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Dear Andrew

National Infrastructure Commission call for evidence - Delivering future-proof energy infrastructure

I am writing in my role as portfolio lead of the Core Cities Low Carbon, Energy and Resilience Policy Hub.

First of all, on behalf of the Core Cities, I want to welcome the establishment of the National Infrastructure Commission. It comes at a critical time in unlocking future investment to enable our UK economy to plan, grow and deliver sustainable and inclusive growth over the long term.

Our Cabinet members would be keen to meet with you and other members of the National Infrastructure Commission to help inform both the current and future stages of work and consider the vital role that Core Cities (and wider City Regions) can play in the delivery of the Commission's objectives.

The Core Cities Cabinet will be meeting in Sheffield on Tuesday 26th January, which we would be delighted if you could attend. If this is not possible, then please advise if there is another suitable date.

Our response below sets out our view on delivering future proof energy infrastructure, recognising also that the separate Transport for the North Board will respond to the challenge of improving connectivity between Cities in the North of England.

However, we would also like to make some more general points with regard to future infrastructure investment that we feel are critical in terms of enabling long term planning and ensuring future resilience; also taking into account the discussions and commitments made at this year's COP21 deal in Paris. These include:

Ensuring climate resilience is assessed and included in all planned investment – Following on from the recent flooding in the North of England and elsewhere, as well as the number of disruptions to transport during a number of extreme weather events in 2012, 2013 and 2014; the National Infrastructure Commission needs to embed climate change adaptation appraisals as part of its investment approach. The Parliamentary Office of Science and Environment cited in 2014 that estimated annual damages from flooding were in the region of £1.1bn a year in England alone. Failing to account for climate change when seeking to rebalance the economy risks undermining the very ambitions we are working towards for the long term.

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Transport for the North of England – The Department for Transport’s resilience review identifying and addressing a range of transport issues to build a more reliable and resilient transport system. Globally, cities are recognising that there is a need, wherever possible, to encourage sustainable transport options to reduce carbon, but they are also inherently more resilient. Greater investment and co-ordination of transport offers strong opportunities to manage extreme weather better, but needs an enabling framework which places this need for a climate resilient transport system at the heart of transport policy. Additionally (going forward from this initial phase), we would like to see this extended to **Support for all UK pan-city region transport projects** that are sustainable, affordable and provide real economic, social and environmental benefit at both a national and local level.

Balancing Energy Supply and Demand – In a similar vein to transport, the transition to a low-carbon economy will inevitably involve a diversification of supply and demand. Our energy sources will comprise a range of renewable and low carbon sources, as well as technologies to manage them, such as smart grids and storage. In essence this creates a broader resilience, allowing the grid to manage disruption from extreme weather. . However our current energy management structures, regulations and organisational frameworks need to be reviewed to ensure that they are fit to deliver a long term planned approach to national, regional and sub-regional supply and demand.

In recognition of the general direction of travel towards greater devolved powers for local government and the benefits of a more holistic approach, we would like to suggest that Core Cities should have the opportunity for involvement in the decision making process around current/future infrastructure policy and service delivery, including at City Region level and through for example a duty to co-operate. We would be happy to elaborate on this and any other points in any future discussion.

In the first instance, our views, specifically in relation to delivering future proof energy infrastructure are set out in the attached appendix.

We look forward to the opportunity to discuss this further.

Yours sincerely,

George Ferguson CBE
Mayor of Bristol
Portfolio Lead for the Core Cities Low Carbon Energy and Resilience Policy Hub

Appendix

Overview

The Core Cities strongly support the establishment of the independent National Infrastructure Commission and the inclusion of the energy infrastructure as one of the first priorities. However, we believe that energy infrastructure also needs to be seen and considered in a holistic way. At a local government level we see and have to respond to the outcomes of the various interconnected elements, as the following three examples demonstrate:

- Vulnerable households living in inefficient homes, which they cannot heat, or power. This creates additional demands on health and social care services and reduces quality of life for residents.
- Failure to invest in low carbon / decarbonised transport systems at the pace that we need within cities and their natural hinterland and between cities, leading to the associated economic and health consequences.
- No requirement for the statutory utilities to link their infrastructure investment with our economic growth plans, leading to the associated economic and social consequences.

Therefore, while we have responded to the detailed questions as asked in the consultation report later we would like to set the context of the Core Cities approach to sustainable growth and reducing social inequalities, and the infrastructure investment and approach that is needed to enable this is happen.

Resilience

The development of new infrastructure should be undertaken with a full resilience audit, not limited to but including; how the new infrastructure will meet the challenges of climate adaptation, i.e. more frequent extreme weather events, how the new infrastructure will support the UK resilience to geo-political events, e.g. not relying on security of supply from unstable regions or governments and how the new infrastructure will support the UK resilience to terrorist attack? Consideration should also be given to current existing energy assets, such as electricity sub stations, many of which were previously built in areas with high level of flood risk.

