Sustainability First
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To : RIIO2@ofgem.gov.uk

Dear RIIO-ED2 Team

RIIO-ED2 : Ofgem request for inputs on proactive management of future system growth. Sustainability First note to Ofgem on 'Energy Efficiency : what is the DNO role in ED2 ?'

Sustainability First is a think tank and charity that works in the energy, water and utilities sectors. We have significant experience of consumer and public interest issues, with a focus on social and environmental concerns - www.sustainabilityfirst.org.uk . Sustainability First Associates have participated in the RIIO2 process as members of Ofgem's Challenge Group, as chairs and members of company CEGs / user groups and via the Ofgem working group process.

In the ED2 sector specific methodology (para 5.63) Ofgem asks for additional inputs from DNOs and stakeholders on whether the package of measures in the ED2 price control will sufficiently help reduce demand in the long-run and thereby reduce the need for investment in future price control periods.

We are pleased to attach a Sustainability First note in response to this request. In particular we focus on the DSO role in promoting energy efficiency but also set this question in a wider context. We consider what more Ofgem and the companies could do to give energy efficiency more traction in ED2.

Our document has a **summary** and is organized in three sections :

- **Section 1 : Ofgem expectation, scale of the challenge and DNO forecasts**
- **Section 2 : DNO approaches to flexibility and energy efficiency – clarifying desired outcomes**
- **Section 3 : Do ED2 incentives 'spur' DNO actions on energy efficiency ?**

We conclude that DNOs should establish partnerships to deliver some major 'beacon' energy efficiency schemes over the next five years. These could possibly make use of innovation funding targeted at vulnerable customer groups under the NIA. If that is not suitable then Ofgem could agree to fund such DNO beacon schemes via an alternative ED2 funding pot. The beacon schemes will need to establish the full value and nature of a future DNO role in active promotion of energy efficiency projects. Namely, that these are a workable and a replicable network offset against future growth in electric heat.

We would be very pleased to discuss our thinking further with Ofgem colleagues, including any wider discussion with companies and stakeholders.

Yours sincerely

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Sustainability First

Note to Ofgem on their request for inputs on 'Proactive Management of Future System Growth'[1]

Energy Efficiency : what is the DNO role in ED2 ?

Energy efficiency is a cornerstone of affordable GB heat decarbonisation. It will be a main focus of the Heat and Buildings Strategy. This note looks at one particular aspect of that much bigger picture. Namely, the DNO role in promoting energy efficiency to avoid higher-cost network development. Potential benefits are three-fold : cost-efficient network development, carbon-reduction, plus lower end-customer bills.

Our note responds to Ofgem's request in the RIIO-ED2 Sector Specific Methodology[2] but also sets the question in a wider context. In particular it looks at what more Ofgem and the companies could do to give energy efficiency more traction in ED2. We conclude that DNOs should establish partnerships to deliver some major 'beacon' energy efficiency schemes over the next five years. These could possibly make use of innovation funding targeted at vulnerable customer groups under the NIA. If that is not suitable then Ofgem could agree to fund such DNO beacon schemes via an alternative ED2 funding pot[3]. The beacon schemes will need to establish the full value and nature of a future DNO role in active promotion of energy efficiency projects. Namely, that these are a workable and a replicable network offset against future growth in electric heat.

Summary

Separate to business plans, Ofgem has asked for inputs from DNOs and other stakeholders to understand whether the ED2 package of measures sufficiently encourages DNOs to take actions to help reduce demand in the long-run and therefore future investment, the scale of the problem and whether additional measures are needed to 'spur DNOs to take these actions'[4] .

Section 1 sets out the scope of the challenge. **Section 2** shows that in seeking 'proactive management of future system growth' it is important to clarify the respective outcomes sought from (1) flexibility and (2) promoting energy efficiency as alternatives to network investment. This matters in terms of the likely effectiveness of current ED2 incentives, including if a main goal is to help reduce demand in the long-run. **Section 3** looks at ED2 incentives, with a particular focus on what a desired DNO role could be in promoting energy efficiency.

[1] ED2 SSM - Overview Document. Page 66. Paras 5.59 – 5.64
https://www.ofgem.gov.uk/system/files/docs/2020/12/ed2_ssmd_overview.pdf
[2] ED2 SSM - Overview Document. Page 66. Paras 5.62 – 5.63
https://www.ofgem.gov.uk/system/files/docs/2020/12/ed2_ssmd_overview.pdf
[3] For example, perhaps a new price-control deliverable on a use-it-or-lose-it basis
[4] ED2 SSM - Overview Document. Page 66. Paras 5.62 – 5.63
https://www.ofgem.gov.uk/system/files/docs/2020/12/ed2_ssmd_overview.pdf

We have found that :

- **Flexibility and energy efficiency deliver different outcomes which are important to understand**
  - Flexibility *plus* energy efficiency should play a full role in avoided network investment.
  - Flexibility is best focused on curbing peak loads – especially from electric vehicles. And potentially heat pumps, if and when these are demonstrated as flexible at scale. Flexibility also supports short- and long-run resilience against network faults and exceptional events
  - Promoting energy efficiency is most suited to reducing growth in demand from electric heat. Initially, any such effort by DNOs is likely to be best focused on poorly-insulated fuel-poor homes potentially in locations without gas.
  - Success in delivery of flexibility and promotion of energy efficiency outcomes does not sit within the direct control of the DNO/DSO. Success on each requires extremely active partnership working - with potentially different partners in each case.

- **DNO efforts on energy efficiency must also place technical energy efficiency front and centre**
  - Electricity distribution losses are a major DNO efficiency issue at ~6-7% of all power transferred over distribution networks. A push to reduce controllable losses and to deploy voltage regulation at scale in ED2 would reduce customer costs.

- **In both ED1 and in ED2 flexibility has had considerably more focus than energy efficiency from both Ofgem and DNOs**
  - New ED1 licence conditions now helpfully clarify Ofgem ambition for the DNO role in flexibility procurement and also in promoting energy efficiency and procuring energy efficiency services.
  - In principle, new licence conditions and ED2 incentives should drive DNO ambition on flexibility, but the dots need joining.
  - DNO promotion of energy efficiency risks remaining relatively second-order to flexibility.

- **New ED1 licence duties and the ED2 incentive package must work as a 'whole' for energy efficiency**
  - Concerted effort is needed from both Ofgem and DNOs to join-up the different incentives to make them work 'as a whole'. This note is therefore focused largely on likely effectiveness of ED2 incentives for DNOs to promote energy efficiency and how to give this area more prominence and traction in Ofgem and DNO expectations.

- **A new approach to appraising DNO energy efficiency schemes must 'level the playing field' in making comparisons**
  - Methodologies for network cost-assessments on energy efficiency need developing to address some basic questions on how to establish comparability with both network alternatives plus flexibility. Metrics and desired outcomes for both flexibility and energy efficiency also need developing in terms of what 'good looks like'.

- **For some ED2 incentives we have some questions as to how far these are likely to successfully drive DNO actions on energy efficiency**
  - **On net-zero incentives** some clarifications are needed, including how far an automatic capacity volume driver will incentivise energy efficiency as a network alternative.
  - **On strategy output delivery incentives** more prominence is needed for energy efficiency as a clearly desired ED2 output, along with suitable targets and metrics**.** Ofgem plus DNOs must join the dots between the different strategies.

- **Clarifying the DNO role on energy efficiency**
  - Energy efficiency in buildings is a new business area for DNOs. Thought is needed on whether explicit incentivisation on engagement and partnership working on energy efficiency will be needed. This seems a material gap.

  - GB has a highly complex landscape of responsibilities and measures to improve building energy efficiency (commercial, residential), and many areas are devolved. DNOs must ensure sufficient in-house expertise (1) to understand where and how best to target their own energy efficiency efforts for maximum network impact and (2) to ensure that their actions deliver genuine 'additionality' and wider benefit.

- **In ED2, DNOs should promote a number of major 'beacon' energy efficiency schemes to establish the network benefits. These should focus on low-income and vulnerable households.**
  - Even with effective partnerships, if DNO's are to promote energy efficiency outcomes in a material way in the period 2023-28, this will need a significant step-up. In ED2, through suitable partnerships, DNOs should aim to promote a number of major 'beacon' energy efficiency schemes targeted at vulnerable customers in poorly insulated homes – and designed to curb future system growth from electric heat pump uptake. These could possibly make use of innovation funding targeted at vulnerable customer groups under the NIA. If that is not suitable, then Ofgem could agree to fund such DNO beacon schemes via an alternative ED2 funding pot[5]. The beacon schemes will enable systematic evaluation in ED2 of the benefits of direct or substantial DNO involvement in promoting energy efficiency schemes going forward. Plus, a far better understanding of what replication and scale-delivery would need to look like and what benefit this could offer to the networks. This would then offer a far better line- of-sight on approaches and pathways for the ED3 period.

  - There are around only 2 million electric heated homes in GB. Government ambition takes new heat-pump installs to 600k annually by 2028. The potential for energy efficiency measures to significantly impact in ED2 is therefore modest. Nevertheless, there is a real opportunity through the five-year ED2 period for DNOs to innovate and learn more about what their new duty on energy efficiency means in practice, building the new partnerships and capabilities required. Existing electric heated homes are typically occupied by low income households plus an early focus for heat pump deployment may well be in local authority or social housing. As such there is scope for DNO focus to be centred in particular on lower income households and those at risk of fuel poverty. With relative higher running costs presently for electric-heat as opposed to gas there are strong affordability reasons to minimise energy demand in electrically-heated homes. This would create a more sustainable network-led solution to fuel poverty than the current Fuel Poor Network Extension Scheme which is still often driving a switch from electric to gas heating.

[5] For example, perhaps a new funding pot for energy efficiency beacon projects on a use-it-or-lose-it basis, perhaps along the lines adopted at final determinations at GD2.

Sustainability First

Note to Ofgem on their request for inputs on 'Proactive Management of Future System Growth'[6]

Energy Efficiency : what is the DNO role in ED2 ?

Summary

Section 1 – Ofgem expectation, scale of the challenge and DNO forecasts

1. Ofgem expectation and scale of the challenge
2. DNO forecasts – EVs and heat-pumps

Section 2 – DNO approaches to flexibility and energy efficiency : clarifying desired outcomes

3. Flexibility and energy efficiency - outcomes and benefits
   - Comparative benefits
   - Flexibility – curbing peak loads

4. Energy efficiency – demand reduction for DNOs
   - Key characteristics
   - Improving the energy efficiency of buildings
   - Electric appliances
   - In combination with flexibility

5. Technical energy efficiency
   - Distribution losses
   - Voltage regulation

6. Section 2 conclusions on flexibility and promoting energy efficiency as an alternative to network investment

[6] ED2 SSM - Overview Document. Page 66. Paras 5.59 – 5.64
https://www.ofgem.gov.uk/system/files/docs/2020/12/ed2_ssmd_overview.pdf

Section 3 – Do ED2 incentives 'spur' DNO actions on energy efficiency ?

