

**Sustainability First**  
**ED2 Business Plans - Ofgem Call for Evidence**  
**8 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.<sup>1</sup>

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)<sup>2</sup>. 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).<sup>3</sup> 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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<sup>1</sup> For example, our major three-year Fair for the Future Project - <https://www.sustainabilityfirst.org.uk/publications-fair-for-the-future>

<sup>2</sup> 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>

<sup>3</sup> 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. SEN 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.

SEN, 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 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 than 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 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 300mm<sup>2</sup> (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 (35mm<sup>2</sup>) (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.