Department for
Business, Energy
& Industrial Strategy

THE FUTURE FOR SMALL-SCALE LOW-CARBON GENERATION

A call for evidence

July 2018

A call for evidence

The call for evidence can be found on the BEIS section of GOV.UK: https://www.gov.uk/government/consultations/the-future-for-small-scale-low-carbon-generation-a-call-for-evidence

Any enquiries regarding this publication should be sent to us at futureofsmallscalesupport@beis.gov.uk

Ministerial Foreword from Claire Perry

The UK has been a world leader in cutting emissions while growing our economy, and in doing so has demonstrated to the world what is possible when Government and industry come together to tackle big strategic challenges.

Last year I was proud to launch the Clean Growth Strategy. The Strategy set out 50 major policies and plans that will help us to cut the cost of energy, drive economic growth, create high value jobs right across the UK, and improve our quality of life.

This call for evidence reaffirms our ambition set out in the Clean Growth Strategy to consider our approach to small-scale low-carbon generation beyond 2019, and to explore the clear cross overs between a smart energy system and small-scale low-carbon generation.

Since 2010, Government support has driven down the cost of small-scale low-carbon electricity generation and helped create an innovative sector of small businesses, as well as larger players. While we are pleased with this achievement and our record of supporting this sector, as technologies mature along with the market, we should look to constantly improve our understanding and approach.

In publishing this call for evidence, I want to understand what the opportunities and challenges are for the sector; to give them the opportunity to demonstrate the options available to provide benefits to the electricity system and UK consumers; and to build a strong consensus for action.

I believe the sector is well-placed to continue nurturing and delivering low-carbon technologies to households and businesses. A decentralised energy system has a role in: protecting consumers from high energy costs for example by locating generation near to demand, improving the resilience and flexibility of our energy system, helping to sustain jobs in this sector and provide the opportunity for future job growth which will enable the UK to take advantage of related industrial and economic opportunities.

However, while we want to seize this opportunity, we must do so in a way affordable for consumers. I know that this cannot be achieved by Government alone - it requires collaboration. I look forward to listening to what the sector has to say, and working with them to realise our shared ambition for the industry.

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General information

Purpose of this call for evidence

Achieving clean growth, while ensuring an affordable energy supply for all consumers, is at the heart of the UK's Industrial Strategy. That means nurturing low-carbon technologies, processes and systems that protect our businesses and households from high energy costs, and securing industrial and economic advantage from the global transition to a low-carbon economy.

In 2017 we published the Clean Growth Strategy[1] in which we outlined the key policies and proposals to deliver clean, smart and affordable power. Specifically related to small-scale low-carbon generation, these included:

- Implementing the Upgrading our Energy System: Smart Systems and Flexibility Plan[2], which will help consumers to use energy more flexibly and could unlock savings of up to £40 billion to 2050; and
- Considering options for our approach to small-scale low-carbon generation beyond 2019, which is the purpose of this document.

This call for evidence seeks to identify the role small-scale low-carbon generation can play in maximising the advantages for the UK in the global shift to clean growth by understanding:

- The challenges and opportunities from small-scale low-carbon generation in contributing to government's objectives for clean, secure, affordable and flexible power; and
- The role for government and the private sector in overcoming these challenges and realising these opportunities.

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[1] HM Government, 2017, *The Clean Growth Strategy: Leading the way to a low carbon future*, Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/651916/BEIS_The_Clean_Growth_online_12.10.17.pdf

[2] HM Government and Ofgem, 2017, *Upgrading Our Energy System: Smart systems and Flexibility Plan*, Available at: https://www.ofgem.gov.uk/system/files/docs/2017/07/upgrading_our_energy_system_-_smart_systems_and_flexibility_plan.pdf

Email: futureofsmallscalesupport@beis.gov.uk
Consultation reference: future for small-scale low-carbon generation

Territorial extent:
This call for evidence applies to Great Britain.

How to respond

Your response will most useful it is framed in direct response to the questions posed, though further comments and evidence are also welcome.

Where possible, responses should be submitted electronically via the e-consultation available at https://beisgovuk.citizenspace.com/clean-electricity/the-future-for-small-scale-low-carbon-generation

Electronic responses should be emailed to futureofsmallscalesupport@beis.gov.uk or sent to the address on page 4.

Additional copies:
You may make copies of this document without seeking permission. An electronic version can be found at https://www.gov.uk/government/consultations/the-future-for-small-scale-low-carbon-generation-a-call-for-evidence

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If you want the information that you provide to be treated as confidential please tell us, but be aware that we cannot guarantee confidentiality in all circumstances. An automatic confidentiality disclaimer generated by your IT system will not be regarded by us as a confidentiality request.

We will process your personal data in accordance with all applicable UK and EU data protection laws. See our privacy policy.

We will summarise all responses and publish this summary on GOV.UK. The summary will include a list of names or organisations that responded, but not people's personal names, addresses or other contact details.

Quality assurance

This consultation has been carried out in accordance with the Government's Consultation Principles.

If you have any complaints about the consultation process (as opposed to comments about the issues which are the subject of the consultation) please address them to:

Email: beis.bru@beis.gov.uk

Executive Summary

The Clean Growth Strategy sets out an ambitious blueprint for Britain's low-carbon future. Alongside the Smart Systems and Flexibility Plan, it commits us to consider options for our approach to small-scale low-carbon generation beyond 2019, and to realise synergies between a smart energy system and future policy on small-scale low-carbon generation.

In this call for evidence we acknowledge the contribution of the small-scale low-carbon generation sector in decarbonising the power system.

Achieving clean growth, while ensuring an affordable energy supply for all consumers, is at the heart of the UK's Industrial Strategy. That means nurturing low-carbon technologies, processes and systems that protect our businesses and households from high energy costs, and securing industrial and economic advantage from the global transition to a low-carbon economy.

This call for evidence seeks to identify:

- The challenges and opportunities from small-scale low-carbon electricity generation in contributing to government's objectives for clean, affordable, secure and flexible power; and
- The role for government and the private sector in overcoming these challenges and realising these opportunities.

The UK has made substantial progress in building a successful renewables industry as part of our move to a low-carbon economy and to support meeting our carbon reduction and renewable energy targets. Since 2010 government support has driven down the cost of small-scale low-carbon electricity generation significantly and we are proud of our record of supporting this sector.

As the electricity system transitions towards a cleaner and more flexible form, and government launches a consultation on the closure of the Feed-In Tariff scheme to new applicants after March 2019, now is an appropriate time to consider the future role for small-scale low-carbon electricity generation.

Government's view is that small-scale low-carbon electricity generation, where it is on balance beneficial to government's objectives and the electricity system, should compete independent of direct subsidy and on its own merits on a level playing field with other electricity generation technologies through competitive, market-based solutions. Subject to receiving clear evidence of such benefits through the call for evidence process the government could then consider what, if any, further action is necessary to facilitate this. Such action could include options which address regulatory barriers, ensure small-scale generators are able to access additional revenue streams or that help guarantee a route to market. The evidence gathered from this call for evidence will allow government to decide how to proceed after the closure of the Feed-In Tariff scheme in April 2019.

Chapter 1: Introduction

Achieving clean growth, while ensuring an affordable energy supply for businesses and consumers, is at the heart of the UK's Industrial Strategy. That means nurturing low-carbon technologies, processes and systems that protect our businesses and households from high energy costs, and securing industrial and economic advantage from the global transition to a low-carbon economy.

