



Action for Warm Homes

National Energy Action (NEA) response to the National Infrastructure Commission call for evidence – Energy Priorities

Introduction

NEA is an independent charity which seeks to help an estimated 4.5 million low income households across the UK who can't adequately heat and power their homes¹. As well as NEA's own work to influence and increase strategic action against fuel poverty at a national level, NEA also delivers practical solutions to improve access to energy efficiency products, advice and training and wider fuel poverty related services to UK households. NEA's supporters are made up of energy efficiency installers, manufacturers, utility companies, local authorities, housing associations, gas and electricity network operators, health agencies, community groups and other voluntary sector agencies. NEA and our supporters warmly welcome the creation of an independent National Infrastructure Commission (NIC) and the opportunity to respond to the call for evidence to identify the UK's long-term infrastructure requirements.

Specifically, NEA's response highlights several opportunities for improving how electricity demand and supply could be better forecast and balanced in the future. Within the response to the consultation questions NEA notes that exploiting these opportunities is predicated on ensuring all domestic customers have access to the benefits of domestic smart meters and, on an aggregated basis, much more accurate domestic energy consumption data will also help ensure supply is better matched to demand in any given area at different times of the day or year.

Whilst new technologies and approaches to demand-side management and energy storage can help facilitate some of this welcome innovation (and reduce the need for superfluous generation), NEA also stresses NIC, Ofgem and the Department of Energy and Climate Change (DECC) must also actively develop a new role for Distribution Network Operators (DNOs). The response notes that DNOs are best placed to co-ordinate these activities on their local distribution networks rather than relying on a central System Operator such as National Grid to perform these roles. As well as improving the efficiency and accuracy of how electricity demand and supply are balanced, this response also illustrates how encouraging DNOs down this path can also enable them to facilitate more efficient use of energy for households, which can in turn offset the need for electricity network reinforcement. NEA therefore highlights current innovation projects that are working towards these outcomes and asks NIC to help build on this good practice.

Finally, NEA's response also highlights that other organisations must be empowered to make a massive 'step change' in permanent reductions in total energy demand across the UK. By encouraging local authorities and their private sector partners to lead on city-wide domestic retrofit projects, NEA notes the NIC could be critical in galvanising this activity which could deliver substantial macro benefits. As well as noting how this will help to deliver the Government's stated vision for energy efficiency to play a central role in obviating the need to build new power stations or subsidise existing electricity capacity² (and therefore help reduce the cost to energy consumers of the transition to the low carbon economy) it is hoped the activities outlined in the response will complement current national energy efficiency initiatives and help accelerate the UK Government's fuel poverty commitments in England³ over the next 14 years as well as support the other UK nations to meet their own statutory fuel poverty targets⁴.

¹ The time lag in publication of official fuel poverty statistics, generally around two years between collection and publication, means that the UK Government's estimates are not current. These statistics are taken from the *Annual Fuel Poverty Statistics Report, 2015, Department of Energy and Climate Change (DECC), May 2015*.

² The Energy Efficiency Strategy: The Energy Efficiency Opportunity in the UK, DECC, November 2012.

³ The *Fuel Poverty (England) Regulations 2014* are now law.

⁴ The 2010 Fuel Poverty Strategy sets out a target to eradicate fuel poverty in Wales by 2018. The Housing (Scotland) Act 2001 requires the Scottish Government to eradicate fuel poverty in Scotland, as far as is practicable, by November 2016.

Enhancing current action & demand reduction as a 'first fuel response'

NIC's primary investigation considers the role of increased interconnection and new technologies in demand-side management and energy storage. Whilst the deployment of increased interconnection could help secure reliable electricity supplies cheaper than indigenous production (and demand-side measures can also help reduce peak demand for electricity), the call for evidence did not seek any specific evidence on how domestic energy efficiency can also contribute to these goals. NEA notes that this unfortunate omission has been made despite repeated calls for the UK Government to recognise home energy efficiency as a hugely important infrastructure opportunity and the Government's own analysis highlighting how cost-effective investment in all forms of energy efficiency could save the UK 196 TWh in 2020, equivalent to 22 power stations⁵.

As a result, NEA highlights that the potential to join up the business case for action on energy efficiency will be a prominent theme within many responses to this consultation. The reason for this level of consensus amongst industry, academics and non-governmental organisations is that the benefits of enhancing energy efficiency are vast and are increasingly being quantified with the same precision as supply side measures. In particular, the International Energy Agency (IEA)'s report '*Capturing the multiple benefits of energy efficiency*' demonstrated the potential for energy efficiency to deliver new jobs and economic growth, reduce pressure on health services, improve energy security and reduce carbon emissions (at the same time as providing a long-term, sustainable solution to unaffordable fuel bills for all consumers). The report also found that that large scale energy efficiency programmes can lead to increases in GDP of up to 1.1% per year; can create significant employment (8–27 job years per €1million invested) and can have a benefit to cost ratio of 4:1⁶.

