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WWF response to the National Infrastructure Commission's call for evidence:

QUESTION 4: ELECTRICITY INTERCONNECTION AND STORAGE

January 2016

SUMMARY

1. WWF-UK welcomes the creation of the National Infrastructure Commission (NIC) and believes that it has an important role to play to provide a holistic assessment of the UK's energy infrastructure needs.
2. In partnership with the business and investment community, WWF-UK has set up the **Renewables Taskforce** (see Annexe 1) to examine how best to maximise the opportunities that renewables offer, including those that will arise as we find the best ways to integrate them into the energy system. The taskforce will soon publish its proposals, which we will be happy to share with the Commission. In the meantime, we wish to bring a major omission in the UK's infrastructure planning to the Commission's attention: **the fabric of our existing housing stock**. Any analysis of future electricity, interconnection and storage infrastructure should include consideration of the UK's buildings, a major consumer of electricity and a significant potential source of both distributed and large-scale energy storage. We therefore urge the Commission to **examine the potential to invest in the fabric of our building stock as an urgent priority**.
3. Failure to assess demand-side opportunities when making supply-side decisions risks policy objectives being achieved at greater cost than necessary¹. Investing in the fabric efficiency of our buildings will help reduce overall energy demand, in turn helping to reduce the scale of investment required to balance the future energy system.
4. We therefore recommend that infrastructure funding together with progressive policy and regulation be used to **unlock private investment in domestic energy efficiency**, alongside existing funding for improvements in low income homes. As the following briefing shows, this would be a value for money investment and help the Government meet its objectives of reducing carbon emissions, improving energy affordability and security, and increasing economic growth.
5. **WWF-UK calls on the National Infrastructure Commission to examine how to make our existing housing infrastructure energy efficient and to examine how to de-carbonise our heating infrastructure in the most cost-effective way, and we encourage the Commission to come forward with progressive policy proposals to bring this about as soon as possible. The following briefing sets out why domestic energy efficiency should be considered under the NIC's remit.**

¹ Green Alliance (2015) Getting More From Less: Realising the Potential of Negawatts In the UK Electricity Market



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ROLE IN THE ENERGY SYSTEM

6. Our homes are a significant element of the UK's **energy infrastructure**, accounting for 36% of total UK electricity consumption and 52% of total gas consumption². Heating homes has a significant impact on our electricity system: 12% of total electricity demand is used for domestic heating³. This is likely to increase in future, as electric heat pumps are one of the principle solutions for reducing emissions from heating⁴, and electrifying 20% of heat demand would see peak electricity demand double from current levels⁵. Accompanying investment in low carbon heat with improvements to fabric efficiency will ensure that these costs are minimised⁶.
7. Homes are also an opportunity to exploit low cost centralised and distributed **energy storage**. Hot water cylinders already provide low-cost load-shifting energy storage in homes equipped with solar photovoltaic panels. In future, phase change materials will allow domestic cylinders to store energy sufficient to meet space heating loads⁷ (rather than hot water loads at present), which would help reduce the impacts of heat pumps at times of peak electricity demand.
8. Similarly, the expansion of **district heating**, supported by the announcement of £300m capital funding in the 2015 Spending review, will provide a significant opportunity to integrate our heat and power systems. District heat networks have a large energy storage potential, and coupled with flexible combined heat and power (CHP) and electric heating to exploit periods of excess renewable electricity, can provide balancing and flexibility services to the electricity system, as is already the case in Denmark⁸.
9. However, the UK **existing domestic building stock** is old and we are in the bottom third for thermal efficiency when compared with our European neighbours⁹, with considerable potential for improvement through increased fabric efficiency. Failure to address this problem risks increasing the costs of balancing the energy system in future, as in many cases, energy efficiency can meet demand for energy services at a lower cost than supply-side measures¹⁰.
10. **New buildings** are another important opportunity to integrate new technologies and techniques (such as voltage optimisation, efficient lighting, demand side response) that will be needed as we move to a more integrated and flexible energy system. The Government must implement the requirements of the EU '**Energy Performance in Buildings' directive** (that all new buildings have very low emissions) no later than 2020¹¹, and must take this opportunity to ensure that new-build regulations are compatible with future electricity system balancing needs.
11. It is therefore essential to decide on the projected energy performance of our built infrastructure, in order to optimise the methods of heat generation and distribution as well as to understand the impact on future electricity needs. The infrastructure programme to deliver a low carbon energy