Purpose of the call for evidence

1.1. This call for evidence seeks to identify the role small-scale low-carbon generation can play in maximising the advantages for the UK in the global shift to clean growth by understanding:

- The challenges and opportunities from small-scale low-carbon generation in contributing to government's objectives for clean, secure, affordable and flexible power; and
- The role for government and the private sector in overcoming these challenges and realising these opportunities.

1.2. The costs of low-carbon generation technologies, have been driven down through government policies and global investment. This includes technologies supported by the Feed-In Tariff scheme (FIT) which has brought forward over 800,000 installations across Great Britain[3].

1.3. Government's view is that small-scale low-carbon electricity generation, where it is beneficial to government's objectives and the electricity system, should deploy in a system in which competitive, market-based solutions are brought forward, the private sector can innovate and invest, and where technologies can compete on their own merits and on a level playing field.

1.4. Specifically we wish to receive views and evidence on:

- The contribution small-scale low-carbon generation can make to the electricity system, and whether on balance it is beneficial to the whole electricity system, in line with government's objectives to provide UK consumers with clean, affordable, secure and flexible electricity;

[3] BEIS, *Sub-regional Feed-in Tariffs statistics*, Available at: https://www.gov.uk/government/statistical-data-sets/sub-regional-feed-in-tariffs-confirmed-on-the-cfr-statistics

- How small-scale low-carbon generation supports the Industrial Strategy's[4] Grand Challenge to promote clean growth, taking into account the five foundations of People, Infrastructure, Place, Business Environment and Ideas;
- How much deployment of small-scale low-carbon generation will occur without government intervention; and
- Whether there is a need for government intervention to enable competitive market based solutions, for example a guaranteed route to market for small-scale low-carbon generators, or whether the market can lead deployment without government intervention.

1.5. Respondents should consider the following points:

- The proposal to close the FIT scheme export tariff to new applicants from March 2019;
- The Control for Low Carbon Levies, announced at Autumn Budget 2017[5];
- That in this call for evidence, we are considering small-scale low-carbon generation technologies as a whole, not just those technologies under the FIT scheme;
- That Government action involving changes to legislation will be subject to Parliamentary processes.

1.6. The evidence provided and responses received as part of this call for evidence will be considered and used to inform policy development ahead of a government response in due course.

The changing energy system

1.7. The electricity system has already seen early signs of change that will impact future deployment of small-scale low-carbon generation. These are driven by:

- **Rapidly falling technology costs**: As noted above, the cost of low-carbon generation technologies has been driven down through government policies and global investment. For example the cost of solar has reduced by 80% since 2008, and onshore wind by 50% since 2009[6,7]. At the domestic scale a 4kW solar photovoltaic system is estimated to have reduced in price from around £5,000/kW in April 2010, to around £1,880/kW in April 2014[8]. Cost reductions are being driven by continuous technology innovation and competitive

[4] HM Government, 2017, *Industrial Strategy: building a Britain fit for the future*, Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/664563/industrial-strategy-white-paper-web-ready-version.pdf

5 HM Treasury, 2017, *Autumn Budget 2017*, Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/661480/autumn_budget_2017_web.pdf

[6] Bloomberg New Energy Finance, 2016, *Summit keynote presentation*, Available at: http://www.bbhub.io/bnef/sites/4/2016/04/BNEF-Summit-Keynote-2016.pdf

[7] We note that these figures do not distinguish between the costs of differing scales of deployment.

[8] KPMG, 2015, *UK solar beyond subsidy: the transition*.

procurement, with costs expected to continue to fall to 2020 and beyond[9]. Lithium-ion battery prices have fallen by just over 70% since 2010, and are expected to more than halve again by 2030 according to industry analysis[10,11]. These cost reductions have led to increased deployment of small-scale low-carbon generation onto the electricity system. Since 2010 costs of low-carbon generation technology have fallen to the extent that deployment is now beginning to happen independent of subsidy and in combination with storage technology[12], with more potential developments in the pipeline[13].

- **Changing patterns of supply and demand**: As more intermittent low-carbon generation is deployed there will be an increasing need for flexibility. As consumers adopt different technologies brought forward by the market such as electric vehicles, home energy management, smart appliances, and smart tariffs, the patterns of supply and demand of electricity will change. It is likely that consumers will be offered a range of innovative services and bundled smart offers by market participants, including aggregators, which could support the integration and optimisation of on-site low-carbon generation.
- **Decentralised energy**: Last year the government commissioned Professor Dieter Helm to undertake an independent review of the cost of energy. The Cost of Energy Review[14] highlighted the trend towards greater decentralisation, digitisation, a move from passive to active demand, and the need to adapt and respond to these trends. We are seeing more generation nearer to people's homes, greater demand with the increased use of electric vehicles, the ability to store energy, and potential for generation avoidance through demand-side response (DSR) to manage electricity more flexibly. However, installing behind the meter generation, and the ability to adjust the timing and volume of production or consumption of electricity, can have unintended impacts on the management of the electricity system and on consumers. These include greater challenges to balancing the electricity system due to increased intermittent generation, and a shift in distribution of network costs between consumers acting as small-scale low-carbon generators and those who are not.

  In addition to the changes to the energy system outlined above, the review highlighted the reliance of homes and businesses on reliable, affordable power. The government are considering the recommendations of the review to reduce

[9] IRENA, 2017, *Renewable Power Generation Costs in 2017*, Available at: http://www.irena.org/publications/2018/Jan/Renewable-power-generation-costs-in-2017
[10] Bloomberg New Energy Finance, 2017, *Lithium-ion Battery Costs and Market*, Available at: https://data.bloomberglp.com/bnef/sites/14/2017/07/BNEF-Lithium-ion-battery-costs-and-market.pdf
[11] International Renewable Energy Agency, 2017, *Electricity storage and renewables: Costs and markets to 2030*, Available at: http://irena.org/-/media/Files/IRENA/Agency/Publication/2017/Oct/IRENA_Electricity_Storage_Costs_2017.pdf
[12] ANESCO, 2017, *Case Study: Clayhill – the UK's first subsidy-free solar farm*, Available at: http://anesco.co.uk/clayhill-uks-first-subsidy-free-solar-farm/
[13] Solar Power Portal, 2017, *NESF commits to developing UK subsidy-free solar in 2018*, Available at: https://www.solarpowerportal.co.uk/news/nesf_commits_to_developing_uk_subsidy_free_solar_in_2018
[14] Dieter Helm, 2017, *Cost of Energy Review*, Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/654902/Cost_of_Energy_Review.pdf

costs to consumers and ensure a fair system, and we will be responding in due course.

- **Expected increase in demand**: As we decarbonise heat and transport, including through increased electrification, we expect the UK's demand for electricity to increase. This means additional generation and flexibility services will be needed to meet this demand. National Grid estimates that electricity peak demand could be as high as 85GW in 2050, compared to around 60GW today, driven by a host of factors, including: one million electric vehicles by the early 2020s, and possibly nine million by 2030[15].

