Department for
Business, Energy
& Industrial Strategy

Combined Heat and Power: the route to 2050

Call for evidence

Closing date: 4 September 2020

June 2020

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

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Executive summary

Clean Growth is one of the four grand challenges of the UK Government's Industrial Strategy and energy efficiency and decarbonising heat are vital parts of the ambition. In June 2019, the UK committed in legislation to bring all greenhouse gas emissions to net zero by 2050.

Combined heat and power (CHP) is an efficient process that captures and utilises the heat that is produced in power generation, this is usually electrical but can in some instances be mechanical. By generating heat and power simultaneously from the same fuel, CHP can reduce carbon emissions by up to 30% compared to the separate generation of heat through a gas-fired boiler and an electricity power station. Where a demand for both heat and electricity exist in the same location, CHP can reduce energy costs whilst reducing carbon emissions and air pollution.

CHP schemes can encompass a range of different generation technologies and can be fuelled by fossil fuels or renewables e.g. biomass. CHP generators may export power not used on site. As dispatchable generation CHP can adjust its exported power output to provide flexibility services to the electricity network. CHP plants are used by a wide variety of sectors, in particular by chemicals, food and drink, paper and refining industries. Large buildings with high heat demands also employ CHP, such as hospitals, and CHP plants are a key technology for heat networks, which in high heat density areas are the most cost-efficient low-carbon infrastructure.

Government provides support to improve the commercial case for investing in CHP because of its relatively long payback period, the environmental benefits of cogeneration and technical complexity. The CHP Quality Assurance Scheme (CHPQA), an annual assessment process, that ensures that all CHP plants that benefit from government support meet a minimum level of energy efficiency.

Since the introduction of the CHPQA scheme, the UK generation mix has changed considerably, with renewable and low carbon generation providing increasing proportions of the national electricity needs. As this has happened, the emission reductions delivered by CHP electricity generation are reduced. Previous modelling work on the impact of new natural gas CHP plant on the GB electricity market concluded that from 2032 new natural gas CHP capacity stop displacing generation by natural gas fired combined cycle gas turbine (CCGT) power stations and begin to displace an increasing proportion of low carbon generation, increasing carbon emissions.

Successful achievement of our Carbon Budget targets on the transition to net zero greenhouse gas emissions by 2050 will require virtually all heat and electricity demands to be decarbonised and significant action taken to help industrial processes to decarbonise. We are seeking views to support the Government as it considers what the role for CHP technologies may be in the transition to 2050. We intend to identify the possible opportunities and technological developments which may be combined with CHP technologies, along with appropriate incentives and support for deployment, to meet these goals.

General information

Why we are consulting

The Government is seeking initial views on the current benefits from Combined Heat and Power (CHP) and the future role of CHP generation of all types in the transition to achieving net zero greenhouse gas emissions by 2050, and in particular how the technology may support the decarbonisation of heat and industry.

We recognise the current challenges facing the economy and this consultation is not indicating the removal of support at this time but are seeking feedback from all CHP stakeholders to shape the future approach.

We invite your views and seek evidence in response to the questions below. Responses will help inform future policy development.

Call for Evidence details

Issued: 12 June 2020

Respond by: 4 September 2020

Enquiries to:

Business Energy Use Team
Department for Business, Energy & Industrial Strategy
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1 Victoria Street
London, SW1H 0ET

Tel: 020 7215 5000
Email: CHPPolicy@beis.gov.uk

Consultation reference: Combined Heat and Power: the route to 2050

Audiences:

We are keen to hear from CHP operators, Heat network operators, energy companies, network operators, technology suppliers, large businesses, SMEs, financial institutions, Energy Service Companies (ESCOs), Local Enterprise Partnerships, Non-Governmental Organisations, academics and anyone else with an interest in this area.

Territorial extent:

GB

How to respond

Respond online at:
beisgovuk.citizenspace.com/energy-efficiency/chp-role-in-route-to-2050-cfe

or

Email to: CHPPolicy@beis.gov.uk

When responding, please state whether you are responding as an individual or representing the views of an organisation.

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

Confidentiality and data protection

Information you provide in response to this consultation, including personal information, may be disclosed in accordance with UK legislation (the Freedom of Information Act 2000, the Data Protection Act 2018 and the Environmental Information Regulations 2004).

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 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 way this consultation has been conducted, please email: beis.bru@beis.gov.uk.

