

RIIO-ED2 Decarbonisation and the Environment Working Group: session 3

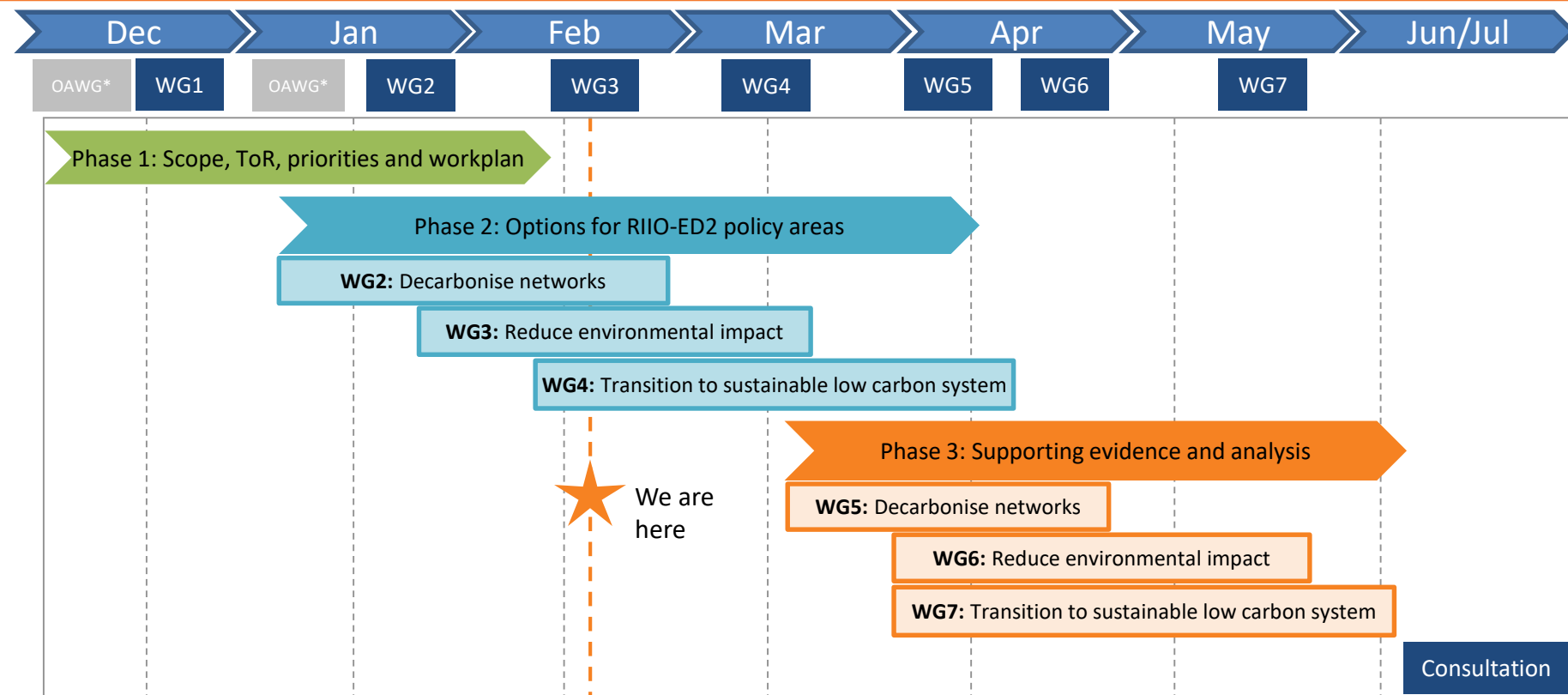


RIIO-ED team
19 February 2020

Purpose of today's meeting is to:

- Discuss options for reducing environmental impact of network activities in ED2, specifically with regards to SF6 and PCBs.
- Recap actions assigned at previous meeting, including reviewing case for decarbonisation incentive and losses mechanism

Timings	Agenda item
10:00 – 10:30	Introduction/Aims of session
10:30 – 11:30	1. SF6 and PCBs: a) ENA updates on work carried out so far, key learnings and implications for RIIO-ED2 (led by SSE) b) Roundtable discussion on proposed approaches in ED2 (All)
11:30 - 12:00	2. Environmental reporting: a) Update on RIGs work and reporting requirements for BPDTs (led by Ofgem)
12:00 – 12:30	Lunch
12:30 – 13:30	3. Actions from previous meeting: a) Behaviours and outcomes we want to see in ED2 and how the extent to which these would be realised with current arrangements in place (All, led by NPg) b) Consideration of what a reputational incentive for losses could look like, and what could be leveraged in the existing arrangements eg losses strategy (led by SPEN)
13:30 - 14:00	Actions and next steps



Phase 1 Settle scope of Group, share and agree a ToR & carry out a prioritisation exercise to inform future work (WGs 1 and 2).

Phase 2 Explore options (for outputs and incentives) for the policy areas under consideration by the Group and the merits and drawbacks of these options. **Group members should put forward policy options for discussion and review ahead of these sessions** (WGs 2, 3 and 4).

Phase 3 Gather evidence and analysis to support and develop options (WGs 5, 6 and 7). As such, options should be brought to the Group by middle of March, to ensure sufficient time for consideration.

In some sessions we may discuss more than one issue area but the aim is to focus on one issue area per session. The above plan allows us to discuss an issue area more than once where policy options can be developed over time.

Proposed dates and locations for D&E working group sessions

WG session	Date	Time	Location
1. Introductory session	9 December 2019	10am-4pm	Ofgem London offices (Room 1.11)
2. Group priorities and policy options: Decarbonising the networks (losses & BCF)	28 January 2020	10am-4pm	Ofgem Glasgow offices (Rooms 1 and 2)
3. Policy options: Reducing environmental impact	19 February 2020	10am-4pm	Ofgem Glasgow offices (Rooms 1 and 2)
4. Policy options: Transition to sustainable, low carbon energy system	12 March 2020	10am-4pm	Ofgem London offices (Room 1.09)
5. Evidence and analysis: Decarbonising the networks	2 April 2020	10am-4pm	Ofgem London offices (Room 1.19)
6. Evidence and analysis: Reduce environmental impact	23 April 2020	10am-4pm	TBC
7. Evidence and analysis: Transition to low carbon energy system	21 May 2020	10am-4pm	TBC

Item 1: Recap of actions from previous session – Ofgem

Actions from previous session:

Action	Allocated to	Due date
Members to confirm whether there is a conflict for them on 2 April	All	7 February 2020
Decarbonisation incentive - scenarios in ED2 and how they would fare against current arrangements.	All to contribute to this. To be coordinated by NPg	Material to be shared week prior to meeting, 12 February 2020
Members to bring ideas to the next meeting on what a reputational incentive for losses could look like, and what could be leveraged in the existing arrangements eg losses strategy	All to contribute to this. To be coordinated by SPEN	Material to be shared week prior to meeting, 12 February 2020
SPEN to send a link to the WSP reports to the group	SPEN	7 February 2020
BCF consistency in reporting - ENA work to be done on this. DNOs to give an update at the next meeting	DNOs through ENA	19 February 2020

Item 2a: SF6

Energy Networks Association

ENA Working Group: Impact assessment - Alternatives to SF6 switchgear Update for ED2 DEWG