1.8. There is the potential for further changes to the system to both promote benefits to the consumer, and ensure the effective management of the electricity system:

- **Smart metering and half-hourly settlement**: We believe the introduction of smart meters and half-hourly settlement could enable suppliers to offer smart tariffs, such as time of use or time of export tariffs. These could enable consumers to take better control of their energy use, encouraging consumers to shift their demand to when energy is cheaper which in turn will help with the management of the electricity grid. Small-scale low-carbon generators could also use these tariffs, generators could be encouraged to consume their own generated supply, and / or export any surplus generation to the grid at times of peak demand. Government is committed to ensuring that smart meters will be offered to every home and small business by the end of 2020. The roll-out is well underway, with over 10 million smart and advanced meters already successfully operating (as at end December 2017)[16]. Building on the functionality provided by smart metering, cost-effective elective half-hourly settlement, which makes it easier for suppliers to offer customers smart tariffs, has been in place since June 2017. Ofgem intends to take a decision on the approach to implementing half-hourly settlement on a market-wide basis by the second half of 2019[17].
- **Storage and DSR**: As set out in the Smart Systems and Flexibility Plan[18], deployment of new technologies such as storage is increasing and the costs of many of these technologies are falling rapidly, and we expect them to continue to fall. National Grid's Future Energy Scenarios 2017 forecasts 1.5GW of small battery storage (domestic and commercial), around a third of total battery storage deployment capacity, by 2040[19]. This additional storage, especially when combined with small-scale low-carbon generation, can enable consumers to self-consume and/or export their generation when changes in energy prices mean they could save, or indeed make, money. DSR can help consumers save

[15] National Grid, 2017, *Future Energy Scenarios*, Available at: http://fes.nationalgrid.com/media/1253/final-fes-2017-updated-interactive-pdf-44-amended.pdf

[16] BEIS, 2018, *Smart Meters: Quarterly Report to end Decembe 2017*, Availabel at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/694355/2017_Q4_Smart_Meters_Report.pdf

[17] Ofgem, 2018, *Market-wide Half-Hourly Settlement (HHS): Strategic Outline Case*, Available at: https://www.ofgem.gov.uk/publications-and-updates/market-wide-half-hourly-settlement-hhs-strategic-outline-case

[18] HM Government and Ofgem, 2017, *Upgrading Our Energy System: Smart systems and Flexibility Plan*, Available at: https://www.ofgem.gov.uk/system/files/docs/2017/07/upgrading_our_energy_system_-_smart_systems_and_flexibility_plan.pdf

[19] National Grid, 2017, *Future Energy Scenarios*, Available at: http://fes.nationalgrid.com/media/1253/final-fes-2017-updated-interactive-pdf-44-amended.pdf

money as well as improve the efficiency of the system. There is currently little DSR from households or small businesses. Alongside storage, DSR can be used with small-scale low-carbon generation to enable consumers to take better control of their energy use, shifting demand to when energy is cheaper which in turn will benefit the grid.

- **Management of the electricity system**: In line with the Smart Systems and Flexibility Plan, distribution network operators (DNOs) are transitioning to a distribution system operator (DSO) role. This involves actively managing networks to enable more competition for network services and encouraging greater coordination between the transmission and distribution boundary. The Energy Networks Association (ENA) launched the Open Networks Project, which will lay the foundations of a smart energy grid in the UK.

  Through the transition, DNOs are expected to open up new network reinforcements to market competition so that new, smart technologies such as storage and DSR can compete with traditional network solutions. This is expected to deliver savings for consumers as traditional reinforcement can be costly and there is potential for large savings when this is avoided or delayed.

1.9. Now is an appropriate time to consider the role for small-scale low-carbon generation particularly as we transition towards a cleaner and more flexible electricity system; and as we publish a consultation on the closure of the FIT scheme to new applicants after March 2019.

1.10. In 2017 we published the Clean Growth Strategy[20] in which we outlined the key policies and proposals to deliver clean, smart and affordable power. Specifically related to small-scale low-carbon generation, these included:

- Implementing the Upgrading our Energy System: Smart Systems and Flexibility Plan, which will help consumers to use energy more flexibly and could unlock savings of up to £40 billion to 2050; and
- Considering options for our approach to small-scale low-carbon generation beyond 2019, which is the purpose of this document.

1.11. The Smart Systems and Flexibility plan set out 29 actions to support the energy system transition by removing barriers to smart technologies, e.g. storage, to empower consumers to use energy when it is cheapest to keep bills as low as possible, reduce the costs of the energy system, and make markets work for flexibility services. Government and Ofgem are working to implement these actions. In this plan we committed to:

- Realise synergies between a smart energy system and future policy on small-scale low-carbon generation.

1.12. Separately, Ofgem are undertaking a wide ranging and ambitious review of electricity network charging. As our electricity system changes, network charges will need to

[20] HM Government, 2017, *The Clean Growth Strategy: Leading the way to a low carbon future*, Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/651916/BEIS_The_Clean_Growth_online_12.10.17.pdf

adapt to reflect that new system. Ofgem's Targeted Charging Review[21] and Access and Forward Looking Charges[22] work aims to introduce a proportionate set of price signals which are smarter, more cost reflective and fairer.

1.13. In conjunction with this call for evidence we are publishing a consultation on the closure of the FIT scheme to new applicants after March 2019. As set out in the FIT scheme consultation, we do not believe that the current FIT flat rate export tariff aligns with government's vision for the future, given our desire to move towards fairer, cost reflective pricing and the continued drive to minimise support costs on consumers, and the vision set out in the Industrial Strategy and Clean Growth Strategy published last year.

1.14. The consultation therefore proposes to close the existing FIT scheme export tariff to new applications at the same time as the generation tariff will close in March 2019, as well as proposing additional administrative changes to the scheme.

1.15. We understand that as part of this transition, different technology scales and types may be faced with different challenges, as may the end users i.e. households, businesses, and local communities. Consequently we understand that there may be a need for multiple approaches from the private sector, and / or government.

[21] Ofgem, 2017, *Targeted Charging Review: Significant Code Review*, Available at: https://www.ofgem.gov.uk/electricity/transmission-networks/charging/targeted-charging-review-significant-code-review

[22] Ofgem, 2017, *Reform of network access and forward-looking charges*, Available at: https://www.ofgem.gov.uk/electricity/transmission-networks/charging/reform-network-access-and-forward-looking-charges

Chapter 2: Opportunities and challenges from small-scale low-carbon generation

Changing consumption patterns, the growth of decentralised energy and deployment of smarter more flexible solutions, present challenges and opportunities from small-scale low-carbon generation in contributing to government's objectives of clean, secure, affordable, and flexible power.

2.1. This chapter considers the opportunities from small-scale low-carbon generation to contribute to government's objectives in the context of the changing energy system, including the potential to lower consumer bills, and contribute to a more efficient, competitive, and flexible system. It also considers the potential challenges further deployment of small-scale low-carbon generation could create. We would like respondents to indicate whether we have captured the opportunities and challenges fully and accurately, and propose solutions for how the challenges may be overcome.

Opportunities for small-scale low-carbon generation

Meeting Demand

2.2. While primary energy demand has fallen constantly since 2006[23], there is the potential for a rise in demand[24,25] in the future. Small-scale low-carbon generation can help meet this potential rise and contribute to the lowering of grid emissions. The Clean Growth Strategy recognises that to meet our 2050 commitment of reducing emissions by 80% compared to 1990 levels, we will need to decarbonise nearly all building heat and most industrial heat. Any electrification of heat will contribute to a rise in electricity demand, for example through the uptake of heat pumps. Similarly, the increased uptake of electric vehicles would further add to electricity demand.