1. Introduction

In the Clean Growth Strategy, the Government set an ambition to enable businesses and industry to improve energy efficiency by at least 20% by 2030. Clean Growth is one of the four grand challenges of the UK Government's Industrial Strategy and energy efficiency and decarbonising heat are vital parts of the ambition. In June 2019, the UK committed in legislation to bring all greenhouse gas emissions to net zero by 2050.

Combined heat and power (CHP) is an efficient process that captures and utilises the heat that is produced in power generation, this is usually electrical but can in some instances be mechanical. By generating heat and power simultaneously from the same fuel, CHP can reduce carbon emissions by up to 30% compared to the separate generation of heat through a gas-fired boiler and an electricity power station. Where a demand for both heat and electricity exist in the same location, CHP can reduce energy costs whilst reducing carbon emissions and air pollution.

CHP schemes can encompass a range of different generation technologies and can be fuelled by fossil fuels or renewable sources such as biomass. CHP generators may export power not used on site. As dispatchable generation, CHP can adjust its exported power output to provide flexibility services to the electricity network. In 2018, the Good Quality CHP capacity[1] in the UK was an estimated 5,985 MWe and 20,722 MWth. This capacity generated 22.9 TWh of good quality electricity, equivalent to 6.9% of all electricity generated in the UK, and 42.4 TWh of heat. While it is difficult to estimate what proportion of the UK's heat demand this serves, due to the different temperature grades of heat required by different users and the different fuels and particular CHP technologies used, it is clear that CHP makes a significant contribution to this demand. CHP is used significantly by, chemicals, food and drink, paper and refining industries. Large numbers of buildings with high heat demands also employ CHP, with hospitals, hotels and leisure centres the biggest users[2]. CHP has been identified as an important technology for achieving Government's targets due to its potential role in decarbonising heating and cooling, and to achieve industrial energy efficiency savings and movement to low carbon fuels.

Government provides support to improve the commercial case for investing in CHP because of its relatively long payback period, the environmental benefits of cogeneration and technical complexity. The CHP Quality Assurance Scheme (CHPQA) is an annual assessment process that ensures that all CHP plants that benefit from government support meet a minimum level of energy efficiency.

Since the introduction of the CHPQA scheme, the UK generation mix has changed considerably, with renewable and low carbon generation providing increasing proportions of the national electricity needs. In 2001, renewable electricity accounted for just 2.6% of all electricity generated, with the majority being generated by coal and gas fuelled power stations[3]. While in 2018, renewable electricity accounted for 33% of all electricity generated, a record high, and the proportion of electricity generated by coal and gas fell by 25% and 3.8%

[1] Good Quality CHP denotes schemes that have been certified as being highly efficient through the UK's CHP Quality Assurance (CHPQA) programme.
[2] Chapter 7, www.gov.uk/government/statistics/digest-of-uk-energy-statistics-dukes-2019
[3] Chapter 5 & Chapter 7 Digest of United Kingdom Energy Statistics 2002 (archived) webarchive.nationalarchives.gov.uk/20021221191758/http://www.dti.gov.uk:80/energy/inform/dukes/dukes2002/index.shtml

respectively from the previous year[4]. As we consider how to meet the commitment to achieve net zero greenhouse gas emissions by 2050, it is sensible for Government to consider what the role for CHP technologies may be in the transition to 2050.

We will also be looking at how support can aid green economic recovery following the COVID-19 pandemic. We intend to identify the possible opportunities and technological developments which may be combined with CHP technologies, along with appropriate incentives and support for deployment to meet both Net Zero targets and aid economic recovery. Stakeholders views on the questions set out in the sections below will aid Government in developing these new approaches.

2. Policy landscape

Recognising the challenge to decarbonise the UK economy, while increasing productivity and minimising energy costs, the Government has developed a policy framework to encourage deployment of highly efficient CHP where this can support decarbonisation of heat and power, particularly in industry, and improve energy efficiency.

2.1 Policy support for Good Quality CHP

2.1.1 CHPQA

In 2001 the Government introduced CHP Quality Assurance programme (CHPQA), to monitor, assess and improve the quality of CHP schemes in the UK[5]. On an annual basis the CHPQA programme assesses the energy efficiency and environmental performance of all types and sizes of CHP schemes against the CHPQA Standard to determine whether they meet the criteria for 'Good Quality CHP' certification. Although, the CHPQA programme is a voluntary assessment programme in 2018 CHPQA Certified CHP accounts for 92% of UK CHP capacity[6].