All these questions suggest a more decentralised, embedded and diversified form of energy production, storage and interconnectedness; not only geographically, but also between systems; heat, electricity, transport, water, waste and digitally and between regulatory entities especially at the city region level to ensure efficiencies in the investment provision and decision for infrastructure construction.

Efficiency

The development of infrastructure should be considered in the context of efficiency. The Core Cities strongly support the UK Green Building Council's response to the National Infrastructure Commission's call for evidence. We suggest that energy efficiency investment in UK homes should be seen as an infrastructure investment. In addition to the UK Green Building Council's well evidenced response for a wide-scale and deep retrofitting of energy efficiency measures to homes, the Core Cities would like to see a national infrastructure approach to the provision of heat networks. The provision of heat networks allows the delivery of heat to be undertaken in the most efficient and low carbon manner, while improving the overall efficiency, resilience and capacity of the UK energy system through the increased use of combined heat & power plants on heat networks.

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Environmental standards

The provision of the infrastructure as outlined in the National Infrastructure Plan 2014 amounts to £466bn, in addition this call for evidence is likely to increase the level of investment by many further tens of billions.

The Core Cities advocate that during the design and construction phase whole life-cycle environmental impacts assessment are undertaken and that high environmental standards are built into the tender and design specifications. The opportunity to achieve high environmental standards on the design, construction and ongoing usage on such a scale of investment will impact positively on developing the necessary UK industries, skills and knowledge about how society will live in a very low carbon / decarbonised world. This is a set of skills and knowledge that the UK can export across the globe.

Interconnectedness

The provision of the future infrastructure that will ensure that the UK can compete in the global economy, contribute to reducing climate change emissions and be resilient to the future local and world extreme events, suggests that the various strategic infrastructure investments be coordinated. Currently this does not happen successfully in the UK and is invariably ad hoc.

As an example, the provision of increased demand side management of the electricity network at a local level, through the provision of smart metering and in-home management systems could also support the development of smart city improved transport management, waste management and heat and electricity storage and capacity solutions. However, because the UK has system regulators; Ofgem, Ofcom, ORR, Ofwat, Environment Agency, Natural Resources Wales, central and local government, this makes the coordination difficult. Core Cities have long advocated that we can take the local lead, responding to the local circumstances of each of our cities and its region. However, currently we have no mechanism to enable this to happen; if we did have a mechanism we suggest that we would enable the provision of more interconnected diverse future proofed infrastructure investment quicker.

Response to Consultation Questions (Energy section 4.1)

1. *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?*

- *What role can changes to the market framework play to incentivise this outcome:*
 - *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?*
 - *Is there a need to further reform the “balancing market” and which market participants are responsible for imbalances?*
- *To what extent can demand-side management measures and embedded generation be used to increase the flexibility of the electricity system?*

Response Q1

With regard to the question: What role can changes to the market framework play to incentivise this outcome?

We consider changing the market framework to ease coordination could have a positive impact. As previously mentioned we would strongly argue that there should be a duty to cooperate on other infrastructure providers to ensure that their investment plans interface with the growth and economic plans of the city region.

With regards to the second bullet point; Core Cities recognise that we can and could play a significant positive approach to assisting the development of demand-side measures on the local electricity network and increasing the take up of embedded generation systems.

Demand side management and embedded generation will be key to a flexible and robust electricity system in the future. Micro generation at the local or community level will form part of the energy mix underpinned by a centralised base load of gas/nuclear generation when required. Wherever possible embedded generation linked to energy storage will be able to increase the length and frequency of demand side management, allowing the National Grid to increase the flexibility of the energy system.

Set out below is an example of where we are currently doing this and with further support and access to infrastructure funding and local mechanisms, this could be accelerated.

Bristol City Council Community Energy Fund

To assist local embedded generation, Bristol City Council, supported by DECC, has developed an approach with community groups and social investors to enable them to invest in installing embedded generation on Bristol City Council's land and buildings, or investing in Bristol City Council's energy generation projects. One of the key aspects to the project is the requirement for the project to negotiate a Power Purchase Agreement with Bristol Energy, a 100% Bristol City Council owned licensed energy supplier.

In addition to the example above, Liverpool, on behalf of the Core Cities, have been working with Government and their network operator over the last eighteen months regarding the strategic role that we could play in ensuring that the electrical infrastructure investment is undertaken in a coordinated manner which both supports economic growth and meets the needs of the distribution network operator. DECC and Ofgem have now committed to explore further Liverpool City Region's proposals on how innovation and collaboration can enable a more coordinated approach to network investment, in order to meet growing network demands. To deliver this, Ofgem commit to considering proposals put forward by the Liverpool City Region and the DNO as part of the 'Quicker and More Efficient Connections' project.