2.3. Small-scale low-carbon generation could help in reducing and managing peak demand on the system, for example through encouraging load shifting. Six GW of low-carbon generation has deployed under the FIT scheme to date, FIT scheme generation supplied 2.5% of UK electricity consumption in 2016/17, with generation totalling some

[23] BEIS, 2017, *Digest of United Kingdom Energy Statistics 2017*, Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/643414/DUKES_2017.pdf
[24] Bloomberg New Energy Finance, 2017, *New Energy Outlooks 2017*.
[25] National Grid, 2017, *Future Energy Scenarios*, Available at: http://fes.nationalgrid.com/media/1253/final-fes-2017-updated-interactive-pdf-44-amended.pdf

7.75 TWh according to the Ofgem 2016/17 Annual Report[26], against a total UK electricity consumption of 304 TWh[27].

Markets for Flexibility

2.4. As the energy system is changing, we are seeing changes to electricity peak demand patterns, as well as an increase in the unpredictability of demand on the distribution networks. This has meant that there is a need for Distribution Network Operators (DNOs) to more actively manage their networks, including developing further system operation-type functions. In the Smart Systems and Flexibility Plan, we encouraged DNOs to open up their networks for market competition. This means that, if cost-effective, batteries, DSR or other distributed energy resources could replace traditional network reinforcement and fulfil objectives of an affordable, clean and secure system.

2.5. The transition from a DNO operator model to a Distribution Systems Operator (DSO) model is expected to be a staggered process, but it is expected that over time distributed energy resources would be able to bid in to relevant markets either directly or via an aggregator. For example, flexible distributed energy resources capable of adjusting how much they consume or generate can support the local distribution network at times of high electricity demand and therefore receive payment for the service. The System Operator (SO) and UK Power Networks (UKPN) are also trialling a platform through which the SO could procure reactive power from resources connected to the distribution network. This approach may support the growth of small-scale low-carbon generation and help to manage the operational challenges that the intermittent generation of some low-carbon technologies present. New markets for flexibility services may therefore provide a source of revenue for small-scale low-carbon generation, although this may need to be in conjunction with other technologies such as storage.

2.6. The DSO transition is underway, industry is modelling five different possible market models for the DSO transition, which the ENA will consult on this year with a view to agreeing on an industry-wide approach, with Ofgem and government.

Co-locating generation and demand

2.7. When generation and demand locate near to each other, the infrastructure needed to transport electricity is reduced. Small-scale low-carbon generation, by its nature, tends to be located close to demand. This is particularly true if generation can be targeted to times of peak usage, such as low-carbon generation combined with storage. Ofgem's Access and Forward Looking Charges work should provide opportunities for generation co-located with demand to receive a fair reflection of the value they are providing to the system through reduced network usage. This should ultimately benefit consumers through reduced network costs.

[26] Ofgem, 2017, *Feed-in Tariff Annual Report 2017*, Available at: https://www.ofgem.gov.uk/system/files/docs/2017/12/feed-in_tariff_fit_annual_report_2016-17_0.pdf

[27] BEIS, 2017, *Digest of United Kingdom Energy Statistics 2017*, Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/643414/DUKES_2017.pdf

Storage

2.8. In the Smart Systems and Flexibility Plan, the government committed to ensure that the benefits to consumers and the energy system from storing electricity for self-consumption and export to the grid at peak times are realised when considering future policy on small-scale low-carbon generation. There are approximately 800,000 installations registered under the FIT scheme[28], installed across homes and businesses, which could be co-located with storage. Storage systems can help households and businesses manage their energy consumption, and as a result, their bills, as well as providing potential revenue opportunities by selling power back to the grid at peak times or consuming power when demand is too low helping to balance the grid and avoiding efficiency losses within the distribution system. By the same token, increasing amounts of small-scale low-carbon generation could further enable the deployment of flexible technologies such as storage, accelerating the transition to a smart, flexible energy system which benefits consumers.

2.9. Electricity storage technologies provide critical flexibility to our energy system – for example, by lowering the cost of system balancing, improving utilisation of intermittent generation (e.g. wind, and solar generation), and reducing or deferring necessary investment in network infrastructure.

2.10. In addition, the government and Ofgem are making clear when storage can co-locate alongside low-carbon generation, without putting at risk agreements under the FIT scheme, RO or CFD. These arrangements ensure that only low-carbon generation is rewarded. The government has already clarified that storage is allowable alongside CFD-supported generation,

Case study – SCENe in the Trent Basin

This community energy demonstrator scheme is being rolled out on a 400 home regeneration project in Nottingham's Trent Basin being developed by Blueprint, a joint venture between Nottingham City Council and Igloo.

The scheme involves the installation of a community scale battery storage facility which will work in conjunction with on-site solar PV installations and will showcase innovative energy efficient solutions for sustainable homes and communities. The scheme is also seeking to deliver the charging infrastructure for electric vehicles. It aims to develop a 'subsidy free' commercial model for community energy.

This is an Innovate UK funded Project, and an example of how the research work on community energy undertaken by the University of Nottingham is directly informing a real world development. The scheme has been supported with £6.3 million funding from the Energy Research Accelerator (ERA) and Innovate UK.

[28] Ofgem, 2017, *Feed-in Tariff Annual Report 2017*, Available at: https://www.ofgem.gov.uk/system/files/docs/2017/12/feed-in_tariff_fit_annual_report_2016-17_0.pdf

provided it meets the metering requirements in the CFD contract[29], and Ofgem has worked with the industry to publish final guidance[30]on co-location of storage within the RO and FIT schemes. It is our intention that any new policy on small-scale low-carbon generation ensures that co-location with storage remains an option.

Demand-side response

2.11. Demand-side response (DSR) can help consumers save money as well as improve the efficiency of the system. There is currently little DSR from households or small businesses. Alongside storage, DSR can be used with small-scale generation to enable consumers to take better control of their energy use, shifting demand to when energy is cheaper which in turn will benefit the grid.

2.12. The government has recently closed its consultation regarding proposals on setting standards for smart appliances[31], which are important enablers of DSR. In the coming years, intermediaries providing aggregation should have a role to help consumers optimise the benefits of small-scale low-carbon generation, whilst also serving electricity system needs. Aggregators would seek to unlock value for customers by aggregating their electricity flexibility into a range of markets and revenue streams enabling small-scale low-carbon generators to more easily access markets.

Smart metering and half-hourly settlement

2.13. The smart metering system has been designed to work with small-scale low-carbon technologies, for example electricity smart meters must be capable of collecting and sending data on the amount of electricity both imported and exported.

2.14. Half-hourly settlement builds on the functionality provided by smart metering, and provides commercial incentives on energy suppliers to develop and offer tariffs that encourage consumers to use electricity when it is cheaper to do so, and / or to export surplus generation when it is most beneficial to the system. It is our expectation for electricity export to be settled on a half-hourly basis to encourage suppliers to offer smart tariffs.

2.15. With the advent of smart meters and smart ‘time of use’ tariffs, small-scale consumers could have greater autonomy over their electricity usage and take advantage of consuming or exporting at times of the day and night that either save or make them money.

2.16. Consumers with small-scale low-carbon generation could also engage in DSR through an aggregator using smart tariffs, potentially including an export tariff.