The CHPQA is an annual certification based on operational data for the immediately preceding year[7]. If successfully certified the CHPQA Certificate is valid until the end of December. In 2019, 1,226 operating CHP plants were Certified through the CHPQA using operational data from 2018. Table 1 shows how these CHP plants breakdown by sectors, based on information provided during the certification process.

[4] Chapter 1, www.gov.uk/government/statistics/digest-of-uk-energy-statistics-dukes-2019
[5] www.gov.uk/guidance/combined-heat-power-quality-assurance-programme
[6] www.gov.uk/government/statistics/combined-heat-and-power-chapter-7-digest-of-united-kingdom-energy-statistics-dukes
[7] New schemes will apply using information rated for their CHP plant until annual operational data is available

CHP User Sector	No. of CHPQA plant installed in 2018
Industrial (non-oil refineries)	167
Oil refineries	6
Large hospitals	22
Other health facilities	121
Universities & colleges	43
Other education facilities	19
Museums & libraries	8
Leisure centres	311
Retail	156
Hotel/Hospitality	118
District heating	72
Sewage treatment	49
Horticulture	50
Other	84
Total	**1,226**

Table 1: Number of CHPQA certified plants, by sector, operational in 2018

The CHPQA certification acts as a 'passport' to enable certified CHP plants to access Government support through several incentives. The incentives are provided to improve the commercial case for investing in Good Quality CHP due to its relatively long payback period, environmental benefit and technical complexity[8]. These incentives are predominantly operational incentives, which require the CHP plants to maintain CHPQA Certified status to continue to access the support. However, from 2001 to March 2020 installers of new or refurbished CHPQA certified plants were eligible to claim enhanced capital allowances for the investment in qualifying plant and machinery[9].The operational incentives CHPQA certificated plants can access include[10]:

- Exemption from the main rates of climate change levy (CCL) and fuel-oil duty
- Exemption from the carbon price support (CPS) tax
- Exemption from Business Rates of Power Generating Plant and Machinery

CHP plants fuelled by renewable and certified by the CHPQA scheme may also receive support for the electricity and/or heat they produce if they satisfied the accreditation criteria for the following schemes:

- Renewables Obligation (closed to new schemes in March 2017)
- Feed-in Tariff (closed to new schemes)

[8] www.gov.uk/guidance/combined-heat-and-power-incentives
[9] www.gov.uk/government/publications/ending-enhanced-capital-allowances-for-energy-and-water-efficient-plant-and-machinery/capital-allowances-ending-enhanced-allowances-for-energy-and-water-efficient-plant-and-machinery
[10] www.gov.uk/guidance/combined-heat-and-power-incentives

- Renewable Heat Incentive (funding confirmed until March 2021)
- Contracts for Difference

2.1.2 Climate Change Levy Exemption

The climate change levy (CCL) tax is charged on most non-domestic supplies of energy used as fuel for lighting, heating and power. The CCL was introduced in 2001 to encourage greater energy efficiency, lower energy use and reduce the UK's carbon emissions. From the introduction of the CCL, electricity generated by CHPQA certified plants, supplied directly to a final consumer (including self-supplies) was exempted as electricity generated in this way meets the three objectives of the CCL when compared with separate use of gas boilers, and electricity from the grid[11]. In April 2003, to encourage greater CHP electricity generation, this exemption was extended to "indirect supplies" (including those supplied by an electricity supplier to a customer).

As announced in both 2016 and 2018 Budgets, CCL rates for electricity and natural gas continue to be rebalanced with rates expected to level up by 2025[12]. Spring Budget 2020 announced main and reduced rates up to 2024[13].

2.1.3 Carbon Price Support

In April 2013, a Carbon Price Floor was introduced on fossil fuels used to generate electricity. This is made up of the EU ETS carbon price and a GB-only tax known as the Carbon Price Support (CPS). Supplies of coal, gas and LPG used in most forms of electricity generation above 2MWe are liable for the CPS tax. In 2015, an exemption was introduced for fuels used to generate Good Quality electricity for CHPQA certified plants for self-supply or use 'on site' (this includes electricity supplied to a consumer by an exempt unlicensed electricity supplier).

2.1.4 Business Rate Exemption

The business rating exemption applies to specified plant and machinery contained within CHPQA certified schemes. It is difficult to determine how many qualifying schemes claim this exemption and the value this represents to operators of CHP plant.