David Nankivell
19 February 2020

- ❖ **The ENA have worked with the member companies to develop a report (currently in draft form) that enables engagement with the European Commission (Re: Review of the F-gas Regulation 517/2014) as they consider alternatives to SF₆-filled MV switchgear with a view to ensuring that any F-gas Regulation amendment is sensible and practical for UK impacted companies.**
- ❖ **The ENA engaged with an expert 3rd party (Threepwood) to develop the report.**
- ❖ **The content of report focuses on the assessed impact of a ban on using SF₆ for new switchgear installations (new non-SF₆ switchgear being installed in applications currently covered by SF₆ switchgear – all voltages). Assessment of the possible effects of a move towards the use of SF₆-free switchgear at distribution and transmission voltages.**
- ❖ **This presentation gives a summary of the initial findings in the report. The report considers 4 aspects (see next slide)**

STAGE 1

**Asset Population
Statistics (Population
of installed SF₆
switchgear)**

STAGE 2

**SF₆ Alternative
Technology Matrix
(alternatives to SF₆
switchgear for the UK
market)**

STAGE 3

**Emissions Analysis
(Annual SF₆ emissions
versus projected
emissions with and
without an SF₆ ban)**

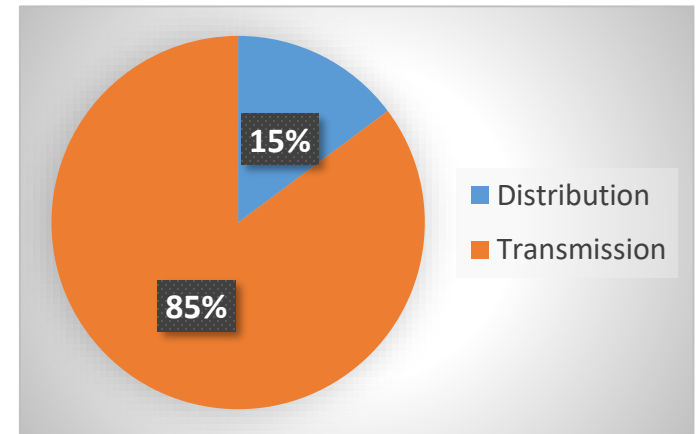
STAGE 4

**Lifecycle Cost Analysis
(Analysis of adopting
alternative technology
compared with
retaining SF₆
switchgear)**

Asset Population Statistics

- ❖ Data from Energy Networks Association (ENA) Member Companies for their in-service switchgear containing SF_6 was collated.
- ❖ All voltages levels were considered, covering two main categories (based on the EU consultation)
 - Distribution switchgear - operating voltage ≤ 52 kV
 - Transmission switchgear - operating voltage > 52 kV
- ❖ The total mass of SF_6 installed in switchgear is currently about 1,300 tonnes. Of this, 15% (circa 195 tonnes) is installed in distribution switchgear.

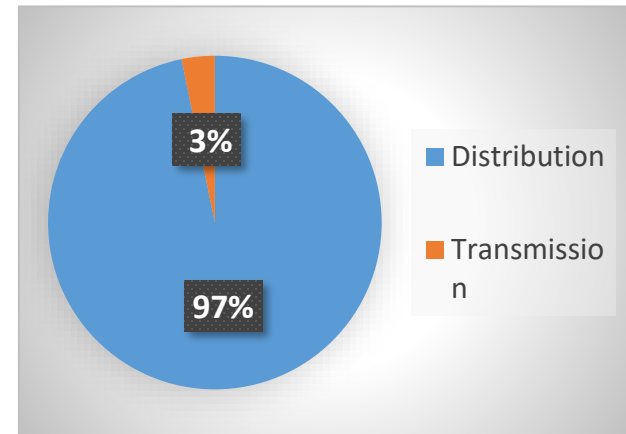
Electrical Switchgear installed capacity of SF_6 = 1,300 Tonnes



Asset Population Statistics

- ❖ Distribution switchgear accounts for around 97% of the total population of 230,730 SF₆ switchgear units in service at all voltages
- ❖ 11kV Ring main units (RMUs) account for 70% of the total population of distribution SF₆ switchgear installed.

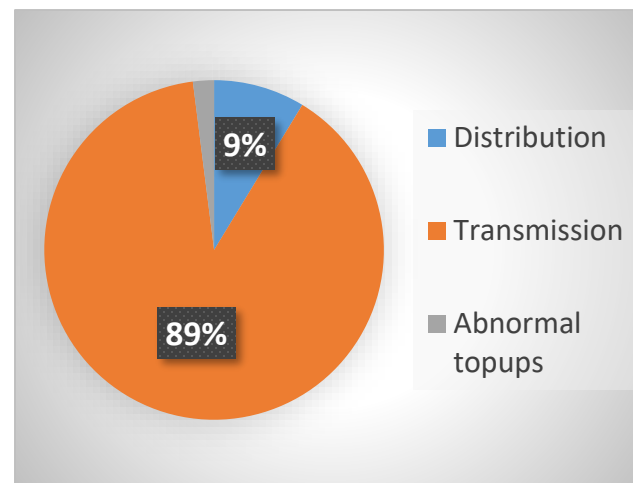
**Total population of SF₆ switchgear
units = 230,730**



Emissions Analysis

- ❑ Data for SF₆ emissions (e.g. reported under RIIO ED1, RIIO ET1) was collated to consider SF₆ emitted from ENA Member Companies current switchgear
- ❑ 89% of emissions are attributed to transmission voltage switchgear.
- ❖ For 11 kV switchgear, the SF₆ emissions are small per unit - accounting for only 0.35 tonnes per annum for the whole population of this switchgear in GB and Northern Ireland

Total SF₆ emission from switchgear



SF₆ Alternative Technology Matrix

- ❑ A review of present and emerging 'alternative' switchgear products was undertaken.
'Alternative' refers to switchgear technology using alternative electrical insulation and switching media to SF₆.
- ❑ During the review, BEAMA and its members contributed to discussions and provided information on alternative technologies.
- ❑ In general, there are alternatives to SF₆ switchgear on the market today for all switchgear applications up to 33 kV.
- ❑ At system voltages of 66 kV and above, manufacturers have been developing alternatives and working with end-users with an expectation that all major switchgear products will be developed by 2025.

However, even though non-SF₆ switchgear alternatives may be available, footprint and/or weight may limit or prevent adoption in some cases. There may also be other compatibility, technical or safety issues which would require satisfactory solutions to be found before non-SF₆ alternatives could be adopted.

- ❑ A life cycle cost analysis (LCCA) of adopting the alternative technologies, compared with retaining SF6 switchgear was undertaken
 - 8 specific switchgear applications were considered
 - The LCCA has calculated according to the NPV method, using the Ofgem RIIO ET2 Cost Benefit Template version 1.3
 - The amount of SF6 removed due to replacement of the SF6 switchgear with non-SF6 types was analysed.

❑ On completion of the LCCA - switchgear application types were ranked in order of increasing cost per kg of SF₆ emission removed by replacement with non-SF6 switchgear.

❑ **Broadly speaking, the cost effectiveness decreases with decreasing voltage level**

❑ In general, 132 kV switchgear replacements are identified as the most cost-effective options for removing SF₆ emissions.