² DECC (2014) Energy Consumption in the UK

³ DECC (2014) Energy Consumption in the UK

⁴ CCC (2015) Sectoral Scenarios for the Fifth Carbon Budget: Technical report

⁵ Sansom (2012) The Impact of Future Heat Demand Pathways

⁶ CCC (2013) Fourth Carbon Budget review, Technical report

⁷ UKERC (2014) The Future Role of Thermal Energy Storage in the UK Energy System:

⁸ Store-EU (2013) Overview of the Danish Power system and RES integration

⁹ UK ACE (2015) The cold man of Europe

¹⁰ Cambridge Economics (2014) Building the future

¹¹ 2018 for public buildings



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system, including balancing electricity supply and demand, must include making the UK building stock energy efficient.

STRATEGIC IMPORTANCE

12. Improving the fabric efficiency of our domestic building stock will help meet Government's three principle energy policy objectives: maintaining the affordability of energy supply, reducing carbon emissions and ensuring secure energy supplies.
13. **Carbon emissions:** Energy efficiency is one of the lowest-cost ways to reduce emissions as many measures such as loft and cavity wall insulation are cheap to install and will eventually pay for themselves in energy savings, going on to save on energy, emissions and bills for decades¹². The Committee on Climate Change (CCC) recommends that a significant improvement in the fabric efficiency of the domestic building stock is part of the cost effective suite of measures to meet legislated carbon budgets. Current policies will not deliver sufficient emissions reduction to meet the fourth carbon budget (2023 – 2027) and the Committee has highlighted domestic energy efficiency as a priority for ensuring that this budget is delivered cost-effectively¹³.
14. The CCC's deployment of domestic energy efficiency measures in its recommendations¹⁴ is broadly equivalent to bringing all homes up to a Band C or above on an Energy Performance Certificate¹⁵. At present, 80% (21 million) of the UK's homes are rated below EPC Band C¹⁶, and will therefore require upgrading if we are to meet carbon budgets cost-effectively.
15. **Energy affordability:** a programme of investment in the UK's housing stock would reduce average household energy bills by an average of £200 - 400 per annum¹⁷. Such a programme would also help reduce fuel poverty, whereby households are unable to afford to adequately heat their homes. This is a particular priority as the UK has some of the highest rates of fuel poverty, despite having some of the lowest energy prices in Europe¹⁸.
16. **Enhanced energy security:** meeting energy needs through demand reduction will reduce our dependence on imported fossil fuels, increasing our energy security. It would also insulate the UK economy from global fossil fuel price volatility. In 2004 the UK ceased to be self-sufficient in gas and in 2012 net imports of gas accounted for just over 40 per cent of gas use¹⁹. The UK could reduce its reliance on imported gas by 26 per cent in 2030 by making UK homes more energy efficient, saving £2.7 billion in gas imports per year²⁰.
17. **Wider benefits:** as well as reducing carbon emissions, investing in domestic energy efficiency will provide significant wider benefits. The warmth and comfort of homes would be improved,

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

¹³ CCC (2015) Progress report to Parliament

¹⁴ CCC (2013) Fourth Carbon Budget Review Technical Report

¹⁵ CCC (2015) Sectoral Scenarios for the Fifth Carbon Budget: Technical report

¹⁶ ACE, Cold Man of Europe Update, Oct 15

¹⁷ Cambridge Economics (2014) Building the future

¹⁸ ACE (2015) The Cold Man of Europe

¹⁹ Energy Bill Revolution, Re-build Britain; June 14

²⁰ Cambridge Econometrics, Building the Future, Oct 2014



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reducing incidences of excess winter deaths. It is estimated that 43,900 excess winter deaths occurred in England and Wales in 2014/2015²¹ and around 30 per cent of these are likely to be due to cold homes²². Spending on energy efficiency would also provide a wider economic stimulus as spending is shifted from (increasingly imported) fuel to construction and labour, providing a manufacturing and construction sector boost. In the long term, reduced energy demand creates net savings which free up spending on other goods and services in the economy²³.

WHAT IS NEEDED?