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[29] BEIS, 2017, *Contracts for Difference: Government response to the consultation to the CFD contract and CFD regulations*, Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/589996/FINAL_-_Government_Response_to_the_CFD_Contract_Changes_Consultation.pdf

[30] Ofgem, 2018, *Guidance for generators: Co-location of electricity storage facilities with renewable generation supported under the Renewables Obligation or Feed-in Tariff schemes (Version 1)*, Available at: https://www.ofgem.gov.uk/system/files/docs/2018/06/final_storage_guidance_0.pdf

[31] BEIS, 2018, *Consultation on Proposals regarding Smart Appliances*, Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/690805/Consultation_on_Proposals_regarding_Smart_Appliances-.pdf

Energy efficiency targets

2.17. In the Clean Growth Strategy, government set out its ambition for all fuel poor homes to be upgraded to Energy Performance Certificate (EPC) Band C by 2030 and the aspiration for as many homes as possible to be EPC Band C by 2035 where practical, cost-effective and affordable. EPC ratings reflect the estimated annual cost of running a home. This means it will be dependent on factors such as how energy efficient the home is, and the cost of the fuel being used to power the home. On-site electricity generation reduces costs through lowering the amount of electricity that needs to be paid for from the grid, so can have a part to play in improving EPC ratings.

Fuel poverty and community energy

2.18. Although lower income households can access the FIT scheme, in practice deployment of low carbon small-scale generation through the scheme has created more inequitable access to such generation. Microgeneration technologies, such as solar photovoltaics, could deliver bill saving reductions to individual properties in a sustainable way for many low income households. Community energy projects could also play a part in supporting those in fuel poverty. There have been numerous examples, such as the Plymouth Energy Community (see case study), of where community energy projects have used FIT scheme revenue from larger systems to fund energy efficiency work, energy advice or other support for more vulnerable members of the community.

Case study – Plymouth Energy Community

Plymouth Energy Community is a highly successful Community Energy organisation with 1200 members, over 300 investors, 33 community owned solar installations and a variety of well-established grassroots services helping the most vulnerable in society.

Their work is admired nationally and has brought £6,500,000 of inward investment to Plymouth to address fuel poverty, energy efficiency and local clean energy supply

Challenges from small-scale low-carbon generation

Behind the meter and inequitable network cost recovery

2.19. As technology develops, network users are increasingly able to adjust the timing and volume of their production or consumption of electricity, for example by installing their own generation on site (i.e. ‘behind the meter’). While the ability to shift the time or volume of demand will have wide ranging benefits to the system, it could also have other unintended impacts.

2.20. One example of this is with regard to fixed system costs. Some costs, such as residual network costs, are recovered from electricity consumers. The current method of recovering these costs allows users to reduce the amount of residual charges they pay, while potentially leaving fixed system costs the same.

2.21. As our system becomes smarter, the recovery of residual network charges could increasingly fall on those who cannot install or access smart solutions. This typically tends to be vulnerable consumers, or those with inflexible demand.

2.22. Ofgem are undertaking a Targeted Charging Review[32] to ensure that all users pay their fair share of electricity network costs.

Tracking deployment and network management

2.23. Linked to the impacts above, deployment of small-scale low-carbon generation is tracked through the FIT scheme register. If the FIT scheme is closed, and projects deploy independent of subsidy, industry and the DNOs will require alternative methods to actively track deployment and manage the network, to keep system costs low for consumers.

System Inefficiencies

2.24. Small-scale low-carbon generation can present challenges to the grid where intermittent generation clusters together. In some parts of the country at certain times, supply from distributed generation is outstripping regional demand and the surplus must be exported onto the transmission network. This means that parts of the distribution networks are now at, or close to, capacity at times of peak generation and low demand. Where distribution networks are close to capacity, queues to connect further generation can develop, and may lead to expensive network reinforcement.

System balancing

2.25. An increased penetration of intermittent generation may also make balancing the system more challenging and costly. Small-scale low-carbon generation installations are not visible or controllable by the System Operator, which can present challenges, for example if forecasted generation does not match actual output. This can lead to the System Operator having to take actions to ensure that demand and supply remain equal. In addition, in areas where lots of generation clusters together and the transmission system becomes lightly loaded, further actions may be needed to control voltages.

2.26. However, electricity storage technologies may be able to partially or fully overcome this challenge by providing critical flexibility to our energy system for example, by absorbing supply at times of high generation, thus lowering the cost of system balancing, improving utilisation of intermittent generation (e.g. wind, solar), and reducing or deferring necessary investment in network infrastructure.

2.27. As part of their transition to a System Operator role, distribution network companies are actively managing the increasing unpredictability on their networks by tendering out for ancillary services. These are technical and commercial agreements whereby a network operator would have access to services that help manage the network and avoid network investment. Such network management is consistent with the smart grid concept and would allow each local network to support additional distributed generation.

[32] Ofgem, 2017, *Targeted Charging Review: Significant Code Review*, Available at: https://www.ofgem.gov.uk/electricity/transmission-networks/charging/targeted-charging-review-significant-code-review

Call for evidence questions

1.	Have we accurately captured all the opportunities and benefits that small-scale low-carbon generation can provide to the UK energy system over the short, medium and longer-term? Are there any that we have missed? Please provide evidence.
2.	How can government help consumers benefit from small-scale low-carbon generation such as local communities, local authorities, and those in fuel poverty?
3.	The introduction of enabling technology and systems such as the roll out of smart meters, and half-hourly settlement, will provide commercial incentives on energy suppliers to develop and offer tariffs. Will smart tariffs provide a viable route to market for small-scale low-carbon generation? If so over what time frame, and what are the possible barriers to these smart tariffs?
4.	Do you agree with the challenges we have identified? Are there any challenges small-scale low-carbon generation presents that you think we have missed? Please provide evidence.
5.	How would you propose the small-scale low-carbon sector, suppliers, off-takers, network/system operators, and/or government can overcome the challenges presented?
6.	What are possible ways to track and monitor behind the meter installations (we would appreciate specific suggestions in relation to how information can be sourced (e.g. direct from businesses and households) and the method for sourcing it (e.g. an annual survey))?
7.	What are the special considerations that should be made when attempting to track different kinds of behind the meter activity?
8.	How do we develop our tools to model and evaluate the system (including system costs and resilience) as decentralised generation and storage develop, specifically approaches to system modelling, data capture, forecasting demand and evaluation of value for money?

Chapter 3: Levelling the playing field – how should government respond?

This chapter aims to develop our understanding of how the small-scale low-carbon generation sector can further look to realise opportunities to contribute to government's objectives of clean, secure, affordable, and flexible power, in the move to market-led deployment.

3.1. Chapter 2 considered the opportunities that the small-scale low-carbon generation sector can exploit to contribute to government's objectives, and the challenges that will need to be overcome.

3.2. The Smart Systems and Flexibility Plan made a commitment to consider how synergies between the UK's aspiration to develop a smart energy system and small-scale low-carbon generation should be realised.

3.3. In this chapter we consider how those synergies could be realised. Following the evidence gathered from Chapter 2 (on opportunities and challenges), where it is on balance beneficial to government's objectives and the electricity system, government may consider whether further action is necessary to allow the small-scale low-carbon generation sector to compete independent of direct subsidy and on its own merits with other electricity generation technologies. This includes the role for government and the private sector in the move to market-led deployment through:

- Creating the environment for competitive markets;
- Innovative market-led solutions;
- Regulatory or government-led interventions.