❑ Replacement of 33 kV switchgear is significantly less cost effective than 132 kV

❑ Replacement of 11 kV switchgear is the least favourable option.

ED1 arrangements for SF6:

- The SF₆ mechanism is a reputational scheme based on a league table of each DNO's annual SF₆ reduction against a baseline. DNOs report:
 - Their SF₆ 'bank' ie total amount
 - SF₆ emitted
 - SF₆ emitted as % of bank

Justification (RIIO-ED1 strategy consultation and decision text):

- Leak rate threshold may be 1-2%, though as equipment ages leakage rate may increase.
- There is a concern that SF6 usage on the distribution system is not adequately monitored and managed, particularly when considering the potential equivalent carbon impact.
- We will introduce **enhanced regulatory reporting specifically for SF6**. We consider that **DNOs should be preparing themselves for the possibility of increased external obligations and reporting on SF6 emissions, such as the proposed amendments to the F Gas Regulations 2009** and Greenhouse Gas Emissions Regulations 2013 being developed by government.

How have DNOs performed?

- Performance against SF₆ emissions is mixed across the industry: some DNOs continue to make good progress, but others have suffered isolated incidents that have increased their overall emissions. DNOs also state some changes in performance are a result of changes to reporting methodologies.
- All DNOs have committed to achieving their targets by the end of the price control.

Key questions for discussion:

1. Is this reputational scheme still fit for purpose in RIIO-ED2?
2. Is additional monitoring required? How can we improve consistency in reporting?
3. What value do consumers attribute to a reduction in SF₆?

Item 2b: PCBs

Energy Networks Association

ENA PCB Strategy Update for ED2 DEWG

David Nankivell
19 February 2020

- ❖ In 2014 Environment Agency (EA) mandated that all Network Operators (T&D) Transformers to be placed on EA PCB Register. (Guilty until proven Innocent). *

- ❖ In 2019 the EU revised the Persistent Organic Pollutant Regulations 2019/1021.

*Member States shall identify and remove from use equipment (e.g. transformers, capacitors or other receptacles containing liquid stocks) containing more than 50 ppm PCBs and volumes greater than 50 ml as soon as **possible but no later than 31 December 2025.***"

- ❖ Significant impact on UK and Ireland network operators.

- ❖ UK legislation allowed Transformers to remain in service until end of operational life. Now this changes to a deadline of 31 December 2025. All transformers to be at a limit of 50ppm or less.

- ❖ DEFRA currently preparing UK legislation (including Impact Assessment) to enact the revised EU POP Regulations.

- ❖ Possible Supply Chain issues including equipment and workforce/third party providers.

*Note different approach in Scotland (SEPA)

- ❖ In 2018 ENA provided DEFRA with total numbers of Transformer population and estimated costs to replace including best and worse case scenarios.
- ❖ In November 2018 ENA established a Strategic Liaison Group and Technical sub-Group
- ❖ Sub group focussing on removing transformers (PMT) from EA register by cohort statistical modelling and to develop non-intrusive testing in conjunction with equipment manufacturer's, technology companies.
- ❖ Strategic group focusing on development of the ENA PCB Strategy in conjunction with the relevant regulators
- ❖ EA also preparing a Regulatory Position Statement (RPS) – ENA Strategy to be an annex to the RPS.

The key objective is for ENA Member Companies, in consultation with environment agencies, to adopt an agreed approach to identify and subsequently remove PCB free equipment from PCB registers and to provide relevant information to allow each ENA MC to develop their own strategy for removing PCB contaminated units from their electricity networks to meet the 2025 deadline.

❖ Cost Implications –

We estimate that a cost to the industry could be in the region of £828M.

- Time, resource, increased demand on supply chain etc.

- The uncertainty exists because it is currently unclear what proportion of units contain PCBs. Whilst data on past units removed suggests that the proportion of units already removed that contained PCBs is below 2%, it is not currently possible to say whether this also applies to the units still installed. We have therefore used a conservative minimum figure of 10% for the replacement of Pole Mounted Units.

- ❖ Expect ENA strategy (work of the cohort group) to provide increasing levels of data on the type, number and location of assets affected by the POPs legislation and its requirements.
- ❖ Timing in terms of levels of certainty and associated costs will be major considerations.
- ❖ Cost implications for meeting the POP regulations and hard 2025 deadline risks driving market related cost inefficiencies in the supply and installation of equipment.
- ❖ Consideration needed on how network activities and investments/expenditure as a consequence of the POPs legislation are taken into account under the ED-2 framework.
- ❖ The Working Group are asked to note this update and remain cognisant of the need to consider this issue when formulating the framework for ED-2.

Item 3: Environmental reporting – Ofgem-led



Data share Environment & Innovation Table summaries 2018/19 (Ofgem RIGs)

January 2020

E1 - Visual Amenity

ED1 to Date	TOTAL								
£m 2012/13 prices	OHL in Designated Areas (Km)	LV OHL removed (Km)	HV OHL removed (Km)	EHV OHL removed (Km)	TOTAL OHL removed (Km)	UG Cable Installed (Km)	Cost £m Inside Areas	£m/Km removed	Cost £m Outside Areas
ENWL	3,545	5.6	21.6	-	27.2	29.3	3.6	0.13	-
NPg	4,376	32.6	22.5	-	55.0	58.1	7.7	0.14	-
WPD	12,981	5.2	12.3	-	17.5	24.5	2.5	0.15	-
UKPN	6,758	1.2	9.5	1.8	12.6	17.8	2.2	0.17	-
SP	3,563	2.9	8.8	-	11.7	2.3	1.0	0.09	-
SSE	15,487	0.6	10.8	1.7	13.0	15.0	2.1	0.16	-

- some of the total costs do not agree with those reported in the costs and volumes pack - Annex J guidance (point 2.6) states that costs should be equal to those on CV20
- There are some differing ratios of UG cable installed /OHL removed – we appreciate this may relate to a variety of DNO specific circumstances or solutions , but may also relate to differing interpretation of the RIGs - there is definitely some ambiguity in the RIGs relating to ‘UG cable installed’, the Annex A definition states volume energised in the year, whereas Annex J section 2.4 states activities undertaken in the year, we should agree consistent interpretation.

E2 - Environmental Reporting

ED1 to Date - Environmental Reporting Costs													
Em 2012/13 prices	Undergrounding for Visual Amenity	Non-Undergrounding Visual Amenity Schemes	Oil Pollution Mitigation Scheme - Cables	Oil Pollution Mitigation Scheme - Operational Sites	Oil Pollution Mitigation Scheme - Non Operational Sites	Persistent Organic Pollutant asset changes	Persistent Organic Pollutant oil changes	Persistent Organic Pollutant oil testing	SF6 Emitted Mitigation Schemes	Noise Pollution	Contaminated Land Clean Up	Environmental Civil Sanction	TOTAL
ENWL	0.0	0.0	-	0.9	-	-	-	-	-	0.2	0.6	-	1.8
NPg	-	-	-	1.3	-	0.1	-	-	-	0.9	0.4	-	2.8
WPD	0.2	0.0	1.5	2.8	1.9	-	-	-	0.1	0.8	0.3	-	7.6
UKPN	-	-	0.0	0.8	-	-	-	-	-	0.7	2.8	-	4.3
SP	-	-	-	3.3	0.4	-	-	-	-	0.4	0.1	-	4.2
SSE	-	-	0.2	2.3	0.0	-	-	-	0.0	1.0	0.7	0.1	4.3