18. The economic consultancy *Cambridge Economics* has modelled the costs and benefits of an ambitious investment programme in domestic energy efficiency to bring all homes up to an EPC certificate rating of C by 2035, which would modernise all of the UK's homes, help eliminate fuel poverty and deliver the carbon abatement necessary to meet carbon budgets.
19. A total of £100 billion of investment would be required over a 20-year period. This could be achieved by Government providing zero-interest loans to encourage householders to invest, or by **regulating minimum energy efficiency standards** at the point of sale²⁴. The latter approach would require minimal public spending, and although would impose a cost on households these would be recouped in the long-run through lower energy bills²⁵. This spending (on domestic labour and goods) compares to the £15 billion spent *every year* by UK households on increasingly imported gas for heating²⁶. Public funds could be used to provide access to low-cost upfront capital, using the existing Green Deal pay-as-you-save framework.
20. This energy efficiency programme would meet the criteria HM Treasury apply for determining their **top 40 infrastructure requirements**. It would also fit with the eight characteristics of infrastructure identified in HM Treasury's valuation guidance. In addition, classifying energy efficiency as infrastructure is consistent with the way energy efficiency is considered by a range of international organisations such as the European Investment Bank (EIB) and the International Energy Agency (IEA)²⁷.

CURRENT POLICY

21. The programme outlined above would address a current gap in the Government's approach to energy and climate policy. The **current target of insulating 1 million homes in the next 5 years**, or 200,000 homes per year, is insufficient to meet our climate targets cost effectively. The commitment to a million homes will be delivered through Energy Company Obligation (ECO), but with the withdrawal of the Green Deal scheme there is now no policy to address efficiency in non-fuel poor homes.

²¹ ONS, Excess Winter Deaths, England and Wales, Nov 15

²² World Health Organisation, Environmental burden of disease associated with inadequate housing, 2011

²³ Cambridge Econometrics, Building the Future, Oct 2014

²⁴ E3G (2015) Taking back control: where next for household energy efficiency policy in the UK?

²⁵ Cambridge Economics (2014) The Economics of Climate Change policy

²⁶ ONS (2015) Quarterly Energy Prices

²⁷ Frontier Economics, Energy Efficiency as Infrastructure, Sept 2016



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22. The Government has set a cap of £650 million per year to be raised from the ECO to support the delivery of energy efficiency measures²⁸. To deliver the programme outlined above, an annual investment of approximately £5 billion would be required. With little current private investment in energy efficiency (due to well understood economic barriers such as split incentives and high discount rates applied by householders to long term savings)²⁹, annual investment will run at less than a fifth of what is required to modernise our homes. This is a direct consequence of the Government failing to adopt a long term infrastructure vision to make the entire UK housing stock energy efficient at the scale and speed required to meet carbon budgets.

CONCLUSION

23. Fixing the UK's existing, leaky housing stock is a huge infrastructure opportunity. Not only does the government's own economic data show that it would deliver comparable economic returns to other major infrastructure projects, but it is an essential investment to strengthen energy security, end fuel poverty and meet our carbon budgets. As this briefing argues, infrastructure funding alongside regulation should be used to unlock private investment in domestic energy efficiency.
24. The Government recognised in its 2011 infrastructure plan that buildings must be considered³⁰, but no action on the housing stock followed. Now is the time to include a retrofitting programme to eliminate energy waste in our homes. It is one of the most widely supported infrastructure solutions in the UK today, with over 200 major businesses, cities, unions and charities in support³¹, including the CBI, Age-UK and Citizens Advice.
25. **WWF-UK calls on the National Infrastructure Commission to examine how to make our existing housing infrastructure energy efficient and to examine how to de-carbonise our heating infrastructure in the most cost-effective way, and we encourage the Commission to come forward with progressive policy proposals to bring this about as soon as possible. The following briefing sets out why domestic energy efficiency should be considered under the NIC's remit.**

²⁸ Treasury, Comprehensive Spending Review, Nov 2015

²⁹ DECC (2012) Energy Efficiency Strategy

³⁰ HMT (2011) National Infrastructure Plan 2011

³¹ <http://www.energybillrevolution.org/whos-behind-it/>



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TASKFORCE 'THE FUTURE OF RENEWABLES'**ANNEX**

1. WWF-UK has convened an industry-led taskforce on the Future of Renewables: the Market after 2020. The taskforce has a broad membership which comprises of energy generators, investors and transmission specialists. The taskforce will look at how to maximise the opportunities that renewables can offer and will investigate how the Government can best incentivise the modern energy system that is needed. Areas of focus for the taskforce are:
 - Building a more modern energy system and the policy mechanisms the Government can use to facilitate a move towards such a system.
 - Maximising the value chain of ancillary services.
 - Encouraging private sector investment in the low carbon economy.
 - The costs of different energy generation technologies
2. The taskforce will be publishing its recommendations in advance of the Budget and would be pleased to share these with the NIC.



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