This international evidence is also supported by extensive independent analysis of the macro benefits of enhancing domestic energy efficiency within the UK context. Building the Future: *The economic and fiscal impacts of making homes energy efficient* produced by Cambridge Econometrics and Verco, for example noted that an ambitious energy efficiency programme can return £3 to the economy per £1 invested by central government; help create a 26% reduction in imports of natural gas in 2030; domestic consumers could save over £8 billion per annum in total energy bill savings; increase relative GDP by 0.6% by 2030; increase employment by up to 108,000 net jobs and help reduce carbon dioxide emissions by 23.6MtCO₂ per annum by 2030.

NEA contests that achieving these macro outcomes is a realistic prospect and the UK has historically been highly effective in reducing energy use and galvanising economic activity through this activity. For example, over 440,000 heating and insulation measures have been successfully installed to over 360,000 homes through NEA's Warm Zones⁷. NEA estimates this activity has helped reduce fuel bills by a total of £38 million per annum provided jobs and training for hundreds of unemployed people, provided major savings to the local health sector and stimulated local economies to a measure of £78 million each year. This activity was part of a broader improvement in the current housing stock that has seen millions of households already gain access to the benefits of energy efficiency measures⁸. Across the UK, this has helped cut energy use by c. 12% since 2000. However, in recent years this progress has now slowed with the introduction last Parliament of the incentive schemes, the Green Deal and the Energy Company Obligation (ECO) which have seen dramatic reductions in delivery rates⁹. In addition, low income households continue to live in less efficient properties than affluent households and currently, only 5% of fuel poor households in England live in the most energy efficient properties (EPC Band C or above) and well over one million live in least efficient properties, despite current and previous energy efficiency schemes.

⁵ Department of Energy & Climate Change, Energy Efficiency Strategy: The Energy Efficiency Opportunity in the UK, Nov 12

⁶ Capturing the multiple benefits of energy efficiency, International Energy Agency, 2014.

⁷ WZs is a community interest company which focuses on installing energy efficiency solutions to low income households in deprived areas using a wide range of funding sources and is delivered on a not-for-profit basis.

⁸ At the end of December 2014, there were around 27 million homes in total in Great Britain, of which 23.9 million have lofts. Between March 2008 and December 2014, the number of homes with loft insulation with thickness greater than 125mm increased from 10.2 million to 16.7 million, a rise of 64 per cent. Around 70 per cent of homes with lofts have loft insulation thicker than 125mm. Since March 2008, the number of homes with cavity wall insulation increased from around 10.0 million to around 14.1 million in December 2014, a rise of 40 per cent. In December 2014 there were around 19.4 million homes with cavity walls, and therefore around 73 per cent of homes with wall cavities have cavity wall insulation. Between March 2008 and December 2014, the number of homes with solid wall insulation has increased from 65,000 to 294,000, more than tripling the level of uptake. In December 2014, there were 8.0 million homes with solid walls, of which around 3.7 per cent had solid wall insulation. There has also been an increasing trend for condensing boilers, replacing non-condensing boilers in households since 2005, partially as a result of a change in building regulations. In 2013, across all households, condensing systems can now be found in approximately 50 per cent of all homes.

⁹ POST note: Number 503, 'Trends in Energy': September 2015, p2. The Parliamentary Office of Science and Technology states it produces independent, balanced and accessible briefings on public policy issues related to science and technology.

NEA also seeks to highlight that according to Department of Energy and Climate Change (DECC)'s own statistics¹⁰ currently only c. 23,000 low income households are being brought up to EPC band C per year. Based on current delivery rates from the relevant components of the ECO scheme and Central Heating Fund (which will now expire at the end of March 2016), NEA estimates the UK Government could miss the fuel poverty target in England by 80 years and 1.8m FP households may still be living in homes below EPC band C by 2030. In addition, some fuel poor households could be waiting over 230 years to receive some insulation measures¹¹. In addition, in November 2015 the Comprehensive Spending Review (CSR) stated that there will be deep cuts to the only GB-wide ECO energy efficiency programme from 2017. The overall spending envelope will be cut to c. £640m per annum which follows a similar previous reduction in 2014 when the budget was reduced by a third; from the original notional spend of c. £1.3bn per annum.