ED1 to Date - Environmental Reporting Activity															
Volumes	Undergrounding for Visual Amenity - km removed	Non-Undergrounding Visual Amenity Schemes - #	Oil Pollution Mitigation Scheme - Cables - #	Oil Pollution Mitigation Scheme - Operational Sites - #	Oil Pollution Mitigation Scheme - Non Operational Sites	Persistent Organic Pollutant asset changes - #	Persistent Organic Pollutant oil changes - #	Persistent Organic Pollutant oil testing - #	SF6 Emitted Mitigation Schemes - #	Noise Pollution - # Interventions	Contaminated Land Clean Up - #	Environmental Civil Sanction - #	Fluid Used to Top Up Cables - Fluid ltrs	SF6 Emitted - kg	Total Noise complaints received - #
ENWL	-	31	-	38	-	-	-	-	-	19	30	1	175,543	162	127
NPg	-	-	-	333	-	-	-	-	11	20	7	39	132,420	385	142
WPD	0	1	53	148	36	-	-	-	20	23	-	-	103,392	1,995	58
UKPN	-	-	-	6	-	-	-	-	5	21	307	64	957,202	454	148
SP	-	-	-	91	3	-	-	-	-	17	-	-	32,405	225	20
SSE	-	-	5	71	6	-	-	-	2	7	34	4	105,383	672	37

Areas of possible inconsistency:

- Oil pollution mitigation schemes
- Contaminated land clean up (Existing RIGs issue – Annex A item 9)
- Environmental civil sanctions

E3 - Business Carbon Footprint (BCF)

ED1 to Date tCO ₂ e	DNO + Contractors						Losses	TOTAL BCF
	Buildings Energy Usage	Operational Transport	Business Transport	Fugitive Emissions	Fuel Combustion	TOTAL		
ENWL	31,471	29,416	5,470	3,836	14,968	85,161	2,107,635	2,192,796
NPgN	18,825	34,992	5,616	2,108	15,109	76,650	1,141,700	1,218,350
NPgY	27,963	34,607	5,939	6,672	17,666	92,847	1,942,666	2,035,513
WMID	33,708	42,552	4,609	20,646	7,549	109,062	2,021,057	2,130,119
EMID	44,189	41,949	4,609	5,892	7,602	104,240	1,920,848	2,025,088
SWALES	19,603	25,903	2,332	9,969	5,769	63,575	702,402	765,977
SWEST	23,869	33,960	3,918	8,969	8,823	79,539	955,194	1,034,733
LPN	25,978	31,354	4,611	1,360	3,927	67,230	2,807,531	2,874,761
SPN	19,334	29,137	5,484	2,109	22,751	78,814	1,969,308	2,048,123
EPN	40,941	45,002	6,916	6,877	17,201	116,937	3,493,931	3,610,868
SPD	33,320	18,872	5,453	998	2,886	61,529	1,327,943	1,389,472
SPM	27,215	23,361	4,499	4,351	1,679	61,104	1,097,690	1,158,794
SSEH	43,296	23,589	3,007	275	38,176	108,343	790,233	898,575
SSES	55,348	47,905	5,367	14,644	17,093	140,358	2,588,662	2,729,020
Ind. Avg	31,790	33,043	4,845	6,336	12,943	88,956	1,776,200	1,865,156

- There is evidence of differing and/or incorrect scalars used in some of the calculations for values above
- Some diverse value ranges – most apparent for ‘Fuel Combustion’ and ‘Fugitive Emissions’
- Are Contractor emissions reported consistently? Annex J guidance (Point 2.25 states – *“As far as possible, DNOs must try to ensure that data provided from different contractors is based on consistent assumptions. Ofgem continue to work with DNOs to develop the consistency of reporting of contractors’ emissions.”*

E4 - Losses [Initiatives] Snapshot

Estimated Cumulative ED1	Estimated Losses Benefit over Baseline Scenario (MWh)	Distribution Losses - Justified Costs over 'Baseline Scenario' (£m)	Avoided DNO costs over 'Baseline Scenario' (£m)	Distribution Losses benefits over 'Baseline Scenario' (£m)	Cumulative discounted net benefits (£m)
ENWL	(158,129)	11.7	0.0	6.7	0.8
NPgN	(2,523)	0.8	0.0	0.3	(0.1)
NPgY	(5,994)	2.2	0.0	0.9	(0.3)
WMID	111,772	24.1	0.0	6.5	(2.8)
EMID	89,566	24.1	0.0	6.5	(2.8)
SWALES	10,830	25.1	0.0	6.7	(3.0)
SWEST	6,595	25.1	0.0	6.7	(3.0)
LPN	14,980	(0.8)	0.0	1.6	0.7
SPN	173	(0.4)	0.0	0.7	0.3
EPN	2,368	(0.8)	0.0	1.3	0.6
SPD	52,053	1.1	(1.1)	2.7	1.8
SPM	99,367	1.9	(1.8)	5.2	3.6
SSEH	(81,092)	0.3	(0.3)	(81,091.8)	3.9
SSSES	(176,543)	0.5	(0.4)	(176,542.9)	8.5
Ind. Avg	(2,613)	8.2	(0.3)	(18,399.2)	0.6

- The table captures initiatives aimed at reducing losses, there are three main categories identified:-
 - Over-sized cables
 - Remedying old plant
 - DUoS recovery (MPAN rectification)
- The table flags:
 - input errors
 - Mixed signing conventions
 - Some commonality within DNO groups, but a distinct lack of commonality across the industry

E6 - Innovative Solutions

ED1 to Date - Reported Values relating to Innovative Solutions												
DNO	Costs (£m)	Additions (#)	Disposals (#)	MVA Released (MVA)	Est. Gross Avoided Costs £m	Est. Losses Impact (MWh)	Est. CI Impact (CI)	Est. CML Impact (Minutes)	Est. GHG Emissions (tCO2e)	Est. Impact on Fatality (fatalities)	Est. Impact on Serious Injury (major injuries)	Est. Impact on Oil Leakage (Litres)
ENWL	11.35	14,649	-	2	28.91	7,971	115,051	4,382,520	-	-	-	-
NPgN	2.66	2,311	-	1,141	5.30	-	266,214	8,505,272	110	0	12	5,250
NPgY	3.98	3,190	-	995	14.80	-	157,757	10,306,953	166	0	14	17,250
WMID	0.63	-	-	2	0.07	384,115	-	-	-	-	-	-
EMID	4.51	-	-	81	5.13	214,800	-	-	-	-	-	-
SWALES	0.77	-	-	59	3.58	224,459	-	-	-	-	-	-
SWEST	1.35	-	-	67	4.32	149,788	-	-	-	-	-	-
LPN	35.05	7,418	-	4	45.24	2,686	21	6	7	0	4	-
SPN	21.13	18,742	-	1	40.68	-	23	4	1,895	0	4	-
EPN	126.47	39,210	-	118	252.18	-	20	4	33,132	0	3	-
SPD	2.41	1	-	160	24.77	-	-	-	-	-	-	-
SPM	0.65	3	-	6	4.84	-	-	-	-	0	2	-
SSEH	2.89	9	3	63	26.07	-	51,946	11,084,458	248,212	-	-	-
SSES	9.64	202	-	45	47.28	-	259,125	33,082,258	7,299	-	-	-
Industry Average	18.11	8,573	3	196	69.62	195,690	106,270	8,420,184	48,468	0	35	11,250

