Title: The Future of Coal Generation in Great Britain **IA No: BEIS015(F)-19-ESNM** **RPC Reference No: 3350(2) - BEIS** **Lead department or agency:** Department for Business, Energy and Industrial Strategy **Other departments or agencies:**	**Impact Assessment (IA)** **Date: 10/12/20** **Stage:** Consultation stage **Source of intervention:** Domestic **Type of measure:** Primary or Secondary legislation **Contact for enquiries:** Philippe Guiblin; philippe.guiblin@beis.gov.uk

Summary: Intervention and Options

RPC Opinion: RPC Opinion Status

Cost of Preferred (or more likely) Option (in 2018 prices)			
Total Net Present Social Value	**Business Net Present Value**	**Net cost to business per year**	**Business Impact Target Status** Qualifying Regulatory Provision
-£15m	145m	-£10m	

What is the problem under consideration? Why is government intervention necessary?

This impact assessment presents the impact of **accelerating the retirement of unabated coal-fired power plants**. Two market failures are identified meaning that coal-fired power generation is overvalued relative to other forms of power generation: (I) The externality arising from emissions of carbon dioxide and other harmful pollutants and (ii) imperfect information leading to investor uncertainty for new build plant. This leads to an inefficient outcome, with harmful and costly impacts of coal generation not accounted for by relative prices in the market. Without Government intervention there could be an excessive delay in the switch from coal-fired power generation to less carbon-intensive forms of generation such as gas and renewables.

What are the policy objectives and the intended effects?

The policy intends to close unabated coal-fired power plants as quickly as possible, to be replaced by cleaner, flexible forms of generation capacity without risking security of electricity supply.

The policy objectives are to: (i) reduce emissions of carbon dioxide and other harmful pollutants from the UK power sector; (ii) increase revenue certainty for investment in lower carbon plant.

Between 1 January 2019 and the end of December 2019, unabated coal has been generating less than 3% of total electricity.

What policy options have been considered, including any alternatives to regulation? Please justify preferred option (further details in Evidence Base)

Options considered are: (0) do nothing; (1) regulation mandating unabated **coal plant closure by 2024 (the preferred option)** and (2) regulation mandating unabated coal plant closure by 2025.

Following consultation in 2016, the Government announced, in September 2017, its intention to regulate for the closure of unabated coal by 2025. Consequently, Option 0 has been ruled out and Option 2 is stated Government policy, albeit regulation giving effect to this position has not yet been introduced. The Government now wishes to consider further accelerating the closure of unabated coal to 2024 (Option 1). This IA updates an earlier assessment of the impacts of closing coal in 2025 and assesses the impact of bringing forward the closure date to 2024.

Will the policy be reviewed? It will not be reviewed. **If applicable, set review date:**

Does implementation go beyond minimum EU requirements?		Yes		
Is this measure likely to impact on international trade and investment?		Yes		
Are any of these organisations in scope?	**Micro** Yes	**Small** Yes	**Medium** Yes	**Large** Yes
What is the CO_2 equivalent change in greenhouse gas emissions? (Million tonnes CO_2 equivalent)		**Traded:** Negligible	**Non-traded:** 0	

I have read the Impact Assessment and I am satisfied that, given the available evidence, it represents a reasonable view of the likely costs, benefits and impact of the leading options.

Signed by the responsible SELECT SIGNATORY: ..... Date: .....

Summary: Analysis & Evidence

Policy Option 1

Description: Regulation mandating unabated coal plant closure by 2024 **(the preferred option).**

FULL ECONOMIC ASSESSMENT

Price Base Year 2019	PV Base Year 2019	Time Period Years 2019 -2035	Net Benefit (Present Value (PV)) (£m)		
			Low: -15	**High:** 80	**Best Estimate:** -15

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	Optional		-10	**-145**
High	Optional		0	**-30**
Best Estimate			-10	**-145**

Description and scale of key monetised costs by 'main affected groups'

Key monetised costs are those that result from the exit of unabated coal stations from the electricity market and their replacement with alternative new capacity and existing generation, as well as the associated impact on the energy system. The following impacts have been monetised: change in carbon and capital costs. These costs are forecast to be £145m in the Central scenario.

Other key non-monetised costs by 'main affected groups'

An assessment of the administration costs of implementation of this policy to be incurred by government, regulators and industry is difficult but is considered in Sections 3 and 5. Implementation will make use of existing data and reporting mechanisms to assess the carbon intensity of generation in abated coal units after 2024, and so additional costs are considered to be negligible in comparison to other components of the cost benefit analysis. Furthermore it is anticipated that no coal plants would remain operational after the coal closure date meaning that admin cost would not arise. In theory, increased demand for new generation capacity could as a result of this policy lead to higher construction costs in the short term if physical build constraints are approached. However, evidence for construction capacity indicate such constraints will not be limiting.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	Optional		5	**130**
High	Optional		10	**180**
Best Estimate			**10**	**130**

Description and scale of key monetised benefits by 'main affected groups'

The following impacts have been monetised: Generation costs, carbon costs, and changes in network and balancing costs (system costs). These benefits are expected to be £130m in the Central scenario. Benefits, excluding non-monetised benefits described below, are therefore estimated to partially offset the costs.

Other key non-monetised benefits by 'main affected groups'

Benefits that have not been monetised include: lower financing costs for new plants, such as gas plants, resulting from an increased certainty that coal will come off the system and provide more opportunities for new generation, and, consequently, higher revenues; and the positive impact on the international climate change arena by the UK being one of the first developed countries to close unabated coal generation; and potential security of supply impacts. The analysis in section 5 discusses the non-monetised benefits in more detail.

