncertainty around load growth is handled. We welcome the fact that Ofgem seems to be proposing some form of volume driver – to avoid creating delays in the system for what are high volume, relatively low cost investments. However we are concerned that there still does not seem to be a consensus on the methodology to be adopted.

In our view, whatever approach is adopted, it is important that there are caps and collars beyond which Ofgem would need to review the expenditure through a reopener. Calibrating a volume driver so that it does not under or over reward the companies (and so it does not lead to under or over investment) is extremely difficult and given this is a new area it is vital that there is both ongoing monitoring and a full review if outturns deviate by more than a certain amount from the forecast.

Where major reinforcement projects are proposed we would expect these to be covered by a PCD in line with Ofgem's overall approach.

Overall Ofgem and DNOs need an appropriate tool-kit to ensure that net-zero investment is not needlessly impeded by undue short-term cost considerations – but which at the same time can also provide assurance that load-related spend is cost-efficient and has in fact been delivered.

We also have concerns that the consumer end-bill impacts of different scenarios are not always made clear – in particular in cases where the company has consciously taken a conservative view for their baseline projections but assumes that substantial load-related sums will later be funded in addition via uncertainty mechanisms. For example, we note that SPEN (which is not exceptional in this regard) envisages that uncertainty mechanisms could add 50% on top of its baseline load related expenditure, equating to around 6% on totex with a further 10% for the proposed reforms to access charges. These represent significant variances to the headline bill impacts which need to be transparently presented.

### 3.3 **Cost benefit analysis**

*Cost of Carbon*

The cost of carbon is an important parameter that the companies are required to use in the cost benefit assessments they carry out for projects with environmental benefits – for example on losses, SF6 and energy efficiency projects.

As highlighted in our response to the Business Plan Guidance consultation the cost of carbon that BEIS now says should be used in assessing proposals has effectively trebled to reflect the fact the UK is now committed to net zero. The Business Plan Guidance and CBA template has not been updated to reflect this. Ofgem has acknowledged in working groups that there may be a need to consider the question of how to treat a substantially higher cost of carbon in its assessment of the business plans. However, there will inevitably be proposals that companies have not included in their plans because they could not be justified using the existing cost of carbon but which would be justified using the new figure. For example, SSEN note in their Losses Strategy that environmental projects have been hard to justify using the cost of carbon that Ofgem proposes. We would also expect this to be the case as well in assessment of replacing SF6 assets ahead of end-of-life (although we recognise as well that, as WPD highlight, the embodied carbon costs would also need to be taken into account when considering early replacement). Given the scale of the change in the cost of carbon we would expect this effect to be material on projects where carbon emissions are the main driver, but Ofgem should test this with companies as a matter of urgency.

Given where we are in the process we would suggest that an additional source of funding may be needed to allow companies to develop proposals that would now meet revised CBA criteria but which were not included in their plans as they did not pass the hurdle based on the old cost of carbon. We suggest above in our comments on losses that a mechanism such as the Net Zero and Reopener Development use-it-or-lose-it allowance (NZARD UIOLI) or the Net Zero Pre-construction

Work and Small Net Zero Projects Re-opener from GD2 /T2 could be a model for a mechanism to fill this important gap.

As noted above SPEN have incorporated capital carbon assessments into their CBAs which we commend and would hope is an approach that could be adopted more widely to deal with embodied carbon. What is unclear is how any appraisal of new infrastructure would then also take account of the extent to which it facilitates decarbonisation of the wider energy system and would suggest this may be a topic for further research.

*SROI*

We welcome the effort that the DNOs have put (collectively) into developing an SROI tool based in large part on Green Book methodologies which takes account of the wider social benefits of their investments. At present the tool is largely only used in the context of vulnerability initiatives or CVPs although SPEN have also used it to assess the benefits of their EAP which their figures suggest are substantial (with Gross Benefits of £421m for a spend of £70m).

The Treasury Net Zero Review places strong emphasis on the wider co-benefits of investments to achieve net zero – and indeed Ofgem itself endorsed that concept in its Green Recovery funding. While clearly Ofgem does not have lead responsibility for tackling wider social and economic problems it cannot make sense for decisions on investments in energy networks to ignore these wider impacts.

We would hope that Ofgem will be supportive of the work the DNOs are doing in this space and look to build on it further for RIIO3.

### 3.4 Overall bill impact

Given the current energy crisis there will rightly be a very strong focus on the near term bill impact of the Business Plans and affordability. We support Ofgem benchmarking and testing the Plans to ensure that costs are justified and to impose stretching efficiency targtes. We find it hard to see how companies can justify a lower rate of ongoing efficiency savings than the 1% pa that the CMA supported in the RIIO T2/GD2 appeals – and which currently only UKPN and ENWL propose in their plans. However it is important that this focus on the near term bill impacts does not lead to necessary investment in resilience and net zero being postponed.

Current distribution charges equate very roughly, on average, to around £100 p.a. in household end-bills. Extensive DNO consumer and stakeholder research has tested ED2 BP proposals and the associated costs. The expected impact of baseline spend on the network bill is clearly spelt out by DNOs. However, more clarity is needed on the likely additional impact on the network charge of non-baseline spend expected (rightly) to be funded via uncertainty mechanisms.

Two factors unrelated to the ED2 business plans are also set to push up electricity distribution network charges. From April 2022, customer network charges (both electricity and gas) will increase substantially due to the SOLR levy (supplier of last resort) and the attempt to smooth the impact for customers of the crisis in wholesale energy costs. Ofgem's announcement on 3 February shows average network charges across gas and electricity rising from £268 to £371 (a 39% increase). This cost of supplier failure is a cost which Ofgem and government choose to pass-through to consumers via the mechanism of network charges. Network charges are also set to increase as a result of the changes to network access charges and the connection charge boundary. In our view, in discussions about future end-bills, both of these factors need clearly separating out from any consideration of

the ED2 plans and funding commitments, and should not detract from the clear desire that customers have shown for the companies to invest towards a net zero future.

**4. Financial information – asset lives**

While we have not looked at the financial information in any depth we note the response by Maxine for Grid Edge Policy which considers at length the issue of asset lives raised by NPG. As part of its Sustainability Principles work, Sustainability First has been looking to place a greater emphasis on the issue of inter-generational equity and the need for a framework within which to consider these issues. This included commissioning a report by Frontier Economics and hosting a roundtable with relevant experts. Based on this we would endorse the conclusions of the Grid Edge Policy response that:

- the issue of asset lives has substantive inter-generational impacts and as such needs an open debate (not to be buried in the depths of technical annexes);
- this tradeoff between the interest of current and future consumers needs to be expressed in terms that consumers can understand – focusing on the outcomes in terms of bill impacts over time rather than just the inputs in terms of technical parameters;
- in particular Ofgem needs to set out what the impacts will be out to 2060 (the period for asset lives) not simply the impacts in ED2.

We are aware of course that the energy crisis will place considerable pressure on bills in the short term but a focus on what is a fair profile of bills over time is key to resolving these difficult tensions.

**5 CVPs**

We have not got the resources to look in depth at all the CVPs that the companies have put forward. However, one observation that we would make on the process is that there does seem to us to be a need to distinguish between a question of whether the initiative is worthwhile (and hence should be funded in ED2) and whether it is sufficiently stand out to merit a specific CVP reward. For example, we would support the case for SPEN's MAAV project to reduce losses to be funded but do not see why it would merit a reward given UKPN have already rolled it out.

We are also aware from looking at the CEG comments that a number of the initiatives are trying to tackle what might be considered valuable areas but where the evidence is not sufficient for the CEG to be able to support the initiative as proposed. We would hope that in such cases there might be a route to allow the company to work further on the proposal in the light of feedback from the CEG and from Ofgem.

In particular Sustainability First has encouraged the companies to look at what they might do to support energy efficiency, specifically thermal insulation as a prospective tool to avoid network investment. As such we were pleased to see that SSEN had put forward an energy efficiency CVP. However, the proposal looks very broadly at a range of energy efficiency measures (where our interest was primarily in thermal efficiency in readiness for heat electrification) and we would agree with the CEG that it does not merit funding in its current form.

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**Sustainability First**

**ED2 Business Plans - Ofgem Call for Evidence**
**9 February 2022**

# ANNEX 1 – DNO LOSSES STRATEGIES

## Introduction

Sustainability First is a think-tank and charity with a focus on social, environmental and economic issues in energy and water. We have significant experience of the RIIO price-control process through our involvement with the Ofgem RIIO2 Challenge Group, Consumer Engagement Groups and Ofgem stakeholder working groups. For many years Sustainability First has also led a significant work programme on how regulatory models must adapt to long-run future challenges.[1]

This Annex forms one part of our Sustainability First response to Ofgem's Call for Evidence on the DNO business plans for the ED2 price control period (2023-28)[2]. Our main response takes a high-level look across DNO business plans from a consumer, citizen and net-zero standpoint – and can be found here - https://www.sustainabilityfirst.org.uk/publications-consultation-submissions

In producing our response to Ofgem, we undertook a detailed look at DNO environmental action plans (EAPs).[3] Our focus was whether DNO EAPs sufficiently lay the ground for decarbonisation and net-zero while achieving a 'right-balance' for long-run affordability, whole-system efficiency and resilience. Three areas stand out as requiring considerably more attention in the next five-year period by both DNOs and Ofgem : the approaches taken to science-based targets and net zero; the need for more ambition and sense of ownership in tackling the challenge of distribution losses; plus, the largely 'unseen' long-run business and consumer risk attaching to DNO SF6 equipment. We have produced stand-alone papers on the last two of these (with the first covered extensively in our main response). Taken together, we see these as the priority areas which will shape the success or otherwise of the most critical EAP outcomes in the ED2 period and beyond.

- **Annex 1 – DNO Losses Strategies**
- **Annex 2 - DNO SF6 Strategies**

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[1] For example, our major three-year Fair for the Future Project - https://www.sustainabilityfirst.org.uk/publications-fair-for-the-future

[2] DNO final ED2 business plans were submitted to Ofgem on 1 December 2022 https://www.ofgem.gov.uk/publications/call-evidence-electricity-distribution-business-plans-riio-2

[3] The DNO environmental action plans (EAPs) are required by Ofgem as a part of the business plan documentation

## ED2 Business Plans – Losses Strategies

Sustainability First is disappointed at the limited number of concrete actions proposed to deal with losses within the ED2 Business Plans and the relative sense of complacency given their materiality. At one level this is unsurprising given how Ofgem has de-prioritised losses compared to past price controls. But losses are a prime example of a "whole systems" issue where DNO action is vital to reduce costs and carbon in the near term and to avoid creating further pressure on the amount of capacity required to meet net zero longer term. We have made this point repeatedly through the ED2 process. This annex recaps the arguments as to why losses are an important issue; sets out the regulatory framework as context; reviews the losses strategies in the Business Plans and then sets out recommendations for how Ofgem could strengthen the regulatory framework to ensure that the commitments that have been made are delivered and to provide incentives for companies to continue to focus on what more they can do cost effectively in this space.

While the Business Plans are light on ambition in this area, they do reveal the wide range of actions the DNOs can potentially take to better understand and help limit losses. This puts paid to the industry-wide myth that losses are a fact of life, must increase over the coming decade and remain largely 'non-controllable'. What particularly concerns us is that there is no clear 'ownership' of distribution losses. Yet if a problem is not owned, it cannot be solved. It is clear to us as the companies move to take on the DSO role, that taking ownership of losses as a whole system issue should be seen as an integral part of that new wider remit. In the meantime, the losses strategies point the way to a number of incremental steps, many of them relatively low-cost, and which would at least make a start now. To ensure this happens there needs to be a stronger regulatory framework around losses in ED2 and we have set out some thoughts on what this needs to involve.

## Why losses matter?

Across the Business Plans we sense relative complacency on losses with all DNOs apart from SSEN putting their primary focus on net zero targets excluding losses. This is unsurprising given that Ofgem appear to buy into the companies' arguments that losses are outside DNO control and that emissions reduction will be addressed anyway as the grid decarbonises. As a result there is now only a "reputational" incentive to deal with losses which given the complexity of the issues is wholly inadequate.