Prior to the announcement regarding these likely reductions, NEA had highlighted in both written and oral evidence to the Energy and Climate Change Select Committee that the UK Government's stated objective to ensure that as many fuel poor homes as is reasonably practicable have a minimum energy efficiency rating of Band C by 2030 was at risk of not being met. According to the Climate Change Committee (CCC)¹² and think tank Policy Exchange¹³ current resources were less than half of what is required to meet these targets. It was therefore anticipated that the Government would ring-fence current levels of ECO resources on fuel poverty alleviation. The impact of this latest reduction in overall resources therefore cannot be understated. Whilst the new programme is likely to be more focused on vulnerable fuel poor households, it is now likely that fewer households will be helped with energy efficiency measures through levy funded supplier obligations than ever before. Without an intervention, it will also be the first Parliamentary term in the last 30 years that there will be no public funding in England for home energy efficiency in England.

The UK Government stated that the rationale for this was to reduce the projected cost of so-called green policies on the average annual household energy bill by £30 from 2017 and specifically noted that the bulk of these savings will come from reforms to the ECO scheme. Whilst levy funded resources can increase energy prices for struggling households who may not benefit directly from the programme in question, the ECO policy reduces total energy demand¹⁴ and can obviate the need to build new power stations or subsidise existing electricity capacity. This decision was therefore short-sighted given the costs associated with this counterfactual. In the following sections NEA has highlighted how NIC can help redress this situation. Finally, NEA would stress this course of action is practicable and necessary, as in the future the burden of policy costs on bills looks set to increasingly be shouldered by domestic consumers as a result of the UK Government's plans to further extend exemptions for heavy polluters.

The role of local authorities and the Core Cities

The Core Cities are England's eight largest city economies outside London along with Glasgow and Cardiff. Collectively they account for 22% of the UK's energy demand and are responsible for 27% of England's carbon emissions. Within their *Competitive Cities, Prosperous People: A Core Cities Prospectus for Growth*¹⁵ they highlighted that in order to be successful for the long term, cities need to help the most vulnerable in society and tackle fuel poverty, become more self-sufficient in terms of energy production, and reduce energy demand. They went on to highlight that with the right incentives it would be possible to harness the huge purchasing power of cities to drive new solutions leading to increased and competitive local energy supply, lower energy usage and carbon emissions, reduced fuel poverty, huge savings to the public purse and a stronger local business infrastructure.

¹⁰ *Annual Fuel Poverty Statistics Report, 2015*, Department of Energy and Climate Change (DECC), May 2015 p.18.

¹¹ NEA is happy to share our methodology for calculating these figures with the Committee however these figures are based on reported delivery rates using the Government's own ECO statistics.

¹² *Addressing fuel poverty and meeting carbon budgets go hand in hand* (CCC), 7 October 2014.

¹³ *Warmer Homes - Improving fuel poverty and energy efficiency policy in the UK*, 2015, Policy Exchange

¹⁴ Based on the figures provided to the EU Commission within *Communication of the United Kingdom's approach and analysis for complying with the requirements of Article 7 of the Energy Efficiency Directive*, Annex A - Final energy consumption savings by year from UK policies included for Article 7 policy plan, TWh [UK Government, June 2014] the ECO was assumed to have delivered between 4.7-6.9 TWh reduction in final energy consumption between 2017 and 2021. This figure will reduce substantially as a result of the proposed changes from 2017. It is also worth noting that the UK Government's Energy Efficiency Strategy made the case that improvements to domestic energy efficiency can reduce the country's dependence on imported fossil fuels and increase energy security. It highlights how cost-effective investment in all forms of energy efficiency could save the UK 196 TWh in 2020, equivalent to 22 power stations.

¹⁵ *Competitive Cities, Prosperous People: A Core Cities Prospectus for Growth*, November 2013.

Table 1: Average Electricity Consumption of the Core Cities per household

	Mean consumption (domestic economy 7)	Mean consumption (standard tariff)	Mean consumption (all domestic)	Economy 7 meters (000's)	Standard meters (000's)	All domestic (000's)
Birmingham	5,178	3,667	3,872	300	1,348	1,647
Bristol	5,246	3,450	3,655	116	593	709
Cardiff	5,229	3,413	3,548	59	475	534
Glasgow	3,633	3,065	3,186	256	795	1,051
Leeds	5,256	3,530	3,715	192	1,076	1,268
Liverpool	5,851	3,341	3,485	71	668	739
Manchester	5,788	3,492	3,754	144	673	817
Newcastle	5,231	3,294	3,487	65	371	437
Nottingham	4,027	3,310	3,543	171	292	463
Sheffield	5,133	3,325	3,432	72	741	813

