October 2019

ENA Technical Losses Working Group

Chaired by: Russell Bryans
SP Energy Networks

Technical Losses Working Group

Purpose and Aims:

Improve understanding of technical losses

Development of best practice and sharing for losses strategies and activities

Review technical and regulatory requirements for a fair and effective losses incentive mechanism in ED2

Key Facts:

Convened in March 2016

Chaired by SP Energy Networks and attended by all six DNO Groups plus National Grid

Reports to ENA Electricity Networks and Future Group

Work package commissioned to investigate "The impact of Low Carbon Transition on Technical Losses"

Requirements for Regulatory Approach

Incentivise

Incentivise economic & efficient management of losses

Balance

Balance between todays and tomorrows customers

Harmonious

Harmonious with other incentives and revenue streams

Efficient

Efficient to operate, practical to implement

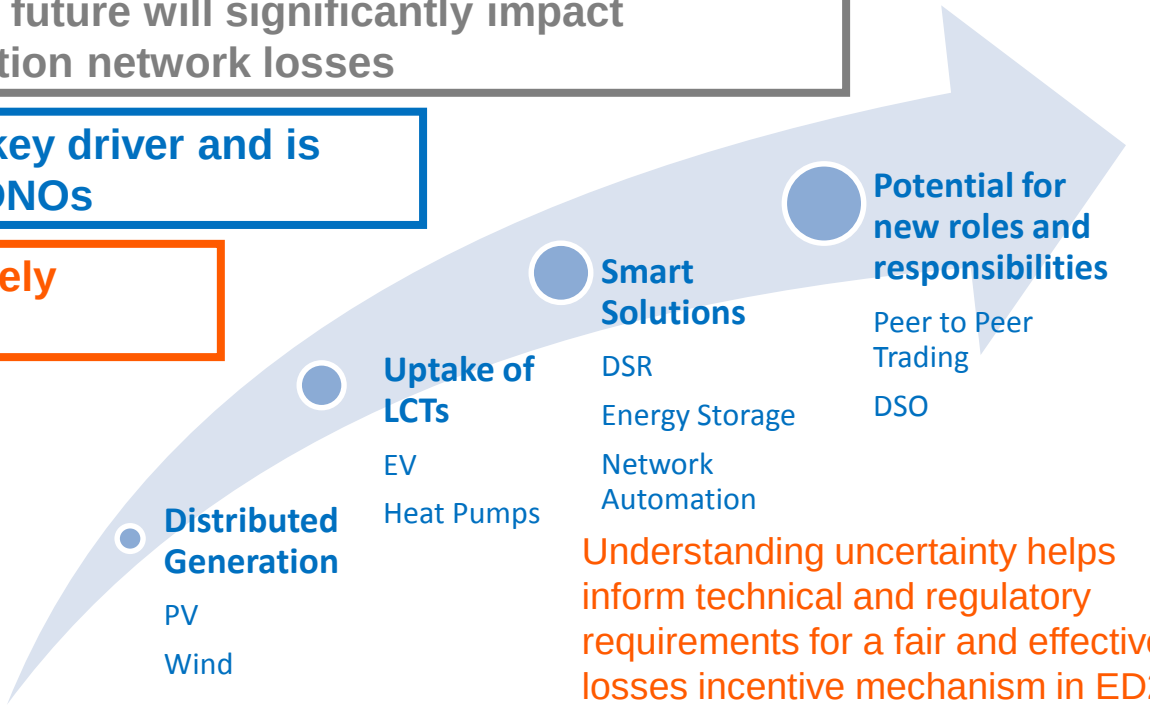
Uncertainty

The move to a low carbon future will significantly impact transmission and distribution network losses

Customer behaviour is a key driver and is outside of the control of DNOs

Losses cannot be accurately measured currently

Losses are sensitive to regional topologies



Understanding uncertainty helps inform technical and regulatory requirements for a fair and effective losses incentive mechanism in ED2

Losses are difficult to quantify and subject to both factors outside DNO control and significant uncertainty

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Technical Losses Mechanism Study

Anna Ferguson

1. **In which sector do you currently work?**
   - Electricity Network (DNO/ TO/ TSO)
   - Supply Chain/ OEM
   - Other Industry
   - Consultancy
   - Regulator/ Government
   - Academia/ Student

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2. What is the biggest issue with losses?