2.1.5 Support for renewable fuelled CHP

Renewables Obligation

The Renewables Obligation (RO) was introduced to support electricity generation from renewable sources. For renewable fuelled CHP plants certified under the CHPQA scheme, and accredited for the RO before 31st March 2017, the power output of the plant is eligible for Renewable Obligations Certificates (ROCs). Certified CHP generating stations receive a higher number of ROCs per unit of Good Quality electricity than power only biomass generating stations. In order to maintain their RO accreditation, such generating stations must continue to be certified under the CHPQA and must report against and meet sustainability criteria.

[11] Grid supplied electricity generated by the marginal plant (which in 2001 would likely have been coal fired power stations or CCGT power stations).

[12] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/508159/reforming_business_energy_efficiency_tax_response_final.pdf

[13] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/872423/Overview_of_Tax_Legislation_and_Rates_2020.pdf

The RO closed to new generating capacity in March 2017, however CHP plants which were accredited to the RO prior to this date and continue to maintain their accreditation are eligible to continue receiving support for the Good Quality electricity generated for 20 years from the date of their accreditation.

Contracts for Difference

Since the closure of the Feed-in Tariff and RO to new entrants, Contracts for Difference (CfD) have become the main mechanism for supporting new large-scale low carbon electricity generation. There have been 3 auctions, or allocation rounds, to date[14]. Dedicated biomass and energy from waste schemes are only eligible for CfD support if they are deployed with CHP. Other fuelled technologies including Advanced Conversion Technologies (ACT), are eligible to apply with or without CHP but they do not need to accredit under the CHPQA quality assurance standard. A recent consultation regarding proposed amendments to the CfD scheme closed at the end of May 2020[15]. Any agreed amendments will be announced in due course.

Renewable Heat Incentive

The Renewable Heat Incentive (RHI), launched in November 2011, to provide support to renewable heat technologies in order to increase deployment and aid market development with the aim of reducing cost of installation. Biomass fuel CHP plants commissioned after December 2013 are eligible for support under the RHI if they are certified under the CHPQA and meet the other conditions of accreditation for the RHI scheme, including complying with air quality requirements.

Accredited, participants in receipt of the solid biomass CHP tariff have to continue to be CHPQA certified each year in order to retain this tariff. The solid biomass CHP tariff rate is higher than that paid to heat only biomass installations. The domestic RHI was extended to March 2022 in the Spring Budget 2020 which will be followed by a £270m Green Heat Network Fund[16] supporting low carbon heat networks. In April 2020, a consultation on non-domestic RHI[17] was launched alongside a consultation on future support for low carbon heat[18].

2.1.6 Interaction with Climate Change Agreements

Several CHP plants are installed on sites covered by a Climate Change Agreement (CCA), a voluntary agreement made by UK industry to reduce energy use and carbon emissions. In return, operators receive a discount on the CCL (currently 92% for electricity and 81%) for any eligible energy consumed at the facilities where a CCA is held. This means that the additional value of CHPQA certification to these CHP plants where energy consumed falls within this eligible energy may only be marginal, representing an additional of 8% of CCL benefit on electricity and 19% on gas consumption. However, a large number of CHPs serving CCA sites are certified under the CHPQA. In 2019, 224 such plants were certified using operational data from 2018. The Spring Budget 2020 announced that the CCA scheme will open to new

[14] www.gov.uk/government/publications/contracts-for-difference/contract-for-difference
[15] www.gov.uk/government/consultations/contracts-for-difference-cfd-proposed-amendments-to-the-scheme-2020
[16] Green Heat Networks Fund announced in the March 2020 Budget www.gov.uk/government/publications/budget-2020-documents/budget-2020
[17] www.gov.uk/government/consultations/non-domestic-renewable-heat-incentive-ensuring-a-sustainable-scheme
[18] www.gov.uk/government/consultations/future-support-for-low-carbon-heat

entrants and be extended to March 2025. A consultation on the CCA scheme was launched in April 2020[19].

2.1.7 Interaction with the EU and UK Emissions Trading Systems

CHP plants that participate in the European Union Emissions Trading System (EU ETS) are generally able to receive free allocation of European Union Allowances (EUAs) for the heat they generate. CHP plants can use this free allocation to meet the compliance requirements to cover the site's carbon emissions[20]. However, CHP plants who supply electricity to the grid, as opposed to an onsite or local customer, are only eligible for free allocation for the heat produced if they are designated as high efficiency. This may explain why many CHP plants located on EU ETS sites chose to be certified under the CHPQA even though as CHP situated on an EU ETS site they are not subject to CCL and the CPS, in 2019 it is estimated that 146 CHP plants were certified using operational data from 2018.