Creating the environment for a competitive market

3.4. We want to help create an environment enabling businesses to start up and grow in the UK, and contribute to creating prosperous communities across the UK. To enable small-scale low-carbon generation to compete on a level playing field with traditional generation, we also need to consider the environment they are operating within, including:

- **The Control for Low Carbon Levies**: Autumn Budget 2017 announced the new Control for Low Carbon Levies which sets out that the government will not introduce new low carbon electricity levies until the burden of such costs is falling. On the basis of the current forecast, this means there will be no new low carbon electricity levies until 2025. However, to ensure the lowest costs for consumers, new levies may still be considered where they have a net reduction

effect on bills and are consistent with the government's energy strategy[33]. Any future action must be consistent with this.

- **State aid:** Under EU law government subsidy must comply with rules on the provision of State aid. The objective of State aid control is to ensure that government interventions do not unduly distort competition and intra-community trade, and in practice the existing EU rules have been sufficiently flexible to allow the UK to make innovative aid interventions where necessary.

  On 23 June 2016, the EU referendum took place and the people of the United Kingdom voted to leave the European Union. Until exit negotiations are concluded, the UK remains a full member of the European Union and all the rights and obligations of EU membership remain in force. During this period the Government will continue to negotiate, implement and apply EU legislation. The outcome of these negotiations will determine what arrangements apply in relation to EU legislation in future once the UK has left the EU.

- **Other constraints:** Government interventions may need to consider future applicable requirements that are as yet unknown. For example we may need to consider the proposed Renewable Energy Directive (Recast) and how this may affect any future domestic legislation in this area.

3.5. The next section will look at the role that the private sector and government could have to facilitate the development of competitive markets. We would like to understand further the extent to which small-scale low-carbon generation can deploy without government intervention.

Innovative market-led solutions

3.6. Government has identified innovation as a central tenet of its Industrial Strategy. To this end, government has recently announced funding of £102m for its "Prospering from the Energy Revolution" Challenge Fund. This fund will develop and demonstrate innovative approaches across electricity, heat, and transport, to see how different technologies, such as storage and small-scale low-carbon generation, and business models might work together in different environments. In doing so it will look to prove the commercial viability of a multi-vector, integrated system approach and create high value local jobs across the country. This funding is in addition to BEIS's internal innovation funding of up to £70m for smart systems innovation up to 2021[34], and Ofgem's Electricity Network Innovation Competitions, which provide up to £70m per year[35].

3.7. The FIT scheme has provided certainty over the minimum long-term revenues for a project, whilst allowing generators to participate in the Power Purchase Agreements (PPA) market if advantageous to them. An unintended consequence of providing this

[33] HM Treasury, 2017, *Control for Low Carbon Levies*, Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/660986/Control_for_Low_Carbon_Levies_web.pdf

[34] HM Government and Ofgem, 2017, *Upgrading Our Energy System: Smart systems and Flexibility Plan*, Available at: https://www.ofgem.gov.uk/system/files/docs/2017/07/upgrading_our_energy_system_-_smart_systems_and_flexibility_plan.pdf

[35] Ofgem, 2018, *Electricity Network Innovation Competition*, Available at: https://www.ofgem.gov.uk/network-regulation-riio-model/current-network-price-controls-riio-1/network-innovation/electricity-network-innovation-competition

revenue certainty, and the flexibility to opt out and back in to the FIT scheme, may have been to curtail the development of the off-taker market for small-scale low-carbon generation. We need to be aware of the risk that government intervention curtails the development of independent market solutions.

3.8. The government could leave future deployment to be driven by energy market forces. It is possible that the sector may bring forward innovative solutions to market, free of interactions with any government-led mechanism. The opportunities offered through smart meters and half-hourly settlement for suppliers to offer new innovative market solutions, such as time of export and time of use tariffs, may mean the market is able to support continued deployment.

3.9. With the cost reductions in low-carbon technologies and new enabling technologies, the business case for deploying small-scale low-carbon generation has changed significantly since the introduction of the FIT scheme in 2010. We expect new opportunities to be brought to market as a result of these enabling technologies, and these changes should be considered as part of this call for evidence.

3.10. Onshore wind and solar have deployed rapidly in the UK since 2010 due to in part financial support provided by government schemes and significant falls in costs. Solar photovoltaics in particular has grown from less than 100MW in 2010 to circa 12.7GW at the end of 2017, including around 4.8GW supported by the FIT[36] accounting for 99% of installations deployed under the scheme. The government has been clear that consumers should not be expected to support sectors indefinitely and that as costs fall, so too should support. To control costs, given the more substantial deployment than anticipated, the government took a number of cost control measures from 2015 onwards, such as closing the RO to these technologies.

3.11. We understand that some projects can deploy without support and are pleased that 2017 saw the UK's first unsupported solar farm being deployed at Clay Hill[37] as well as announcements from other developers who intend to deploy unsupported solar projects[38]. A number of onshore wind developers have announced their intention to follow suit.

3.12. These are promising and welcome developments. However, the majority of projects announced to date are either very large installations that can realise economies of scale, such as Cleve Hill (350MW) and Little Crow (120MW), or projects that benefit from favourable site characteristics such as easy access to an existing grid connection or a strong commercial case for co-location with storage, as at Clay Hill. There may not be many more UK sites with such characteristics; and it is therefore unclear whether government intervention is still needed to enable these technologies to realise their potential contribution to our energy goals, especially at the smaller end of the generation scale.

3.13. We are keen to receive evidence from industry regarding the models being developed that will allow projects to deploy without support so that we can better understand the

[36] BEIS, 2018, *Sub-regional Feed-In Tariff statistics*, Available at: https://www.gov.uk/government/statistical-data-sets/sub-regional-feed-in-tariffs-confirmed-on-the-cfr-statistics

[37] ANESCO, 2018, *Case study: Clay Hill – The UK's first subsidy-free solar farm*, Available at: http://anesco.co.uk/clayhill-uks-first-subsidy-free-solar-farm/

[38] Such announcements, representing more than 500MW of combined installed capacity, include: Hive Energy's plans for 'pioneering' 350MW solar farm in Kent, see http://www.hiveenergy.co.uk/consultation-commence-new-solar-park-north-kent-coast/; and NESF commits to developing subsidy-free solar in 2018, see https://nextenergysolarfund.com/?wpfb_dl=161

potential scale of this emerging sector and if targeted government action may enable its expansion. For example, whether changes to building regulations and efficiency banding provide a means to increased unsupported solar photovoltaic deployment, both for new builds and retrofit installations. We are keen to understand what scale of deployment could be supported by the capacity and ancillary services markets as well as the emerging corporate PPA market that has been gathering pace in the UK recently.

Regulatory or government-led interventions

3.14. There may be government interventions that can help competitive markets for small-scale low-carbon generation to develop, whilst supporting the foundations of the Industrial Strategy of People, Infrastructure, Place, Business Environment and Ideas.

Access to markets

3.15. To enable small-scale low-carbon generation to operate on a level playing field with other more traditional generation sources, they may require access to revenue opportunities that they cannot currently access. This may require regulatory change but would give the sector the potential for revenue stacking.

3.16. The development of local energy markets may offer a route for distributed energy resources to access revenue streams from which they have traditionally been excluded. There are a number of potential models for these types of markets. These range from alternative supply arrangements for specific geographical areas, peer-to-peer platforms for trading energy, and local markets for flexibility.

3.17. Current trials of local energy markets are attempting to understand the benefits that they can have for the system, including access to new and existing revenue streams for distributed energy resources which includes small-scale low-carbon generation. The trials are also considering benefits from deferred network reinforcement, the supply of low-carbon generation to the electricity system, and greater consumer participation.