*Helping stem the inevitable increases*

Our sense is that one reason the companies have argued against any stronger incentive is that they expect losses to increase significantly with increased utilisation of the network and a stronger role for flexibility – and are concerned that they could be penalised if losses were financially incentivised. A 2018 study by WSP for the Energy Networks Association found that at maximum levels of penetration, low-carbon technologies could increase distribution losses by up to 350% (ie from current levels of 6-7% to over 20%). This is because, as several companies note in their Plans, losses increase quadratically with demand (ie if demand doubles, losses quadruple).

In our view this makes it all the more important to put an emphasis on actions that can be taken in the next five years to work to understand and help mitigate this impact – and should absolutely not be an excuse for stepping back.

*Carbon impacts do matter*

The other argument that is made is that the grid is rapidly decarbonising and hence in future there will not be carbon emissions associated with losses. This ignores the importance of cumulative long-lived emissions for climate impacts. It also seems to overlook the fact that losses are heavily concentrated in peak-periods(as losses increase quadratically with load). What matters therefore in terms of the carbon emissions from losses is not the average grid carbon intensity but the carbon intensity at peak which is higher than average and likely to remain so as gas peaking plants are likely to continue to be used for some time.

The CBA tool that companies are required to use to justify actions to reduce losses is also based on an outdated cost of carbon. The new BEIS figure – which reflects the commitment to net zero - is three times the previous figure. SSEN have highlighted in their plan that it is hard to justify actions on losses using the old figure – but more could be justified with the updated figure. There seems to us to be no excuse for Ofgem continuing to use the old figure.

While Ofgem expects the companies to report on their business carbon footprint both including and excluding losses, the SBTi is very clear that losses fall within scope 2 for the distribution networks. Someone has to take ownership and therefore have responsibility for the emissions associated with losses. While we of course are not suggesting DNOs have full control over losses they certainly have potential to introduce more control than others.

SSEN, having moved early with a 1.5 degree SBTi target, clearly understand the importance of reducing losses if they are to meet their targets (exacerbated in their case by having emissions from diesel generation on the Scottish Islands which is even harder to deal with). Other DNOs, either explicitly or implicitly seem to to be relying on grid decarbonisation to meet their SBTi targets.

*This is a real cost for consumers*

In the latest price cap announcements it is clear from the supporting spreadsheets that the cost of losses is adding £15-20 to each household customer bill on top of the basic cost of wholesale electricity of around £150. This 10% uplift (against 6-7% actual losses) reflects the fact that domestic demand is peakier and hence they incur a higher proportion of the overall cost of losses based on line loss factors.

Moreover, as we understand it, this probably still underestimates the cost to consumers of losses. Certainly a number of companies in their Business Plans make the point that Ofgem's CBA methodology understates the cost of losses because the figure used of £52 /Mwh is an average cost and does not take account of the fact that losses arise primarily at peak when the cost of energy is higher.

Even as it stands, this £15-20 cost is highly significant when viewed against the annual network charge of c £100 pa and ought to merit closer scrutiny. While suppliers have to pay for losses their focus has always been on the way the costs of losses are allocated between suppliers rather than on how the overall level could be reduced (which they have no incentive to do). Responsibility for managing the cost of losses has to sit with the DNOs and represents a real opportunity to drive bill savings for customers.

*High losses make achievement of net zero harder*

Ofgem has focussed its attention on sweating the network assets harder in order to help contain the costs of decarbonisation. Clearly this is right but if sweating the network assets harder leads to a

radically higher level of losses then the amount of additional renewable generation capacity that will be required to meet net zero will have to increase radically as well. This must be treated as a whole system issue (or an efficiency issue) with the full impact of losses taken into account in decisions on the appropriate level of utilisation the networks should be striving for.

*There are things the companies can do*

As noted above one reason for the downplaying of losses in the ED2 framework was the argument the DNOs made that these were outside their control. In their Business Plans all apart from SSEN consistently refer to their "controllable emissions" as excluding losses. However, from a review of their losses strategies, as set out below, there clearly are multiple steps that the DNOs can take which would bring losses down to a lower level than otherwise – from the use of low-loss equipment through to improvements in voltage management and other operational actions.

Of course DNOs do not fully control losses – which are determined by the level of demand and hence loading on the network - but as a part of their new DSO role they are actively exploring how they can use flexibility contracts and price signals to better manage loads on their networks. It seems obvious that addressing the challenge of unmanaged losses should be an inherent part of that role.

**Context – the regulatory framework**

Past distribution price controls have included a financial incentive on losses going back to at least DPCR2 in 2000-4 (when the incentive was 3p/kWh). However, the incentive was withdrawn part way through the DPCR5 price control (in 2014) because volatility in the settlement data made the incentive as designed unworkable – as reflected in the DPCR4 close-out decision where Ofgem had to make significant adjustments (which were then the subject of a legal challenge). Given these difficulties, in ED1, instead of incentivising the outcome in terms of the level of losses, Ofgem introduced a new licence condition to minimise losses, the requirement for a losses strategy and the Losses Discretionary Reward which was intended to incentivise action by the companies to better understand and measure losses and the steps that could be taken to tackle them. The aim was that with an improved understanding it should be possible to reintroduce a financial incentive on losses in ED2. In its Guide to the ED1 Price Control in the section on losses strategies Ofgem says:

"*We plan to introduce a losses incentive for RIIO-ED2 and we expect the DNOs to include proposals for establishing a reliable losses baseline during RIIO-ED1. They should consider how power system modelling, innovative approaches, sharing of best practice and shared initiatives could help*".

With changes to the team at Ofgem this intention seems to forgotten.

That said, in their Business Plans a number of the companies (including eg UKPN) highlight the progress that has been made as a result of the Losses Discretionary Reward notwithstanding the fact that Ofgem only awarded a reward in the first round, but not in the subsequent two. Absent even that incentive it is unclear how Ofgem expect further progress to be made in ED2.

For ED2 Ofgem set out in the Sector Specific Methodology Decision that it would move away from having any financial incentive on losses and would rely simply on a "reputational" incentive. This was the proposal that the ENA had put forward. Sustainability First has consistently argued that a reputational incentive will be ineffectual in this technical area and that given its importance a financial incentive is needed to ensure adequate focus by the companies.

While Ofgem has made clear that the companies should take into account the impacts of losses in their CBA assessments, there is no incentive for DNOs to proactively seek out new opportunities in period (given there is no financial benefit to them in reducing losses). There are also real questions around a number of aspects of the CBA toolkit as noted above.

Across the rest of Europe, the normal model is that DNOs are responsible for the costs of the electricity to cover losses. In the latest CEER report comparing approaches across countries Ofgem is quoted as saying that it intends to introduce a financial incentive once smart meters are rolled out. However this message has not been communicated as part of the ED2 dialogue and more work would clearly be needed through ED2 to understand how smart meter data could be used – but which the companies are not currently incentivised to do.

**ED2 Business Plans - Clarity of strategies**

In the Business Plan Guidance Ofgem sets out its baseline expectations as being for the DNOs to:

- Develop and commit to implementing a strategy to efficiently manage both technical and non-technical losses on the DNO's network over the long term. This should include specific actions and performance measures to track the impact of actions in RIIO-ED2.
- Commit to reporting on the progress of implementing the losses strategy and associated performance measures.
- Contribute to the evidence base on the proportion of losses that network companies can influence/control.

There is a very wide range in how well the companies set out their losses strategies although at bottom it seems that they are all following very similar approaches. The best strategies are probably NPG and SPEN that set out detailed actions that they will pursue in ED2 including eg volumes of transformers they will replace alongside options they are still exploring. Having this clear set of "actions and performance measures to track the impact of actions in RIIO-ED2" is part of the baseline expectations as set out above and is essential for stakeholders to track progress. We are doubtful that the majority of the Business Plans meet even this basic expectation.

ENWL and UKPN provide relatively clear articulations of their strategies which set out in broad terms the steps they will take in ED2 but less obviously presented as a set of actions. SSEN repeats its strong commitment to reducing losses but, like WPD, has very little in terms of concrete actions and is less well structured than the others.

All of the DNOs apart from WPD give a figure for the losses they expect to avoid over ED2 but often this is buried and the basis for the figure is not always clear (ie whether it is per annum, over ED2 or over the lifetime of the asset). The table below shows what they have included. The very different scale of numbers quoted highlights the need for a consistent reporting framework in this area. As things stand with the ambiguity over what the figures represent and with no scalar (eg also presenting the figure as a %) or historical context it is impossible to form any view on the relative ambition. While more information may be available in the EJPs there is no sense from the Business Plans or the Strategies what else has been considered and what a stretch target might have looked like (eg taking account of the higher BEIS cost of carbon).

| Company | Target losses avoided | Comment |
|---|---|---|
| SSEN | 169GWh | Basis unclear – over lifetime of assets? |
| UKPN | 10.5 GWh to end of ED2<br>471GWh over lifetime of assets | |
| SPEN | 36 GWh | |
| WPD | - | |
| ENWL | 8GWh per annum | |
| NPG | 320.6 GWh | Basis unclear – over lifetime of assets? |

As discussed below, SPEN are unique in providing a clear build-up of their figure in terms of the impact of the different actions they plan to undertake in ED2. None of the others provide this.

The other measure of ambition on losses is the amount that the companies expect to spend on projects to deal with losses but these figures are again hard to find. As noted in our main response the proposed spend on losses is extremely low compared with other elements of the Environmental Action Plans. For example, UKPN propose spend of £6m on losses out of a total EAP spend of £246m. This seems totally out of balance. While as noted below there will be expenditure included elsewhere in the business plans which will also help reduce losses, the scale of this is not clear.

***The core elements of all strategies***

Although some are clearer than others about the actions they propose to take, there is essentially a set of common elements across all six Business Plans:

- Where transformers are being replaced for other reasons to replace them with EU eco-design 2021 low loss equipment (defined as "**opportunistic**" replacement).

- Where underground cables are being replaced for other reasons to replace them with cables with a minimum cross section of 300mm2 (again "**opportunistic**" replacement). As a part of this the companies commit to avoiding "cable tapering" in future.

- To "**proactively**" replace the oldest highest loss transformers. All companies are replacing their oldest ground mounted transformers although the cut-off date varies (ENWL 1990, others pre 1958/ 1962). SPEN have also committed to proactively replace 4 primary substations on losses grounds. Decisions on what equipment merits replacement on this basis are taken using Ofgem's CBA template which, as noted above, understates the cost of carbon.

- Where pole mounted transformers are being replaced because of PCB contamination to do this with very low loss amorphous core transformers – again "**opportunistic**".

- Upsizing 6.6kV (and below) to 11 kV (which also brings benefits in terms of standardisation of equipment).

SPEN's plan is unique in that it sets out clearly for each of these categories (and broken down by voltage level) the numbers of items of equipment they will replace and the losses that will be saved as a result. This provides the basis for transparent reporting and the other DNOs should be asked to provide equivalent projections. SPEN see this as the basis for a quantified element in the Reputational ODI they propose (alongside the qualitative angle discussed below).

UKPN highlight an issue with Ofgem's current RIG reporting in this area as any investment that does not have costs specifically linked to losses should not be reported (ie "opportunistic" investment would not be counted in losses reporting). While it is helpful to delineate where there are incremental costs to address losses it is important that the impact on losses of all investments is visible (ie including "opportunistic" investments done for other reasons using low loss equipment even if that is now standard).

***Other actions being explored***

There are then some additional actions that have been adopted by at least one DNO and which most if not all others have considered. Even where they consider it does not present value for money, they often say they will keep it under review. With the significantly higher cost of carbon that BEIS is now saying should be used for appraisal it seems likely that many of these proposals would be justified - but it is unclear what incentive the DNOs will have in practice to take them forward absent any financial incentive or other source of in-period funding. These actions include:

MAAV (contact losses) – already implemented by UKPN in London and proposed to be rolled out across their other regions. SPEN include it as a CVP. SSEN rejected but keeping under review.

TASS (turning off one transformer of a pair when lightly loaded) – included by SSEN as part of their plan building on their innovation project. SPEN pursuing. Others rejected for now.

Voltage reduction – WPD

Dynamic voltage optimisation – NPG CVP

Energy efficiency at substations - SSEN

Of these we are particularly interested in the initiatives around voltage regulation which seem to us to have significant potential to help both with losses and energy bill savings / energy efficiency. We are aware that the picture is complex with some customer devices responding in different ways but on the evidence to date (eg from WPD's NIA project) we consider this should be a priority area for all DNOs to explore and to start trialling at scale, with a view to implementation in ED2. The Engineering Code Review Independent Panel report also highlighted this as a key opportunity area.