8. How well are DNOs currently incentivised on energy efficiency ?
    - Join-the-dots : new ED1 duties, Ofgem reform programmes and the ED2 incentive package

9. Cost assessment approaches, metrics and DNO outcomes for energy efficiency
    - Cost-assessments
    - Metrics
    - DNO Outcomes

10. ED2 incentives on energy efficiency : clarifications and gaps
    - Net-zero – ED2 approaches to strategic investment and uncertainty mechanisms. Will these drive energy efficiency ?
    - Strategy delivery output incentives (ODIs) – how far do these 'join-up' to support energy efficiency (DSO, vulnerability) – including with innovation (NIA)

11. DNO role and expertise on energy efficiency
    - DNO expertise and ensuring 'additionality'
    - Active partnerships for energy efficiency - are DNOs sufficiently incentivised ?

12. Section 3 conclusions on ED2 incentives for energy efficiency

Annex 1

Table 1 : Flexibility & energy efficiency. Network benefit, DNO dependencies for delivery & wider long run benefits

SSEN Save project slide : peak-load-shifting and demand reduction

Definitions

Section 1 - Ofgem expectation, scale of the challenge and DNO forecasts

1. Ofgem expectation and scale of the challenge

From a national standpoint, more jigsaw pieces have fallen into place since late 2020. Government high-level goals for electrification of transport and heat towards 2030 are now more clearly articulated[7]. From a DNO perspective, three further jigsaw pieces are expected soon : DfT's Transport Decarbonisation Plan, the BEIS Heat and Buildings Strategy, and HMT's Net-Zero Review. The latter being expected to address how the costs of economy-wide decarbonisation might be met, including distributional impacts and cost-mitigations. Clarification of government long-term thinking on the balance between energy-customer and tax-payer funded pathways to net-zero will be helpful to Ofgem and DNOs - informing their own approaches to decarbonisation at least cost to consumers, including on heat decarbonisation and energy efficiency schemes.

Ofgem expectation

The ED2 SSM Overview states[8] :

*'**We note that much of the increase in demand, especially from electric vehicles (EVs), can occur off-peak, and networks should plan for and seek to maximise this**. However, when network constraints are anticipated to arise, **we expect DNOs to first consider whether flexibility, including energy efficiency measures and Demand Side Response (DSR), would provide a more economic and efficient solution than network reinforcement.** Building additional capacity to meet a longer-term forecast of demand may sometimes be the most efficient approach, but this also creates some risk of consumers paying for assets that are not needed. We will therefore require persuasive justification for proposals for physical investment in new capacity to meet demand growth over the longer-term, including an assessment of the costs and benefits of such an approach to network investment'.*

Ofgem says they want to see **DNOs play a more proactive role in managing future system growth and that taking part in measures to reduce growth now might be cheaper than reactively responding in the future**. For business plans they also say [9] :

*'We anticipate that DNOs will work with suppliers, aggregators, local authorities, and other third parties to develop mutually beneficial proposals. **These might include working with local councils to identify priority areas to upgrade the energy efficiency of buildings to proactively help to curb demand growth.** Or collaborating with relevant parties to facilitate the installation of smart technologies and appliances in regions the DNO has identified as likely to need closer management in the future; making use of the increasing digitalisation of the system to support a framework where signals enable smart technologies to help shift or lower peak usage'*

Ofgem conclude by asking whether :

[7] To end sales of new combustion engine vehicles by 2030 and for all new cars and vans to be fully zero emission at the tail-pipe from 2035. Plus, a target to roll-out 600,000 heat-pumps per annum by 2028.

[8] ED2 SSM - Overview Document. 1.13
https://www.ofgem.gov.uk/system/files/docs/2020/12/ed2_ssmd_overview.pdf

[9] ED2 SSM - Overview Document. 5.59- 5.62
https://www.ofgem.gov.uk/system/files/docs/2020/12/ed2_ssmd_overview.pdf

' the package of measures in our price control ***sufficiently encourages DNOs to take actions in RIIO-ED2 that would help reduce demand in the long-run and thereby reduce the need for investment in future price control periods****….*including …. ***whether additional measures are needed to spur DNOs to take these actions' .*** Ofgem might in due course issue more direct guidance[10].

In practice, when looked at in the round, a great many of the ED2 incentive arrangements focus on flexibility procurement. Ofgem expects DNOs to play a more proactive role in managing future system growth and curbing peak demand, linking to the DSO baseline activity for whole energy system planning[11]. This expectation also links to the new ED1 licence duties on procurement and use of flexibility services – but which also specifies promoting the uptake of energy efficiency measures.[12]. [13].

Recognising the uncertainty around expected rates of electrification of heat and transport and possible impact on the networks, in their February 2021 RIIO-ED2 business plan guidance[14], Ofgem has clarified that DNOs should demonstrate that their forecasts have been informed by the range of assumptions found in the net-zero compliant energy pathways in the ESO 2020 FES and the CCCs 6th Carbon Budget. The business plan guidance extracts key assumptions relevant for DNO investment planning from those scenarios and indicates that 'DNOs must use these key assumptions as part of determining the range of demand for their network'[15]. Assumptions for penetration (in millions) of EVs and heat pumps in 2030 - across scenarios - are as follows :

- **EVs** : FES spread - 4.8m to 11.7m. CCC spread - 14.2 to 18.4m. FES indicates 16-31TWh additional load from EVs and CCC - 33-41TWh
- **Heat pumps** : FES spread - 1.7m to 7.5m incl hybrid HPs. CCC - reflects generally higher uptake but a narrower spread 4.1m-5.9m. On additional TWh from heat-pumps there is something of a disconnect between FES - 6-24TWh & CCC - 8 TWh.
- **Additional peak demand by 2030 from both EVs & Heat Pumps (GW)** : FES – 13-17GW. CCC – n/a

[10] ED2 SSM - Overview Document. Page 66. Paras 5.62 – 5.63
https://www.ofgem.gov.uk/system/files/docs/2020/12/ed2_ssmd_overview.pdf

[11] ED2 SSM. DSO 1.1. A1.16 p 81 third bullet (BP Guidance : 1.2 third bullet).
[12] 5.59
[13] Standard Conditions of the Electricity Distribution Licence. 21 January 2021
https://www.ofgem.gov.uk/system/files/docs/2021/02/electricity_distribution_consolidated_standard_licence_conditions_22_01_2021.pdf
SLC 31E - The licensee must coordinate and direct the flow of electricity onto and over its Distribution System in an efficient, economic and coordinated manner. This includes the following:
(a) procuring and using Distribution Flexibility Services where it is economic and efficient to do so;
(b) procuring Distribution Flexibility Services in the most economic manner possible;
(c) subject to 31E.3, procuring Distribution Flexibility Services in accordance with objective, transparent and market-based procedures;
(d) **promoting the uptake of measures to improve Energy Efficiency, where such services cost-effectively alleviate the need to upgrade or replace electricity capacity and support the efficient and secure operation of the Distribution System. This may include procuring Energy Efficiency Services, where it is economic and efficient to do so;**

[14] Ofgem RIIO-ED2 Business Plan Guidance. 1 February 2021 – pp 38-43 paras 5.1-5.18
https://www.ofgem.gov.uk/system/files/docs/2021/02/ed2_business_plan_guidance_-_published_1_february_2021.pdf
[15]

2. DNO Forecasts – electric vehicles and heat pumps

DNOs must translate these national net-zero compliant pathways into scenarios applicable in their own licence area, informed by structured and effective stakeholder consultation, including inputs from the devolved governments and local authorities.

DNOs are asked to set out their own detailed assumptions on overall demand, including from uptake of heat pumps and electric vehicles, show how these forecasts translate into associated peak loads – plus their assumptions on how they expect flexibility markets, smart technologies and consumer behaviour are likely to impact that peak demand[16].

Electric vehicles

DNOs will of course produce EV forecasts for their own areas. One challenge thrown up by the ED2 SSM however relates to the expectation that DNOs can encourage 'off-peak' operation of EVs via smart charging[17]. A DNO doesn't have a direct remit in practice unless there are network capacity-charges (or similar) for households or a rethink on access charges for small customers. How far DNOs can in the end successfully influence developments in off-peak EV charging - and factor into their business plans - will be for debate. DNOs will certainly need to work very closely with many actors perhaps new to the network world - and on an ongoing basis : OZEV, EV charge-point developers, the EV supply chain and also with energy retailers as they develop new off-peak tariffs. Throughout the ED2 period DNOs must also work very closely with local authorities on their EV charge-point plans, not least to monitor the realism of expectations on off-peak smart-charging[18].

Electric heat

In terms of avoided network investment, electric heat seems the 'hardest' area. The size and location of the electric heat challenge over the next decade is hard for DNOs to estimate with confidence. A recent Regen report[19] indicates that 31,000 heat-pumps were sold in 2019 against 1.6 m gas boilers. They note that 600,00 heat-pump installs p.a. by 2028 represents 20-times current sales[20] and ~one-third of current gas-boiler sales. Their model also indicates that the government goal would entail a heat-pump in nearly every new-build home, and that at current replacement rates of non-gas boilers, a proportion of gas-boiler households would also need to switch to heat-pumps. In the Energy White Paper BEIS indicate the annual opportunity for off-gas grid heating replacements in England to be around 50-70,000 annually[21].

The FES range for additional load due to heat-pumps by 2030 is 6-24 TWh and CCC 8 TWh. FES consumer transformation scenario for 2030 attributes ~8 GW at peak to additional residential heat

[16] Ofgem RIIO-ED2 Business Plan Guidance. 1 February 2021 – p 40 para 5.8-5.18 https://www.ofgem.gov.uk/system/files/docs/2021/02/ed2_business_plan_guidance_-_published_1_february_2021.pdf

[17] 4.49

[18] E.g OZEV : private charge-points will be required to be 'smart'. Unresolved for *public* charge points (e.g. m-ways, shopping centres, airports, city-centres etc).

[19] Regen. Rethinking Heat. A utility-based approach for ground-source heat-pumps. March 2021. https://www.regen.co.uk/publications/rethinking-heat/

[20] very roughly, a rate of increase of around 1.5 times each year from 2019

[21] Energy White Paper. P 114 & footnote 161.

pump load.[22] Some heat-pumps will be in gas-connected areas so possibly 'hybrid' and assumed not to contribute to peak electricity. We also of course don't know how heat pumps will be distributed across new-build / retrofit – or in able-to-pay homes or in social housing. We do know however that policy will first seek to encourage heat-pump installation in those parts of the country without access to a gas supply[23] [24]. Regen estimate that for a typical domestic property a heat-pump will make up over 50% of their annual electricity demand (presumably much of which likely to be in winter). Given these significant uncertainties, DNOs must work closely on the detail of their forecasts for heat pumps with local authorities, regional housing developers and others to gain a better understanding of likely impacts at specific points on their network.

In particular, there is currently only limited understanding and little hard evidence of household electricity consumption patterns with heat pumps consistent with satisfactory warmth and service in different types of home and household (heat, hot-water, seasonal, daily). The Electrification of Heat demonstration project supported by BEIS and the Energy Systems Catapult, due to complete in 2022, is installing 750 heat pumps across a representative range of housing types, many in gas-connected areas (including some hybrid heat pumps), plus energy efficiency measures where appropriate. This project will helpfully increase knowledge of heat-pump usage and household satisfaction[25].