The UK will leave the EU ETS at the end of the implementation period on 31 December 2020. Outcomes of a joint consultation with the Devolved Administrations was published in June 2020 and provides detail about the design and operation of UK carbon pricing[21].

1. **Do you agree with our characterisation of the benefits and incentives?**
2. **Do you have any additional points to make on the current incentives?**
3. **Do you receive any non-financial or alternative benefit(s) for achieving CHPQA certification?**

2.1.8 Value of current incentives

Analysis commissioned by BEIS from the CHPQA administrator looked to estimate the combined value of the different incentives available to CHP plants due to achieving 'Good Quality' CHPQA certification. This highlighted how the incentives flow to CHP plants used by different user types on an annual basis. The results of this analysis are shown in Table 2. Operational information from CHP plants in 2018 was used to estimate the total value of the CCL exemption, the CPS exemption and the value of the ROCs and RHI payments received by accredited CHP plants. Due to the difficulty in estimating its value to CHP plants, business rates exemption was excluded from this analysis. The value of CfD was also not considered as although some CHP generating stations have been awarded CfD contracts, none of these are currently operational.

[19] www.gov.uk/government/consultations/climate-change-agreements-scheme-extension-and-reforms-for-any-future-scheme

[20] The size of the free allocation of European Union Allowances (EUAs) allocation is determined by a number of factors, particular the Carbon Leakage status of the heat consumer and the existence of product benchmarks for the end product using the CHP heat. More information is available here: www.gov.uk/guidance/participating-in-the-eu-ets#carbon-leakage-and-the-eu-ets

[21] www.gov.uk/government/consultations/the-future-of-uk-carbon-pricing

CHP User Sector	No. of CHPQA plant installed	Total Value of Incentives (£)	Total Power Output (MWh)	'Good Quality' Power Output (MWh)	'Good Quality' Heat Output (MWh)
Industry (Non Oil Refinery)	167	£219,163,450	17,767,910	8,874,530	19,545,480
Oil Refineries	6	£169,107,640	11,875,020	6,794,600	13,874,460
Large Hospital	22	£16,454,930	474,240	445,140	1,061,880
Other Health	121	£11,125,910	563,070	535,740	852,620
University/College	43	£12,581,820	423,440	414,780	666,110
Other Education	19	£51,590	2,590	2,590	3,070
Museums/Libraries	8	£461,930	25,840	25,520	26,770
Leisure Centres	311	£3,761,610	193,600	189,310	259,360
Retail	156	£1,088,790	118,760	107,190	92,500
Hotels	118	£1,886,900	98,930	94,840	115,240
District Heating	72	£22,415,470	1,275,120	473,900	909,000
Sewage Treatment	49	£4,082,900	517,940	312,000	325,680
Horticulture	50	£7,386,130	585,400	552,070	754,870
Other	84	£61,622,240	6,895,650	1,469,700	1,250,120
TOTAL	**1,226**	**£531,191,310**	**40,817,510**	**20,291,910**	**39,737,160**

Table 2: The estimated total value of annual incentives to CHPQA certified plants for operation in 2018, by sector

Table 2 refers to both the total power output and the 'Good Quality' power output as well as the 'Good Quality' heat output. 'Good Quality' power and heat outputs are the proportion of the outputs generated where there is demand for both outputs. The total power produced from CHP plants may be greater than the 'Good Quality' power, because the main purpose of many CHP plants is to generate electricity, including for export. For such CHP plants there may not demand for all the available heat generated. The incentives describe in this section are only available to plants for the proportion of their generation which is 'Good Quality' or the portion of fuel input used for this generation.

2.2 Business models and market incentives

The range of CHP technologies used in different settings for different outputs mean that there is significant variation in the investment case and business models which underpin the decision to install CHP plants. While many plants will be installed to meet the energy demand of the operating organisation or serve those of other organisation on the same site, the ability to export electricity and/or heat generated to other users allow access to additional revenue streams. This means that the interaction between different user types and the incentives available is complex.

Heat networks are a key technology to decarbonise heat and in high heat density areas are the most cost-efficient low-carbon infrastructure. The majority of heat networks in development currently are being fitted with natural gas CHP plants as the financial revenues achievable from selling electricity to the grid improve the commercial case for deployment[22].