Mention is also made in most strategies of looking at certain operational issues – albeit typically without any clear actions or metrics:

Power factors (working with I&C customers) and installing reactive power compensation / power factor correction;

Power quality (including the impacts of EVs and LCTs) where active harmonic filters can help;

Reducing network imbalances across 3 phases;

Network configuration to balance load on different circuits

Engagement with the ESO.

There are then a range of other investment or operational options which are at an earlier stage of development or are only mentioned as ideas that are being explored by 1 or 2 DNOs. Again it is

unclear what incentive the companies would have to take any of these forward without a financial incentive or other funding source. These opportunities include:

On-line Tap Changers (SSEN)

Normal Open Point optimisation (UKPN)

Proactive replacement of heavily loaded LV OHL (SPEN)

DC Distribution (SPEN)

Blown LV fuse detection (SPEN)

Use of copper versus aluminium (SSEN)

Use of 3 phase services in new build / retrofits (WPD)

Installing metering at sub-stations to understand unmetered usage (UKPN)

Service connections – unlooping (SPEN), min cable size (35mm2) (UKPN)

Fault Current Limiters (WPD)

Heat recovery at substations

Finally, a number of companies talk about doing more to improve their understanding of losses using smart meter data, improving time of use modelling, linking to DFES etc. Work is also in hand to improve the understanding of the impacts of embedded generation (which can reduce the distance energy travels reducing losses but can also lead to increased loads at other times) and to understand the impacts of energy efficiency / battery storage. A number of the plans refer to the research done by Imperial which shows that 36-47% of losses arise on the LV network. LV network visibility is a key strand of all company Business Plans (as a part of the DSO role) and is also a key to better understanding losses.

Assessing the overall level of losses is based on the difference between the electricity entering the networks (at the grid supply points) and the electricity consumed (as measured through metering). The difficulties with estimated meter reads and hence the volatility in settlement data have made it hard to accurately determine the level of losses. Smart meter data should address this but further work is need to confirm this. Moreover to understand where on the network the losses are happening and how best to manage them requires separate network monitoring and/or network modelling. Progress is need on both these fronts.

Reflecting on this list it is clear that there is a very considerable amount more that the DNOs can do to better understand and control losses. While it may be inevitable that losses will increase as demand grows for EVs and heat electrification and with more use made of flexibility, this only increases the importance of DNOs taking the steps that they can (in particular as losses increase with the square of load). Ofgem must far more actively challenge arguments that losses are outside DNOs control and should ensure that there are meaningful incentives for companies to take these initiatives forward.

***Conclusion – need for a clear incentive***

In thinking about the regulatory framework that is needed to help drive forward the agenda on losses in the next 5 years there are different aspects that need to be addressed:

1) **Holding the companies to account for the commitments they have made** in their Business Plans.

As noted above all the plans have some core elements of investments which help reduce losses either as a by-product of investment in low loss (or up-sized) equipment when the asset needs replacing or as proactive investment to replace high loss assets. As with all forms of investment in the price control there is a need to ensure this commitment is delivered on. Clearly with the introduction of the EU Eco design standards the companies are forced to adopt low loss equipment as that is all that will be available – but there will still be options about going beyond that standard and on sizing of the equipment.

This could be done by having **a PCD or having an outcome based financial incentive** (targeted on avoided losses (GWh) which is a measure all the companies use).

Another approach would be to have clearer **engineering standards** around losses. The independent panel looking at Electricity Engineering Codes for BEIS made clear, based on earlier research by Goran Strbac and others, that when equipment is replaced it should be with equipment that is oversized to deal with losses. They recommended a new engineering standard or a more prescriptive licence condition on losses. This over-sizing aligns with the approach the companies are already taking as described in their business plans. Embedding this approach in an engineering standard would help ensure that the companies adhere to re-sizing as standard at the point of asset-replacement, which also clearly makes sense from a "future-proofing" perspective. Some companies like UKPN are clear that these standards are now built into their engineering standards / policies but this needs to be reinforced across the sector.

As a part of this there is then also a need for **clear and consistent reporting**. As highlighted above, there is currently no consistent basis for reporting avoided losses in the Business Plans. Ofgem needs to ensure a consistent approach reflecting the time period over which the avoided losses are counted and to show, separately, both opportunistic and proactive investment.

2) **Encouraging the companies to press ahead with the wider range of ideas and opportunities** that they have mentioned in their Losses Strategies.

This would include the companies **revisiting opportunities** that they may have rejected previously but which would now be justified with the much **higher cost of carbon**.

It also needs to include a strong element of **sharing learning and collaboration**. Over recent years the ENA Losses Working Group seems to have largely focussed on developing a shared line about the regulatory framework for ED2. Based on the range of ideas included in the Losses Strategies there clearly is a role for the Group to carry out an urgent review of major lessons learned from LDR and NIA projects (including on voltage reduction).

In our view this requires both:

- A **financial incentive based on a qualitative assessment** of the levels of innovation and learning that the companies have achieved. SPEN provide an example of a qualitative metric

based on the LDR criteria (understanding of losses; sharing of best practice / stakeholder engagement; losses innovation) which they suggest could be used as part of a reputational incentive. We firmly believe that a financial incentive would be stronger and is consistent with the approach already being taken on the Strategy Delivery Incentive in other areas. If reliance is to be placed on a reputational incentive, then proper thought needs to be given to how this would work as we set out in the body of our response. In our view, as a minimum Ofgem would need to carry out a comparative assessment of losses strategies on an annual basis and publish a clear league table / RAG rating of the companies. While a comparative approach can hinder collaboration we believe that using the LDR criteria which include sharing learning would mitigate that risk.

- **A UIOLI funding pot for initiatives that were not included** in the Business Plan but which are subsequently found to meet the CBA criteria (in particular taking account of the increased cost of carbon). We see a strong analogy here with the Net Zero and Reopener Development use-it-or-lose-it allowance (NZARD UIOLI) or the Net Zero Pre-construction Work and Small Net Zero Projects Re-opener included in GD2 / T2.

In the absence of a financial incentive, **reputational regulation** would need to be made to work. As we set out in the body of our response this means ensuring comparative data is readily accessible to enable benchmarking; reflecting on the sources of reputational influence (and how best to strengthen them) and making a link to the regulatory framework. Stakeholders will expect Ofgem to know what is happening in the sector and see Ofgem as a trustworthy source of information looking **across the DNOs. In the context of losses this would mean:**

- ensuring clear commitments on areas the companies will explore (as NPG and SPEN have provided to some extent in their actions lists) which they can then be held to account on;
- some form of annual report / RAG ranking by Ofgem as envisaged by SPEN in their vision for the ODI-R (at Annex 2 of their Losses Strategy) including qualitative scoring on improving understanding of losses, sharing best practice and "losses innovation";
- a clear commitment to reintroduce a financial incentive in ED3 (as promised in the ED1 Guide and in the CEER Losses report 2020) and a plan for the work needed to deliver it.

**3) An improved framework for assessing losses**

As flagged by several companies in their Business Plans there is a need for further work by Ofgem / the industry on the valuation of losses. All companies use the Ofgem CBA methodology but a number (ENWL, SSEN, NPG) comment on the fact that it values energy based on an average annual price whereas losses are highest at peak times when prices are highest.

This disaggregation of losses by TOU is an important step – and, linked to that, seeing the impact in terms of system capacity rather than "energy" might help reinforce why losses are so important going forwards.

NPG make the link with flexibility price signals and this clearly needs further thought in the context of the DSO role.

SSEN also raise a question about the assumed cost of carbon which they say makes environmental projects hard to justify. As noted above Ofgem should now certainly use the BEIS up-to-date figure which is consistent with net zero.

Bringing all this together we would like to see Ofgem focus in its reporting on accredited science-based targets (which count losses in scope 2) rather than purely the "BCF excluding losses" which has been the focus to date.

However separate reporting of total losses is also important. Building an understanding of the impact of load growth and network utilisation on the overall level of losses going forward ought to be a major consideration for the ESO in its Future Energy Scenarios and future capacity assessment. Seeing losses through this strategic lens should help in understanding the implication of losses for the generation and transmission capacity required which should then feedback into the approach taken by DNOs to assessment of options for dealing with losses.

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**Sustainability First**

**ED2 Business Plans - Ofgem Call for Evidence**
**9 February 2022**

# ANNEX 2 – DNO SF6 STRATEGIES

## Introduction

Sustainability First is a think-tank and charity with a focus on social, environmental and economic issues in energy and water. We have significant experience of the RIIO price-control process through our involvement with the Ofgem RIIO2 Challenge Group, Consumer Engagement Groups and Ofgem stakeholder working groups. For many years Sustainability First has also led a significant work programme on how regulatory models must adapt to long-run future challenges.[1]

This Annex forms one part of our Sustainability First response to Ofgem's Call for Evidence on the DNO business plans for the ED2 price control period (2023-28)[2]. Our main response takes a high-level look across DNO business plans from a consumer, citizen and net-zero standpoint – and can be found here - https://www.sustainabilityfirst.org.uk/publications-consultation-submissions

In producing our response to Ofgem, we undertook a detailed look at DNO environmental action plans (EAPs).[3] Our focus was whether DNO EAPs sufficiently lay the ground for decarbonisation and net-zero while achieving a 'right-balance' for long-run affordability, whole-system efficiency and resilience. Two areas stand out as requiring considerably more attention in the next five-year period by both DNOs and Ofgem : the need for more ambition and sense of ownership in tackling the challenge of distribution losses; plus, the largely 'unseen' long-run business and consumer risk attaching to DNO SF6 equipment. We have produced stand-alone papers on each. We see these as priority areas in shaping the success or otherwise of critical EAP outcomes in the ED2 period and beyond.

- **Annex 1 – DNO Losses Strategies**
- **Annex 2 - DNO SF6 Strategies**

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[1] For example, our major three-year Fair for the Future Project - https://www.sustainabilityfirst.org.uk/publications-fair-for-the-future

[2] DNO final ED2 business plans were submitted to Ofgem on 1 December 2022 https://www.ofgem.gov.uk/publications/call-evidence-electricity-distribution-business-plans-riio-2

[3] The DNO environmental action plans (EAPs) are required by Ofgem as a part of the business plan documentation

# Annex 2 – DNO SF6 Strategies

**Summary**

This Annex examines the DNO SF6 Strategies as set out in their environmental action plans (EAPs).

**Section I** paints a general picture of the DNO SF6 challenge, making use of information in Ofgem's own reports on DNO SF6 'banks' and leakage. **Section II** takes a detailed look at DNO proposals for ED2 SF6 leakage targets plus looks across their wider SF6 Strategies to tackle their long-run SF6 challenge. **Section III** concludes with specific suggestions for Ofgem on regulatory approaches to the DNO SF6 strategies – both at draft determination stage and for financial incentives to drive a gear-change over the next-five years in DNO approaches to their SF6 risk.

The paper is organized as follows.

**Section I – SF6 Overview**

1. Headline conclusions
2. DNO SF6 context
    - Regulatory
    - DNO SF6 challenge – key features
    - Ofgem SF6 ED1 reports – SF6 banks and leakage

**Section II – DNO ED2 SF6 Targets and Strategies**

3. Stakeholder views on DNO approaches to SF6
4. DNO ED2 commitments and leakage targets against bank
5. SF6 Strategies
    - Overview
    - Core elements
    - Improved knowledge of SF6 bank
    - Reducing total SF6 bank
    - Procurement of SF6 alternatives and approach to supply-chain – including DNO collaboration
    - DNO innovation on SF6

**Section III – Suggestions for Ofgem on SF6 Incentives in ED2**

6. Ofgem draft determinations and regulatory incentives for SF6 in ED2
    - Incentives - headline conclusions
    - Draft determinations
    - Within-period financial incentives for SF6 strategies

## Section I – SF6 Overview

### 1. Headline conclusions

**DNO SF6 strategies** vary considerably in quality. They range from the comprehensive to simply being on the 'to-do' list. The costs attaching to the strategies are not well-understood. With over 200,000 items of DNO equipment containing SF6[4] – i.e a directly-controllable scope 1 emission - SF6 assets need far greater focus by DNOs in ED2. As a long-lived intense green-house gas[5], a robust SF6 strategy must surely be a major input into development of DNO science-based targets. Given the immature state of several SF6 strategies in EAPs, Ofgem should provide a strong regulatory signal and opt to financially incentivise the ED2 SF6 strategy process, including collaboration. If left simply to reputational regulation as Ofgem presently propose, a concerted effort by DNOs in the next five years to address their long-run SF6 risk cannot be assumed – be that to support cost-efficient outcomes for SF6 asset-management or for net-zero delivery.