Importantly, flexible heat-pump operation has yet to be successfully demonstrated at scale. More evidence is needed before flexible heat-pump operation can be considered as a robust alternative to avoided peak-related network investment[26], [27]. In addition, the flexibility offered by heat pumps may well be dependent on the thermal efficiency of the building, scope for pre-heating and whether hybrid or not. Trial homes in the south-east in the Electrification of Heat project will have thermal stores and explore the potential for flexible heat-pump operation at scale. The 'Future Flex' domestic customer trial, due to report shortly, also includes some heat-pump load[28].

Energy efficiency rather than flexibility should be regarded as the main means by which to tackle long-run growth in overall electricity demand from heat-pumps – especially given current uncertainty on the capability for flexible operation.

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[22] The scenarios table in the Ofgem business plan guidance (p 39) - which Ofgem extracts from FES and CCC - doesn't split out expected additional peak load by EV load and heat pump load.

[23] Energy White Paper. P 114 & footnote 161

[24] E.g. UKPN NIA project Communiheat in Great Barcombe, Sussex looking to create a DNO low carbon heating blueprint for off-gas grid communities
https://innovation.ukpowernetworks.co.uk/projects/communiheat/

[25] https://es.catapult.org.uk/impact/projects/electrification-of-heat-demonstration/

[26] See report by Maxine Frerk. Grid Edge Policy for SSEN. 'An electric heat pathway. Looking beyond heatpumps' - https://www.smarternetworks.org/project/nia_ssen_0039/documents

[27] Sustainability First & CSE. PIAG Paper : 'Heat decarbonisation: potential benefits of smart-meter energy-consumption data'. February 2021. p . 9 : discussion of availability of robust information on the energy performance of heat pumps in a GB context and whether they are being used in the way they are designed / expected to be used. This is needed to understand the grid implications of increased heat pump take-up, including the level of flexibility that heat-pumps could deliver.
https://d37809f7-dc9f-4c4f-835a-410a5acfa633.filesusr.com/ugd/ea9deb_adef2eaaa0e84179a318b260e75cec84.pdf

[28] Future Flex. WPD and Everoze. https://www.westernpower.co.uk/downloads-view-reciteme/128923

DNO forecasts

There is now experience from innovation projects (DNO, other) on the capability and flexibility benefit that certain LCTs – and in particular EVs - can offer to the networks in terms of avoided peak investment[29]. There is also now considerable experience of market-led 'real-life' patterns of EV charging. Some DNO innovation projects have also assessed the network impact of certain energy efficiency measures (but seemingly not the impact of better thermal insulation)[30].

In developing their forecasts for ED2 and beyond – and especially DNO expectations on how far future peak-demand growth can be curbed (i.e. as a result of smart-charging, tariffs, heat-pump operation etc) DNOs should show :

- How they have factored in findings from innovation and other projects into their forecasts - including how they have tested their own and the assumptions of others on the degree of flexibility and energy efficiency assumed – and -
- The steps they are taking – working with stakeholders including local authorities, key commercial actors and and others to test their thinking on likely uptake rates – plus flexibility potential - for EVs and heat-pumps in their area
- How the first two then translate into robust forecasts to 2030 in their area for flexibility capability and the potential to curb peak loads[31] plus any energy efficiency potential[32] against the scenarios in the ED2 Business Plan Guidance[33]
- And how these are then incorporated as business plan targets for delivery of both flexibility and energy efficiency potential as an alternative to network investment – plus associated metrics to monitor outcomes.

[29] For example SSEN My Electric Avenue - http://myelectricavenue.info/

[30] E.g SSEN Save energy efficiency project on LED lighting - https://save-project.co.uk/; SSEN Social Constrained Zones w National Energy Action. WPD Open LV; UKPN Energywise - focused on vulnerable households provided with Eco kettles, LED lights and standby shutoff
https://innovation.ukpowernetworks.co.uk/projects/energywise/
See also Appendix 3 of SSEN literature review for SAVE project for more on LNCF-funded projects to look at energy efficiency
https://save-project.co.uk/wp-content/uploads/2019/09/SDRC-1_Review-learning-from-other-projects.pdf

[31] i.e. assumptions on **% of peak-load reduction** (average, range) at particular network locations due to shifting
[32] i.e. assumptions on **% of reduction in overall load** (average, range) at particular network locations – plus associated peak-load reduction from the lower energy base-line
[33] ED2 Business Plan guidance pp 38-39

Section 2 – DNO approaches to flexibility and energy efficiency : clarifying desired outcomes

3. Flexibility and energy efficiency – outcomes and benefits

With adoption of a new ED1 Licence Condition 31E in December 2020 on DNO flexibility procurement and energy efficiency both Ofgem and DNOs need to better understand the relative potential of flexibility and energy efficiency outcomes for avoided network investment in developing next steps for the ED2 period and beyond. This is particularly the case for evaluating and implementing energy efficiency solutions, where there is less experience. In Table 1(Annex 1) we attempted a high-level comparison.

At network locations which are constrained either now or likely to be so in the future, DNO actions for flexibility and energy efficiency need to produce two main outcomes:

- **To reduce likely growth in peak-loadings to a level lower than otherwise**

- **To reduce the rate of growth in total electricity demand to a level lower than otherwise**

Either outcome should help to reduce the need for network reinforcement by curbing or reducing network loadings at a particular time-of-year, time-of-day; enable smaller connection assets than otherwise; enable less load-related reinforcement at higher voltage than otherwise[34].

DNO / DSO actions should help other actors to enable delivery of those outcomes. Broadly the actions take two forms :

- **Flexibility : operational measures to delay / defer a need for new peak-related network investment –** designed to avoid a need for network investment at a particular location through the nature of agreements for non-firm access and / or for flexibility. May have short-run or long-run impacts. Such actions include promotion of flexible customer responses - including via tenders, flexible connections, smart-controls, price-signals for self-balancing / local-matching. Flexibility of course can support cost-efficient fault management and resilience against exceptional events. Flexibility can also encourage load turn-up either in generation constrained areas or when wholesale energy prices are low (e.g offshore wind at night).

- **Energy efficiency investment[35] -** 'guaranteed' to reduce overall load at a particular location such that additional network investment (on an equivalent cost basis) is avoided for the long-run. Also enables associated reduction in peak load. Examples include improvements in thermal insulation of electrically heated property, replacement at scale of existing electrical equipment with significantly more efficient alternatives[36].

Sustainability First has a long-held view that improving thermal energy efficiency in homes is fundamental to affordability today and tomorrow, including with respect to minimising the costs of the transition and ensuring that these costs do not fall disproportionately on those least able to afford their energy, in particular to heat their homes. In our Sustainability First Viewpoint document

[34] See Annex - slide from SSE Save project presentation

[35] See Annex for definitions : energy efficiency; flexibility; constraint from LC31E, LC25B and ED2 SSM

[36] Eg LED lighting schemes, HVAC, induction motors etc - subject to not being already incentivised under other energy efficiency schemes

on the final ED2 SSM[37], we welcomed explicit recognition[38] for the under-sung but important role for electricity efficiency / electricity demand reduction in DNO initiatives to avoid load-related capex and in delivering net-zero at lowest cost to consumers. The potential benefits being potentially three-fold : cost-efficient network development, carbon-reduction plus improved end-customer affordability.

Comparing benefits to DNOs of flexibility and energy efficiency

Table 1 illustrates the broad benefits to DNOs of both (1) flexibility and (2) energy efficiency – plus some key considerations for delivery. As an alternative to new network investment, each has different characteristics, and over time may therefore drive different outcomes in terms of improved or more efficient network management. In practice DNOs should develop their own such comparative analysis - including an attempt at quantification. But, on the basis of our own high-level thinking, we make the following points :

- Both flexibility and energy efficiency offer the potential for deferred investment and optionality.

- Flexibility is well-suited to curb peak demand growth from EVs. Energy efficiency is better suited to curb the rate of demand growth from heat-pumps including peak-load (and regardless of whether heat-pumps are flexible in their operation).

- In principle, the long-lived benefits of avoided network investment may be more assured for energy efficiency investment than for flexibility. However, flexibility solutions can also be long-lived depending on, for example, the nature and length of agreements with end-users for firm/non-firm access and on contract-terms for flexibility services.

- As a non-network alternative at a given location, flexibility may be a lower-cost and more readily delivered option than energy efficiency. For flexibility, innovations in digital monitoring and control have a significant role, including by third-parties.

- The business case for energy efficiency may be harder to establish given (1) upfront spend may be higher (2) establishing the comparative benefit of *long-run* savings may be complex and (3) DNO partnership-working is essential to delivery. In the ED2 period, relative heat pump numbers are likely to be significantly lower than EV numbers. Many heat pumps will also be installed in new build homes which are already energy efficient.

- Third party actors are central to delivering both flexibility and energy efficiency. Successful delivery of flexibility however involves an ongoing third-party role - especially as many smaller customers begin to engage. This is not the case for assuring enduring outcomes from energy efficiency however.

- Wider long-run societal benefits also need to be factored into cost-benefit assessments of either flexibility procurement or promoting energy efficiency against new network investment. For

[37] Sustainability First. Viewpoint. RIIO-ED2. Ofgem Sector Specific Methodology : A green light for the energy transition. 26 January 2021
https://www.sustainabilityfirst.org.uk/expert-viewpoints/238-ofgem-sector-specific-methodology-a-green-light-for-the-energy-transition

[38] Ofgem. RIIO-ED2 Methodology Decision. Overview. 17 December 2020. Paras 5.59-5.64
https://www.ofgem.gov.uk/system/files/docs/2020/12/ed2_ssmd_overview.pdf

example in both cases, reduced carbon emissions (reduced fossil-dependency, less embodied carbon) and improved affordability through lower energy bills than otherwise. On the basis of our high-level comparison, energy efficiency looks likely to offer a greater societal benefit overall.

Flexibility - curbing peak loads

- Flexibility on distribution networks is well-suited to services which some customers can offer - via their low-carbon technologies - in support of avoided new peak-related network investment – enabling improved matching of supply and demand (nationally, locally). Those LCTs include intermittent renewables (PV, wind), electric vehicles (including V2G) and battery operation.

- DNOs must promote and facilitate flexibility. Successful and cost-efficient delivery depends on very many other actors bringing tech, data and customer-facing innovation and services into the mix.

- End-customer willingness is essential to successful delivery of flexibility – including where customer response is automated. This in turn means that end-customers must see a benefit (lower bills, convenience etc). This is not the case for energy efficiency.

- Flexible heat-pump operation has yet to be successfully demonstrated at scale - as discussed in section 1.

4. Energy efficiency – and demand reduction from a DNO standpoint

Key characteristics

As noted, licence duty 31E encourages DNOs to promote the uptake of measures to improve energy efficiency as a cost-efficient alternative to network investment including procuring energy efficiency services where economical and efficient. We look more at the DNO role in this area in section 3.