- Measurement
- LCT (Low Carbon Technology) uptake
- Cost
- Environmental impact
- Other (please state)

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3. **Who pays for losses?**

- DNOs
- Suppliers/ customers
- Transmission Owners
- System Operator
- Don’t Know

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- Project Aim and Key Findings
- Complexity
- LCT Impact
- Regulatory Approach
- Conclusion

Key Findings

Complexity

Losses are complex, difficult to measure and vary based on regional topology

LCT Impact

Technical losses will increase as we move to a low carbon future

Regulatory Approach

A reputational incentive with a CBA approach is recommended

Complexity

Calculating Losses

Losses are small in absolute terms, but this means that they vary a lot when the settlement values vary by a small %.

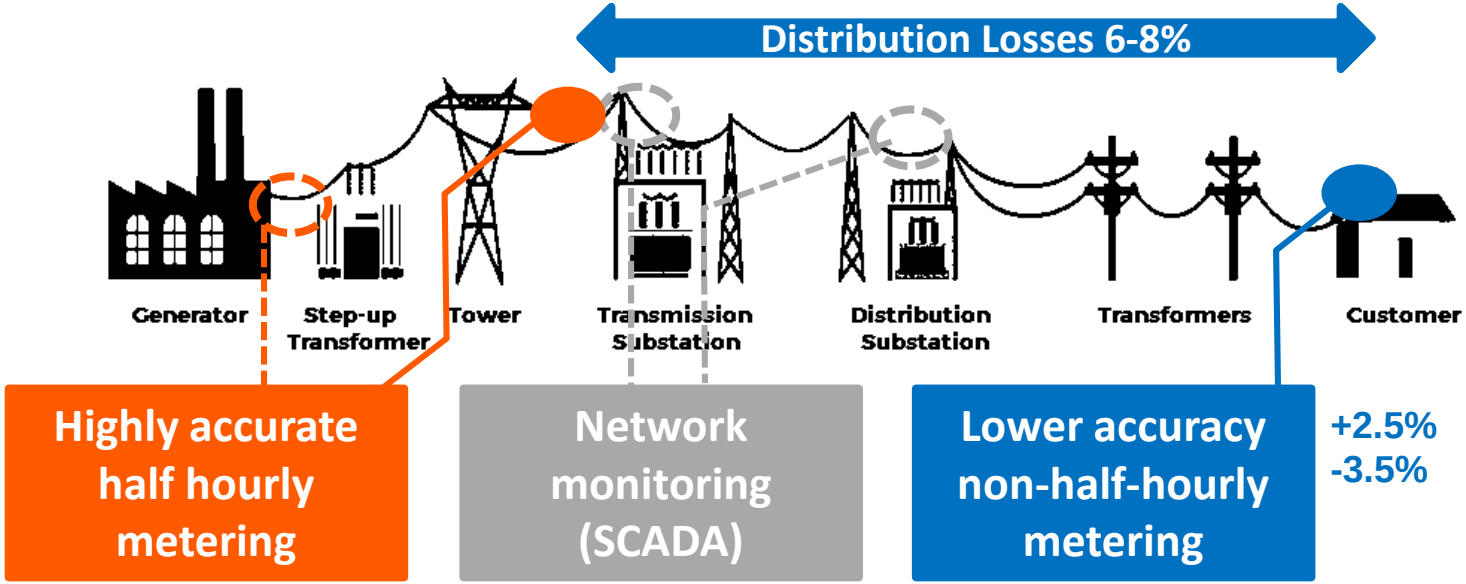
- Statutory limits for domestic energy metering is +2.5% / -3.5% accuracy
- Small metering accuracy values appear as a large tolerance on losses
- Different metering systems consume different levels of electricity

Annual Energy In from Settlements  **−** **Annual Energy Out from Settlements**  **=** **Reported Losses** **6 – 8%**

Small variations in settlement volumes lead to large tolerances on losses

Measurement of Losses

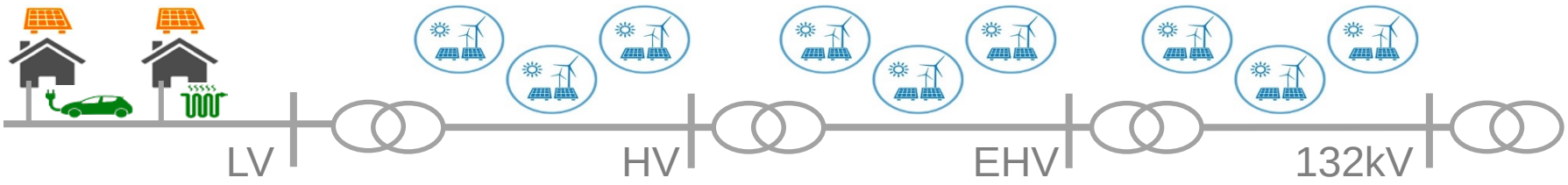
Different types of metering arrangements and monitoring at only some network locations do not allow losses to be measured accurately.