Table 2: Average Gas Consumption of the Core Cities

	kWh	No of meters (000's)
Birmingham	14042	386
Bristol	11934	168
Cardiff	12769	136
Glasgow	11799	246
Leeds	14034	302
Liverpool	12076	194
Manchester	12031	180
Newcastle	14234	109
Nottingham	12596	116
Sheffield	14009	220

Table 3: Fuel Poverty levels of the Core Cities in England [Low Income High Cost definition¹⁶]

LA Name	Region	Estimated number of households	Estimated number of Fuel Poor Households [LIHC]	Proportion of households fuel poor (%)
Birmingham	West Midlands	412401	78086	18.9
Leeds	Yorkshire and The Humber	327513	38133	11.6
Newcastle upon Tyne	North East	118362	15344	13.0
Manchester	North West	209159	31195	14.9
Liverpool	North West	210818	30567	14.5
Sheffield	Yorkshire and The Humber	234893	25509	10.9
Bristol City of	South West	191878	25379	13.2
Nottingham	East Midlands	128710	18050	14.0
England Average				9.9

¹⁶ At the Spending Review in October 2010, the government announced that it would commission an independent review to consider the current fuel poverty target and definition. In March 2012 Professor Hills published the final report of his independent review of fuel poverty, making several recommendations for how fuel poverty should be measured. Professor Hills proposed a new measure: the Low Income High Cost (LIHC) indicator. This table uses both the 10 per cent indicator and Hill's low income high cost measure of fuel poverty. Under the LIHC definition a household is considered to be fuel poor where they have required fuel costs that are above average (the national median level) and were they to spend that amount, they would be left with a residual income below the official poverty line. The low income high cost measure consists of two parts, the number of households that have both low incomes and high fuel costs and the depth of fuel poverty amongst these households. Prior to the introduction of the Low Income High Costs indicator in England, fuel poverty was measured under the 10 per cent indicator. Under this indicator, a household is considered to be fuel poor if they were required to spend more than 10 per cent of their income on fuel to maintain an adequate standard of warmth. An adequate standard of warmth is usually defined as 21°C for the main living area, and 18°C for other occupied rooms. Northern Ireland, Scotland and Wales continue to use the 10 per cent definition and it is the basis of any respective statutory eradication targets within these nations.

Who will deliver city-wide energy efficiency schemes and how would it work?

Because of their intrinsic understanding of their local areas and the fact they already have responsibility for affordable warmth strategies, climate change strategies and local development plans etc, city wide retrofits should be co-ordinated within that city region, local authority or unitary council. Generally trusted by residents, they will be able to foster local partnerships and involve/co-ordinate/contract with other local parties. As a result, in contrast to the current centralised model of delivery, this approach would also be able to leverage local employment and wealth creation opportunities.

Whilst the obligation to initiate and report on progress must rest with the public sector, delivery of the scheme can either be handled in-house or by contracting with a private sector scheme manager. As with the local authority, this party would have the ability to tender for energy efficiency goods/services to carry out responsibilities such as coordinating home energy audits, project planning, technical support and feasibility studies and possibly installation and ongoing maintenance of any energy plant etc. This party may also be willing to carry a liability or contractual obligation as part of a defacto contractual standard. These principles are well established in contract energy management (CEM) or in the allocation of delivery risk under an energy services contract.

What would need to be undertaken locally to deliver a city wide vision?

- Identify areas with potential for District Heating or community energy schemes
- Identifying ward level areas of high fuel poverty, wider deprivation and poor housing. Using this information to target initial delivery at groups that are in most need
- Liaising with Local Enterprise Partnerships, local Health and Wellbeing Boards, energy and water suppliers, Electricity and Gas Network Operators to identify local co-funding sources
- Co-ordinate delivery of whole house audits (SAP assessment and a deemed pre intervention EPCs)
- A private sector energy auditor will check what approaches are necessary then prepare recommendations CO2 savings, cost of measures, projected energy bill reductions, provide a list of potential revenue streams
- Enforcement against landlords who rent out properties below EPC band E or are in category 1 or 2 hazard of excess Cold as determined by HHSRS

What role can NIC play nationally?