Here, we take energy efficiency in the DNO context to mean :

- Measures to improve the thermal efficiency of an electrically heated building
- Substitution of an old inefficient high-consuming electrical appliance with a more efficient one[39].
- Measures expected to result in once-and-for-all reduction of electrical load overall – plus an associated reduction in peak-load.
- Depending on appliance characteristics (eg storage heaters, heat pumps, hot-water storage) flexible operation to curb peak load may also be feasible *in addition*.

[39] For example, the SSEN Save project installed LED lightbulbs. Its assessment of the potential for replacing LED lightbulbs at scale against a physical network alternative indicated a mixed NPV outcome (on the basis of an average winter peak-load reduction in the trial of 47 watts per participating household). Additional modelling for the project also found that for homes without electric heat, it was hard to make the case for substitution of additional appliances.

https://save-project.co.uk/wp-content/uploads/2019/09/SDRC-8.3_LED-trial-report.pdf

Improving the energy efficiency of buildings

From a network standpoint some 'in principle' areas to consider on improving the energy efficiency of buildings include the following :

- Promoting energy efficiency may cover both the non-residential and residential sectors.

- The residential sector seems likely to be a focus for DNO energy efficiency activity. A desired outcome surely must be for the individual-level benefit to fall to households less able-to-pay – especially those in vulnerable circumstances.

- Promoting energy efficiency and procurement of energy efficiency services as an alternative to network investment will require careful targeting by DNOs - both in terms of network location and in terms of reaching the particular household group that DNOs intend should benefit.

- The anticipated ramp-up of heat-pump installations to meet the 2028 goal coincides directly with the ED2 period. As noted, initial government and policy encouragement for heat-pump uptake has a focus mostly on areas without gas. DNOs will therefore wish to consider their own ED2 energy efficiency activity in those same geographic areas where there are also network constraints (or likely to be). Scope for significant impact from DNO energy efficiency initiatives in ED2 may therefore be relatively modest. However, ED2 is a very important 'proving period' for effectiveness of DNO actions on energy efficiency as an alternative to network-build. The potential and likely viability of energy efficiency as a DNO tool needs to be well-understood for ED3, in readiness for expected network reinforcement driven by major heat electrification.

- All such measures by DNOs need alignment with plans and initiatives detailed in the forthcoming Heat and Buildings Strategy (and devolved equivalents). This will aim for most homes to be rated EPC C by 2035[40]. The Future Homes Standard aims for all new homes to be well-insulated and without fossil fuel from 2025. Plus, DNOs must take account of plans outlined in the recent Fuel Poverty Strategy for England[41] and devolved equivalents. For example, the Fuel Poverty Strategy has a focus on existing dwellings with an Energy Performance Certificate rating below C (ie from G-D). A large segment of such homes are either owner-occupied or privately rented, which from a network standpoint raises a challenge in terms of partners and 'reach'. There are also questions for DNOs on how best to ensure that their efforts on energy efficiency deliver 'additionality' rather than simply displace other existing energy efficiency schemes such as the ECO.

There are also more directly scheme-related considerations for DNOs on energy efficiency of buildings at constrained parts of the network including whether new-build or retrofit and which housing sector. We return to these topics in section 3.

[40] Heat and Buildings Strategy – including Future Homes Standard, updating Decent Homes Standard for the public sector homes, Future Buildings Standard for non-domestic buildings etc

[41] Sustainable Warmth: protecting vulnerable households in England. 11 February 2021

From a DNO standpoint, energy efficiency of buildings therefore adds up to a multi-dimensional picture and largely new territory. For heat pumps energy efficiency has the undoubted potential to support Ofgem's goal of 'proactive management of system growth'. All of these issues will benefit from further thought but this should not stand in the way of making progress in ED2. DNO near-term priorities therefore seem likely to be on :

- Property not directly subject to access charges (i.e.residential retrofit)
- Those parts of a DNO network not on the gas grid
- Building effective delivery partnerships and
- Developing in-house understanding and expertise on the GB funding landscape for energy efficiency measures (commercial, domestic) to shape effective and targeted strategies for 'additionality' - not duplication.

We discuss the nature of the DNO role on energy efficiency plus incentives for partnerships in section 3.

Energy efficient appliances & information programmes

Not a main focus for this note, but in principle, DNO actions to promote energy efficiency might include replacement of old inefficient domestic appliances with more efficient ones at especially constrained locations (e.g. old tumble driers, old freezers) to reduce overall demand and, potentially peak load (not guaranteed in the case of tumble driers). Simply to note that this is one 'tool' in the DNO 'tool-box'. Over the years, a number of DNO innovation projects have evaluated the potential benefits of location-specific and community-based interventions at local substations, including installing more efficient appliances, often coupled with information / education / app development / community-led initiatives[42]. An up-to-date summary of lessons from these various DNO energy efficiency projects may be of use to underpin DNO forecasts should DNOs wish to include more such schemes in their ED2 business plans as a means of 'promoting' energy efficiency measures.

Energy efficiency and flexibility in combination

In practice, energy efficiency in combination with flexibility procurement is likely to produce the greatest and most enduring overall network impact. In the future, this will be highly relevant to electrically heated property, including where electric vehicles are also charging or as and when heat-pump operation also offers flexibility. We strongly support DNOs promoting both such actions. However, as noted, from the standpoint of electricity markets, Ofgem, and DNOs there has been significantly more focus so far on promoting and procuring flexibility - rather than seeking electricity demand reduction via energy efficiency.

[42] For example, ENWL, WPD Open LV, SSEN Social Constraint Managed Zones with NEA, UKPN energywise

5. Technical energy efficiency : distribution losses and voltage regulation

A major aspect of DNO electricity efficiency in ED2 must surely be concerted steps **to address the technical efficiency of the networks.** With significant new loads expected in the 2030s a focus on technical efficiency to avoid new network investment is central to delivering net-zero at lowest cost to consumers and future consumers. Two major examples are approaches to **distribution losses** and **voltage regulation**.

Distribution Losses : Sustainability First has argued strongly for losses to be given more focus and sharper financial incentivisation in the ED2 SSM[43]. Losses are both a major long-run efficiency issue and a short-run carbon issue for the distribution networks. Given Ofgem interest in what more can be done to curb long-run load growth via energy efficiency and demand reduction then tackling losses ought to be high on their own agenda as well as that of DNOs. Today, distribution losses account for c 6-7 % of power transferred over distribution networks. Connecting more low-carbon technologies and building new network assets to meet electrification goals, plus sweating assets harder – including via flexibility - will each contribute to higher levels of electricity distribution losses than today. A consultancy paper by WSP for the ENA in 2018 suggested that losses could rise very substantially in the period to 2030 - more than three-fold [44]. Incentivising the companies to use low-loss equipment on their networks will improve the energy efficiency of DNO's own operations. **Cost-assessments of DNO plans - for new load-related network investment, for flexibility, for energy efficiency – should each include an evaluation of the expected impact on losses. Seemingly, only energy efficiency offers a clear *additional benefit* on reduced losses – by reducing demand overall and therefore reducing the need for an equivalent unit of electricity supply.**

Voltage regulation : other than as an 'emergency' response voltage regulation was a relatively neglected area for DNOs prior to ED1 (also for the ESO). Now however the potential is understood and starting to be exploited as a very effective mechanism, including as a market service, to improve management of losses, provide flexibility and reduce load[45]. Voltage is maintained within statutory limits (+10%/-6%) with system stability secure and customer equipment not at risk. A recent

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[43] Sustainability First Viewpoint. January 2021. Ofgem Sector Specific Methodology. A Green Light for the Energy Transition
https://www.sustainabilityfirst.org.uk/expert-viewpoints/238-ofgem-sector-specific-methodology-a-green-light-for-the-energy-transition

Sustainability First. Ofgem's RIIO ED2 Methodology Consultation. September 2020
https://www.sustainabilityfirst.org.uk/images/publications/consultations/Sustainability_First_-_ED2_SSM_Submission_-_250920_-_final.pdf

[44] ENA CEP023 Technical Losses Mechanism Study. Refers to a 2018 WSP study for an earlier ENA Working Group on 'Impact of Low Carbon Transition – Technical Losses'. This found that increasing uptake of LCTs will significantly impact losses. WSP suggest that at maximum levels of penetration, LCTs could increase losses by 2030 up to 350% on existing levels, with rural networks being relatively more impacted than urban.

Also, WSP Insight by Anna Ferguson, WSP. 26 February 2021
https://www.wsp.com/en-GB/insights/what-can-electricity-networks-do-about-technical-losses

[45] The Value of Lost Load (VoLL) for Electricity in Great Britain. Final report for OFGEM and DECC. London Economics. 2012.
https://www.ofgem.gov.uk/ofgem-publications/82293/london-economics-value-lost-load-electricity-gbpdf

literature review by Northern Powergrid concludes that a 1% reduction in voltage can result in a 1% reduction in small-customer demand ('conservation voltage reduction') - and possibly more depending on the type of load and prevailing network conditions[46].

During ED1, DNOs have run very worthwhile innovation projects on voltage regulation. Initial schemes were focused on higher voltage substations, demonstrating that scale deployment would offer substantial customer savings[47]. At lower voltages, DNOs have been looking at voltage regulation to mitigate the impact of LCT clusters. One project indicates savings of 'up to 10% of the energy consumed on the LV network' and potential savings for individual customers 'of up to £70 per annum'[48]. Another LV trial of interest, is looking to reduce deployment costs by making use of customer smart meters to monitor voltage[49]. Some DNOs are bringing voltage regulation into business-as-usual in ED1. There are still questions about how far the benefits of voltage reduction apply also to EV charging and Heat. ENWL will be exploring this further through their QUEST project. Subject to this, in ED2, Ofgem should look for significant efficiency savings from voltage regulation deployed at scale as a cost effective alternative to network reinforcement.

In thinking about energy efficiency in ED2, Ofgem and the companies should look very actively at the benefits of technical efficiency. Better losses management and voltage regulation are two significant examples where improvements in *technical efficiency* of network management can significantly offset future impacts of load growth from EVs, heat pumps and other low carbon technologies. This is certainly not an 'either-or' question on whether to insulate homes, but on an equivalent cost-basis the avoided-cost benefits to customers through technical efficiencies may be high-value and more readily achieved at particular constrained locations.

6. Conclusions on flexibility and promoting energy efficiency as an alternative to network investment

Section 2 suggests that for the decade ahead DNO actions need to focus on (1) concerted strategies to encourage customer flexibility for EV charging and (2) on promoting energy efficiency in a highly aware and targeted way for electric heat.

Given the prospective volume of EV and heat-pump connections in ED2 and beyond, a much deeper understanding is needed on precisely where on their networks DNOs might as a priority need to

[46] NPG. Boston Spa Energy Efficiency Trial. Literature Review. February 2021
https://www.northernpowergrid.com/asset/0/document/5985.pdf

[47] ENWL Class project. Prospective savings of £300m across all GB customers over 25 years
https://www.enwl.co.uk/go-net-zero/innovation/key-projects/class/what-is-class/

[48] ENWL Smart Street project
https://www.enwl.co.uk/globalassets/innovation/smart-street/smart-street-key-docs/smart-street-closedown--report.pdf

[49] Northern Powergrid Boston Spa Energy Efficiency Trial. Smart Meter Voltage Measurement Performance. December 2020
https://www.northernpowergrid.com/asset/0/document/5865.pdf

pursue flexibility options or to promote energy efficiency solutions. This far more granular and developed picture must be clearly communicated via the new Network Development Plans[50].