**Leakage reduction targets** – DNOs are required to adopt an ED2 SF6 leakage target. Individual targets sit against a complex backdrop of ageing equipment, variable but improving data on actual leakage, and SF6 banks still growing with new SF6 equipment being installed. In so far as it is possible to judge (given very variable baseline information presented in EAPs), the ambition-level of targets chosen by DNOs for overall rates of SF6 leakage-reduction against their total bank seem modest (and in some cases perhaps only level-pegging) – either against ED1 targets set six-years ago and / or against actual performance over the ED1 period. At draft determination, Ofgem should seek to better understand what a reasonable 'stretch-target' for SF6 leakage-reduction against bank and its associated cost could look like for each DNO. This is presently very hard to judge. In addition, within the total EAP BCF cost-envelope for ED2 it is hard to know in prioritising reductions in their scope 1 and scope 2 controllable emissions what short- and long-term trade-offs each DNO has made. For example, how has a DNO balanced relatively easy near-term steps to decarbonise (e.g. operational transport fleet) against SF6 measures ? For example, was the trade-off made against SF6 measures which may be incremental and lower cost (e.g. leakage-detection, asset monitoring) instead of against more costly asset-based measures (i.e replacing items of leak-prone SF6 equipment).

**Common reporting methodology** - DNOs are also required to develop a common SF6 reporting methodology. Yet despite this being an Ofgem baseline expectation, not every DNO clearly commits in its EAP to making progress. Only two indicate an expected date. At draft determination, Ofgem should specify dates both for completion of the common reporting methodology and also the start-date for reporting. Otherwise, there will continue to be no comparable basis by which to understand progress against targets – be that for leakage or for reduction over time in DNO SF6 banks.

**Reducing SF6 bank –** in line with their science-based targets one or two DNOs reference a long-term vision of SF6 elimination from their operations. Under Ofgem's current CBA methodology, SF6 asset-replacement invariably is justified only at end-of-life despite the value of avoided carbon emissions being factored into the assessment. While this equation may change in the future if a higher cost-of-

[4] **Total DNO SF6 Bank 2019-20 = 320,656 kg (7, 300, 000 tCO2e)**
**Total DNO SF6 Leakage 2019-20 = 865 kg (20,000 tCO2e)**
[5] 22,800 times the intensity of CO2

carbon is used in CBA assessments[6], presently an asset must prove itself relatively leaky before it can be replaced early. Yet each DNO has many tens-of-thousands of SF6 equipment items right across their network – and growing. For the most part this equipment doesn't leak and / or is sealed. The strategies must therefore fully examine options, pathways and priorities for cost-efficient and considered steps on managing-down SF6 banks over time. This needs a far better grasp of the full long-run costs and benefits, including carbon impacts[7], of asset replacement, the available viable commercial options and the sheer practicality of managing-down DNO SF6 banks to align with SBT time-frames. Some DNO strategies are already well-developed. For example, on inventory, data-collection, and long-run approaches to asset management. And some are barely off the starting blocks. Some also indicate a fuller understanding of available non-SF6 alternatives and perhaps have more active supply-chain engagement. On innovation in SF6 asset-management, the strategies indicated little new or ground-breaking. Several DNOs already make use of infra-red leakage detection and one DNO references exploring SF6 recycling. Going forward, we would like to see more effort devoted in strategies to how innovative approaches, including data-analytics, could help to tackle the many fundamental outstanding questions implicitly raised by the strategies on how best to manage-down SF6 banks over the long term.

## 2. DNO SF6 Context

*Regulatory*

Sulphur Hexafluoride (SF6) is a man-made green-house with a warming potential ~23,000 times that of carbon-dioxide. Long-lived and potent, it is widely used as an effective insulator in electricity substation switch-gear and circuit breakers. Equipment containing SF6 is found at every network voltage.

SF6 usage is controlled via the F-Gas regulations[8]. Broadly, the rules require reduced sales of all F-Gases, a ban on F-Gases in new equipment subject to alternatives being available, and leak prevention and record-keeping for existing equipment.

Until now, due to lack of viable equipment alternatives, electricity sector switch-gear and circuit breakers containing SF6 have been exempt on an EU-wide basis from phase-down of sales and for new-procurement. DEFRA is currently reviewing the F-Gas regulations for report by end-2022. DNOs expect new proposals by Spring 2023 and updated regulations in 2024. For electrical equipment containing SF6 where viable cost-efficient alternatives exist UK phase-out is increasingly on the cards. Any ban prior to end-of-life in the ED2 period would doubtless lead to discussion of a price-control re-opener. A far-reaching SF6 phase-out and ban looks more of a reality for ED3 and beyond.

[6] Elsewhere in our ED2 response to Ofgem we have stressed that the new BEIS figure for the enduring cost-of-carbon – applicable to cost-benefit assessments in line with net-zero - is now three-times higher than the figure currently used by Ofgem in their CBA template. Ofgem will wish to revisit this. In using the higher BEIS figure for the cost-of-carbon in their CBA assessments DNOs may well find that certain proposed investments - where reducing carbon emissions is a main benefit (previously ruled-out on cost-benefit grounds) - may now have a higher benefit.

[7] Including accounting for embodied carbon associated with early-replacement

[8] https://www.gov.uk/government/collections/fluorinated-gas-f-gas-guidance-for-users-producers-and-traders#full-publication-update-history

Either way, active forward-planning by DNOs on their SF6 bank and supply-chain alternatives is clearly a very important element of risk management.

In ED2, regardless of new rules, the requirement by Ofgem for DNOs to adopt science based-targets for greenhouse gas reduction to limit warming to 1.5°, plus DNO plans to meet net-zero statutory targets, also mean that long-run DNO stewardship of their SF6 assets, including control of SF6 leakage, takes on new significance. For the first time Ofgem requires DNOs to have an SF6 Strategy[9]. This is very welcome.

The ED2 sector specific methodology[10] noted that DNO strategies would to some extent mirror those for transmission IIG (insulation and interruption gases). In Section II we look in detail at the DNO SF6 strategies.

*The DNO SF6 challenge – key features* [11]

High-voltage switchgear can contain hundreds of kilograms of $SF_6$, with rules on maintenance, leakage-checks and reporting (inventory, leaks). At medium voltage – assumed to be <50kV[12] – equipment containing <5kg of $SF_6$ is often sealed. So, in general terms more 'fit-and-forget'.

In GB, most SF6 by mass sits in transmission equipment[13]. By volume, this represents ~85% of the full SF6 network inventory or 'bank'. And almost all leakage recorded is from transmission - some 97%[14]. But, when we look across the voltages at the numbers of switchgear units which contain SF6 this picture reverses. There are over 200,000 of these in GB. Virtually all in distribution networks - some 97%. And most equipment items which contain SF6 sit at very low voltage – over two- thirds at 11 kV[15].

[9] RIIO-ED2 Business Plan Guidance. 30 September 2021. Appendix 3. Environmental Action Plans (EAP). Baseline Expectations. P 74
https://www.ofgem.gov.uk/publications/riio-ed2-business-plan-guidance

**Sulphur Hexafluoride (SF6)**

- Commit to implementing a strategy in RIIO-ED2 to manage SF6 on their network. This should include economic and efficient actions to reduce leakage rates and where appropriate, economic and efficient SF6 asset replacement.
- Adopt a target for SF6 leakage reduction.
- Commit to reporting on total SF6 bank and leakage reduction rates using a common DNO methodology.

[10] RIIO-ED2 Methodology Decision: 17 December 2020
https://www.ofgem.gov.uk/publications/riio-ed2-sector-specific-methodology-decision
Annex 1 - Delivering value for money services for consumers. Appendix 4. Para A4.3

[11] Sustainability First. Expert Viewpoint. 18 November 2020.
https://www.sustainabilityfirst.org.uk/publications-expert-viewpoints/149-sf6-time-to-get-serious

[12] ENA Slide Set to ED2 Decarbonisation and Environment Working Group. 19 February 2020. **GB : SF6 'Bank' – *using EU boundary medium-voltage definitions for T & D* >52kV and <52kV.**

[13] Op cit. ENA indicate total GB bank estimated at ~1,300 tonnes. Of which Transmission holds 85% and Distribution around 15% (195 tonnes).

[14] And leakage from Distribution equipment (i.e.. <52 kV) at 3% of total T&D leakage.

[15] 70%

So, not to underplay the challenge of SF6 leakage for DNOs, but the practical reality is that distribution also faces a significant long-term and complex network asset-management challenge arising from such extensive holding of very many small equipment items containing SF6.

DNOs describe their SF6 leakage in EAPs as a share of their internal business carbon footprint (BCF) - ranging from 13% to 4% (in all cases as a share of their BCF minus losses)[16]. For some idea of how this sits within the total envelope of internal BCF emissions, one DNO indicates SF6 leakage to be equivalent to emissions from their operational transport - but substantially less than those from their business transport or their own buildings[17]. If emissions from losses are also included within BCF, then greenhouse emissions associated with SF6 leakage – together with all the other elements of scope 1 and 2 emissions – become a very small share indeed of total BCF. Adding contractor emissions (scope 3), smaller still. Nevertheless, none of this should detract from the fact that SF6 leakage is a scope 1 emission that arises directly from DNO business activity and is therefore 'directly controllable'[18].

DNOs have summarised their ED1 activity on SF6 at a high-level as follows[19] :

- Investment and replacement of most significant contributors to SF6 losses on the network
- Innovation projects looking at alternatives to SF6 underway
- Investigation into more efficient repair options
- Use of FLIR (infra-red) camera to locate leaks
- Consideration of minimising emissions by de-gassing in situ
- Investigation into causes of SF6 leakages
- Installation of low leakage SF6 equipment
- Use of stringent high specifications at lower voltages to reduce SF6 leakage rates
- DNO collaboration via the ENA SF6 working group
- Understanding and compliance with FGas Regulations and contributing to the EU Consultation

In 2019-20, total leakage reported by DNOs to Ofgem amounted to 865 kg of SF6 (19,722 tCO2e)[20]. This is fourteen times less than leakage reported from transmission assets in the same year[21]. Even so, in terms of making progress towards DNO science based and net-zero targets, leakage prevention must be a first-order emissions reduction measure for DNOs.

[16] For example, WPD – 13% (EAP p 26); Northern Powergrid – 11% (Chart on BCF Components. BP p 80. 'Fugitive Emissions' = 11% (ie without losses and emissions of external contractors); SPEN – 4% (EAP. SF6 Strategy. P 90); UKPN - 4% of scope 1& 2 emissions (excl losses).

[17] NPG – Figure 1. Components of our Business Carbon Footprint. BP p 80. Buildings energy usage – 50%; Business transport – 28 %; Operational transport – 11%; SF6 leakage – 11%.

[18] Described as 'fugitive emissions' in some plans – a technical term which in our view fails to adequately convey that these are controllable green-house gas emissions from leaking equipment.

[19] SSEN & WPD slides to Ofgem Decarbonisation & Environment Working Group. 11 September 2020.

[20] https://www.ofgem.gov.uk/publications/riio-1-electricity-distribution-annual-report-2019-20

[21] 12,441 Kg of SF6 leakage total for NGET, SPEN, SSET reported in 2019-20 https://www.ofgem.gov.uk/publications/riio-electricity-transmission-annual-report-2019-20

Without action, the risk of leakage will increase from older equipment deteriorating. This is currently assumed to be more problematic at higher distribution voltages, although current reporting requirements on leakage to Ofgem are not sufficiently granular to analyse this. Also, new load-related and other asset investment is still increasing the overall size of DNO SF6 banks. While not raising additional leakage prospects in the near term, it is hard to know if this will be the case in the long-term[22].

The EAPs show that tackling leakage from deteriorating (most likely older) equipment at higher distribution voltages - either through repair or through limited asset replacement based on 'end-of-life' CBA assessments - to be the main focus for the DNO SF6 ED2 investment commitments.