As a result of this analysis NEA's recommendations to NIC highlight the need for the UK Government to create a 'Warmer Community Fund (WCF)' within the current infrastructure budget. This new programme would run alongside the next supplier obligation and following pilots within the Core Cities, over time could emulate the Scottish area based schemes where all local authorities receive some ring-fenced funds to undertake the aforementioned activities with additional funding allocated to keener authorities (or their partners) via a 'top up'. NEA also notes local authorities, housing associations and other local agencies can help reduce public costs (like cold related morbidity) by improving housing standards. However, it is also critical they work more closely with a range of partners (Local Enterprise Partnerships, local Health and Wellbeing Boards, energy and water suppliers, Electricity and Gas Network Operators etc), to create local co-funding opportunities. These co-funding opportunities can ensure central Government funds lever in other resources from the private sector locally, strengthening the benefit to cost ratios for any investment. These opportunities are explained further below in response to the consultation questions. In addition, central Government must also support a systematic educational programme for relevant public sector professionals from local councils, procurement and planning officers so that all local authorities can identify existing and potential opportunities to support this new national policy.

Summary of recommendations

- I. NIC should state that all domestic customers must have access to the benefits of domestic smart meters to facilitate more accurate domestic energy consumption data
- II. NIC should recommend that Ofgem and the Department of Energy and Climate Change (DECC) actively develop a new role for Distribution Network Operators (DNOs) to become local System Operators (SO) rather relying on a central SO to perform this task
- III. NIC must highlight to the Government that permanent reductions in total energy demand can also obviate the need to build new power stations or subsidise existing electricity capacity and reduce the cost of electricity network reinforcement. As a result, a deliberate policy intervention to make domestic energy efficiency a top infrastructure priority is justified and is a prudent course of action
- IV. NIC must consult explicitly on how upgrading Britain's coldest homes can improve millions of people's lives whilst boosting the economy and creating local jobs. Specifically, in advance of the consultation, NIC should undertake its own analysis of the economic and fiscal impacts of making homes energy efficient and investigate the impact central Government resources can have in securing local co-funding from the private sector and the impact this has on the benefit to cost ratios for any national energy efficiency investment. This analysis should be compared to other infrastructure investments to ascertain value for money
- V. NIC should highlight to the UK Government the opportunity for city-wide energy efficiency schemes and for this new approach to be piloted within the Core Cities. These pilots would be undertaken with a view to emulating (and enhancing) the current Scottish area based schemes

Responses to the consultation questions [Electricity interconnection and storage]

What changes may need to be made to the electricity market to ensure that supply and demand are balanced, whilst minimising cost to consumers, over the long-term?

NEA welcomes the NIC's observation that by better balancing supply and demand, the UK can reduce costs to energy consumers and can help reduce emissions and fossil fuel imports. NEA believes that exploiting these opportunities is predicated on ensuring all domestic customers have access to the benefits of domestic smart meters and, on an aggregated basis, much more accurate domestic energy consumption data will also help ensure supply is better matched to demand in any given area at different times of day or the year. NEA does not however see how increased interconnection and new technologies in demand-side management and energy storage require changes to the electricity market. NEA believes these activities are already supported through a range of existing initiatives such as the capacity mechanism (in the case of interconnection) and existing Short Term Operating Reserve (STOR) contracts (in the case of demand side response).

However, as noted in the introduction, NEA does believe that NIC, Ofgem and the Department of Energy and Climate Change (DECC) must actively develop a new role for an agent to co-ordinate these activities. Given their detailed knowledge of large energy users and small scale embedded generators on their network, NEA believes Distribution Network Operators (DNOs) are better placed to co-ordinate these activities on their local distribution networks rather than a central System Operator such as National Grid (albeit co-ordination between both parties would clearly be required). As well as improving the efficiency and accuracy of how electricity demand and supply are balanced, encouraging DNOs down this path can also enable them to facilitate more efficient use of energy for households, which can in turn offset the need for electricity network reinforcement.

Ofgem has already stated that within the RIIO¹⁷-ED1¹⁸ period Distribution Network Operators (DNOs) have an important role in enabling more efficient use of energy for households to offset the need for network reinforcement (or defer it) in a given part of their distribution area¹⁹. However, despite the innovation highlighted in the projects below, NEA believes this activity is taking too long to become BAU and conventional reinforcement in their networks may be taking place regardless of the opportunities to consider alternative investments in energy efficiency. There is therefore a pressing need for the NIC to clearly state to the UK Government that there is a need to ensure DNOs:

- I. Identify ahead of time load related 'reinforcement hotspots' across their geographic territory
- II. Obtain a forecast of the business as usual reinforcement costs
- III. Establish an alternative cost-benefit analysis indicating which 'other actions' could be taken to either defer or mitigate the reinforcement need in an area entirely (through permanent electricity demand reductions, not demand shifting). This will require working with supportive agents to simultaneously assess the scale of electricity demand reduction potential within that area of the network and aggregate this potential
- IV. Identify complementary domestic energy efficiency activity that is also currently being planned within this area and match the initial alternative investments to this existing or planned activity within that area and approach the delivery partners (this latter element is critical because the most valuable role DNOs can play is simply to provide capital to an existing or planned project, rather than starting a new one)
- V. Grade the potential aggregation of electrical demand reductions by prioritising electrically heated **domestic** customers on the basis that there are positive social impacts and wider benefits (reduction in local health costs etc)
- VI. Provide capital or develop projects which meet the 'Golden Rule' test set out below
- VII. Produce annual reports on the aforementioned activity.