- The RIGs are unclear for a number of areas on this table and the results above highlight these inconsistencies, main comments:
 - Differing approaches from each DNO in the sections which are populated
 - Inconsistent signing conventions for £m values
 - Some obvious anomalies for CI and CML values
 - A wide range of values reported for avoided costs

E7 - Low Carbon Technologies

ED1 to Date No. Installed	Primary Network						Secondary Network					
	Heat Pumps	EV slow charge	EV fast charge	PVs (G83)	Other DG (G83)	DG (non G83)	Heat Pumps	EV slow charge	EV fast charge	PVs (G83)	Other DG (G83)	DG (non G83)
ENWL	-	-	-	-	-	18	135	270	1,181	9,437	-	516
NPgN	-	-	-	-	-	11	1,394	596	1,493	14,938	-	269
NPgY	-	-	-	-	-	21	2,034	575	2,053	17,359	1	446
WMID	-	-	-	-	-	26	1,060	687	2,292	10,266	45	562
EMID	-	-	-	-	-	68	2,149	1,176	3,011	15,091	77	666
SWALES	-	-	-	-	-	58	747	179	535	5,908	35	352
SWEST	-	-	-	-	-	66	3,182	412	1,268	10,801	107	520
LPN	-	-	-	-	-	7	67	2,107	3,586	2,645	-	285
SPN	-	-	-	-	-	57	1,197	1,621	5,661	11,558	1	666
EPN	-	-	-	-	-	141	3,907	2,238	9,060	26,456	1	1,286
SPD	-	-	-	-	-	247	260	746	880	7,800	4	442
SPM	-	-	-	-	-	193	306	794	775	9,160	1	637
SSEH	-	-	-	-	-	111	-	10	439	4,402	201	927
SSES	-	-	-	-	-	97	41	2,010	4,420	15,098	659	5,006
Ind. Avg	-	-	-	-	-	80	1,268	959	2,618	11,494	103	899

- We can see some greater consistency on the reporting of LCTs connected so far in ED1, although there are still some unusual results...
 - Some low values for heat pumps
 - A mix in the reporting of DGs

Item 4: Actions from previous meeting

In the previous session NPg presented, and we discussed, whether an incentive could be needed in RIIO-ED2 to drive societal decarbonisation. For example, NPg's material highlighted uncertainty surrounding wider policy decisions that could impact DNO activities in ED2. In light of this, we assigned an action for the group to:

- Develop scenarios to stress test the current arrangements
- Consider whether the current (and proposed new) arrangements are flexible enough to ensure the realisation of the desired behaviours and outcomes?

Network decarbonisation – **STRENGTHEN**

Societal decarbonisation – **NEW and EXTENDED**

Behaviours/Outcomes	Mechanism
Networks enable the uptake of low-carbon technologies <ul style="list-style-type: none"> • Connection • Use 	<p><i>Connection</i></p> <ol style="list-style-type: none"> 1. Extend BMCS to services that support decarbonisation (3rd party data usage, installation of heat pumps, witness testing installation of DG etc.) 2. Extend TTQ and TTC to include disruptive load 3. Volume driver <p><i>Use</i></p> <ol style="list-style-type: none"> 4. Incentivise kWh output from generators?
Flexibility is part of all network investment considerations	<ol style="list-style-type: none"> 5. Whole System CBA? 6. Reporting (data) to build market confidence that enables a route to a deep and liquid flexibility market
Transition to low carbon at lowest possible cost <ul style="list-style-type: none"> • Minimise the whole electricity bill, not solely ED2 costs. 	<ol style="list-style-type: none"> 7. Cost reflective price signals 8. Whole system CBA to minimise overall costs for customers? 9. Totex cost benchmarking to allow for optimal opex or capex solutions – no perverse incentives through false boundaries
Sustainable low-carbon energy system	<ol style="list-style-type: none"> 10. Cost reflective price signals 11. Whole system CBA? 12. Regional plans through enhanced stakeholder engagement 13. Consistent standards for national and regional Future Energy Scenarios

Behaviours/Outcomes	Incentive/Mechanism
DNO delivers an environmentally sustainable network and establish credibility with regional stakeholders	<ol style="list-style-type: none"> 1. Enhanced stakeholder engagement (throughout ED2) 2. Whole system CBA? 3. Environment plans as part of ED2 business plan 4. ED2 commitments and annual stakeholder reporting process
Respond to climate change emergencies and reflect heightened interest from stakeholders	<ol style="list-style-type: none"> 5. Enhanced stakeholder engagement (throughout ED2) 6. Environment plans as part of ED2 business plan
Build stakeholder trust through consistent reporting across the sector – reducing carbon measured consistently	<ol style="list-style-type: none"> 7. Consistent business carbon footprint and embedded carbon definition in public reporting 8. Ofgem annual reporting
Recognise the changing landscape for network losses – reducing may not be best with higher network utilisation from low carbon technologies	<ol style="list-style-type: none"> 9. Business plans 10. Optimised through whole system CBA? 11. Losses strategy 12. ED2 commitments and annual stakeholder reporting process

Environmental impact - **RETAIN**

Behaviours/Outcomes	Incentive/Mechanism
Reduction of adverse environmental impact	<ol style="list-style-type: none"> 1. Law - Environment Agency regulator 2. ED2 commitments and annual stakeholder reporting process
Good asset stewardship	<ol style="list-style-type: none"> 3. Law - Environment Agency regulator
Responsive to regional stakeholder needs	<ol style="list-style-type: none"> 4. Enhanced stakeholder engagement (throughout ED2) 5. Area of Outstanding Natural Beauty allowance 6. ED2 commitments and annual stakeholder reporting process

Societal decarbonisation: wide impact, step change

The government's net zero by 2050 target will have significant implications for DNOs, as will the move towards cleaner air...

- Heat and local road traffic will be increasingly electrified during the ED2 price control period and beyond.
- Government will *"introduce a future homes standard, mandating the end of fossil-fuel heating systems in all new houses from 2025."* This means that, from 2025 at least, many new homes will have to be fitted with heat pumps. More policy steps like this are likely.
- Public and political awareness of the problems caused by highly polluted air in urban centres is growing. The UK routinely breaks legal limits.
- A major acceleration in the uptake of ultra-low emission vehicles for local traffic is necessary, and the only available technologies at present are electric or hybrid cars.
- There is a high chance of significant uptake of these vehicles within the next decade, driven by government policy reform and falling technology costs.

"Heat pumps are an established solution in many other countries, but not yet in the UK. Establishing them as a mass-market solution will take some time, with strong progress required during the 2020s. There are particular opportunities in new-build properties, homes off the gas grid, non-residential buildings and for hybrid heat pump systems retrofitted around existing gas boilers." and that

"In our recent Net Zero report we recommended an end to sales of petrol and diesel cars and vans by 2035 at the latest and early deployment of hybrid heat pumps, increasing electrification in the 2020s. A heat decarbonisation strategy could imply further electrification beyond this."