For transmission in RIIO2 Ofgem addressed the leakage and asset management challenge for SF6 (and other interruption gases) with two incentives. First, via a stretch leakage-reduction target - specified against a very clearly defined baseline - with potential for a fine where targets are missed (and for some TOs, but not all, a potential to reward improvement beyond targets)[23]. Second, an incentive for a specific programme of asset-intervention for National Grid (who have a particularly tough leakage problem) to help them manage-down some of their worst deteriorating SF6 assets. This programme to be targeted and carefully monitored[24]. For ED2, Ofgem do not presently plan for any financial incentives to improve DNO management approaches to SF6 assets. We return in our conclusions to the question of sharper incentive signals for DNOs. It is also worth noting that there is also an anomaly on proposed RIIO2 SF6 incentive approaches between transmission and distribution - given that 132 kV is classed as a transmission voltage in Scotland and a distribution voltage in England & Wales.

Generally, in looking across individual EAPs it has proved hard in simple terms to :

- **Understand the main lessons learned by each DNO from their SF6 leakage performance in ED1 -** how far targets were met and / or were in the end challenging, how problems were tackled and how far lessons on ED1 leakage have informed proposed actions and investment priorities for ED2.

- **Understand the basis for the ambition-level of each DNO SF6 leakage-reduction target relative to ED1** – in particular whether a DNO has simply adopted a straight-line trajectory from their ED1 target or performance, or their final 2019-20 outturn (or other date). Or, given SBTs, net-zero, and extensive stakeholder testing on environmental priorities[25], whether as a result the

[22] ENWL RIIO2 Action Plan for SF6 : 'Our long-term vision is for our network assets to be 100% free of SF6 (or other greenhouse gases), but at present this is not technically or financially viable. We will continue to use SF6 switchgear until such time that the SF6-free solutions have been technically approved and are cost-effective over the whole asset life-cycle. While this market matures, our SF6 holding may increase, with the installation of new SF6 switchgear on the network; this switchgear will be highly unlikely to leak'.

[23] RIIO-2 Final Determinations Electricity Transmission System Annex (Revised). 3 February 2021. Insulation and Interruption Gas (IIG) Leakage ODI-F. Pp 43-45 .
https://www.ofgem.gov.uk/sites/default/files/docs/2021/02/final_determinations_et_annex_revised.pdf

[24] RIIO-2 Final Determinations. NGET Annex (Revised). 3 February 2021. Pp 33-36
https://www.ofgem.gov.uk/sites/default/files/docs/2021/02/final_determination_nget_annex_revised.pdf

[25] eg WPD

proposed ED2 trajectories for leakage reduction are more (or less) ambitious in ED2 when set against ED1. [26]

- **Compare between DNOs on the relative ambition of their proposed reduction targets and investment commitments for SF6 leakage.**

*Ofgem SF6 ED1 reports - SF6 banks and leakage*

In taking a high-level view of commitments on SF6, and with limited resource, it has not been possible for Sustainability First to directly answer these important questions. In practice, given the great variability in the information provided by DNOs, we are not clear whether the EAP material in fact offers ready answers – in particular on questions around comparisons.

In attempting a better overview against which to judge DNO plans on SF6, we looked back at the information reported in Ofgem's own annual distribution report for 2019-20 on SF6. In practice this information is also relatively limited.

Absent better information in business plans, Ofgem's own ranking and RAG-rating perhaps offers a helpful start to any base-lining process. The tables are organised by licence area for each DNO - rather than by DNO name - so we have also added our own summary for 19-20 by DNO[27].

**SF6 emissions as a percentage of the SF6 bank**

| | DPCR5 - 2013/14 | DPCR5 - 2014/15 | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 |
|---|---|---|---|---|---|---|---|
| ENWL | 0.42% | 0.21% | 0.10% | 0.39% | 0.37% | 0.24% | 0.48% |
| NPgN | 0.17% | 0.11% | 0.16% | 0.10% | 0.22% | 0.11% | 0.09% |
| NPgY | 0.57% | 0.44% | 0.46% | 0.53% | 0.32% | 0.24% | 0.25% |
| WMID | 0.54% | 0.32% | 1.69% | 0.88% | 0.76% | 0.65% | 0.43% |
| EMID | 0.28% | 0.08% | 0.41% | 0.28% | 0.25% | 0.27% | 0.42% |
| SWALES | 0.27% | 0.87% | 0.56% | 0.51% | 0.57% | 0.81% | 0.38% |
| SWEST | 1.39% | 1.12% | 0.90% | 0.60% | 0.91% | 0.58% | 0.59% |
| LPN | 0.02% | 0.05% | 0.02% | 0.04% | 0.02% | 0.06% | 0.09% |
| SPN | 0.08% | 0.07% | 0.08% | 0.08% | 0.17% | 0.09% | 0.06% |
| EPN | 0.22% | 0.19% | 0.19% | 0.27% | 0.23% | 0.10% | 0.13% |
| SPD | 0.49% | 0.47% | 0.01% | 0.01% | 0.24% | 0.04% | 0.05% |
| SPMW | 0.55% | 0.54% | 0.18% | 0.28% | 0.38% | 0.20% | 0.16% |
| SSEH | 0.18% | 0.27% | 0.11% | 0.07% | 0.03% | 0.16% | 0.21% |
| SSES | 0.47% | 0.46% | 0.52% | 0.55% | 0.78% | 0.88% | 0.73% |
| **Total** | **0.35%** | **0.32%** | **0.37%** | **0.32%** | **0.35%** | **0.30%** | **0.27%** |

Source *: Ofgem Annual Distribution Report. 2019-20*

[26] See section 4 below on proposed ED2 SF6 leakage targets.

[27] **ENWL** (Electricity North West) = ENWL**; NPG** (Northern Power Grid) = NPgN, NPgY; **WPD** (Western Power Distribution) = WMID, EMID, SWALES, SWEST; **UKPN** (UK Power Networks) = LPN, SPN, EPN**; SPEN** (Scottish Power Energy Networks) = SPD, SPMW; **SSEN** (Scottish & Southern Energy Networks) = SSEH, SSES.

**SF6 emitted as % of bank - SNAPSHOT**

| **Ranking** | 2015/16 | 2016/17 | 2017/18 | 2018/19 | 2019/20 |
|---|---|---|---|---|---|
| ENWL | 4 | 9 | 9 | 8 | 12 |
| NPgN | 6 | 5 | 4 | 5 | 3 |
| NPgY | 10 | 11 | 8 | 9 | 8 |
| WMID | 14 | 14 | 12 | 12 | 11 |
| EMID | 9 | 8 | 7 | 10 | 10 |
| SWALES | 12 | 10 | 11 | 13 | 9 |
| SWEST | 13 | 13 | 14 | 11 | 13 |
| LPN | 2 | 2 | 1 | 2 | 4 |
| SPN | 3 | 4 | 3 | 3 | 2 |
| EPN | 8 | 6 | 5 | 4 | 5 |
| SPD | 1 | 1 | 6 | 1 | 1 |
| SPMW | 7 | 7 | 10 | 7 | 6 |
| SSEH | 5 | 3 | 2 | 6 | 7 |
| SSES | 11 | 12 | 13 | 14 | 14 |

*Source : Ofgem Annual Distribution Report. 2019-20*

Below is our own summary of Ofgem's SF6 information on SF6 leakage against bank for each DNO (for the most recent reporting year 19-20).

| **SF6 reporting to Ofgem by DNO – 2019-20** | **SF6 bank (Kgs) – 2019-20** | **SF6 kg emitted – 2019-20** | **SF6 kg emitted as percentage of each DNO bank – 2019-20** (rounded) |
|---|---|---|---|
| **ENWL** | 16,098 | 78 | 0.48% |
| **NPG** | 36,195 | 63 | 0.17% |
| **SPEN** | 35,562 | 42 | 0.11% |
| **SSEN** | 27,156 | 172 | 0.63% |
| **UKPN** | 116,857 | 116 | 0.10% |
| **WPD** | 88,788 | 395 | 0.44% |
| **Total** | **320,656 kgs** | **866** | **0.27%** |

*Source : Sustainability First from Ofgem Annual Distribution Report. 2019-20*

From this Ofgem material, we conclude as follows.

*SF6 banks in 2019-20*

- Information on SF6 banks is submitted to Ofgem as 'total SF6 installed' (ie by volume (kgs)). This information should also be submitted in tCO2e to feed more transparently into SBT and net-zero calculations[28].
- Between DNOs, there are significant differences in the volume / size of SF6 banks (kg). UKPN and WPD each have a large share of the total DNO SF6 bank of 320,656 kg (taken together, approaching a 60% share).
- For some DNOs, there is a significant difference within their SF6 banks between their different licensed areas (i.e. SSEN, UKPN, WPD).
- In every DNO licence area except one (SSEN-Southern), the volume of the SF6 bank continued to grow in 2019-20 against the previous year. Several DNOs note in their EAPs that their overall SF6 asset holding is likely to increase due to the rate of new capital investment and the absence of suitable alternatives[29].

*SF6 leakage in 2019-20*

Against an overall DNO average of 0.27% leakage against the total SF6 bank (320,656 kg in 2019-20), our summary table indicates substantial differences on SF6 leakage at a DNO-level. Such differences will need a better understanding in future iterations of the SF6 strategies. For example in 2019-20 :

- UKPN with the largest SF6 bank by volume, had the smallest leakage-rate relative to its bank
- SSEN with the smallest SF6 bank volume, had the highest leakage-rate relative to its bank[30]
- WPD and ENWL have similar percentage leakage rates reported relative to their banks – albeit WPD's SF6 bank is five-times greater by volume than ENWL, so it is also perhaps important to understand the underlying asset picture.

Ofgem presently do not receive detailed information broken down by asset type - either in relation to the DNO SF6 bank or to SF6 leakage. For the longer-term such basic information will need to be recorded and reported to judge proposed DNO actions on SF6, including their adequacy or otherwise. EAPs (and detailed engineering justifications for ED2 which we have not looked at) offer some high-level insight into DNO priorities on tackling SF6 leakage-rates for their main deteriorating DNO assets. But more generally in terms of total SF6 bank, it is presently not feasible to judge either the practicality or the potential costs of possible SF6 phase-out or eventual removal. Nor indeed how far basic differences between DNO SF6 banks and leakage might also eventually impact individual DNO costs differently. This is the kind of detailed analysis that DNO SF6 strategies and plans will eventually need.

This over-view in Section I has drawn on available Ofgem and ENA/DNO material.

In Section II we now turn to the DNO ED2 environmental action plans and SF6 strategies.

[28] Ofgem guidance. 31 March 2021. ED2 Business Plan Template Data M23.Environmental Action Plan. pp 139-140.

[29] Eg. ENWL

[30] In their EAP, SSEN acknowledge this. They say that their ED2 focus on SF6 asset interventions are scheduled for SEPD (ie Southern). That SEPD leakage rates are significantly higher within SSEN and also comparatively high compared with other DNOs.

## Section II – DNO ED2 SF6 Targets and Strategies

### 3. Stakeholder views on DNO approaches to SF6 management

From a stakeholder and consumer standpoint, and as our main response to Ofgem makes clear, ED2 is not in any sense business-as-usual in environmental terms for DNOs. Net-zero necessitates major new areas of business activity and new spend - plus a step-change across all activity. The requirement to adopt science-based targets and to meet the UK's statutory net-zero targets both in own-operations and wider business activity feeds directly into DNO EAP commitments and priorities - including for SF6.

DNOs thoroughly tested their EAPs through multiple stages of engagement. They received strong support from both customers and stakeholders for DNOs to be ambitious on decarbonisation and net-zero as well as in other environmental areas. Likewise, DNOs undertook extensive testing of customer and stakeholder views on cost trade-offs to inform high-level decisions about levels of EAP spend relative to other business areas, and also to inform more detailed decisions on specific EAP commitments and priorities. Generally, from a consumer standpoint, the EAP proposals have been generally well-considered. In the face of current energy bill pressures however the materiality of EAP costs clearly must be well-understood.