There remain significant questions however on how DNOs are expected to 'make-the-case' for flexibility and, in particular for energy efficiency against network alternatives :

- It may be hard to demonstrate that the benefits outweigh the costs where, for example : significant upfront capital outlay and / or third-party costs are incurred or third-party involvement is also needed; where asset lives are not necessarily readily comparable; where a flexibility value, or an efficiency or a carbon benefit is hard to monetise or demonstrate. Account needs to be taken of the 'real option' value of flexibility solutions which enable networks to delay decisions on reinforcement until demand growth is more certain. Conventional NPV analysis undervalues flexibility[51].

- Outcomes for flexibility and reduced load sought by the DNO sit largely with the customer / on the customer-side of the meter. Successful delivery therefore requires not only appropriate DNO / DSO ambition and engagement but also committed third actors, who may or may not be sufficiently resourced to engage and collaborate on initial scheme delivery. In the case of flexibility, small customers will need to deliver collectively on a long-term commitment .

[50] LC 25B

[51] Forthcoming paper from Maxine Frerk for Oxford University Integrate Programme

Section 3 – Do ED2 incentives 'spur' DNO actions on energy efficiency ?

7. How well are DNOs currently incentivised on energy efficiency ?

This section looks at the ED2 incentive package for energy efficiency and tries to answer Ofgem's question on how far this will 'spur' DNO actions.

We have taken a high-level look across Ofgem measures which could be expected in broad terms to encourage DNO actions on energy efficiency either to reduce - or to smooth - the need for additional load-related capex within this or subsequent price-control periods – in particular where those reinforcement costs are to be recovered from customers in general. These measures include major Ofgem programmes (access charges, full-chain flexibility), new ED1 Licence conditions[52] (on flexibility, a network development plan and whole electricity system) - plus a mix of ED2 SSM incentives.

Join-the-dots : new ED1 duties, Ofgem reform programmes and ED2 incentive arrangements

As noted, the distribution licence condition 31 E.1 gives welcome new duties for :

'procuring and using distribution flexibility services where economic and efficient to do so - and for

'promoting the uptake of measures to improve energy efficiency where such services cost-effectively alleviate the need to upgrade or replace electricity capacity and support the efficient and secure operation of the distribution system. This may include procuring energy efficiency services, where it is economic and efficient to do so'.

The terms 'energy efficiency' and 'energy efficiency services' are defined in the licence condition[53] .

LC 31E1(i) is also framed as a long-run duty extending beyond individual price-control periods.

'*anticipating the future electricity requirements of its distribution system and developing competitive approaches to procuring distribution flexibility services and, **where applicable**, energy efficiency services, **wherever this is in the best interests of current and future electricity consumers in Great Britain**'*.

Guidance from Ofgem on the caveats highlighted here around the long-run nature of the duty would be helpful.

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[52] Electricity Act 1989. Standard conditions (consolidated) of the Electricity Distribution Licence. Reissued – 3 February 2021.
https://www.ofgem.gov.uk/system/files/docs/2021/02/electricity_distribution_consolidated_standard_licence_conditions_22_01_2021.pdf
Licence Condition 31E. Procurement and use of Distribution Flexibility Services pp 207-211
and Licence Condition 25B. Network Development Plan pp 162-3
Plus also forthcoming in ED1 in 2021, new **Whole Electricity System** licence condition

[53] LC 31E.20 p 212 "Energy Efficiency" means the ratio of output of performance, service, goods or energy, to input of energy; "Energy Efficiency Services" means a service contracted to improve the Energy Efficiency of a network user or users. See also Annex for definitions

The new licence condition 25B for a biannual network development plan that looks ten-years out will improve visibility of constraints and set out DNO plans on flexibility and energy efficiency as an alternative to reinforcement. A new 'whole *electricity* system' condition is also imminent, with a stress on coordination with the ESO and other stakeholders. In combination these three new licence duties are clear and in terms of flexibility and promoting energy efficiency have the potential to be transformative. They are not expressly incentivised in ED1 however.

It will be helpful for Ofgem to clarify how the new licence duties are expected to inform and shape :

- DNO ED2 business plan forecasts
- Relevant Ofgem reform initiatives (access reform, full-chain flexibility).
- Relevant ED2 SSM incentives. These include approaches to strategic investment, the design of ED2 uncertainty mechanisms and strategy output delivery incentives (DSO[54], vulnerability, large connections).
- ED2 decarbonisation targets as measured by business carbon foot-print, data strategies and whole energy system approaches.

Conclusion on joining-the-dots : guidance is needed on how the dots join-up on energy efficiency as between the new ED1 licence conditions, access reform, the flexibility work programme and ED2 incentives. These otherwise risk remaining a sub-optimal patchwork of separate measures.

8. Cost assessment approaches, metrics and DNO outcomes for energy efficiency

Central to 'joining the dots' on energy efficiency – and seemingly with little or no developed thinking so far - is how to establish common approaches to cost-assessment, metrics and outcomes in order to justify DNO actions. This should also inform thinking on how far 'early' investment can create longer-term savings. Clarifying these areas will not be easy but is essential. This is an area where Ofgem and DNOs need to work together on further guidance. It will also help to clarify the material difference – if any - between 'promoting the uptake of measures to improve energy efficiency' and 'procuring energy efficiency services'.

Cost assessments

Costs and benefits of network and non-network alternatives (both energy efficiency and flexibility) must be assessed on an equivalent basis. Getting this right will entail further thought e.g treatment of asset lives, depreciation, discount rates, optionality value, avoided costs (losses, carbon - including embodied) and wider social benefits (energy bill savings).

For energy efficiency at a low-voltage constraint in ED2, it is perhaps unclear how far value will be readily demonstrated via a simple CBA. Upfront costs may be high, delivery may depend on successful partnership (including securing other funding), and long-run or wider benefits may prove hard to monetise or attribute. It is possible that other approaches to cost-assessment for valuing energy efficiency schemes in ED2 will be warranted such as social return on investment (SROI) but while this may be part of the solution it does not resolve all the issues.[55] ENA Open Networks have

[54] ED2 SSM Overview. P 87 - DSO baseline standard A1.35 states : Through DSO strategies we expect to see DNOs setting out how they will comply with SLC 31E

[55] The ENA is understood to be developing a whole economy and social cost benefit approach for evaluating whole-system benefits under the CAM (coordinated adjustment mechanism). Also, similarly, GDNs and DNOs on metrics for their vulnerability strategies have been developing an SROI approach (social return on investment) (SSM Annex 1 p 60-61. Para 6.26)

recently concluded a Common Evaluation Methodology Tool[56] to assess flexibility projects against network alternatives, but so far this does not include energy efficiency projects. A DNO NIA project has begun to look at network valuation of energy efficiency projects, including international lessons, but has yet to report[57].

This is important both for companies in assessing individual proposals but also for Ofgem in its approach to benchmarking using statistical techniques which may not readily accommodate demand side actions.

Metrics

In our rapidly evolving electricity system, the choice of metrics matter. This includes how far non-network alternatives are successful as long-run solutions in place of network investment. DSOs are currently considering a set of outcomes, potential targets and metrics for evaluation of their different strategies. One area to consider will be what meaningful metrics might look like to assess the long-run value of DNO's active promotion of energy efficiency schemes. **Energy efficiency metrics and reporting on energy efficiency outcomes should also directly tie into possible targets within vulnerability strategies for energy efficiency initiatives and schemes**.

DNO outcomes

In considering 'what good looks like' from DNO involvement in energy efficiency schemes as an alternative to network investment[58] a number of questions arise, including its relationship to 'whole-system' thinking. For example, how far is the goal of promotion of energy efficiency schemes by DNOs expected to achieve (1) a long-run reduction in overall electricity demand and / or peak demand; and / or a whole-system goal to (2) permanently reduce *energy* demand more widely by facilitating a substitution from gas or oil demand (and a potential carbon reduction). Or perhaps, achieve a combination of all of those benefits. There is also a question as to how far energy efficiency interventions by DNOs might be expected to be location-specific or potentially network-wide.

Our assumption here is that energy efficiency measures by DNOs will focus chiefly on achieving reductions in electricity demand at particular locations where there are constraints. Ultimately, DNO goals on energy efficiency can be framed in terms of bringing a benefit to consumers in general - via lower network costs from avoided network investment – *plus* also deliver an individual-level benefit for particular pre-defined customer groups. In the near-to-medium term until the system fully decarbonises there should also be a potential carbon benefit (lower fossil fuels, embodied carbon, lower losses than otherwise).

[56] Report for ENA from Baringa. Common evaluation methodology and tool. 24 December 2020 https://www.energynetworks.org/industry-hub/resource-library/open-networks-2020-common-evaluation-methodology.pdf

[57] UKPN Firefly NIA Project. June 2019. Aims to understand the viability of a DNO-led approach to energy efficiency as alternative to network reinforcement and to model the areas of greatest benefit and likely implementation costs.
https://innovation.ukpowernetworks.co.uk/projects/firefly/

[58] See Annex 2 for 'energy efficiency' definitions used in : LC31E and ED2 SSM

Conclusion on DNO approaches to cost-assessment, metrics and outcomes for energy efficiency : these areas each need to become better understood. There is presently a particular 'gap' around DNO approaches to evaluating the long-run costs and benefits of energy-efficiency which warrants review. Clearer guidance on cost-assessment will pave the way for bigger energy efficiency schemes being more clearly cost-justified. Better understanding of the treatment of costs and benefits of energy efficiency measures for DNOs will help clarify the somewhat ambiguous licence-condition term 31E.1(g) 'where appropriate' - and also a step to better informing how far energy efficiency schemes could become a scale alternative to network investment in ED3.

9. ED2 incentives on energy efficiency : clarifications and incentive gaps

Ofgem asks if additional measures are needed in the ED2 package to 'spur DNOs to take actions to reduce demand in the long-run'[59]. Even if the new ED1 licence duties and ED2 incentives become more 'joined up' as described, thought is still needed on how far the ED2 package of measures will drive energy efficiency in practice.

In ED1, Ofgem, DNOs and third actors have focused on flexibility as the main alternative to network investment. Flexibility also still dominates thinking on the ED2 incentives, in particular on the DSO role plus Ofgem's work programme on full-chain flexibility.

This section focuses largely on **clarifications and incentive gaps for energy efficiency** – where Ofgem's own expectations – and those of DNOs – are much less developed

Net-zero - ED2 approaches to strategic investment and uncertainty mechanisms. Will these drive energy efficiency ?