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

- *Are there specific market failures/barriers that prevent investment in energy storage that are not faced by other 'balancing' technologies? How might these be overcome?*
- *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.)*

Response Q2

With regard to the market failures/barriers question we believe that there is strength in tying together generation and storage, otherwise there can be little incentive to install energy storage if you have to 'pay' to then fill it. Without clear links between the two, energy storage by itself will have limited appeal in wide scale deployment. There is a lack of clear and stable incentive mechanisms to give confidence to the market for it to invest in meaningful energy storage and management systems.

While the National Grid does provide incentives for players at scale (3MW+) to participate in demand response (DR) for frequency control purposes - this can only be seen as a small scale solution with limited returns for companies to participate should the numbers of DR events increase (currently typically 10 - 30pa) due to coal being phased out and renewables offering a variable mix. While it is likely that many of these players participating in DR will have redundancy plans in place to ensure that they are not adversely affected by these events, the next logical step would be to incentivise them to invest in (or increase their) energy storage solutions as well, in order to allow them to withstand a higher frequency or increase the duration of events.

Equally as DR technology and energy storage becomes easier to implement and aggregate into the domestic market, large portfolio owners (such as Housing Associations) will be able to offer DR aggregation at scale to the Grid, providing a new set of partners the National Grid can work with to peak shave demand. If energy storage is coupled with renewable generation & DR technology then there are opportunities for estate owners moving towards self-sufficiency, reducing demand on the Grid.

With regards to the second bullet point, Core Cities would strongly advocate that all the scales mentioned in the question are appropriate for future energy storage technologies. Technologies employed at the transmission and distribution levels will provide additional levels of redundancy and contingency scales and allow the Grid to balance the energy mix at times of stress. The domestic scale will be able to benefit hugely from localised energy storage, which depending on type – battery, hot water or both – will allow householders to have a level of energy independence which when aggregated nationally can be used to shave peak demand where required.

New smart metering and digital technologies and software will enable each of the scales to “talk” between each other and also between technologies. It is imperative that as we move to a more decentralised, embedded and diversified form of energy production, that the large scale centralised approach that has served the UK well for the last 60 years, allows for a more pluralistic approach to meet our energy challenges and opportunities.

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Therefore, we would advocate that if any future funding approaches are being devised, that they are open to non network operators to make applications and in addition, that a proportion of funding is allocated for each of the three scales.

Currently a number of Core Cities are exploring, or have in demonstration, the following distribution network or domestic storage options:

- Electrical battery storage in properties linked to solar PV generation (in demonstration).
- Installing solar power (canopies and domestic) for electricity (as part of FIT), with further future potential for any surplus electricity not required in the house being directed to the immersion heater in the hot water cylinder to support further energy conservation.
- Cryogenic liquefied gas electrical generation from waste heat (in discussion).
- Phase change material heat storage from waste heat arising from electrical generation (in discussion). This approach improves the overall electrical system generation efficiency.
- Use of Dimplex quantum storage heaters and immersion heaters with smart controls throughout several tower blocks as a means to aggregate peak shaving (in discussion)
- Liquid Air (compressed when electricity is plentiful) as a transport fuel (funding application submitted)
- Connection of solar PV, electric vehicle charging, heat pumps, heat network and smart control technology in a holistic system configuration (funding approved commencement February 2016).
- Energy Storage test bed at Newcastle University.

3. What level of electricity interconnection is likely to be in the best interests of consumers?

- *Is there a case for building interconnection out to a greater capacity or more rapidly than the current 'cap and floor' regime would allow beyond 2020? If so, why do you think the current arrangements are not sufficient to incentivise this investment?*
- *Are there specific market failures/barriers that prevent investment in electricity interconnection that are not faced by other 'balancing' technologies? How might these be overcome?*

Response Q3

We currently do not wish to make any comment regarding question three.

4. 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?

Response Q4

Previous EU Green Capital Cities such as Copenhagen, Stockholm, Hamburg have all set their own ambitious climate targets (Copenhagen to be carbon neutral by 2025 and Stockholm to be fossil fuel free by 2050) and can provide key learning in terms of balancing energy supply and demand.

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In addition, forums such as the Covenant of Mayors, the Compact of Mayors and Rockefeller Resilient Cities provide global learning and commitment to tackle climate change (including through reducing energy demand and finding more efficient and cleaner forms of energy supply) including the most recent learning and commitments made at COP21, which Bristol supported as part of its year as EU Green Capital 2015 - the Paris City Hall Declaration and the 'Under2' Memorandum of Understanding.

Japan has a very strong track record of research and investment in this field through their 'NEDO' (New Energy and Industrial Technology Development) Governmental arm which is running a number of ground breaking pilot on energy storage and demand side response technology in pilots across Europe including Greater Manchester.

The UK is also making its own progress in other areas with innovative and collaborative work across our different sectors such as on the development of Ultra Low Emissions Vehicles, Marine Energy Accelerator programmes and longer term energy storage.

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