Specifically on SF6, one DNO said that stakeholder feedback was that SF6 was a 'key priority'. The same DNO tested five possible levels of reduction for SF6 leakage set against expected potential bill impacts. A clear majority of stakeholders favoured the maximum level of ambition that was put to them, and the DNO felt reassured that the options presented were in the correct range and 'sufficiently ambitious'[31]. Another DNO reports that when stakeholders were asked about implementing a new management approach for a potent green-house gas found in some equipment, 89% understood and 81% said 'yes' and only 2% said 'no'[32]. A third DNO said that some respondents were shocked at the figures shared on the potency and impact of SF6 and recognised that investment to reduce SF6 emissions would be costly but said that if investment was delayed, the real cost would be felt by future generations in terms of climate change. They wanted the DNO to be smarter with its equipment, replacing older kit with more environmentally friendly alternatives, as and when this technology becomes available while being mindful of the costs associated with replacement before end-of-life. They also wanted to see the DNO proactively managing its subcontractors, ensuring they understood the SF6 impact of the equipment that they supply[33].

At the other end of the engagement spectrum on SF6, one DNO simply notes under a short section on 'customer and stakeholder engagement' that the importance of the environment, and specifically achieving net-zero, is recognized by customers and stakeholders alike – but that 'we do not have any specific customer feedback on SF6 emissions'.[34] They also note in their business plan summary that

[31] WPD – Supp Annex 2a – p 99 SF6 trade-offs. Against their present 17% SF6 reduction target, tested possible ED2 SF6 reduction targets of : 5% ↓(= minus-£0.06p p.a.); 10%↓ (= no bill impact); 15%↓ (= £0.08p p.a); 20%↓(=£0.10p p.a); further ambition / an alternative (uncapped).
[32] ENWL. EAP p 12
[33] NPG. Detailed Engagement Findings p 119. We did not locate a write-up where comparative bill impacts of different ambition levels for SF6 leakage and management were tested with stakeholders. The EAP p 13 discusses different costed options in light of stakeholder insights on 'delivery of an ambitious reduction level while remaining mindful of costs'.
[34] UKPN. EAP section on SF6 p 42.

they responded to feedback on their draft plan to make more ambitious commitments, inter al, 'on our dependence on SF6 switchgear'[35]

## 4. DNO ED2 commitments and SF6 leakage targets against bank

Ofgem's ED2 baseline expectations on leakage targets and reporting are as follows[36] :

- **Adopt a target for SF6 leakage reduction.**
- **Commit to reporting on total SF6 bank and leakage reduction rates using a common DNO methodology.**

The table below attempts to collate information from DNO EAPs relevant to their ED2 commitments and targets adopted for SF6 leakage reduction against their SF6 bank.

As noted, the considerable variability in DNO SF6 asset condition, and also the fact that DNO banks may increase at varying rates over ED2, mean that for each DNO the main ED2 'benchmark' on ambition-level on SF6 leakage reduction, must, for the time-being, be their own ED1 target. Or, alternatively their performance (however specified) against that target. At present, this is the only practical way to give context to ambition-levels for ED2 targets. Adoption of science-based targets should in the end drive a better understanding of the ambition level of DNO commitments to tackle leakage and also for reducing their SF6 bank.

Meaningful cross-company comparison on targets on the basis of information in the EAPs is hard. Even so, our table below of DNO SF6 leak-reduction targets might at least prompt some useful questions. In itself it doesn't offer conclusions on the relative ambition of DNOs in their ED2 proposals on SF6 leakage reduction.

Pulling this table together has not been straightforward. The EAPs do not necessarily set out clear information on initial ED1 SF6 leakage reduction targets - nor on ED1 out-turn performance against those targets in a standard or readily accessible way - so there may well be errors of interpretation in our table. Several EAPs also don't set out in a single place their ED2 leakage reduction targets alongside the specific investments proposed to deliver the targets, nor the expected cost. On balance, ENWL and NPG probably offer clearest context for their selected targets. NPG in particular has a clear and helpful graphic[37].

SSEN provide a very full account of their approach on SF6, but their leakage reduction target is baselined against 2019-20, so it is hard to understand the chosen 'ambition-level' relative to their ED1 target or their historic ED1 performance (plus their cost-information is redacted in their EAP). UKPN has also placed its proposed investments in the context of its science-based targets. Only one DNO, ENWL, openly recognises the uncertainty of target-setting against ageing assets. They commit

[35] UKPN. BP – p 9

[36] RIIO-ED2 Business Plan Guidance. 30 September 2021. Appendix 3. Environmental Action Plans (EAP). Baseline Expectations. Page 74 - https://www.ofgem.gov.uk/publications/riio-ed2-business-plan-guidance

**Sulphur Hexafluoride (SF6)**

- Commit to implementing a strategy in RIIO-ED2 to manage SF6 on their network. This should include economic and efficient actions to reduce leakage rates and where appropriate, economic and efficient SF6 asset replacement.
- Adopt a target for SF6 leakage reduction.
- Commit to reporting on total SF6 bank and leakage reduction rates using a common DNO methodology.

[37] NPG. Annex 4.6. EAP. Fig 4 p15.

to review their target 'at the end of the first two years of RIIO-ED2 and look to impose a stretch target if we are on track to meet our initial goal'[38]. This seems a good approach.

In their baseline expectation, Ofgem simply require a target to be set for leakage reduction, but do not suggest how this should be formulated relative to ED1 or in terms of 'stretch'. To support a more universally ambitious approach to SF6 leakage reduction across all DNOs, Ofgem may therefore wish to consider whether every DNO should similarly undertake a two-year review of the ambition of the targets currently proposed in their EAPs.

| DNO | SF6 ED2 commitment / target for leakage against bank | What is the ED2 target is baselined against ? | Ambition level of proposed ED2 target ? | Cost attributed to meeting ED2 target for SF6 leakage |
|---|---|---|---|---|
| **ENWL** | Maintain an SF6 leakage rate of below 0.30 % of total SF6 bank<br><br>Reduce carbon emissions by ~340 tCO2e p.a.<br><br>Commit to review leakage rate after 2 years – and look to impose a stretch target if on track to meet initial goal (EAP p 30) | EAP Appendix F – sets out clearly<br><br>ED1 *average leakage rate* to date = 0.33% relative to bank<br>ED1 forecast = 0.35%<br>ED2 target = 0.30%<br><br>*ED1 goal* was to reduce leakage against bank by > 20% -from a rate of 0.38% in 2013 to 0.30% by 2023.<br><br>In first six years of ED1, average SF6 leakage is 0.33% of total bank (i.e 48kg p.a ).<br><br>*NB – Ofgem Table - 19-20 leakage rate was 0.48% of bank* | EAP says :<br>(1) we will *replicate our ED1 target* to maintain a leakage rate of 0.3 %<br><br>Also : 0.3% would be an improvement of ~10% on *ED1 performance to date'* | £9.6m |
| NPG | Reduce SF6 losses by 15%.<br><br>Report annually on progress | Yes – a clear graphic on kg leakage agst bank from 2011. (Fig 4 Annex 4.6. EAP p15). Sets out ED1 'stretch target', actual emissions against ED1 target, end-ED1 forecast and trajectory of ED2 target<br><br>Since start of ED1, SF6 losses 23% lower. | Yes<br>Graphic suggests a reducing trajectory by against both ED1 out-turn and ED1 'stretch target' by end-ED2 | £0.3m p.a = £1.5m total Targeted asset replacement over four-years. Seven leak-prone assets with >5kg SF6 |

[38] ENWL. EAP p 30

| | | | | |
|---|---|---|---|---|
| SPEN | BP Commitment 75 : Reduce our SF6 leakage by 10% over the RIIO-ED2 period, compared to RIIO-ED1.<br><br>'Leakage needs to be signif reduced to achieve 2030 & 2050 CO2 redn targets' – despite ongoing higher SF6 deployment in SPEN network. | ED2 target is base-lined against ED1 out-turn (ie not against ED1 target)<br><br>Time-line back to 2013, indicates 'annual leakage at 0.75% of total SF6 mass against a target of 0.85%' | Unclear<br><br>EAP SF6 strategy notes due to better data-collection that leakage increased by 9% in 20-21 from 19-20 – with Manweb up 53%. | £5.159m (EAP p 99) |
| SSEN | Aim to reduce BCF impact from SF6 leakages by a minimum of 35% by 2028 from 2019/20 levels.<br>Also, begin reducing our holdings | Target is baselined against 2019-20.<br><br>EAP p 25<br>SBT (1.5 degrees) for delivery in 2033 agst 19-20 base-year means must reduce SF6 emissions 35% by 2028 and 55% by 2033<br><br>EAP p 25<br>'We had an ambitious ED1 target on both our networks to reduce SF6 by 15% and although we are currently behind, we are seeing benefits from the strategy and expect continued improvement of our performance in the final years of this price control'. | SSEN EAP p 43 Fig 9 on BCF notes the following SF6 emissions reductions<br>2016 - 3,165 mtCO2e<br>2017 – 3,105 mtCO2e<br>2018 – 4,281 mtCO2e<br>2019 – 4,568 mtCO2e<br>2020 – 3928 mtCO2e<br><br>Ambition level not clear. 2019 had a high emissions level (so may mask true ambition level against ED1 ?) | £5.6m<br>Aim to replace 45 units – but do not specify voltage etc<br><br>(Also, all EAP costs, incl for SF6, redacted) |
| UKPN | EAP 11.6<br><br>Reduce leakage to 0.1% of the installed bank by end-RIIO2.<br><br>A reduction of 9% against current performance.<br><br>0.1% leakage by end RIIO2 'which is a 1% contribution towards our carbon reduction target at the current bank' | Baselined against ED1 target of 0.2% - 'have consistently managed SF6 leaks below that target'<br><br>EAP App 16 – p 41)<br>ED1 baseline 2014-15 was 0.1% - (but target was 'up to 0.2%' in 18-19)<br><br>Current leak-rate is 0.11% of bank. | Ambition level set against ED1 outturn<br><br>Will tighten *target* to 0.15% of the quantity of SF6 on our network for the beginning of ED2 period – and then tighten *target* annually to reach our *goal of reducing leakage to no more than 0.1% by the end of ED2 – a 9% improvement on current performance*<br><br>'As we move toward this goal by the end of the | EAP Appdx 16 – p 42<br><br>£6m ex ante baseline: 12 schemes / 108 items of equipment 'to slow down rate of increase in SF6 bank (EPN - £1.26 m; LEB - £4.37m; £0.36m SPN)<br><br>Commitment to install no |

| | | | | |
|---|---|---|---|---|
| | | | period, we will ramp our target down from 0.15% which will maintain our industry leading performance'. | new 132kV or EHV (>20kV) SF6 equipment in ED2. (In ED1 replacement of 14 x 132kV units in hand) |
| WPD | Commitment 12 - Significantly reduce our impact on climate change by delivering a 20% reduction in SF6 losses and drive industry partners to develop technological alternatives to reduce overall volumes of SF6 on the system. | EAP p 35 &<br>Supp Annex2a. p99<br><br>Initial ED1 target was to achieve a leakage rate of 0.37% against bank by end ED1. This was expected to to reduce losses by 17% over 8 years.<br><br>By 2021, had achieved a 0.11% leakage rate (but see below for note on outturn against initial ED1 target due to a changed basis for leak recording).<br><br>EAP p 35 Fig 16.<br>In 2015-16 adopted a new basis for leakage recording (top-ups *plus* estimates of actual leakage). As a result, ED1 annual leakage target seems not to have yet been met revised reporting in any ED1 year so far - but perhaps may do so by end ED1. | Annex2b p 99: states that 'leakage rates are now so low there are diminishing returns and therefore a limit on the scale of further improvement that can be delivered'.<br>Following stakeholder testing, WPD propose to deliver a 20% reduction in SF6 losses over the 5-years of ED2 at a bill impact of £0.10 / customer p.a.<br><br>EAP p 35<br>'Whilst a 20% reduction may appear a conservative target for RIIO-ED2 it does represent an increase on our RIIO-ED1 commitment'<br><br>By end-ED2 aim to reduce SF6 leak-rate by 37% against current ED1 commitment. | No numbers or costs in EAP<br><br>Asset replacement: 11 kV – 'leak & replace' >11kV 'two leaks & replace'<br><br>Customer bill impact of £0.10 / customer p.a. |

*Source : Sustainability First. ED2 commitments and leakage targets pulled together from DNO ED2 SF6 Strategies*

## 5. DNO SF6 Strategies

*Overview*

Ofgem's baseline expectation on SF6 strategies is[39] :

- **Commit to implementing a strategy in RIIO-ED2 to manage SF6 on their network. This should include economic and efficient actions to reduce leakage rates and where appropriate, economic and efficient SF6 asset replacement.**

The ED2 sector specific methodology[40] noted that DNO strategies would to some extent mirror strategies for transmission IIG (insulation and interruption gases). Namely :

- **Proposed approach to reducing emissions**
- **Leak repair**
- **Asset management**
- **Procurement**
- **Innovation**
- **Collaboration for alternatives**

Ofgem decided against a DNO 'asset management target' as a baseline expectation for SF6. Rather, they expect this to reflect in the DNO SF6 strategies and also in associated reporting via the AER (annual environmental report).