The alternatives to reinforcement that may be appropriate could be encouraging a DNO to help replace inefficient electrically heated systems, provide a contribution towards connecting a household to a modern efficient district heating or gas network, help fund solid wall insulation or provide capital towards lighting improvements or other low cost energy saving measures etc. However, in order for these alternative energy efficiency projects to occur, first they must be located in similar locations to those places where the DNO is planning to invest in network reinforcement alongside areas with relatively high population density, high deprivation and high penetration of electrically heated housing. This means the opportunity to invest in these projects will not be evident in every instance and this 'convergence' may only occur in a smaller number of planned reinforcements a DNO's may be planning on their network.

Another critical challenge for these alternative investments (and the key for delivering value to all energy customers, not just the direct beneficiaries of these measures) is that the contribution by the DNO to the cost of these projects would always have to be lower than the cost of the business as usual network reinforcement (the so-called 'Golden Rule' referenced above). However, complying with these criteria should not always deter a DNO from considering these approaches and taking a longer-term view of reinforcements to their network as potential exists for leveraging national or local energy efficiency programmes funds that can defray some of the cost of the in-house measures (should these exist)²⁰. Where the 'Golden Rule' criteria is met this would ensure the investment in energy efficiency is more cost effective; benefiting all energy consumers whilst also providing a direct social outcome for the recipients of the energy saving measures.

¹⁷ "RIIO" stands for Revenue = Incentives + Innovation + Outputs

¹⁸ The RIIO-ED1 price control sets the outputs that the 14 electricity Distribution Network Operators (DNOs) need to deliver for their consumers and the associated revenues they are allowed to collect for the eight-year period from 1 April 2015 to 31 March 2023.

¹⁹ *Strategy decision for the RIIO-ED1 electricity distribution price control*, Ofgem, 04 March 2013.

²⁰ In some instances, meeting the requirement to ensure the costs of an alternative project is always lower than the cost of the network reinforcement may not be feasible and therefore, justifiably, the aforementioned generic efficiency incentive would not provide a reward. This challenge may therefore result in DNOs being understandably reluctant to invest in any projects where the 'margin of feasibility' is tight. It is therefore important to understand how the regulatory regime incentivises a DNO to identify complementary energy efficiency activity that is already being planned or developed within an area. This is where the potential exists to 'piggyback' a DNO investment alongside 3rd party fund instead of making the investment entirely independently (albeit with the same intention of avoiding an unnecessary reinforcement of the network).

The *Low Carbon Network Fund (LCNF)* in particular provides results and information collected from various projects that have trailed some DNO-led projects aiming at reducing load as an alternative to network reinforcement. These projects (and others) have given network companies a better understanding of the opportunities and challenges of pursuing this model. A brief summary of these projects are provided below.

Solent Achieving Value from Efficiency (SAVE)²¹

Led by Scottish and Southern Energy Power Distribution (SSEPD) in the Solent and surrounding area, the project aims to establish to what extent energy efficiency measures can be considered as a cost effective and predictable by quantifying theoretical expectations with investigating actual customer responses to a range of different technologies. The trial will compare the effectiveness of four energy efficiency measures (LED installation, data-informed engagement campaign, DNO price-signals direct to customers plus data-informed engagement, and community coaching) and produce an investment decision tool that introduces the deployment of energy efficiency measures as a solution to network constraints.

Less is More²²

Western Power Distribution partnered with the Centre for Sustainable Energy to help communities reduce their electricity demand, especially at peak times so that less money was spent on upgrading substations, to cope with rising demand. The project encouraged ten communities, "attached to" a monitored substation to consider their electricity use and find ways to reduce it and/or shift it to off-peak times, in return for up to £5,000. The project was presented as a solution to create savings for everyone, with reduced bills and reduced upgrade costs.