Climate Change Committee, July 2019, Reducing UK emissions: 2019 Progress report to Parliament

Societal decarbonisation: wide impact, step change

... but, there is still significant uncertainty over the longer term pathway to net zero carbon emissions and clean local air

- Hydrogen might ultimately play a significant role, meeting needs that may otherwise have required investments in electricity distribution networks.
- We're yet to see an Energy White Paper that is expected to set out some milestones for the route to decarbonisation... may be published Q2 2020 following anticipated Government changes.
- The extent of customer uptake of new technologies is uncertain.
- Therefore, Ofgem needs to ensure its framework is flexible and adaptive.
 - DNOs should not be incentivised based on outcomes which are beyond their control, such as the level of uptake of new technologies by end users (like electric vehicles).
 - These outcomes will be largely determined by the cost of these technologies, consumer attitudes and government policies.

RIIO-ED2 Losses Mechanisms



19th February 2020



Recap from Jan 28th DEWG



February 19th 2020, Ofgem DEWG

Potential RIIO-ED2 Losses Regulatory Approach

WSP,
ENA Technical Losses
Working Group



Technical Losses WG – Work Packages

- Impact of the Low Carbon Transition on Losses
- Potential Regulatory Approaches for RIIO-ED2

Key Findings

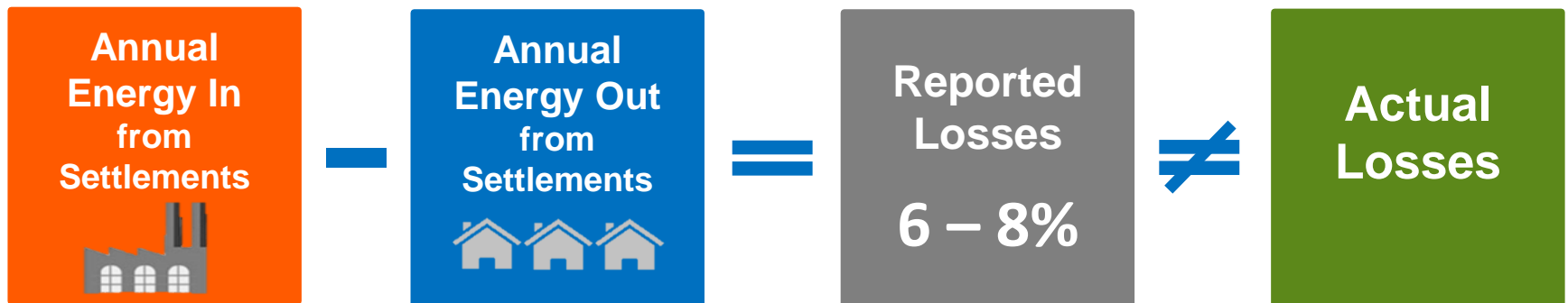
- Losses inherent with operation of electricity networks - cannot be eliminated, vary by network topology and predominantly driven by customer behaviour.
- Losses cannot be accurately measured.
- Technical losses will increase as we move to a low carbon future.
- An approach consistent with RIIO-T2 reputational approach, recognising that there is also opportunity for CBA losses activity is recommended.

Complexity

Calculating Losses Is Inaccurate

**Losses are small in absolute terms...
They vary a lot when settlement values vary by a small %.**

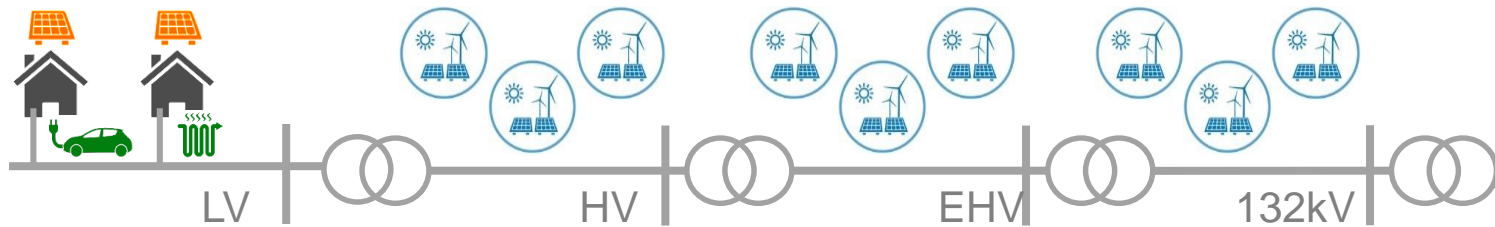
- Statutory limits for domestic energy metering is +2.5% / -3.5% accuracy
- Small metering accuracy values appear as a large tolerance on losses
- Different metering systems consume different levels of electricity
- Energy Out Settlement are mix of HH, NHH and UMS (up to 18month process)



Small variations in settlement volumes lead to large inaccuracies on losses

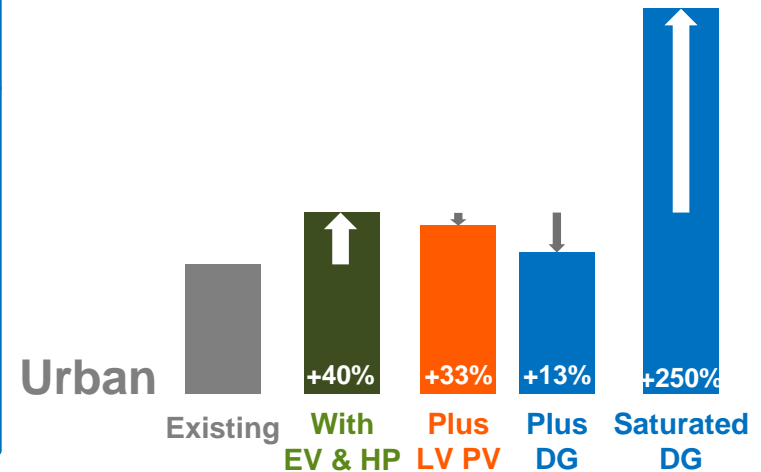
LCT Impact

LCT Impact by 2030 – Urban



Impact of 2030 LCT uptake in Urban areas

- Losses significantly increase due to future load growth from EVs & HPs
- Low uptake generation reduces losses
- High penetrations of actively managed generation dramatically increases losses