In practice there is very considerable variability among the SF6 strategies. Some DNOs produce at best a couple of pages in their EAPS, indicating that a strategy remains a work in progress. Others set out a full strategy document either in their EAP or in a separate Annex. The most comprehensive are SPEN (within their EAP) and SSEN (EAP plus an SF6 Appendix). Possibly they are each ahead of the game being already required by Ofgem to have an SF6 transmission strategy, plus an incentivised approach to leakage. NPG also sets out a clear account of their EAP approach to SF6. Several DNOs also indicate a long-run SF6-free vision in the context of their commitment to science-based targets, but at the same time may not yet have developed a comprehensive strategy[41]. One DNO proposes collaboration on a strategy through the ENA[42].

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[39] RIIO-ED2 Business Plan Guidance. 30 September 2021. Appendix 3. Environmental Action Plans (EAP). Baseline Expectations. Page 74
https://www.ofgem.gov.uk/publications/riio-ed2-business-plan-guidance

[40] RIIO-ED2 Methodology Decision: 17 December 2020
https://www.ofgem.gov.uk/publications/riio-ed2-sector-specific-methodology-decision
Annex 1 - Delivering value for money services for consumers. Appendix 4. Para A4.3
'We therefore consider it is right for SF6 to be included within the baseline expectations **and have strengthened the expectation by outlining that DNOs should have an SF6 strategy.** We note that in RIIO-ET2, the **transmission operators' Insulation and Interruption Gas (IIG) strategies set out their proposed approach to reducing emissions, leak repair, asset management, procurement, innovation and collaboration for alternative IIGs. We consider a similar breadth of coverage from the DNOs' strategies would be welcome.** We also note that some respondents questioned whether an asset management target was an appropriate inclusion within the baseline expectations. At Consultation we included this as an 'and/or' requirement, however have removed this addition for the final Decision. We consider the SF6 strategy expectation and associated reporting within the AER to sufficiently cover this.

[41] UKPN, ENWL
[42] ENWL

| **Company** | **DNO SF6 Strategy** – how far does strategy in EAP cover the ground suggested by Ofgem in ED2 sector specific methodology ? |
|---|---|
| **ENWL** | 2-pages. Clear approach. Recognise more to do. Propose collaboration on a strategy via ENA |
| **NPG** | 4-pages. Clear approach. |
| **SPEN** | 10-pages. Comprehensive approach. |
| **SSEN** | 4-pages plus 13-page Annex. Comprehensive approach. |
| **UKPN** | 2-pages. More to do |
| **WPD** | 1-page. More to do |

*Source : Sustainability First*

*Core elements of strategies*

Although some strategies are clearer or more comprehensive, there is a set of common elements across DNO approaches.

SPEN has a strong asset-focus with a stress on the need for actions to be cost-efficient reflecting an approach which embodies 'reduce, replace where economic and to identify feasible alternatives'. In particular they give a full account of their different assets that contain SF6, and, also helpfully discuss state of play on available asset-alternatives, summarized in a good table – see below.

SSEN is the lead DNO on SF6 for the ENA and also for the DEFRA review of the F-Gas regulations. Although SSEN give no costed information, they set out a considered and detailed *process* for SF6 management – from basic inventory, to monitoring, measuring, leak-detection, replacement (incl supply chain involvement). This includes the following elements :

- Commit to efficient and economic actions to reduce leakage rates and improve management of SF6 assets
- Adopt target(s) for SF6 leakage and/or SF6 asset management
- Develop a reporting system to report on total SF6 bank , leakage reduction rates and where possible using a common DNO methodology.
- Develop and implement an 'alternative first approach' for replacement of all of our SF6 assets due for replacement. Our strategic aim is to work internally and externally to develop economic and efficient alternatives to SF6 to enable the long-term removal of this greenhouse gas from our system.
- Deliver on our Science Based Targets to reduce emissions as a result of SF6 leakage by 35% by 2028 and 55% by 2033 from a 2020 base.
- In SSEN, targets will be measured against output performance measures (KPIs) governed through the Asset Management System. To review & adapt as needed for the most economic and efficient outcomes for consumers.
- Be compliance-ready for GB legislation developments
- Enhance equipment handling procedures and processes;
- Record usage at all life-cycle stages (from purchase to disposal);
- Quantify and minimise emissions during testing, manufacturing, installation, operation and maintenance and reclaim gas at the equipment's end of life;
- Review the processes and training related to SF6[43].

[43] SSEN EAP. p 25

*Improved knowledge of SF6 bank*

Several DNOs note the important role for data analytics (NPG, SPEN) in obtaining a better understanding of their SF6 assets. Indeed, SPEN indicate that their reported leakage increased by 9% overall in 20-21 from 19-20 (in Manweb up by 53%), due largely to improvement in completeness of data collected[44].

SSEN say : 'Our strategy to minimise SF6 leakage from our switchgear, implemented in 2019/20, focuses on using updated data to improve our understanding of our SF6 assets'[45] As noted, SSEN show a relatively poor ED1 performance on leakage against bank in Ofgem's RAG-rating, but they now also seem to point the way on transparent disclosure about their SF6 assets[46].

Both SPEN and SSEN describe a detailed approach to their SF6 inventories. For example, as of May 2021, SSEN know that they have almost 11,000 SF6 assets in service, three-quarters of which are 10-30 years old. They describe the asset-classes most prone to leakage and at which voltage (over half = 6.6/11kV). For their total asset bank, they have identified the five asset-types which account for two-thirds of the total bank. And for equipment most prone to leakage, they know which asset models and manufacturers.

This more detailed understanding of SF6 assets also suggests that there is a potential for leakage to become problematic not just at higher distribution voltages (which contain most SF6) but also on medium-voltage equipment.

*Reducing total SF6 bank*

In line with their science-based targets at least three DNOs reference a long-term vision of SF6 elimination from their operations. Total DNO SF6 bank amounted to 320,656 kg in 2019-20 (7,310,956 tCO2e) and grew in every year of ED1. While as noted the total DNO SF6 mass is far less than that for transmission, each DNO has many tens-of-thousands of smaller SF6 equipment items right across their network. It should also be stressed that for most part this equipment doesn't leak and / or is sealed.

At the same time, new SF6 equipment will still be installed during the ED2 period.

SPEN say[47]: 'where modern SF6-free equipment is now available, we have considered whether otherwise healthy legacy SF6 filled plant should be replaced before its anticipated end of life. Currently, our cost assessments – which include evaluating the cost of carbon- suggest that it is not viable to replace good condition SF6 assets with like-for-like non-SF6 solutions. However, this will be kept under review.

SSEN spells out the case for an 'alternative first' approach[48]: 'Change will not happen unless we all push for it and that is why we are adopting an alternative first approach to all SF6 replacements, whereby investment decisions will have to justify why an alternative to SF6 is not suitable for any

[44] SPEN. A4c.3 – 6.12.2 p 98
[45] SSSN EAP p25
[46] SSEN EAP. Appendix B. Pages 106-118
https://ssenfuture.co.uk/wp-content/uploads/2021/12/A_13.1_EAP_CLEANFINAL_REDACTED.pdf
[47] SPEN EAP p 93
[48] SSEN EAP Appendix B. p 115

particular project. Project teams will have to demonstrate the business case for SF6 for every case put forward in ED2'.

WPD say they have a 'leak and replace' regime on 11kV distribution assets and a 'two leaks and replace' regime on larger or higher voltage assets but do not spell out their underlying CBA approach.

To meet their science-based targets, both NPG and UKPN each indicate an aim to reduce the total size of their SF6 banks. NPG notes[49] : 'our investment decisions are based on economic viability, but we recognise we have a responsibility to take proactive action where we can to minimise our environmental impact, as doing nothing would undermine our long term goals to achieve net zero operations by 2040.'

We did not have the resource to look at any of the accompanying Engineering Justifications nor the CBA material. And in any case, much of that material is unavailable to third-parties such as ourselves.

Under Ofgem's CBA methodology however, SF6 asset-replacement is invariably justified only at end-of-life despite the value of avoided carbon being factored into the assessment[50]. Elsewhere in our ED2 response to Ofgem we have stressed that the new BEIS figure for the enduring cost-of-carbon - applied in cost-benefit assessments and aligned to net-zero - is now three-times higher than the figure currently used by Ofgem in their CBA template. Ofgem will wish to revisit this. If applying the higher BEIS cost-of-carbon figure in their CBA assessments DNOs may perhaps now find - for those assets where reducing carbon emissions was a main benefit but previously ruled-out on cost-benefit grounds – that these may now show a higher benefit. One added complication is that at least two DNOs note how removing healthy SF6 switchgear also has a high embodied carbon cost, likely to reduce the total carbon benefit of early SF6 asset replacement[51]. The point remains however that in using Ofgem's current cost-of-carbon in CBA evaluations, an SF6 asset must presently prove fairly leaky before it will be considered for replacement.

It is therefore all the more important for the SF6 strategies to explore options, pathways and priorities for cost-efficient and considered steps on managing-down DNO SF6 banks over time. This will need a far clearer grasp of the full long-run costs and benefits, including carbon benefits, of asset replacement, viable options available and the sheer practicality of managing-down DNO SF6 assets to align with SBT time-frames. As noted, some DNO strategies are already some way down the track, while others on the face of it seem barely off the ground.

*Procurement of SF6 alternatives and approach to supply-chain – including DNO collaboration*

In the RIIO2 period, at both distribution and transmission voltages, engagement with manufacturers and the supply chain on cost-efficent procurement of non-SF6 and non-greenhouse gas alternatives has a new urgency. Not least, some current alternatives are understood also to contain at least some green-house gases. Given that those alternatives will also have long-asset lives the implications of their use also needs to be well-understood in terms of meeting company science-based and net-zero targets.

[49] NPG – EAP Annex 4.6. p 14
[50] Also accounting for an embodied carbon value associated with early-replacment
[51] WPD - EAP p 35. ENWL

Broadly speaking, on a life-cycle cost-analysis basis, the cost-effectiveness of replacement of SF6 assets with non-SF6 switch-gear decreases with decreasing voltage level. So, in general, 132 kV switchgear replacements are the most cost-effective options; replacement of 33 kV switchgear is significantly less cost-effective than 132 kV, and replacement of 11 kV switch-gear is the least-cost effective.[52]

DNO strategies reflect the differing availability and differing cost-profiles at the different distribution voltages of suitable alternative equipment. DNOs also seem to have differing degrees of engagement with the supply-chain. Subject to competition rules, procurement of SF6 alternatives is a clear area for significantly more sector-wide collaboration and push.

UKPN say[53]: 'there is currently no reliable, safe alternative to SF6 insulated equipment for the lower voltages we operate on our network that is available at scale'

NPG say[54] : 'to reduce the volume of SF6 on our network we need to replace our circuits with non-$SF_6$ alternatives. While alternatives to SF6 are being explored by manufacturers they currently have limited viability to be rolled out across the network. The feasibility of SF6-free solutions depends on the voltage level. NPG also notes it is the first DNO to trial indoor non-SF6 switchgear equipment at distribution voltage level[55].

- **Low voltage (LV) <1kV:** No solutions have been found to address assets at this level.
- **Medium voltage (MV) 1kV-52kV:** There are a limited number of products available in both primary and secondary distribution. Typically these cost 5 to 30 per cent more than SF6 equipment, require additional maintenance and widespread production capabilities have not yet been developed.
- **High voltage (HV) and extra high voltage (EHV), >52kV>150 kV:** SF6 free gas blends for gas insulated switchgear up to 145kV have been demonstrated with wide-spread commercialisation expected from 2025.

NPG indicate SF6 alternatives at both 132kV and 66kV currently to be ~30% higher-cost. Both SPEN and SSEN are likely to have practical experience to share with other DNO colleagues on 132kV alternatives.