[22] www.gov.uk/government/publications/hndu-pipeline

Full decarbonisation of power, heat and transport will require significant levels of system flexibility so that technologies such as solar and wind generation, heat pumps and electric vehicles can be integrated onto the system. Flexibility ensures that energy supply and demand can be shifted in time or location so that the system can be balanced. In 2017, we published with Ofgem the Smart Systems and Flexibility Plan and we are making good progress in delivering it[23].

As dispatchable generators, CHP operators can provide flexibility to the system. They can generate electricity during periods of high prices, and potentially accessing revenue from National Grid's balancing mechanism and balancing services markets. There are also some direct and indirect benefits, which CHP operators can access, depending upon the nature of their business and activities undertaken. These include cost savings from the avoided purchase of more expensive grid electricity, increased security of supply and on-site resilience.

There are a number of changes to the regulatory framework which are likely to influence the commercial case for CHP plants. In August 2017, Ofgem announced its Targeted Charging Review (TCR) to address inefficiencies and unfairness in some aspects of electricity network charging arrangements. It published a final decision in November 2019[24], setting out two areas of reform. The 'residual' element of network charges (approximately half of total network costs) will be levied as a fixed charge for all consumers, instead of being based largely on an individual user's consumption from the grid. On average those with onsite generation will pay more as a result of this change. The second area is reform to some 'embedded benefits', meaning that smaller distributed generators (including some CHP plants) will no longer be paid to reduce suppliers' exposure to balancing services charges. Ofgem is also currently developing regulatory arrangements for the next network price control, RIIO-2, which will replace the current price controls for transmission and distribution networks[25].

The GB Capacity Market (CM) auctions were established as part of the Electricity Market Reform (EMR) to ensure security of supply by providing a payment for reliable sources of capacity, alongside their electricity revenues, to ensure they deliver energy when needed. CHP plants are an eligible generating technology and can enter the auction process, so long as the plant is not in receipt of another form of state aid[26]. Government has recently consulted on the arrangements for the next auction round, including the implementation of carbon emissions limits and the treatment of CHP plants[27].

4. **Do you agree with our summary of the wider direct and indirect benefits of CHP? Can you describe any other monetary or non-monetary benefits you are aware of?**

5. **In what circumstances would the business case for CHP deployment remain sufficiently positive, in the absence, reduction or closure to new entrants of the incentives described above in sections 2.1 and 2.2? How will this differ in the short, medium and long term?**

6. **Are there any barriers to CHP acting as a flexible system asset that are specific to the technology? How does this differ for industrial scale plant, CHP used in heat networks and small-scale plants?**

[23] www.gov.uk/government/publications/upgrading-our-energy-system-smart-systems-and-flexibility-plan
[24] www.ofgem.gov.uk/publications-and-updates/targeted-charging-review-decision-and-impact-assessment
[25] www.ofgem.gov.uk/network-regulation-riio-model/network-price-controls-2021-riio-2
[26] www.gov.uk/government/collections/electricity-market-reform-capacity-market
[27] www.gov.uk/government/consultations/capacity-market-proposals-for-future-improvements

7. **How do you consider the changes to the network regulatory framework (e.g. Targeted Charging Review, introduction of RIIO-2 etc) will influence the decisions of both new and existing CHP plant operators?**

2.3 Impact of increased deployment of low carbon generation.

As the level of low carbon electricity generation in the UK has increased, the emission reductions delivered by CHP electricity generation are reduced. In 2014, the impact of additional natural gas CHP capacity on the GB electricity market was modelled. The analysis concluded that new natural gas CHP would deliver carbon savings throughout the 2020s, as the electricity produced by additional capacity would primarily displace generation by natural gas fired CCGT. However, over a longer period, an increasing proportion of low carbon generation would be displaced so that additional natural gas CHP would increase carbon emissions from 2032. The analysis suggested that plant deployed up until 2023 will deliver net carbon savings over their lifetime, typically between 10-20 years, but those deployed later would not[28].

Since 2014 there has been a significant increase in the rate at which the electricity generation mix has decarbonised. In 2014, renewable generation accounted for 19.1% of the electricity generated[29], while in 2018, this contribution accounted for 33% of all electricity generated. The impact of this means that it is likely the tipping point at which additional natural gas CHP capacity would increase carbon emissions is likely to be earlier than the 2014 study indicated.