Electrical losses are not measured directly.

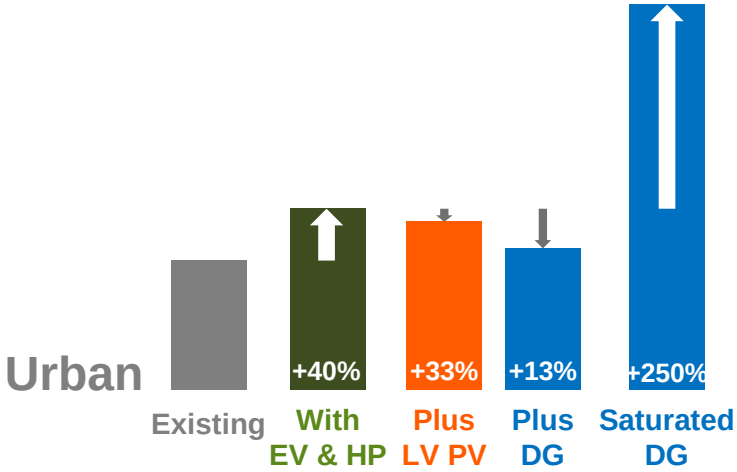
LCT Impact

LCT Impact by 2030 – Urban



Impact of 2030 LCT uptake in Urban areas (no reinforcement)

- Losses significantly increase due to future load growth from EVs & HPs
- At low uptakes generation can reduce losses
- High penetrations of generation can dramatically increase losses



The uptake of low carbon technologies will significantly impact losses

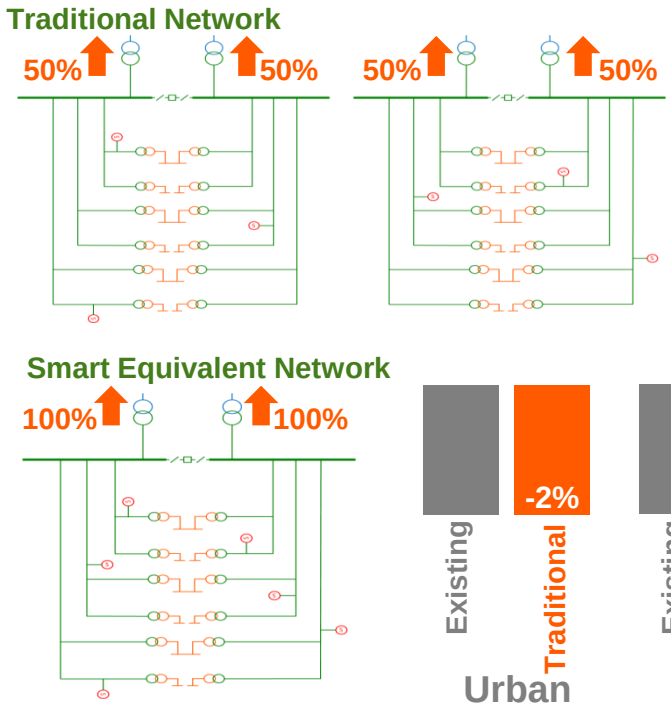
Network Evolution

Traditional Reinforcement

- Accommodating low carbon generation and demand through traditional means would require wide scale reinforcement
- Traditional reinforcement investment needs by 2050 estimated at £35-£50Bn*
- Losses would broadly be maintained near existing levels

**Transform model*

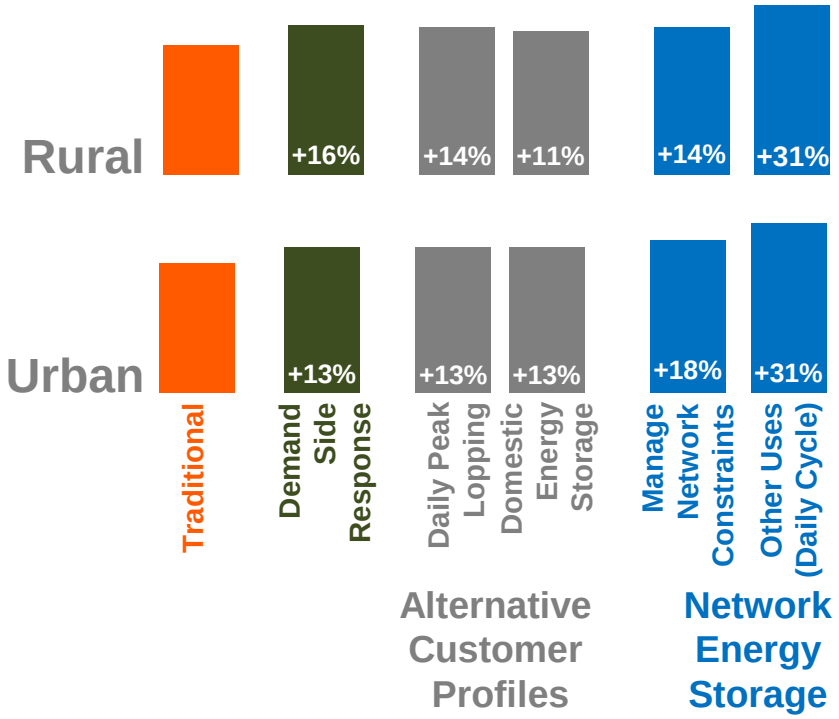
- **Alternatively low carbon generation/ demand could be accommodated through smart networks at a reduced cost**
- **Inevitable increase in losses**