We are supportive of Ofgem's wish - in the face of uncertainty - for flexible approaches to giving a green light to DNO load-related investment for connecting more EVs, heat-pumps and other LCTs. The ED2 SSM includes several uncertainty mechanisms designed to enable well-justified investment for net-zero at lowest cost to consumers, be that for baseline funding or, if more uncertain, using volume drivers or reopeners. Generally, Ofgem's expectation for DNOs to first demonstrate that they have considered non-network alternatives is clear – both for strategic investment[60] and as per the DSO baseline standards for planning and network development[61]. Each includes an explicit reference to promoting energy efficiency.

Strategic investment

ED2 includes a provision for companies to include proposals for strategic investments that would be treated as price-control deliverables, where the funding can be clawed back if not delivered. DNOs are expected to demonstrate extremely close-working with local authorities and other relevant stakeholders to assure themselves - plus Ofgem - that such scheme proposals are robust. DNOs will also need to assess and incorporate the role they see for energy efficiency in reducing the size of a strategic investment for heat. This could be quite a challenge where the scheme plan might be to 'over-size' assets on a 'touch-the-network-once' basis. The points below on access charges may also be relevant here.

[59] SSM Overview. Para 5.63 on proactive management of future system growth
[60] ED2 SSM Overview Document 5.59 (p 66)
[61] ED2 SSM Overview Document A1.16 p 81

Automatic capacity volume driver

Given the considerable uncertainty around the uptake rate for both EVs and especially for heat-pumps this mechanism may in the end drive a relatively large share of all ED2 non-baseline load-related capex at constrained network locations. Ofgem are looking at how to couple this with a utilisation metric for assurance that such investment is genuinely required.

In our Viewpoint paper on the final ED2 SSM[62] we were supportive of an automatic capacity volume driver to deal with uncertainty around load-growth and in Ofgem wanting to avoid an incentive which drove companies to undertake unnecessary investment. However, we also had a concern that a utilisation metric was complex and could in itself lead to unintended outcomes. As an alternative, we suggested a simple capacity volume driver - but with a capacity ceiling based on business plan projections (eg +/- 5-10%). This offers the potential for a 'simple metric' to accommodate small variations. But, above that given threshold, release of additional load-related funding would be subject to more in-depth scrutiny of utilisation, including to safeguard against company gaming. Such an approach could help in facilitating speedy investment at specific locations – but at the same time offer a clear check and balance so that company obligations to conduct their operations in an economic and efficient manner are assured.

In accommodating new loads from EVs, heat-pumps and other LCTs onto networks, there is a question around **how far the proposed automatic capacity volume driver is likely to drive 'right' company responses on asset- or non-asset solutions – especially for energy efficiency**. One related factor is how far this mechanism aligns with the Totex incentive mechanism (TIM)[63].

- **For flexibility outcomes** – the expectation is that cost-savings of avoided peak-load investment at a given location from flexibility actions can be satisfactorily base-lined against the cost of the network alternative as specified by the volume driver (£/kW). The costs of procuring flexibility are 'allowable' under Totex and therefore also aligned in incentive terms.

- **For energy efficiency outcomes** – it is perhaps less clear how a permanent energy demand reduction from reduced heat-pump load will be satisfactorily base-lined / demonstrated against a network alternative funded via an automatic capacity volume driver. This question relates to our earlier points on the need for more work on suitable DNO approaches to cost-assessment, metrics and outcomes for energy efficiency. This may not be a significant matter for ED2, as energy efficiency services procured by DNOs may still be modest but may become an issue for the longer term. While in ED2 promoting uptake of energy efficiency measures could be incentivised via customer vulnerability strategies (see below) it is less clear how far this would be the case for actions on energy efficiency procurement. If demand drops permanently then existing models would not count this as providing "increased capacity" so it is not clear that the volume driver would create the right incentive.

[62] Sustainability First Viewpoint.

https://www.sustainabilityfirst.org.uk/images/publications/expert_viewpoints/expert_viewpoint_ofgem_sector_specific_methodology_a_green_light_for_the_energy_transition.pdf

[63] The Totex Incentive Mechanism (TIM) permits the company to retain a share of the efficiency benefit it has delivered over the course of its full price control against the allowances agreed at the start of the price control.

The Totex incentive mechanism (TIM)

In principle the TIM has driven flexibility actions by DNOs in ED1. This very much relates to our earlier points about a need for suitable approaches to evaluating both the costs and benefits of both flexibility and energy efficiency. Where flexibility or energy efficiency are more cost-effective alternatives than network investment then DNOs must be suitably incentivised to pursue those outcomes. The challenge is to compare outcomes on an equivalent basis, and if there is not a sound footing for this, then the outcomes (and therefore the companies) will be either under- or over-incentivised to pursue those solutions. Importantly, if energy efficiency offers wider social benefits than a conventional reinforcement it may be better to do that even where this might cost the DNO more. In which case the TIM would not seem to drive the 'right' behaviour. **To close this gap some additional incentive or use-it-or-lose-it funding may be needed for energy efficiency.**

Access charging reform – and energy efficiency

Not strictly an ED2 incentive, but certainly a part of the long-run net-zero mix, new access and forward-looking charging arrangements should support clearer customer-facing price-signals for large network connections and also for network-usage – be these for generation or for load. In principle, the new charging arrangements will incentivise 'efficient' sizing of connection assets (i.e. for large connections – including major new housing developments or major electric heat retrofits). Plus through DUOS, and subject to customer responsiveness, could support more efficient patterns of network usage by encouraging load-shifting.

There could be a question to consider on the relative 'added' benefit of energy efficiency measures (or flexibility) dependent on where the connection-charge boundary will in the end be drawn (e.g.retaining the present 'shallowish' charges or moving to 'shallow'). Should the cost of reinforcement to the network increase due to a change in connection boundary, then one outcome will be that customers-in-general will meet a larger share of network reinforcement cost than now. If so, then promoting energy efficiency at that location may offer a potentially bigger saving and customer benefit (by lowering the bill for all customers). This is clearly a complex set of interactions to which Ofgem may wish to give some thought.

Conclusion on ED2 net-zero incentives : Ofgem and the companies may need to consider how far these align well with driving network-related energy efficiency solutions for the long-run. This is a complex question that links with the conclusions around cost assessment and metrics above.

ED2 Strategy Output Delivery Incentives (ODIs) – how far do these 'join-up' to support energy efficiency (DSO, vulnerability) including with innovation (NIA))

The ED2 SSM has introduced three new strategy-ODIs designed to encourage and assess ambitious outcomes in key areas of DNO activity - for DSO, vulnerability and large connections. Common base-line standards must be met within these wider strategies.

DSO strategies

As noted, DSO baseline standards on network planning and operation explicitly reference flexibility and promoting energy efficiency in assessing network options[64] . There is also a separate DSO base-line standard on engagement and information provision which explicitly includes groups in vulnerable situations[65] . The SSM also states : 'we expect there could be additional ways DNOs can engage vulnerable customers in flexibility markets or otherwise promote their interests as DNOs develop DSO capabilities. *As such, we invite DNOs to include other proposals in their DSO strategies and highlight how their DSO strategy is coherent with their vulnerability strategy*'[66]. **Explicitly linking the DSO base-line standard for promoting energy efficiency to the DNO vulnerability strategy seems obvious. This expectation is presently not spelt out and should be made explicit.**

Vulnerability strategies

ED2 SSM reflects the principles-based licence duty for DNOs to treat customers fairly, especially those in vulnerable situations, plus includes a vulnerability strategy to 'ensure DNOs provide appropriate support and services to consumers in vulnerable situations in ED2'[67]. The three areas identified by Ofgem of primary focus for DNO vulnerability strategies[68], plus two of the three principles and their associated baseline expectations[69] would readily lend themselves to DNOs taking action targeted on vulnerable customers to promote energy efficiency schemes in an electric heat future. Yet in a word search of the baseline standards and strategy ODIs for both vulnerability and

[64] DSO baseline standards and strategy
(BPI /CVP/ODI-F)

Baseline Standards
Role 1 – Planning & Network Development. A1.16 p.81
'DNOs to have in place transparent and robust processes for identifying and assessing options to resolve network needs, using competition where efficient. This should include demonstrable cross-sector engagement, optioneering, and planning with sectors or vectors other than their own. DNOs should consider flexibility ***and promoting energy efficiency*** *in addition to innovative use of existing network assets and traditional reinforcement. The process of identifying options should include engaging with other network licence holders and current and prospective network users. Options must be fairly compared against one another, with flexibility used where it is economic and efficient compared to investing in traditional reinforcement or technological solutions. We expect a consistent approach for valuing flexibility, taking into account the option value it provides in the context of uncertainty. DNOs must ensure transparency in their approach to allow scrutiny of decision-making'.*

[65] ED2 SSM. Overview. P 86 Activity 3.1 on market information. Para A1.32
[66] ED2 SSM. Overview. P 78. A1.7
[67] ED2 SSM. Annex 1. Delivering value for money services for consumers p 55
[68] ED2 SSM. Annex 1. Delivering value for money services for consumers p 63
vulnerability to a loss of supply; being in, or at risk of, fuel poverty; risk of being left-behind by the energy system transition towards net- zero
[69] ED2 SSM. Annex 1. Pp 163-164**. Principle 2** : identifying consumers in vulnerable situations); **Principle 3**: understand new forms of vulnerability, in particular by identifying blockers **to participating in a smart flexible energy system**

for large connections the term energy efficiency does not appear[70]. **We suggest that DNOs adopt a collective target to deliver a number of major 'beacon energy efficiency schemes' in ED2.** This readily integrates with Ofgem thinking on the NIA, whole-electricity system[71] and whole-energy system[72] (see NIA below).

Network Innovation Allowance

One of two areas singled out by the SSM for NIA funding is for vulnerable customers[73]. We very much hope that DNOs will look actively at how to make the most of this important opportunity. To some extent the NIA focus rightly sits around ensuring that vulnerable customers have equal access to the benefits of a smart world and are not 'left-behind'.

However, we also very much see promoting energy efficiency within scope of the NIA. **We would like to see - through suitable partnerships - DNOs develop a number of major 'beacon' energy efficiency schemes targeted at vulnerable customers – and designed to curb future system growth from electric heat pump uptake. The schemes would be firmly aligned with desired outcomes of vulnerability strategies.**

The 'innovation' element would revolve around systematic evaluation of the impact, costs and benefits of direct or substantial DNO involvement in promoting energy efficiency schemes, plus a far better understanding of what replication and scale delivery would look like and what long-run whole *energy* system benefit this could bring to the networks in terms of net-zero at lowest cost to consumers. This would then offer a far better line- of-sight on approaches and pathways for the ED3 period.

NIA funding targeted at vulnerable customer groups might perhaps be judged more suited to smaller projects for 'promoting uptake of energy efficiency measures', rather than these proposed beacon energy efficiency schemes. **In which case Ofgem could opt to fund DNO energy efficiency beacon schemes via an alternative ED2 funding pot on a use-it-or-lose-it basis**[74].

In terms of location for these beacon projects, it seems logical for DNOs to prioritise areas without access to gas which as noted is where policy direction suggests electric heat will initially grow. Alternatively DNOs could promote creation of 'social constrained zones' where affordability is a particular issue and which perhaps already have high levels of electric heat.