SPEN devote a substantial part of their SF6 strategy to describe their active pursuit of alternative equipment supply[56] **: '**we will drive the development and adoption of SF6-free technologies, collaborating with supply chain and industry peers and piloting new technologies where technically viable'. As well as cost-efficiency, SPEN describe the physical and efficiency benefits that SF6 insulating characteristics bring – in particular enabling a smaller footprint at both indoor and outdoor sites – making substitution more of a challenge, especially at very low voltage. The SPEN summary table below gives a helpful snapshot on state-of-play.

[52] ENA Slides to Ofgem ED2 Decarbonisation & Environment Working Group. 19 February 2020. Impact assessment – alternatives to SF6 switchgear. Life-cycle cost-analysis – slide 16.
[53] UKPN - EAP App 16 – p 42
[54] NPG – EAP Annex 4.6. p 14
[55] ABB equipment
[56] SPEN EAP. A4C.3 p 93 section 6.12.1

| Switchgear/ System Level | Legacy Technology | Current Technology Interruption | Current Technology Insulation | SF6 alternatives available ? | Market Ready Date | Cost Change in RIIO-ED2 |
|---|---|---|---|---|---|---|
| **132kV** | Oil /Air Blast | SF6/Alt gas | SF6/Alt gas | Yes [Vac/Alt gas] | Now | ↑ |
| **EHV (33kV)** | Oil/SF6 | SF6/Vacuum | Solid/SF6 | No | 3yrs-plus | N/A |
| **HV Primary (6.6/11kV)** | Oil/SF6 | Vacuum | Solid/Air | Yes | Now | ↔ |
| **Secondary HV (6.6/11kV)** | Oil | SF6/Vacuum | SF6 | No | 5-8 yr | ↑ |
| **Overhead Line Switchgear** | Oil | SF6/Vacuum | SF6/Solid | Auto-reclosers (Yes) PM Switches (No) | Now – 3 years | ↔ |
| Source : SPEN EAP. Table 18: 'Switchgear and SF6 alternative development'. P.93 A4C.3 p 93 section 6.12.1 | | | | | | |

In sum, the DNO strategies as set out in their EAPs leave a great many unanswered questions for future procurement approaches. In light of company science-based and net-zero targets these questions require very active consideration in the ED2 period, including via strong collaboration effort (competition rules permitting). For example :

- For how long should new SF6 switch-gear continue to be installed in DNO networks – either as a replacement unit or for new load-related assets ? And at what voltages ?
- Do alternatives also contain greenhouse gases ? If so, in light of long asset-lives, for how long will it be prudent on grounds of either cost or carbon-reduction to install these alternatives ?
- Should DNOs agree priorities for their supply-chain engagement to better focus asset development ? e.g. higher / lower voltages ? indoor / outdoor switchgear ?
- Should there be more common DNO approaches to replacing leaking assets at different voltages pre-end-of-life ?
- What do DNO visions 'to eliminate SF6 banks' mean in practice ? How does this play out for small sealed SF6 units at the lowest distribution voltages which are not leaking ? i.e. is there a general consensus to leave these in place on a life-cycle cost-basis (followed by safe-disposal) ? How far might imperatives on green-house gas removal drive uneconomic early-replacement ? If so, are the operational and cost-impacts well-understood from both an affordability and resilience standpoint ?

*DNO Innovation on SF6*

Generally, the strategies do not emphasise DNO innovation as a focus for helping to tackle SF6 leakage, nor for tackling the potentially bigger long-term logistics, including the operational challenge and costs, of eventual elimination of SF6 banks.

There would seem to be two key areas for SF6 where innovation can be expected to make an important contribution in ED2.

*Innovation for leakage detection, leakage reduction and overall improvement in asset monitoring and management :* Several DNOs introduced infra-red SF6 leak-detection in ED1 and some DNOs

mention plans to introduce or increase this capability in ED2. Indeed, it is not clear why this is not referenced as standard practice for all DNOs in ED2. There are also several references to the use of improved data-analytics in SF6 asset-management, but other than SSEN these are not expanded on. There is one brief reference to exploring potential opportunities with asset recovery contractors and manufacturers on the recycling of used SF6 gas.

*DNO collaboration and greater engagement with manufacturers and the supply chain in developing SF6 alternatives* – especially at lower distribution voltages. As discussed above, this area is rightly a main focus for DNO innovation on SF6 and the strategies outline how several new investments are planned on this basis in ED2.[57]

Given the many uncertainties above, we would wish to see DNOs commit to innovation actions in both of these major areas with regular progress reports via their Annual Environmental Reports.

## Section III – Suggestions for Ofgem on SF6 Incentives

### 6. Ofgem draft determinations and regulatory incentives for SF6 in ED2

*Incentives - headline conclusion*

From both a decarbonisation and consumer standpoint, DNOs have a particular SF6 asset-management challenge. There are long-run risks – logistical and operational – and potentially high-cost. Even with adequate leak management, SF6 assets need life-long containment and safe-disposal. Critically, suitable equipment alternatives are not yet cost efficient or even commercially available at every distribution voltage.

Some core elements for addressing the SF6 challenge are certainly reflected in DNO EAPs and SF6 strategies. Nevertheless, we still see a need for concerted effort and clear incentives to drive progress in this relatively 'unseen' and unglamourous asset-management area.

Our specific suggestions for Ofgem on the DNO SF6 strategies are two-fold.

- At draft determination stage to clarify key elements in Ofgem's SF6 baseline expectations

– and also very important -

- To introduce financial regulatory incentives for the SF6 strategies to drive a gear-change in DNO outputs and outcomes on SF6 by the end of the ED2 period. These incentives need to shape a better grasp of what 'good-looks-like' for SF6 asset management equipment items large and small in the long-run. The incentives also must actively motivate joint-working among DNOs and the supply chain, so that viable and cost-efficient solutions can be identified capable of addressing the long-run SF6 distribution company business risk.

Ofgem's ED2 baseline expectations on SF6 - for a leakage reduction target and for a common reporting methodology – are best described as 'minimal'. Even so, we much welcomed the introduction, for the first time, of the need to adopt and implement an SF6 Strategy which brought DNOs in line with transmission. Unlike for transmission however, we regret that Ofgem saw

[57] E.g. NPG, SPEN

reputational regulation as the way forward for SF6 in ED2[58] – through the SF6 Strategies and the Annual Environmental Report – whether for establishing new leakage targets, for addressing actual leakage performance, for delivering a common reporting methodology, or, longer-term for reducing the SF6 bank through improved approaches to asset management.

In the meantime, DNOs have begun to take on board the practical reality of science-based targets and statutory net-zero targets. This fundamental change in the external drivers to decarbonize DNO operations – against clear deadlines - must surely now also knock-through into DNO and Ofgem thinking on the nature of SF6-equipment as a future business risk. Over time, science based targets and net-zero will entail near-elimination of DNO SF6 assets.

Against this wider context, our review of the DNO SF6 strategies reinforces our initial thinking[59] that SF6 presently remains a neglected area of DNO asset management. In general terms, neither the business plans nor the Environmental Action Plans suggest that this area is a priority for either the companies or for Ofgem. Yet from both a consumer and environmental standpoint clear long-run risks attach to a business-as-usual / 'do-little-or-nothing' approach – logistically, operationally and in cost-terms.

We see a strong case for Ofgem to recognise the need to do more in ED2 to drive concerted action by DNOs to avoid unnecessary longer-term costs and risks being picked up by future consumers, possibly in a disproportionate way if everybody gets this wrong.

*Draft determinations*

**At draft determination Ofgem should** therefore look to :

- **Common reporting methodology** - set a date for completion of the methodology plus the start-date for common reporting into Ofgem.
- **ED2 Leakage Targets** – request each DNO (1) to express their proposed ED2 leakage target against a common agreed ED1 baseline so that the relative ambition-level of the ED2 targets are clear and (2) to describe why the target represents a 'stretch' against the newly-agreed common ED1 baseline. There is already a clear precedent in transmission for just such a well-defined Ofgem approach to target-setting[60].
- **SF6 Strategies** – consider whether each SF6 strategy as set out in company EAPs sufficiently meets the Ofgem baseline expectation. As noted, we consider two may still have 'more to do'.

[58] ED2. Ofgem Common Methodology Decision. December 2020.
Unlike transmission, Ofgem decided against a leakage penalty – and also wished to avoid incentivising needless asset replacement.

[59] https://www.sustainabilityfirst.org.uk/images/publications/other/Working_Paper_-_Greening_electricity_distribution_networks.pdf

[60] RIIO-2 Final Determinations Electricity Transmission System Annex (Revised). 3 February 2021. **Insulation and Interruption Gas (IIG) Leakage ODI-F. Pp 43-45 .**
https://www.ofgem.gov.uk/sites/default/files/docs/2021/02/final_determinations_et_annex_revised.pdf
Initial baseline calculated, using the average leak-rate from 2013-20, with separate levels of improvement applied (0-15%) for each TO. Initial leakage rate is multiplied by the IIG Inventory at the end of RIIOT-1 to prove a target baseline in tonnes of CO2e.

*Within-period financial incentives for SF6 strategies*

Ofgem has proposed a financially-incentivised balanced score-card for the environment in the ED2 period. In their EAPs, DNOs set out their own proposals for which elements of their EAP performance should be financially incentivized. No DNO has suggested that SF6 should be financially incentivised under the score-card, notwithstanding that this is a controllable scope 1 BCF emission.

Thus the companies and Ofgem both favour a reputational approach to regulation of SF6 in ED2. For the reasons set out in the preceding paragraphs and reflected throughout this paper we disagree. SF6 demands a stronger regulatory signal in ED2. A reputational incentive is inadequate to the task of driving the change-of-gear necessary for DNO approaches to their SF6 risk over the next five years – albeit annual reporting to Ofgem via a common methodology - and also reporting more widely on their SF6 strategies via the AERs – is at least an improvement.

We would therefore strongly encourage Ofgem to consider a 'within-period' SF6 financial incentive along the following lines.

- **A financial incentive for SF6 leakage against target** – while we agree that at distribution voltages SF6 leakage is comparatively low by volume, a financial incentive would send a far sharper signal for better outcomes - across DNO leakage performance and reporting, gas-handling, leakage monitoring, leakage management and equipment repair. A well-defined leakage target would offer a readily quantified output suited to a financial incentive. One option would be to include this incentive as a part of the environmental balanced score-card. Also, if desired, (as per transmission), it may be feasible to acknowledge genuine difference in the underlying reasons among DNOs for their SF6 leakage position by switching-on the penalty / reward elements of the incentive differently. It would also be possible, as one DNO already proposes, to revisit the ambition of a target after two years.

- **A financial incentive for the SF6 strategies** – development of DNO SF6 strategies and acting on these over the next five years ranks highly in addressing the considerable business risk which SF6 represents. Given the significant variability in the SF6 strategies presented in the EAPs, we conclude that some form of financial incentive for the strategies, as well as one for the leakage-reduction target as proposed, would send an important signal from Ofgem to DNOs about the need for pro-active management of their SF6 business risk in ED2. The incentive would reward overall quality of the SF6 strategies against the Ofgem criteria, including approaches to inventory, reporting on asset-management and bank, integrated data-analytics, innovation, and, important, active DNO collaboration on developing viable alternatives at all voltages through the supply chain. Because of the long-run nature of the DNO SF6 asset management challenge, and the potential scale of uncertainty, any financial incentive on SF6 is likely to be a mix of quantitative and qualitative elements (for example, like the per DSO strategy output delivery incentive). One possible model for Ofgem to consider might be the ED1 Distribution Losses Discretionary Reward. This was put in place at the start of ED1 to make progress on DNO losses strategies and to spur innovative approaches[61]. A financial incentive for SF6 strategies could also be introduced via the balanced score-card. Or, via a separate incentive. Because the desired outcomes here are both long-run and complex, perhaps a separate incentive may be

[61] The Losses Discretionary Reward (LDR) was introduced in the RIIO-ED1 price control to encourage and incentivise DNOS to undertake additional actions to better understand and manage electricity losses https://www.ofgem.gov.uk/publications/riio-ed1-losses-discretionary-reward-submissions-tranche-three

appropriate. Either way, Ofgem should not reject the idea of a financial incentive out-of-hand on the basis that the SF6 strategies do not lend themselves to a simple quantifiable metric set. Rather, Ofgem should view a financial incentive as a suitable means to drive progress in an environmental area in need of far more active attention both by themselves and by the companies.

**Sustainability First**
**9 February 2022**

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