3.18. Existing local energy markets include Cornwall's local energy market in partnership with Western Power Distribution and Open Utility's trading platform for UK Power Networks to procure local flexibility services. These provide platforms through which distributed energy resources, including renewables, can offer services, either directly or through aggregators. Although in initial stages, these illustrate the potential for local energy markets to offer revenue streams for distributed generation.

3.19. Additionally, providing or improving access to alternative markets for small-scale low-carbon generation could be considered. Markets include the Capacity Market, Balancing and Settlement market, and markets to value energy efficiency (demand reduction). The Energy Networks Association launched the Open Networks Project, which will lay the foundations of a smart energy grid in the UK. DNOs are already starting to open up the delivery of network requirements to a market based approach[39].

[39] Energy Networks Association, 2018, O*pen Networks Project: Opening Markets for Network Flexibility*, Available at: http://www.energynetworks.org/electricity/futures/open-networks-project/open-networks-project-overview/

3.20. Government is committed to ensuring that the ancillary services market becomes more transparent and that new technologies and players are able to compete on a level playing field.

3.21. National Grid (NG) published roadmaps[40,41,42] to detail the System Operator's proposed actions for each of its service areas as a follow up to the consultation on the System Needs and Product Strategy (SNAPS) in 2017[43]. These documents set out the NG's needs and simplify balancing services to create transparent markets. They also state that the NG will work closely with DNOs to ensure that all parties on the system have the appropriate access and routes to market.

3.22. The Capacity Market (CM) is intended to be technology neutral and allow all types of generators to participate with rewards appointed according to their contribution to security of supply. However, the technical eligibility framework does not currently provide a route for some low-carbon technologies (wind and solar in particular) to participate because such technologies were expected to be supported by low-carbon subsidy instead. As the costs of wind and solar projects have fallen, we are anticipating an increase in the number of projects that will be possible without subsidy and therefore an increase in the number of developers who might show an interest in bidding into the CM. BEIS intends to begin looking into the necessary changes that would allow low-carbon generation to bid in as part of the 5-year review of the CM. This will involve consulting on any proposed changes, working with National Grid to calculate the de-rating methodology, and introducing amendments to the CM legislation.

3.23. Ofgem's Access and Forward Looking Charges[44] work stream aims to provide price signals which reflect the costs and benefits imposed onto the whole system from a network perspective. This could provide an additional revenue stream for generators which locate close to demand, particularly those that can target their output to when it is most valuable to the system.

Planning and regulatory requirements

3.24. There may be other regulatory requirements for small-scale low-carbon generation to promote energy efficiency at a domestic and commercial level. For example: health and safety standards may need to be revised to protect consumers and ensure the delivery of quality, safe products to customers; planning regulations may need to be brought in

[40] National Grid, 2017, Product Roadmap for Frequency Response and Reserve, Available at: https://www.nationalgrid.com/sites/default/files/documents/Product%20Roadmap%20for%20Frequency%20Response%20and%20Reserve.pdf

[41] National Grid, 2018, Product Roadmap for reactive power, Available at: https://www.nationalgrid.com/sites/default/files/documents/National%20Grid%20SO%20Product%20Roadmap%20for%20Reactive%20Power.pdf

[42] National Grid, 2018, Product Roadmap for restoration, Available at: https://www.nationalgrid.com/sites/default/files/documents/National%20Grid%20SO%20Product%20Roadmap%20for%20Restoration.pdf

[43] National Grid, 2017, System Needs and Product Strategy, Available at: https://www.nationalgrid.com/sites/default/files/documents/8589940795-System%20Needs%20and%20Product%20Strategy%20-%20Final.pdf

[44] Ofgem, 2017, *Reform of network access and forward-looking charges*, Available at: https://www.ofgem.gov.uk/electricity/transmission-networks/charging/reform-network-access-and-forward-looking-charges

line with the requirements to install small-scale low-carbon generation within developments and close to electricity demand.

3.25. The Clean Growth Strategy published in October 2017 outlines a number of ambitions for improving existing buildings. These include upgrading all fuel poor homes and as many privately rented homes as possible to EPC Band C by 2030, and as many other homes as possible to EPC Band C by 2035. We will be considering how small-scale low-carbon generation could contribute to the achievement of these targets and what government intervention may be required.

3.26. The Standard Assessment Procedure (SAP) is the methodology used to calculate EPC ratings. The government published its response regarding the next planned set of changes to SAP in November 2017[45]. These changes can only come into force as part of SAP 10 following consultation by the Ministry of Housing, Communities, and Local Government (MHCLG). This consultation is due to be published late 2018/ early 2019, subject to outcomes of the Hackitt review. Some of the expected changes to SAP could affect the impacts of small-scale low-carbon generation on the EPC ratings.

Network charging

3.27. Our future energy system will look different from the current linear model, and it is important that network charging reflects this fact. Ofgem is developing, through the Targeted Charging Review[46], and work on network access and forward looking charges, new network charging methodologies which will aim to be more cost reflective for the smarter system which is coming. This will provide new revenue opportunities for generators who can reduce network costs, which should also be available to small-scale low-carbon generation, particularly when co-located with storage. Comments on future network charging arrangements should be directed to the relevant consultations being run by Ofgem.

Other Investment Considerations

3.28. We understand that there are many factors that affect decisions to invest in small-scale low-carbon generation beyond the availability of direct support. Other factors may include the structure of charges for electricity supply, building regulations, local planning rules and impacts on business operating costs. We welcome evidence on the relative importance of these other factors in decisions to invest in small-scale low-carbon generation.

Decarbonising heat infrastructure

3.29. There are a number of options with potential to decarbonise how we heat our homes and businesses – including heat networks, heat pumps, hydrogen and biogas – but it is not yet clear which will work best at the scale needed to meet our 2050 targets.

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[45] BEIS, 2017, *Changes to Government's Standard Assessment Procedure (SAP): Government Response*, Available at: https://www.gov.uk/government/consultations/public-consultation-on-proposals-to-amend-the-standard-assessment-procedure-sap

[46] Ofgem, 2017, *Targeted Charging Review: Significant Code Review*, Available at: https://www.ofgem.gov.uk/electricity/transmission-networks/charging/targeted-charging-review-significant-code-review

3.30. In the short term and over the next decade or so, we need to be testing different approaches to heat decarbonisation and supporting more take-up of low-carbon heating, where it is cost-effective to do so. Government has a number of important programmes and projects working to that end and published a *Future Framework for Heat in Buidlings*[47] call for evidence in June. As set out in the Clean Growth Strategy, BEIS is also exploring the alternative options and technologies that can help meet the longer-term challenges and government plans to publish a review of the current evidence later this year.

3.31. Different potential heat decarbonisation pathways will have very different impacts on the electricity system, and understanding the different potential interactions with distributed generation will be important. This is particularly the case when considering scenarios that lead to a significant increase in electricity demand, where the value of system flexibility and technologies that can minimise the associated networks and supply challenges will be greatest.

Guaranteed route to market

3.32. In the FIT scheme consultation 2018[48] we outlined our preferred option to close the FIT scheme to new entrants from March 2019. If we were to close the scheme to new entrants the potential implications for small-scale low-carbon generators we have identified are:

- The removal of a route to market for generators, particularly for smaller capacity generators; and,
- Export revenue uncertainty which could potentially limit developers' access to long term finance, and consequently limit project deployment.