Increasing network losses to accommodate Low Carbon Transition can be justified compared to traditional reinforcement costs

Smart Solutions

- Smart solutions increase network utilisation and therefore load 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

History of Loss Reduction Incentives

DPCR 1 (1990-1994)	None
DPCR 2 & 3 (1995-2005)	Financial incentive based on outputs plus volume driver
DPCR 4 (2005-2010)	Financial incentive based on outputs Losses target based on historic 5 year rolling average
DPCR 5 (2010-2015)	Fixed targets (locked in underlying errors in settlements) **Never activated, replaced with a loss reporting requirement**
RIIO-ED1 (2015-2023)	Licence obligations and a reward mechanism

Regulatory Approaches Considered

1. **Reputational Incentive**
   (e.g. score actions to reduce / better understand losses)
2. **Cost-Benefit Analysis Based Incentive**
   (e.g. CBA tools to fairly account / justify losses interventions)
3. **Mechanism based on measured losses**
   (e.g. DPCR4 losses incentive mechanism)
4. **DNO Procurement of Losses**
   (e.g. capping losses rate in tariffs)

Possible alternatives identified from Stakeholder Engagement and Literature Review

1) Reputational Incentive

Building on the RIIO-ET2 Sector Methodology:

- Assessing implementation of a reputational incentive model for Distribution.
- Reputation incentive could be used alongside additional incentives, such as a CBA-based incentive.
- Understanding the advantages and disadvantages of different possible reputational incentives.

Assessing whether a Reputation Incentive is fit for purpose for Distribution and potential options for the approach

2) Cost-Benefit Analysis Approach

Cost Benefit Analysis (CBA) to fairly account for financial and environmental cost of losses in designs:

- **CBA compares lifetime costs - may justify losses efficient designs with higher upfront costs.**
- **CBA used by some countries to inform / justify key investment decisions (e.g. Australia, Sweden)**
- **In ED1, DNOs already use the Ofgem CBA template to test and justify losses activities.**

A CBA based approach can be used to inform investment decisions and fairly account for the cost of network losses when comparing options

3) Mechanism based on measured losses

- GB DPCR4 & DPCR5 mechanisms used settlement data. DNO allowed revenues were adjusted by calculated losses vs. losses target.
- **Suspended by Regulator** due to difficulties in accurately measuring losses and in making meaningful comparisons between DNOs.
- Remains **difficult to measure losses accurately**.
- Only a few countries use formulaic incentive, no evidence of improvements yet.

A mechanistic approach heavily reliant on accurate losses measurement

4) DNO Procurement of Losses

- In many countries (including Norway, Denmark, Austria, Belgium and France) procurement of losses is the responsibility of network operators.
- Incentives are applied though capping revenue or capping the losses rate in tariffs.
- Very different in GB where procurement of losses is by suppliers – not the DNOs.
- To apply in GB **would require wide scale and costly industry changes**.

In GB procurement of losses is by suppliers, not the DNO.
This approach would require far reaching whole industry change.

Recommended approach:

+

Losses activities could be added to Environmental scorecard.

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

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 to accurately measure losses.
2. A mechanism based on procurement of losses is not recommended due to the complexity.
3. **Both Reputational and CBA-Based Incentives are recommended for consideration within wider RIIO-ED2 framework.**

The finalised report will be published on the ENA website in November 2019.

For further information please contact LossesTeam@SPEnergyNetworks.co.uk

4. **What should the priorities be for a revised CBA?**

- **Distinguishing between high/ low carbon losses**
- **Consistency between DNOs**
- **Cost of Procuring Losses**
- **Asset Life Time/ Project Life Time**
- **Traded Carbon Price**

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