Also, if there were some major local authority, social landlord or similar projects 'ready-to-go' for electric-heat coupled with whole-house energy efficiency, then these may perhaps also be suited to DNO funding under the £300m ED1 Green Recovery Project announced by Ofgem and the ENA on 8 February 2021[75] .

[70] Word-search of the ED2 SSM Overview, plus the 174-page ED2 SSM Annex 1 on 'Delivering value for money services for consumers' -
[71] Forthcoming ED1 licence condition
[72] Incentivized in ED2 under the Consumer Value Proposition
[73] ED2 SSM. Overview p 49 para 4.91
[74] For example, perhaps a new funding pot for energy efficiency beacon projects on a use-it-or-lose-it basis, along the lines adopted at final determinations for GD2 on bio-methane.
[75] https://www.energynetworks.org/newsroom/energy-networks-set-to-power-up-the-green-recovery

Conclusion on Strategy ODIs and NIA in promoting energy efficiency :
New or additional obligations on DNOs are not the issue. However, it is **very important for energy energy efficiency to be given more prominence as a clearly desired ED2 output, along with suitable targets and metrics.** Ofgem should spell out the synergy of promoting energy efficiency via (1) the core DNO/DSO role – linked to (2) delivery of company vulnerability strategies and Ofgem's principles and base-line standards – plus (3) the NIA focus on innovation for vulnerability. The energy efficiency door is potentially already wide-open for DNOs to develop ambitious and innovative schemes in their ED2 business plans. Ofgem plus DNOs must join the dots. **This will also lay the ground in establishing the role for energy efficiency as a major long-run non-network alternative in curbing future system growth. Should the NIA not be suited to fund our proposal for DNO energy efficiency beacon schemes in ED2 then Ofgem could do this via an alternative funding 'pot'.**

10. DNO role and expertise on energy efficiency

Improving the thermal efficiency of buildings will not necessarily translate directly into better-management by DNOs of constraints on their networks or demonstrable reductions in new load-related capex. This is why innovation funding under the NIA or an alternative pot for some beacon schemes targeted on vulnerable customer groups seems a right road to start down. Initially, as noted, locations off the gas-grid and / or in locations where homes are predominantly electrically-heated (still an important sector) seem areas more likely to benefit.

We see important and legitimate reasons for a considerably more active DNO role in promoting and potentially driving improvements in the thermal efficiency of domestic properties. Nevertheless, the new ED1 licence duty[76] and the ED2 DSO baseline standards on promoting energy efficiency as an alternative to network investment **still leave basic questions on quite how far that DNO role on energy efficiency might go : how active a DNO might be, likely priorities, and how that role might evolve going forward.**

BEIS consulted in 2019 on a wider role for networks on energy efficiency. Part of the motivation was a street-by-street approach to retrofit - to which there is clear value. In our view however DNOs do not have the customer-facing experience to take on such a lead. We doubt that Ofgem intends that they should – and the language of LC 31E is clear on the DNO duty being to avoid unnecessary network investment.

We have consistently argued that both GDNs[77] and DNOs need to demonstrate how they are best placed to lead energy efficiency in a particular circumstance - i.e linked to avoiding reinforcement of the network. This to us is a legitimate extension of the network role and LC31E now clearly supports this position. A main consideration for DNOs will be demonstrating clear synergies with their DSO role – in particular linking to delivery of company vulnerability strategies and Ofgem's principles and base-line standards – and actively putting NIA innovation funding to good use to these ends.

[76] LC 31E 1.d 'promoting the uptake of measures to improve Energy Efficiency, where such services cost-effectively alleviate the need to upgrade or replace electricity capacity and support the efficient and secure operation of the Distribution System. This may include procuring Energy Efficiency Services, where it is economic and efficient to do so;'

[77] However, in the GDN draft determinations Ofgem took the view that energy efficiency was out of scope, even where there were synergies with their operational role (eg to avoid reinforcement).

Some further in-principle considerations with respect to a more active DNO role in relation to longer-term domestic energy efficiency programmes may include :

- **Whether or how-far DNO actions on thermal efficiency could make a material difference in terms of network usage - either near-term or longer-term** (eg **near-term**: off-gas grid retrofits where the network is already very constrained; new housing developments where direct-acting heat and hot-water are fast becoming the norm in small yet potentially still relatively poorly insulated homes; **longer-term**: post-2025, reducing sizing of connections for new housing developments where a gas supply will no longer be permitted (additional to access charges); or, important, large retrofit programmes for electric heat (especially heat-pumps).

- **Where, due to their geographic footprint, a comparatively minor DNO funding input could significantly enhance / leverage major energy efficiency programmes led by other key partners and stakeholders** – including programmes led by local authorities, social landlords, new house builders, community energy schemes, fuel-poverty groups – especially in the light of the Ofgem Green Recovery initiative and government 'build back better' and levelling-up agendas. This could also relate to initiatives which are largely informational / educational – as well as investment in physical energy efficiency.

Other practical considerations include :

- New-build or retrofit : many new-build homes are already relatively well-insulated. Under the Future Homes Standard all new homes will be rated EPC C. Much of the existing housing stock remains very poorly insulated however (ie rated EPC G-D) and therefore may be a more relevant focus. As noted, the upcoming Heat and Buildings Strategy and updates to the public sector Decent Homes Standard, subject to practicality and affordability, will look to improve as many existing homes as possible to EPC C by 2035.

- Which housing sector : while in some ways energy efficiency savings through partnerships with social landlords may be more readily delivered, many privately-owned homes are poorly insulated (owner-occupied , privately-rented) but would require very effective partnerships.

- Off-gas grid : new regulations are expected to phase out fossil fuels in off-grid homes, businesses and public buildings, with a backstop date for any remaining fossil fuel heating systems. DNOs will wish to understand how this might shape energy efficiency scheme possibilities in off-grid areas coupled with with tackling network constraints[78]. Many fossil-heated off-gas grid properties may be 'hard-to-reach' - unless part of a particular scheme. The UKPN Communiheat project is looking to create a low-carbon blueprint for off-gas communities[79].

- Large housing schemes installing electric heat (new-build, retrofit) : may be more readily partnered by DNOs – including demonstrating a network benefit from relieving a constraint i.e.

[78] In the Energy White Paper (p114) BEIS say they wish to open the market of homes not on the gas grid to heat pumps or other clean energy alternatives, representing some 50,000 to 70,000 installations a year (an assumed replacement rate of once every 15- 20 years with a total stock of 1.1m households in England using fossil fuel heating off the gas grid)

[79] E.g. UKPN NIA project Communiheat in Great Barcombe, Sussex looking to create a DNO low carbon heating blueprint for off-gas grid communities
https://innovation.ukpowernetworks.co.uk/projects/communiheat/

an electrical connection smaller than otherwise for a given heat output. Or, lower electricity consumption against SAP ratings for particular property-types – including potentially at peak.

- Existing electric storage heater systems (including social landlords) : energy efficiency retrofit could support these homes where the network is already constrained. But, flexibility (ie moving to smart storage of heat) may be a preferred solution[80].

DNO expertise on energy efficiency and ensuring 'additionality'

DNOs have some limited experience in facilitating small energy efficiency schemes through ED1 innovation projects[81]. Unlike for flexibility however, a focus on energy efficiency is not a core business area or strength. To scale-up their ambition for energy efficiency schemes under LC 31E, DNOs during the ED2 period will need new expertise in-house to interface both internally and externally to develop :

- **A deep understanding of the complex GB landscape for energy efficiency – integrated with delivery of their vulnerability strategy -** including national and devolved approaches. To indicate but a few: the 2020 Energy White Paper proposals[82], the forthcoming BEIS Heat and Buildings strategy, a proposed Future Buildings Standard for non-domestic buildings, the Future Homes Standard, the public sector Decent Homes Standard, the Scottish Government draft Heat in Buildings Strategy consultation[83] and the Scottish Government updated net-zero plan to 2032[84]. These are all likely to be highly material for DNOs in considering where and how best to devote their own energy efficiency efforts. As noted, the recent Fuel Poverty Strategy for England targets energy efficiency measures for fuel poor households living in poorly insulated homes with an EPC rating of band G-D. Much of this property is privately-rented or owner-occupied. Existing property rated at band C or above is not a government priority for insulation programmes, irrespective of household profile in terms of being fuel poor or vulnerability.

[80] See report by Maxine Frerk. Grid Edge Policy for SSEN. 'An electric heat pathway. Looking beyond heatpumps' - https://www.smarternetworks.org/project/nia_ssen_0039/documents

[81] For example, SSEN Save Project, SSEN Social Constrained Zones, WPD Open-LV, UKPN Energywise

[82] Energy White Paper. Powering our Net-Zero Future. 14 December 2020. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/945899/201216_BEIS_EWP_Command_Paper_Accessible.pdf

[83] Scottish Government. Draft Heat in buildings strategy - achieving net zero emissions: consultation. 5 February 2021 https://www.gov.scot/publications/heat-buildings-strategy-achieving-net-zero-emissions-scotlands-buildings-consultation/

[84] Scottish Government. Securing a green recovery on a path to net zero: climate change plan 2018–2032 – update. 16 December 2020 https://www.gov.scot/publications/securing-green-recovery-path-net-zero-update-climate-change-plan-20182032/

- **A comprehensive grasp of the many different funding programmes and measures available for energy efficiency schemes - both now and in the pipeline - to ensure 'additionality' of DNO-promoted schemes**. This will include national-level initiatives including commercial schemes (CRC, ESOS, a possible new demand-reduction scheme in the capacity market[85]) and for residential energy efficiency schemes (ECO, Green Homes Grant etc) as well as regional initiatives by metro-mayors and by local authorities where relevant. DNO involvement **should largely complement existing energy efficiency programmes and coordinate with these but not substitute for them**. For example, suppliers lead on ECO delivery and have targets they have to meet. While it makes sense for DNOs to coordinate with ECO schemes, this by itself would not necessarily result in more energy efficiency delivered. Related to this, as DNOs become more active on domestic thermal efficiency, the potential for interactions of the different schemes will need careful consideration. At the same time, a need to demonstrate 100 per cent 'additionality' should not create a needless hurdle – nor such a high hurdle that DNOs are deterred from appropriate involvement and engagement with energy efficiency schemes. **Ofgem and DNOs need to consider interactions on 'additionality' further.**

Are DNOs sufficiently incentivised to develop active partnerships for energy efficiency schemes ?

Engagement is intrinsic to developing robust business plans, including strategy output delivery incentives for DSO, large connections and vulnerability. Ongoing engagement in ED2 (unlike ED1) is now deemed business-as-usual and not expressly incentivised.

Arguably, energy efficiency is a largely new business area for DNOs for which they must develop a constructive 'can-do' approach. This will need active new collaborations and partnerships if, as an alternative to network investment, they are to succeed in promoting efficiency schemes and / or procure energy efficiency services at scale. At least one DNO has consulted on and published a Heat Strategy.