Energywise

The Vulnerable Customers and Energy Efficiency (VCEE) project also known as energywise is a partnership between ten organisations, led by UK Power Networks. The project is exploring how residential customers who may be struggling with fuel bills can better manage their household energy usage and consequently their energy bills by changing their behaviour. The project aims to recruit 550 households who may be struggling with fuel bills in the London Borough of Tower Hamlets and carrying out two trials. The trials will test different ways of helping households better understand and control their energy spending, enabling them to make changes which may save them money on their energy bills²³. The project is rare in its scope as it involves a wide range of partners including UK Power Networks, NEA, British Gas, CAG consultants, Tower Hamlets Homes, Institute for Sustainability, Bromley by Bow Centre, Poplar HARCA, University College London and Element Energy.

Outside of the LCNF, there have been other projects which have provided insights which can support the development of this model:

Power Saver Challenge²⁴

The project aimed to extend the life of existing network assets by working with customers to reduce the amount of electricity they use, in return of a reward. Electricity North West Ltd worked with NEA in Stockport on a proof-of-concept, gathering 10 teams in a competition, to aim for the challenge of a 10% reduction in winter peak electricity compared to the previous year, and with the help of advice and energy-saving equipment. The aim was explicitly to test the feasibility of avoiding investment in an urban primary substation and extend the life of the existing asset.

²¹ For more information visit: www.smarternetworks.org/Project.aspx?ProjectID=1325

²² For more information visit: <http://www.lessismore.org.uk/>

²³ Firstly the project will explore if households benefit from smart metering solutions (smart meter and smart energy display) and from energy efficiency technologies such as energy efficient light bulbs, an ecoKettle and standby saver. Secondly understanding their appetite to change their behaviour by swapping to an 'off-peak' tariff.

²⁴ For more information visit: <http://www.powersaverchallenge.co.uk>

Supporting Local Energy Efficiency as an Alternative to Network Reinforcement²⁵

In 2015, NEA and Agility ECO produced a report investigating the possibility to divert budgets currently allocated to load-related network upgrades into local schemes that improve energy efficiency for those who need it the most. In the report this concept is explained fully and is referred to as Alternative Investment Strategy (AIS). Specifically, the report looks to analyse the “Size of the Prize” on Northern Power Grid’s network, the economic feasibility of investment in local energy efficiency and how this compares to conventional network reinforcement and practical feasibility.

To further highlight the value for money of expanding this innovation activity into BAU, DNOs are incentivised to deliver ED1 outputs as efficiently as possible. The effect of this regulatory framework should mean that where a DNO makes a saving in the cost of their investments (by implementing the new DNO model); they get to keep a proportion of the saving, with the remainder returned to consumers. As noted above, provided the contribution by the DNO to the cost of alternative projects is always lower than the cost of the network reinforcement, DNOs can then look to this mechanism to incentivise the installation of alternate heating technologies or in-home energy efficiency to offset the need for network reinforcement²⁶.

However, due to a range of non-financial barriers (such as distrust of new approaches or the need for many parties to work together to pull through this opportunity) and a lack of third party funds for domestic energy efficiency which would allow a DNO to ‘piggyback’ their investment alongside third party funds instead of making the investment entirely independently albeit with the same intention of avoiding an unnecessary reinforcement of the network, consideration of alternative investments in energy efficiency are still being overlooked. The consequence of this could be energy consumers paying for unnecessary reinforcement projects throughout the remainder of the distribution price control. NEA would therefore restate a pressing need for the NIC to clearly state to the UK Government the need to ensure DNOs undertake the aforementioned activities.

Is there a need for an independent system operator (SO)? How could the incentives faced by the SO be set to minimise long-run balancing costs?

As noted above, NEA favours Distribution Network Operators (DNOs) co-ordinating these activities on their local distribution networks rather than a central System Operator such as National Grid.

Is there a need to further reform the “balancing market” and which market participants are responsible for imbalances?

As noted above, NEA believes these activities are already supported through a range of existing initiatives such as the capacity mechanism (in the case of interconnection) and existing Short Term Operating Reserve (STOR) contracts (in the case of demand side response).

To what extent can demand-side management measures and embedded generation be used to increase the flexibility of the electricity system?

NEA believes demand-side management measures and embedded generation are useful activities to balance and potentially lower demand however the extent to which they can be relied upon to provide these services when required is subject to a range of unknown factors including the predictability to save or dispatch known amounts of power at any given point. This is particularly the case for intermittent small scale embedded generation. In addition, as noted above, the options for permanently reducing energy demand through domestic energy efficiency also appear to have been overlooked in this context.

²⁵ For more information visit: <http://www.northernpowergrid.com/downloads/1704>

²⁶ Ofgem have also set out some clear requirements to improve the quality of information DNOs (or other parties) have access to about vulnerable consumers and request that there is a clear explanation of how this information will be used

What are the barriers to the deployment of energy storage capacity?