3.33. Typically eligible small-scale generators have received remuneration for the electricity they export to the grid via the export tariff provided under the FIT scheme. The closure of the FIT scheme would remove this method of remuneration, in line with the objectives of the Control on Low Carbon Levies to protect consumers from rising policy costs. Evidence suggests that these smaller capacity generators may currently struggle to access an alternative route to market for their surplus electricity, but our evidence also shows that there will be some deployment of small-scale generation without any form of export tariff. Within the PPA market there appears to be a competitive short-term PPA market with around 40 off-takers participating, however, availability of longer-term PPAs appears limited. Moreover, market evidence suggests that the current PPA market does not extend to provide a route to market for the smaller capacity generators within the 0-5MW capacity range.

3.34. For larger generators the FIT scheme export tariff has provided a guaranteed revenue stream, even where the generator may have opted into the PPA market. The FIT scheme has supported developers to attract sufficient low cost capital to finance new projects by providing visibility and a degree of certainty over long term revenue streams. The closure of the FIT scheme would mean developers would be dependent on securing certainty over longer-term revenue streams from other sources. With long-term fixed price PPAs currently scarce, projects are not guaranteed to secure an agreement.

[47] https://www.gov.uk/government/consultations/a-future-framework-for-heat-in-buildings-call-for-evidence
[48] https://www.gov.uk/government/consultations/feed-in-tariffs-scheme

3.35. The current FIT scheme aims not to distort the competitive market for electricity, however, as it does not track the prevailing wholesale price it enables FIT scheme generators to follow market peaks and to be rewarded for this by opting out of the export tariff to take advantage of other market opportunities. However this may have had a wider impact on the off-taker market with generators opting into the FIT scheme export tariff, when the wholesale market price drops below the FIT export tariff.

3.36. With this in mind one option to consider could be a guaranteed route to market. Such an option would need to take advantage of developments in the electricity market and support the delivery of the Smart Systems Plan in such a way as to enable the development of a competitive market that is mutually beneficial to both small-scale low-carbon generation and flexible solutions such as storage.

3.37. Currently PPAs are typically offered at a discount to the wholesale market price. To allow the PPA market, and other market offerings to develop, any guaranteed route to market would need to operate at a meaningfully lower rate. This would provide the space for market innovation.

3.38. In addition to the general considerations outlined in paragraph 3.449such an option would also wish to consider the following:consider the following:

- **Supporting smart:** With the smart meter roll-out progressing, exports from small-scale low-carbon generators will be able to be metered. We would expect any guaranteed route to market to require the metering of any export volumes.

  We would want a guaranteed route to market to take advantage of these developments in the electricity system and to provide clear incentives for behaviour that supports the efficient operation of the electricity system.

- **A tariff fit for purpose:** We want to enable small-scale low-carbon generation to take advantage of market solutions. We would expect the operating terms of any guaranteed route to market to enable generators to take advantage of these solutions by allowing generators to opt out.

  Further, we would not wish to see any guaranteed route to market stifle market innovation.

- **Lowest cost to the consumer:** An export tariff, as per the current FIT scheme export tariff, does not reflect market signals, such as varying time of day or intra-day prices. Equally when it exceeds the wholesale price, it could be argued that generators are being over compensated.

  It is important that costs to consumers are minimised, including costs to the energy system as a whole. To do this a guaranteed route to market would need to incentivise behaviours which promote efficient grid management such as self-consumption, and alleviate grid constraints.

- **Controlling costs:** Autumn Budget 2017 announced the new Control for Low Carbon Levies which sets out that the government will not introduce new low

[49] For examples of the general considerations see: ECOFYS, 2014, *Design features of support schemes for renewable electricity*, Available at: https://ec.europa.eu/energy/sites/ener/files/documents/2014_design_features_of_support_schemes.pdf, and IRENA, 2015, *Renewable Energy Auctions: A Guide to Design*, Available at: https://www.irena.org/publications/2015/Jun/Renewable-Energy-Auctions-A-Guide-to-Design

carbon electricity levies until the burden of such costs is falling. On the basis of the current forecast, this means there will be no new low carbon electricity levies until at least 2025. However, to ensure the lowest costs for consumers, new levies may still be considered where they clearly demonstrate a net reduction effect on bills and are consistent with the government's energy strategy[50]. Any future option must meet these criteria.

- **Eligible technologies:** The FIT scheme currently provides support to five technologies, solar photovoltaics, anaerobic digestion, hydro, wind, and micro-CHP. It is appropriate to consider whether these same technologies should be supported in future. Alternatively it may be appropriate to take a technology neutral approach to enable lowest cost low-carbon generation to deploy to meet our objectives for a clean and affordable electricity supply.
- **Capacities eligible:** Recent research carried out by BEIS indicated that generators >50kW in scale could participate effectively in the PPA market. However, respondents suggested that smaller small-scale generators i.e. those <30kW and community projects would still struggle to access the PPA market.

3.39. Further action could be targeted at areas where there are limited or no routes to market currently available. Areas which could be considered in more detail include: allocation rules and regulations, such as legislative and State aid constraints criteria, eligibility of technologies of varying capacity sizes; any administrative and/or governance requirements which could cover both generators and suppliers.

Call for evidence questions

9.	Are off-takers, suppliers, and aggregators able to lead the deployment of small-scale low-carbon generation currently? If so how will this occur, over what timescales, and what are the implications for deployment levels? How would deployment be supported by the capacity and ancillary services markets as well as the emerging corporate PPA market? Please provide evidence.
10.	What would be the impact on jobs, deployment, and the supply chain, if deployment were left to market forces beyond 2019? Please support your answer with clear evidence.
11.	In your view, are small-scale low-carbon generators currently able to deploy independent of subsidy e.g. through the PPA market? Does this vary for differing technologies and capacities of small-scale low-carbon generation e.g. domestic vs.

[50] HM Treasury, 2017, *Control for Low Carbon Levies*, Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/660986/Control_for_Low_Carbon_Levies_web.pdf

	commercial scale? If not, can you explain how long it will take for this market to emerge and if government intervention is required? Please provide evidence.
12.	What factors, including financial, affect your decisions to invest in small-scale low-carbon generation?
13.	Does government need to take regulatory intervention(s) to enable the development of competitive markets for small-scale low-carbon generation? If so, what and why? If these actions were taken, what benefits would this provide to consumers and the electricity system?
14.	How can we encourage and unlock private sector finance to enable market-led deployment?
15.	How would a guaranteed route to market operating at a discount to the market price impact the transition of small-scale low-carbon generation to competitive markets? Please provide evidence to support your answer.
16.	What innovative solutions would be required in the PPA market to bring forward small-scale low-carbon generation? Please provide evidence to support your answer.
17.	A guaranteed route to market would require costs to be robustly controlled for consumers, as outlined in the Control for Low Carbon Levies. How could this best be achieved, without creating 'boom and bust' cycles for the small-scale low-carbon generation sector?
18.	What would be the general challenges (including technical challenges) of designing a guaranteed route to market that offers a time of export tariff to support the aim of developing a smart and flexible network?
19.	How long would a guaranteed route to market need to run for to help the development of competitive markets?
20.	How could future regulations or other interventions be designed in order to capture the benefits of storage combined with small-scale low-carbon generation? If specific technical requirements are needed, please specify those as well.
21.	If implemented what effect would the actions you outline have on the small-scale low-carbon generation sector and the benefits this sector brings to UK consumers?