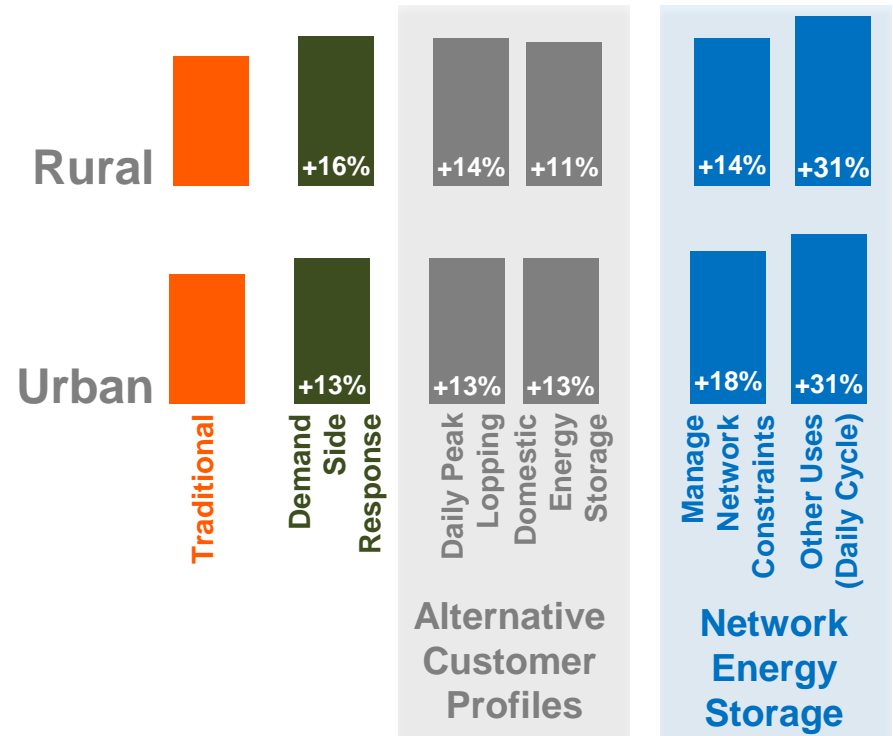


The uptake of low carbon technologies will significantly impact losses

Network Evolution

Smart Solutions

- Smart solutions increase network utilisation and therefore load and losses
- Simulations considered:
 - Demand Side Response
 - Alternative Customer Profiles
 - Grid Energy Storage
- Comparisons of losses against network with traditional reinforcement applied



**Smart Solutions increase losses,
reinforcement choices must adequately consider losses**

Regulatory Approach

International Regulatory Approaches Considered

- | | | |
|---|--|--|
| 1 | Reputational Incentive
(e.g. score actions to manage / understand losses) | ✓
✓
Complimentary to both incentivise and fund responsible losses activities |
| 2 | Cost-Benefit Analysis
(e.g. CBA tools to justify losses interventions) | |
| 3 | Mechanism based on measured losses
(e.g. DPCR4 losses incentive mechanism) | ✗ Same issues as DPCR5 approach which was indefinitely suspended |
| 4 | DNO Procurement of Losses
(e.g. capping losses rate in tariffs) | ✗ Used across Europe, would require wide scale industry change in GB |

**Options identified from
Stakeholder Engagement and Literature Review**

Recommended:



Reputational Incentive

Losses activities could be added to Environmental scorecard as part of Ofgem annual report.

- **Performance of DNOs monitored against their own Losses Strategies.**
- **Transparently allows interested stakeholders to easily review DNOs against their losses obligations.**



Cost-Benefit Analysis



Justify losses Strategy activities as part of ED2 submission using CBA.

Enhance existing CBAs:

- **Commonality in assumptions using ENA Best Practice Guide.**
- **Review impact of certain variables (cost of procuring losses; carbon price; societal benefits etc.)**

Approach for consideration within wider ED2 regulatory framework

Conclusions

Conclusion

Conclusions from assessments of different approaches:

- ① — A mechanistic/formulaic approach is not recommended for ED2 due to difficulties accurately measuring losses.
- ② — A mechanism based on procurement of losses is not recommended due to the complexity and errors.
- ③ — **Both Reputational and CBA-Based Incentives are recommended for consideration within wider RIIO-ED2 framework.**

The finalised report is available:

<http://www.energynetworks.org/electricity/engineering/technical-losses/>

SPEN Responses to actions from DEWG (28 Jan)

SPEN Losses Vision

“Consider all reasonable measures which can be applied to reduce losses and adopt those measures which provide benefit for customers”

Ofgem Questions

- a. Members to consider the behaviours and outcomes we would like to see in ED2 and see how those outcomes would fare against current arrangements
- b. Members to consider what a reputational incentive for losses could look like, and what could be leveraged in the existing arrangements
e.g. losses strategy

ED2 Desired Outcomes

Incentivise

Incentivise
economic & efficient
management of
losses

Balance

Balance between
today's and
tomorrow's customers

Incentivise the **Economic** and **Efficient**
management of losses

- Provide customer benefit
- Focus on characteristics under DNO control

Balance current and future requirements &
Harmonious with other RIIO incentives

- Not create barriers to low carbon transition or network innovation
- Recognise smart / actively controlled networks
- Consider future uncertainties (e.g. LCT, DSO)
- Encourage losses innovation

Efficient and **practical to implement**

- Balance between complexity and accuracy
- Recognise metering limitations, smart meter rollout, network diversity
- Consistent, traceable and meaningful

Harmonious

Harmonious with
other incentives and
revenue streams

Efficient

Efficient to operate,
practical to implement

ED1 Losses Arrangements



License Obligation SLC 49

To maintain losses as low as reasonably practical

Comply with DNO Losses Strategy

Losses Strategy

Losses activities including CBA justifications

RRP Reporting

Table E4: Losses driven activities
Table E3: BCF

Losses Discretionary Reward

Availability of up to £32m to encourage DNOs to better understand and manage losses

Complex boundary between Strategy and LDR.

Potential overlap between LDR and innovation.

Much greater stakeholder info available than in D5.

Existing ED1 license, strategy and reporting arrangements form solid basis for refinement for ED2

RIIO-2 Approach (RIIO-ET2)



Environmental Action Plans “draw together the direct carbon impacts claimed in Investment Decision Pack and list where carbon reduction” is:

- 1) the main driver of the proposal
- 2) contribute to a substantial part of benefits

Ofgem, RIIO-2 Business Plan Guidance (31 Oct 2019)

Appendix 2: Environmental Action Plan

Transmission losses (ET only) and Shrinkage (gas only)

- Develop and adopt strategy to contribute efficiently to fewer losses on network, including over the long term, than would otherwise be the case in the absence of strategy
- Report on key milestones of implementing losses reduction strategy
- Contribute to evidence base on proportion of losses that network companies can influence/control

SPEN ET2 losses proposal

Minimising Electricity Losses

Common Reputational Incentive: £0m

What we've learned

Transmission losses arise when electricity is transported across a network. Factors affecting losses include the materials and design of assets on the network, the distance electricity travels, and the voltage at which the electricity is transported. Losses are expected to increase in future as an increasing number of decentralised renewable generation is connected to the transmission network.

Our proposals

We propose to integrate reporting of the initiatives we are taking to mitigate the losses on our network within the Environmental Action Plan and annual reporting framework.

Our Losses Strategy detailing our approach to minimising controllable losses is located within Annex 7: Environmental Action Plan.

**Propose a similar approach as RIIO-ET2:
Integrate reporting of losses activities within the
Environmental Action Plan and annual reporting**

Proposed ED2 Losses Arrangement

Refine ED1 Approach

License Obligation SLC 49

To maintain losses as low as reasonably practical.

Comply with DNO Losses Strategy

Reputational Incentive

Losses Strategy

Losses activities including CBA justifications



Strategy activities in **Environmental Action Plans**.

RRP Reporting

Table E4: Losses driven activities
Table E3: BCF



Annual report to monitor DNO performance against strategy commitments.

Losses included in:

- 1) **Environmental Action Plans**, and
- 2) **Environmental Scorecard** as part of Ofgem annual report.

Move LDR activities to Losses Strategy and Innovation Allowances.