8. **How do you plan to address the declining carbon reduction of natural gas CHP, where it is currently the preferred technology?**

3. Potential future developments for CHP

Delivery of net-zero and our future carbon budgets will require virtually all heat and electricity demands to be decarbonised and significant action taken to help industrial processes to decarbonise. There are a range of low carbon heat sources that could play a part in this transformational shift. Electricity, hydrogen and bioenergy have the potential to play a strategic role in long term heat decarbonisation, while technologies such as heat networks could play an important enabling role.

Government has previously held and continues to provide support programmes to encourage and support businesses and industry to improve their energy efficiency and to transition to a low carbon future. These include the Industrial Heat Recovery Support (IHRS) programme which provides grant support to industrial businesses of any size to identify and invest in opportunities for recovering and reusing heat that would otherwise be wasted[30]. The £315 million Industrial Energy Transformation Fund (IETF) will support businesses with high energy use to transition to net zero through investing in energy efficiency and low-carbon technologies[31]. Additionally, the Industrial Energy Efficiency Accelerator (IEEA) has made

[28] www.gov.uk/government/publications/bespoke-natural-gas-chp-analysis
[29] www.gov.uk/government/statistics/digest-of-united-kingdom-energy-statistics-dukes-2015-printed-version
[30] www.gov.uk/guidance/industrial-heat-recovery-support-programme-how-to-apply
[31] www.gov.uk/guidance/industrial-energy-transformation-fund

available a total of £7.3m in UK government funding has been made available to 15 projects to increase the number of energy efficiency technologies available to industry[32].

Previously, through the Carbon Capture and Utilisation Demonstration (CCUD) programme, BEIS has allocated up to £20 million to design and construct carbon capture and utilisation (CCU) demonstration projects to encourage industrial sites to capture carbon dioxide which could then be used in industrial applications[33]. In July 2018, the Carbon Capture, Usage and Storage (CCUS) innovation programme launched to offer grant funding for world-leading research and innovation projects that can reduce the cost of capturing and sequestering CO2 and/or increase the deployment of CCUS[34].

9. **How could these schemes support moving CHP to better achieve energy efficiency and decarbonisation objectives for your circumstances/system?**

3.1 Fuel switching

Natural gas is the fuel used by the majority of currently operational CHP plants, accounting for 69.4% of the total fuel used by CHP plants in 2018. By-products or waste products from industrial processes also provide a fuel source for CHP plants with 1.2% of the total fuel consumed by CHP plants coming from blast furnace gases and 3.5% from refinery gases. Renewable fuels accounted for 17% of the total fuel used by CHP plants. While this was the second largest category of fuels used, it is clear that fossil fuels are still the predominant fuel source for CHP plants[35]. The renewable fuels used for CHP plants in 2018 were broken down into gaseous renewable fuels which accounted for 42%, solid biomass which accounted for 36% and waste fuels 20%. Liquid renewable fuels accounted for less than 1% of all renewable fuels used.

In order to achieve Net Zero and our future carbon budgets, the fuel used by additional CHP capacity will need to move away from this reliance on fossil fuels. The potential to expand the existing use of renewable fuels such as biogas, present opportunities for fuel switching for existing natural gas CHP plants and alternatives for new capacity. The 3 phase Industrial Fuel Switching competition allocated funding to stimulate early investment in fuel switching processes and technologies, as these projects conclude they will improve our understanding of the feasibility of using lower carbon fuels in a variety of circumstances[36].

In recent years significant attention has been given to the role of hydrogen could play in decarbonising heat. There are multiple methods for producing hydrogen and a number of different ways of distributing this. Historically, hydrogen played a role in heating in the UK, making up approximately 50% of town gas, but since the switch to natural gas, the safety of using higher concentrations of hydrogen in the current gas system, needs to be proven[37].The £33 million Low Carbon Hydrogen Supply competition aimed to accelerate the development of low carbon bulk hydrogen supply solutions in multiple sectors[38].

[32] www.gov.uk/government/publications/industrial-energy-efficiency-accelerator-ieea
[33] www.gov.uk/government/publications/carbon-capture-and-utilisation-demonstration-ccud-innovation-programme
[34] www.gov.uk/government/publications/call-for-ccus-innovation
[35] Chapter 7 www.gov.uk/government/statistics/digest-of-uk-energy-statistics-dukes-2019
[36] www.gov.uk/government/publications/industrial-fuel-switching-to-low-carbon-alternatives#history
[37] www.gov.uk/government/publications/heat-decarbonisation-overview-of-current-evidence-base
[38] www.gov.uk/government/publications/hydrogen-supply-competition

The prospect of using hydrogen as a fuel for CHP plants, also presents opportunities for new CHP technologies, such as fuel cells to play a part of the future technology mix. While fuel cell CHP plants have yet to be deployed.