DNOs have a particular challenge. Namely to identify and target those geographic areas where (1) curbing future demand growth would be beneficial to the network and which also (2) coincide with government and wider aims on fuel poverty and whole-house / whole-building energy efficiency retrofit.

All of this adds up to a new need for extremely close-working on the ground with the devolved governments, metro-mayors, relevant local authorities, social landlords and third sector organisations (NEA, CSE, Citizens Advice, community energy organisations). Not least to find suitable ways to identify and support schemes targeted at fuel-poor home-owners and private landlords of EPC G-D property who are being encouraged to switch to electric heat. Suitable relationships also need to be forged with suppliers[86] and third sector organisations who already lead on major energy efficiency schemes via the ECO. Relationships are also needed right across the energy efficiency supply chain, including on retrofit, with major housing developers, plus builder and installer representatives.

[85] Energy White Paper. Powering our Net-Zero Future. 14 December 2020. p115

[86] As noted, ensuring 'additionality'. Plus, over the next few years, as the supplier threshold for ECO responsibility reduces, there will be more parties with whom to interface

Taken together, these new partnerships must support DNOs to :

- Collaborate with the right organisations to produce the desired energy efficiency outcomes - for the networks, for consumers and the wider energy efficiency 'community'
- Become 'aware and informed customers' of the energy efficiency world and associated services
- Encourage sufficient providers to come forward and compete at constrained network locations to provide energy efficiency services
- Enable new business models to emerge for delivery of energy efficiency services to the networks at scale.

Conclusion on DNO partnerships for energy efficiency : successful 'can-do' promotion of energy efficiency schemes by DNOs as an alternative to network investment will hinge on forging major new relationships at particular locations on their networks. This is a new and arguably complex business area for DNOs. **One question for Ofgem is how far ED2 incentives and general expectations on engagement and partnership-working currently envisaged in the strategy ODIs** (DSO, large connections, vulnerability – plus the NIA), **can deliver the degree of step-up needed in practice for DNOs to successfully promote energy efficiency measures including procuring energy efficiency services. Or rather, whether some explicit incentivisation is needed on active partnership working in ED2 to 'spur' DNO action on energy efficiency.**

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11. Section 3 – Conclusions on DNO incentives for energy efficiency

Ofgem wants to understand if the package of measures in the ED2 period 2023-28 will sufficiently encourage DNOs to take actions in ED2 that would help reduce demand in the long-run and thereby reduce the need for investment in future price control periods. Our conclusions from our high-level look in this section at incentives for energy efficiency are as follows**.**

- **Dots must be joined in a far more concerted way on the new ED1 licence duties** (on flexibility and energy efficiency, a network development plan, whole electricity system) – **plus the ED2 SSM incentive set**. Otherwise, these risk forming a sub-optimal patchwork, rather than a strong and aligned incentive-set.

- **Methodologies for network cost-assessments on energy efficiency need developing** to address some basic questions on how to establish genuine comparability with both network alternatives plus flexibility. Metrics and desired outcomes for both flexibility and energy efficiency also need developing in terms of what 'good looks like'.

- **On ED2 uncertainty mechanisms**, we flag questions for Ofgem on how far the proposed automatic volume driver will drive energy efficiency alternatives. Also, how far the Totex incentive mechanism aligns well with desired outcomes for energy efficiency.

- **On strategy output delivery incentives** it will be **very important for energy energy efficiency to be given more prominence as a clearly desired ED2 output, along with suitable targets and metrics. Ofgem and DNOs should join the dots** on promoting energy efficiency via (1) the core DNO/DSO role – linked to (2) delivery of company vulnerability strategies and Ofgem's principles and base-line standards – plus (3) the NIA focus on innovation for vulnerability.

- **Our high-level look at ED2 incentive arrangements, suggests that considerably more DNO effort will be devoted in ED2 to driving flexibility than to promoting energy efficiency**, which is essentially much harder for DNOs to deliver. This is perhaps inevitable in ED2, taking account as well of the stage of the rollout of electric heating. But, **by the start of ED3 energy efficiency would need to be well-established as a non-network scale alternative if there is to be any reasonable chance of off-setting future demand-growth from electric heat. This strongly points to using ED2 as a period for innovation and active learning.**

- **Delivering desired outcomes from both flexibility and demand-reduction sit largely beyond the direct control of the DNO. Both require concerted collaboration, partnership-working and competitive service provision.** However, curbing peak demand via flexibility is now a well-understood and established DNO business area – and well incentivised as an activity - in contrast to promoting energy efficiency. So although delivery of flexible EV charging is arguably 'new' for ED2 in terms of actively curbing peak-demand growth at scale, there are already many lessons from DNO innovation projects as well as market-led practical experience from which to inform future DNO network plans and actions. Plus, and important, there is a burgeoning market in EV charging with many different actors fully focused on delivering commercial flexibility solutions both to the networks and ESO. In ED2, in procuring flexibility services as an alternative to network investment, DNOs will of course need to ensure that they are responsive to this rapidly growing market in agile, open and constructive ways.

- By contrast, **DNOs will need to devote far more attention to demonstrating whether and how electricity demand-reduction - delivered through general improvements to the thermal efficiency of buildings at a particular location - can become a credible and cost-efficient long-run solution for DNOs to deploy as an alternative to network investment.**

- There are questions for Ofgem and DNOs to consider around the 'boundaries' for the **nature and focus of the DNO role in promoting energy efficiency as a non-network alternative**. It is most likely that initial DNO energy efficiency actions on buildings will link to reducing overall demand growth from electric heat and hot water – either existing storage heaters and / or new heat-pump installations off the gas grid.

- **If DNO's are to promote successful energy efficiency outcomes in the period 2023-28, this will need a significant step-up.** In ED2, closely integrated with their DSO and vulnerability strategies, and delivered through suitable partnerships, **DNOs should aim to promote a number of major 'beacon' energy efficiency schemes targeted at vulnerable customers via NIA funding (or an alternative use-it-or-lose-it pot) – and designed to curb future system growth from electric heat pump uptake.** This in turn will enable **systematic evaluation in the ED2 period of the costs and benefits of direct or substantial DNO involvement in promoting energy efficiency schemes. Plus, a far better understanding of what replication and scale-delivery would need to look like and what benefit this could bring to the networks.** This would then offer a far better line-of-sight than presently exists on DNO approaches to energy efficiency and likely pathways for the ED3 period, including when electric heat starts to substitute for gas at scale.

- Beyond ED2, and informed by HMT's net-zero review, **a long-run consideration** for government, Ofgem and DNOs will be **to establish a balance between tax-payer and customer-funded initiatives on energy efficiency** in seeking to alleviate the major network impacts of a wholesale switch to electric heat.

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15 March 2021

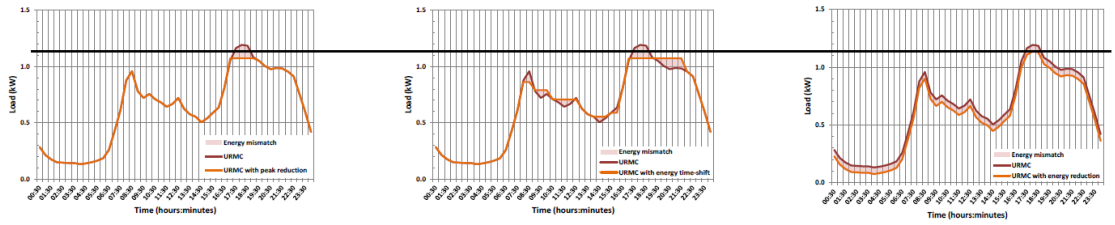
Annex 1 - Table 1

Flexibility & energy efficiency: network benefit, DNO dependencies for delivery, & wider long-run benefits			
	Flexibility	**Energy Efficiency / Electricity Demand Reduction**	**Comment / Query**
(1) Network benefit			
Deferred investment / optionality	√	√	
Avoided peak	√	√	
Avoided overall demand	? - probably not	√√	
Enduring impact	? – subject to contract length (e.g for non-firm access, flexibility service)	√√	
(2) DNO dependencies for delivery			
At a particular network location, the non-network alternative must demonstrate a positive NPV[87].	**√ ?**	**??**	The higher the upfront cost of the non-network alternative (eg energy efficiency), the higher the hurdle. For flexibility, this is also an issue where the full value cannot yet be stacked, monetised or scaled.
Requires 3rd party involvement to initiate / deliver	**? √**	√√	
3rd party upfront investment cost	√	√√√	Energy efficiency - only likely to be cost-effective at scale if joined with other support schemes (ECO
Ongoing 3rd party involvement needed - to deliver predicted benefit (aggregator, other)	√√	No	
Customer willingness	√√	No	
Supports balancing of intermittent renewables (PV, wind)	√√√	No	
Supports more cost-efficient use of EVs	√	No	
Supports more cost-efficient use of batteries	√√	No	
Supports more cost-efficient use of Heat Pump technology	? – only if suited to flexible operation	√√√	
(3) Wider long-run benefits			
Carbon – via less fossil dependency / less embodied carbon	√	√√	
Affordability - lower energy bills	√ (in principle)	√√	
Losses - lower energy bills due to reduced losses	No	√√	
Source : Sustainability First. March 2021			

[87] ie over a given lifetime, and on an equivalent cost-basis, savings to the network from the non-network alternative must exceed the costs of network investment

SSEN Save Project Slide

The Challenge



(a) Peak reduction (b) Electricity time-shifting (c) Electricity reduction

3

Scottish & Southern Electricity Networks

https://save-project.co.uk/wp-content/uploads/2019/09/SAVE-Methodology.pdf

Definitions

Flexibility

ED2 SSM Glossary : The ability to modify generation and/or consumption patterns in reaction to an external signal (such as a change in price, or a message).

SLC 31E

"**Distribution Flexibility Services**" means Distribution Non-frequency Ancillary Services and Distribution Constraint management;

"**Distribution Non-Frequency Ancillary Services**" means a service used by the Distribution Licensee for steady state voltage control, fast reactive current injections, inertia for local grid stability, short-circuit current, black start capability and island operation capability;

Energy Efficiency

ED2 SSM Glossary : End-use energy efficiency

A reduction in the amount of energy required to provide equivalent energy services to consumers. For example, loft, cavity wall insulation and double glazing allows a building to use less heating and leads to a reduction in base heat demand

SLC 31E

"**Energy Efficiency"** means the ratio of output of performance, service, goods or energy, to input of energy;

"**Energy Efficiency Services**" means a service contracted to improve the Energy Efficiency of a network user or users:

Constraint

SLC 31 E

"Distribution Constraint" means any limit on the ability of the licensee's Distribution System, or any part of it, to transmit the power supplied onto the licensee's Distribution System to the location where the demand for that power is situated, such limit arising as a result of any one or more of:

(a) the need to not exceed the thermal rating of any asset forming part of the licensee's Distribution System;
(b) the need to maintain voltages on the licensee's Distribution System; and
(c) the need to maintain the transient and dynamic stability of electricity plant, equipment and systems directly or indirectly connected to the licensee's Distribution System and used by the licensee to operate the licensee's electricity distribution system in accordance with the Act, this licence, or any other requirement of law;