Given the remit of the NIC is consider the case for capital investment, NEA would highlight the main barrier to large scale storage is the upfront costs of the technologies compared to the unknown returns once it is in operation. In addition, NEA would highlight that energy storage can be construed at different scales and that the ability of a home to retain heat that is generated by an off-peak Economy 7 storage heater for example should be considered as a valid form of energy storage. Again, the main barrier to the mass deployment of homes capable of thermal retention is the upfront costs, particularly for solid wall properties. In December 2014, there were 8.0 million homes with solid walls, of which around 3.7 per cent had solid wall insulation. As noted above, NEA has estimated that based on current deployment rates some fuel poor households could be waiting over 230 years to receive this insulation measure.

What is the most appropriate scale for future energy storage technologies in the UK? (i.e. transmission network scale, the distributed network or the domestic scale.)

As stated above, whilst new technologies and approaches to demand-side management and energy storage can help facilitate welcome innovation (and reduce the need for superfluous generation), NEA also stresses NIC, Ofgem and the Department of Energy and Climate Change (DECC) must also actively develop a new role for Distribution Network Operators (DNOs) to co-ordinate this activity on local distribution networks.

What can the UK learn from international best practice in terms of dealing with changes in energy technology when planning to balance supply and demand?

Many EU countries have prioritised meeting their energy needs through increased domestic energy efficiency and recognise this can reduce their dependence on imported fossil fuels and help to increase the European Union's energy security. An EU-wide building retrofit programme could cut gas use by an amount equal to circa 80% of imports from Russia.²⁷ NEA has also consistently highlighted that HM Treasury currently receive very significant sums through carbon taxes and VAT on domestic energy bills. Over the duration of this UK Parliament alone domestic energy consumers will contribute well over £14 billion to the Treasury²⁸, £30 billion over 10 years²⁹. Even before the last General Election the Treasury raised an additional £500 million pounds creating higher energy bills³⁰. NEA highlights that in common with thirteen other EU governments³¹, channelling these funds (or equivalent non-levy funded resources from the infrastructure budget) would be a sound use of public money and as well as improving the quality of life of the poorest and most vulnerable members of our society, can also future-proof the economy and help reduce total UK energy demand by 50% by 2030³². These benefits can also be secured alongside stimulating low skilled labour and GDP growth, better air quality, reduced energy imports and carbon reduction etc.

²⁷ E3G Briefing, Energy efficiency as Europe's first response to energy security by Ingrid Holmes, Luca Bergamaschi and Nick Mabey, June 2014.

²⁸ We estimate that £11.82bn will be collected in England, £1.33bn in Scotland, £690m in Wales and £190m in Northern Ireland).

²⁹ This analysis of the revenues the Treasury receives from domestic consumers is based on Government sources to estimate how much expected revenue they will receive from a) the European Union Emission Trading Scheme (EU ETS), b) the Carbon Price Floor (CPF) and c) VAT on an average electricity bill. We have then combined this with expected VAT revenues from domestic gas bills. These estimates are all based on the Government's own assumptions regarding energy consumption and this includes an unfounded assumption that EU products policy will increase the domestic energy efficiency of electric appliances substantially. However, what the analysis does show, regardless of the impact of various assumptions, is that both carbon revenue and VAT receipts help the Treasury yield large amount of money, which is collected regressively and without an intervention will further strain the finances of particularly low income households.

³⁰ This figure is the estimated income from the Carbon Price Floor 2015-16 compared to 2014-15. Source: Carbon Price Floor, 14 May 2014, House of Commons Library, p 10.

³¹ According to a recent report: *The economic case for recycling carbon tax revenues into energy efficiency*, Prashant Vaze and Louise Sunderland, February 2014: 13 countries in the EU have pledged to return part of the proceeds from the EU-ETS auctions to climate and energy efficiency programmes.

³² Policy proposals for the Liberal Democrat 2015 election manifesto: How to increase living standards, improve quality of life and future-proof the economy by David Boyle, Duncan Brack, Paul Burall, Fiona Hall MEP, Martin Horwood MP, Julian Huppert MP, Baroness Parminter, Neil Stockley and Mike Tuffrey, 2014 calls for an aim to reduce total UK energy demand by 50 per cent by 2030, including retrofitting 1 million homes every year, transform the Green Deal into an effective national programme to raise the energy efficiency standards of all Britain's households, eradicate fuel poverty, and provide funding by recycling revenue collected from the Carbon Price Floor and the EU Emissions Trading Scheme.