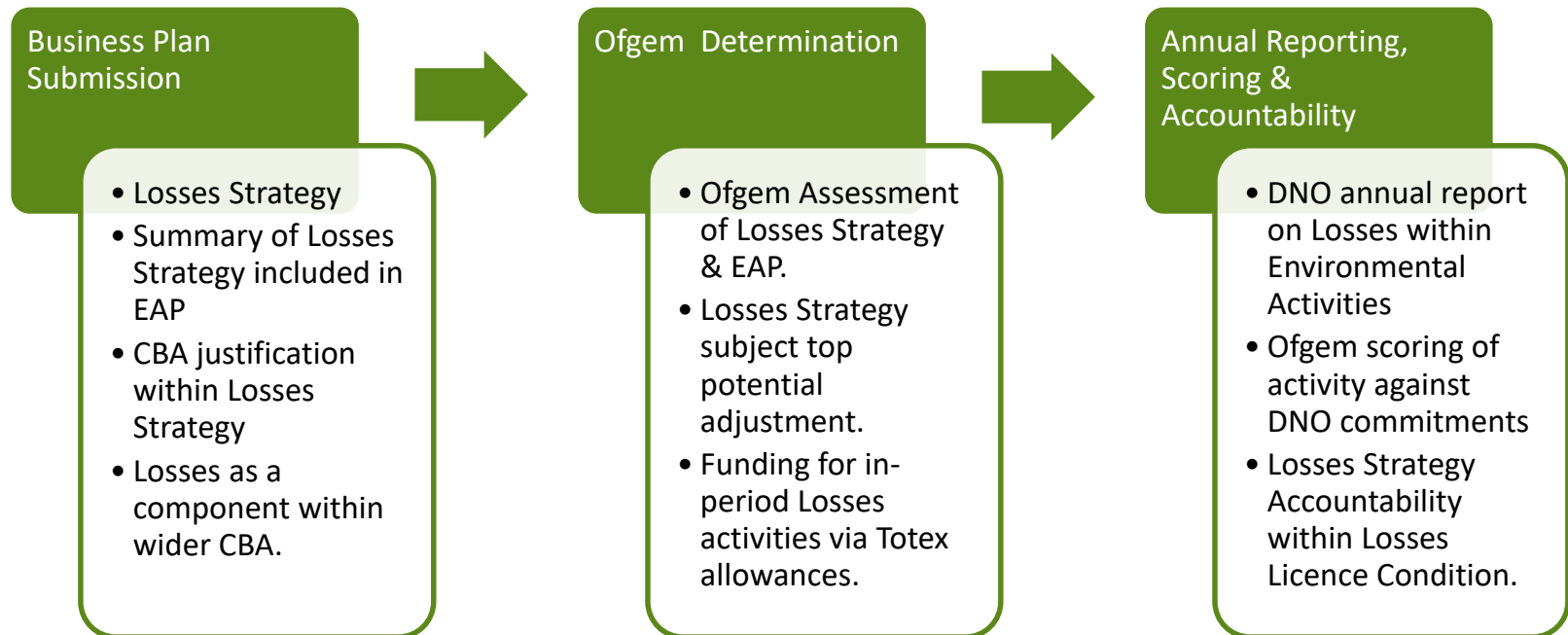
Simplify RIIO-ED2 by aligning reputational incentive with other Environmental drivers and RIIO-2 sector guidance.

Examples ED2 Losses Activities

Example	Description & Handling
Increased conductor size & lower loss transformers for new schemes.	<ul style="list-style-type: none"> Customer benefit demonstrated through whole-life CBA in Losses Strategy. Activity funded via increased unit cost regardless of activity Annual reporting of volumes of lower loss equipment including estimated losses savings.
Early replacement of high loss transformers	<ul style="list-style-type: none"> Customer benefit demonstrated through whole-life CBA in Losses Strategy. Activity funded via Totex reported under Losses activity. Annual reporting of progress vs. plan including estimated losses saving.
Losses optimised reinforcement scheme.	<ul style="list-style-type: none"> Customer benefit demonstrated through whole-life CBA in scheme's engineering justification. Activity funded and reported via load related activity. Annual reporting of activities and description of benefits.
Losses optimised network operation	<ul style="list-style-type: none"> Customer benefit through whole-life CBA within Losses Strategy e.g. Project LEAN. Activity funded via Totex (CV21) with annual reporting of activities and benefits.
Stakeholder engagement to reduce non-technical losses.	<ul style="list-style-type: none"> Qualitative justification within Losses Strategy. Annual reporting of activities and description of benefits.

Approach should incentivise and fund the economically efficient management of controllable losses

Overview of Process



Approach should incentivise and fund the economically efficient management of controllable losses

How could the reputational incentive work?

Table 2 – Comparison of different reputational incentive mechanism approaches



Name	Description	Output	Pros	Cons
Published Losses Strategy – No Scoring	This should be based on transparency, allowing interested stakeholders to form their own views (i.e. progress reported versus the losses strategy).	Report detailing progress against the losses strategy.	No scoring or comparison between DNOs.	On its own, may not provide a sufficient incentive for DNOs to optimise their performance.
Published Losses Strategy – With Scoring	The performance of DNOs could be monitored against their Losses Strategy and this could be scored (e.g. red, amber, green scoring).	RAG showing how well the DNO met their Losses Strategy commitments.	A measurable incentive without specific financial penalties.	The published losses strategies between the DNOs are likely to be quite different. There will be comparison between DNOs, which has drawbacks.
Published Losses Strategy with agreed areas and elements	The DNO could be monitored versus a set of agreed areas, for example understanding of losses, engagement and knowledge sharing, BaU Integration. Could include output from the CBA incentive mechanism.	Score showing how well the DNO has performed against each of these areas.	A measurable incentive without specific financial penalties. Elements can be obtained from previous incentive schemes.	Difficult to associate elements with a physical number-based scoring system, and some of the elements may not be applicable to certain DNOs.

SPEN: Similar to ED1.

SPEN: Greater visibility of Losses performance.

SPEN: Greater visibility and DNO comparability pending development of qualitative vs quantitative areas.

Additional material

- Between now and late March, we will be discussing and evaluating options for consideration and inclusion in our Methodology Consultation in summer.
- We covered the below areas briefly in our first session. Get in touch if you would like to include something on the agenda for one of these working groups.

Visual amenity – Undergrounding of AONBs and NPs

Key questions:

1. Should DNOs continue to deliver mitigation outputs in protected areas in ED2?
2. If so, how should this be funded and how should the amount of money available for delivering these outputs be set?
3. How should the scheme operate? Should DNOs submit funding requests during the price control or should they consult stakeholders on specific projects (and expenditure) as part of their business plan development?

Fluid filled cables and Noise reduction

Key questions:

1. How have these outputs driven business practices and performance?
2. How can we improve consistency in reporting?
3. Consideration of the relationship between oil leakage and refurbishment vs replacement works, and between oil leakage and the weather

Environmental EAP scope

Key question:

1. To what extent does the ET2 EAP capture what DNOs should be considering in ED2?

Our core purpose is to ensure that all consumers can get good value and service from the energy market. In support of this we favour market solutions where practical, incentive regulation for monopolies and an approach that seeks to enable innovation and beneficial change whilst protecting consumers.

We will ensure that Ofgem will operate as an efficient organisation, driven by skilled and empowered staff, that will act quickly, predictably and effectively in the consumer interest, based on independent and transparent insight into consumers' experiences and the operation of energy systems and markets.