10. **What scope is there to increase the use of alternative, low carbon and renewable fuels for use in CHP plants? Are there any specific considerations in relation to hydrogen?**

11. **What are the challenges and benefits of converting existing natural gas CHP to new fuels? Are you taking steps in this area or are you aware of other projects which are?**

3.2 Technological developments

As indicated by Table 1, a significant number of CHP plants are used to serve industrial processes. The CHP plants play a key role in supplying these sites where large electricity and heat demands exist. The use of heat in industrial processes is much more varied than for heat in buildings, because of this the evidence base on effective decarbonisation options is less well-developed than for heat in buildings. A combination of technologies is likely to be required to achieve deep decarbonisation in various industrial sectors cost-effectively.

There are currently a number of CHP plants which are fuelled by biogas produced by on-site anaerobic digestion (AD) plants. As section 2.1 outlines, several of the financial incentives available for such CHP plants with on-site AD are due to close soon or have closed to new entrants in recent years. Market insight has indicated that AD CHP plants may be looking at investing in different ways of utilising their assets once these plants require replacement/refurbishment, such as conversion to produce biomethane to inject into the gas grid.

Various studies for BEIS in recent years have also noted that the heat requirements of some industrial processes mean that certain low carbon technologies are unlikely to be suitable. Across industry, a combination of solutions is likely to be required. There is thus a potential role for a range of lower carbon technologies and fuels to contribute to the decarbonisation of industry, including the electrification of certain processes and the use of biomass and hydrogen fuels for others[39].

Developments in energy efficiency and carbon capture use and storage (CCUS) may play a role alongside CHP plants and fuel switching options to help achieve decarbonisation of the industrial sector.

12. **Which key technological developments have greatest potential to be combined with CHP? Would these enhance performance and improve efficiency of CHP?**

13. **What are your views on the practicalities and potential costs and benefits of converting existing CHP plant to new uses or combining with new technologies?**

[39] www.gov.uk/government/publications/heat-decarbonisation-overview-of-current-evidence-base

14. **Taking account of all the previous sections, what changes would you propose to the incentive framework for CHP to be better targeted to achieve decarbonisation and energy efficiency, while not impacting on industrial competitiveness?**

15. **If the incentives described in section 2.1 were to change, how could the money be best used to support new energy efficiency measures and decarbonisation?**

4. Questions

1. Do you agree with our characterisation of the benefits and incentives?

2. Do you have any additional points to make on the current incentives?

3. Do you receive any non-financial or alternative benefit(s) for achieving CHPQA certification?

4. Do you agree with our summary of the direct and indirect benefits of CHP? Can you describe any other monetary or non-monetary benefits you are aware of?

5. In what circumstances would the business case for CHP deployment remain sufficiently positive, in the absence, reduction or closure to new entrants of the incentives described above in sections 2.1 and 2.2? How will this differ in the short, medium and long term?

6. Are there any barriers to CHP acting as a flexible system asset that are specific to the technology? How does this differ for industrial scale plant, CHP used in heat networks and small-scale plants?

7. How do you consider the changes to the network regulatory framework (e.g. Targeted Charging Review, introduction of RIIO-2 etc) will influence the decisions of both new and existing CHP plant operators?

8. How do you plan to address the declining carbon reduction of natural gas CHP, where it is currently the preferred technology?

9. How could these schemes support moving CHP to better achieve energy efficiency and decarbonisation objectives for your circumstances/system?

10. What scope is there to increase the use of alternative, low carbon and renewable fuels for use in CHP plants? Are there any specific considerations in relation to hydrogen?

11. What are the challenges and benefits of converting existing natural gas CHP to new fuels? Are you taking steps in this area or are you aware of other projects which are?

12. Which key technological developments have greatest potential to be combined with CHP? Would these enhance performance and improve efficiency of CHP?

13. What are your views on the practicalities and potential costs and benefits of converting existing CHP plant to new uses or combining with new technologies?

14. Taking account of all the previous sections, what changes would you propose to the incentive framework for CHP to be better targeted to achieve decarbonisation and energy efficiency, while not impacting on industrial competitiveness?

15. If the incentives described in section 2.1 were to change, how could the money be best used to support new energy efficiency measures and decarbonisation?

This consultation is available from: www.gov.uk/government/consultations/combined-heat-and-power-chp-the-route-to-2050-call-for-evidence

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