Key assumptions/sensitivities/risks **Discount rate** 3.5

The key assumptions are those that significantly affect the economics of coal, as this determines the profile of coal generation and retirements without intervention. These assumptions include future fossil fuel prices, decisions on compliance with Industrial Emissions Directive, and future low carbon deployment. The present value base year is 2018. as analysis indicates that costs and benefits will commence in 2019, although the proposed regulation will not come into effect until some years later.

BUSINESS ASSESSMENT (Option 1)

Direct impact on business (Equivalent Annual) £m:			Score for Business Impact Target (qualifying provisions only) £m:
Costs:	**Benefits:**	**Net:**	**£50m**

Summary: Analysis & Evidence

Policy Option 2

Description: Regulation mandating unabated coal plant closure by 2025.

FULL ECONOMIC ASSESSMENT

Price Base Year 2019	PV Base Year 2019	Time Period Years 2019 -2035	Net Benefit (Present Value (PV)) (£m)		
			Low: **-15**	High: **80**	Best Estimate: **-15**

COSTS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	Optional		-10	-145
High	Optional		0	-30
Best Estimate			-10	-145

Description and scale of key monetised costs by 'main affected groups'

Key monetised costs are those that result from the exit of unabated coal stations from the electricity market and their replacement with alternative new capacity and existing generation, as well as the associated impact on the energy system. The following impacts have been monetised: change in carbon and capital costs. These costs are forecast to be £145m in the Central scenario.

Other key non-monetised costs by 'main affected groups'

An assessment of the administration costs of implementation of this policy to be incurred by government, regulators and industry is difficult but is considered in Sections 3 and 5. Implementation will make use of existing data and reporting mechanisms to assess the carbon intensity of generation in abated coal units after 2025, and so additional costs are considered to be negligible in comparison to other components of the cost benefit analysis. In theory, increased demand for new generation capacity could as a result of this policy lead to higher construction costs in the short term if physical build constraints are approached. However, evidence for construction capacity indicate such constraints will not be limiting.

BENEFITS (£m)	Total Transition (Constant Price)	Years	Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	Optional		5	130
High	Optional		10	180
Best Estimate			**10**	130

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BUSINESS ASSESSMENT (Option 2)

Direct impact on business (Equivalent Annual) £m:			Score for Business Impact Target (qualifying provisions only) £m:
Costs:	**Benefits:**	**Net:**	**£50m**

Contents

Evidence Base

Section 1: Introduction

In November 2015, the Government announced its intention to consult on proposals to end unabated coal generation in Great Britain by 2025.[1,2] In November 2016, the Department for Business, Energy and Industrial Strategy (BEIS) published a consultation on proposals for how to put that into effect.[3]

The Government confirmed, on 18 September 2017, following the consultation, that it would proceed with action to regulate the closure of unabated coal power generation units by 2025. Our analysis, at that time, demonstrated that a closure date of 2025 balanced the objectives of affordability, security of supply and decarbonisation. A formal Government Response to the consultation[4], and accompanying Impact Assessment,[5] was published on 5 January 2018.

Whilst legislation giving effect to the commitment to close unabated coal by 1 October 2025 has not yet been introduced, the level of coal generation on the electricity system has continued to decline. Between 1 January 2019 and the end of December 2019, unabated coal has been generating less than 3% of total electricity in GB. The Government's ambition on tackling climate change has also increased since the conclusion of the consultation, with a target for the UK to reach net zero emissions by 2050 set in law in July 2019. In light of this increased ambition, and our reduced

[1] https://www.gov.uk/government/news/government-announces-plans-to-close-coal-power-stations-by-2025

[2] Unabated coal power generation refers to the use of coal without any technologies to substantially reduce its CO2 emissions, such as carbon capture and storage.

[3] https://www.gov.uk/government/consultations/coal-generation-in-great-britain-the-pathway-to-a-low-carbon-future

[4] https://www.gov.uk/government/consultations/coal-generation-in-great-britain-the-pathway-to-a-low-carbon-future

[5] https://www.gov.uk/government/consultations/coal-generation-in-great-britain-the-pathway-to-a-low-carbon-future

reliance on coal generation, the Government now wishes to consider further accelerating the closure of unabated coal to 1 October 2024[6].

This Impact Assessment assesses the impact of bringing forward the closure date to 2024 and updates the impact of an earlier assessment of the impacts of closing coal in 2025. **However, the difference in the *estimated* monetised impacts of a plant closure in 2025 are negligible compared to bringing forward coal plant closure to 2024 and therefore are shown as the same in the impact assessment.**

The Government's consultation "Consultation on closure of unabated coal generation in Great Britain" published on 10 December 2020 proposes to introduce provisions which will provide a designated "Enforcement Authority" with the power to verify compliance on an ad hoc basis with the power to request emissions data. We believe this is a proportionate approach as it provides appropriate enforcement powers to discourage non-compliance, without creating legislatively complex monitoring and compliance scheme which will likely prove to be unnecessary. This is because we do not expect any coal plants to stay open after 2024 and therefore do not expect that the enforcement powers will need to be employed. As such, we do not expect there will be any costs associated with this measure.

Rationale for intervention

1. Coal has historically played an important role in meeting the UK's needs for electricity. However, recently the utilisation of coal has declined with the growth of the renewables sector, strong carbon prices and the construction of new gas power stations. Coal is the most carbon intensive fossil fuel, producing around twice the carbon dioxide (CO_2) per unit of electricity as natural gas. The burning of coal also produces other harmful pollutants such as particulate matter (PM), Sulphur Dioxide (SO_2) and Nitrogen Dioxide (NO_2).

2. On 12 June 2019, the Government set a legal target for the UK to reach net zero carbon emissions by 2050. Alongside this the Government is committed to maintaining the security of our electricity supplies. The Government therefore wants to close unabated coal-fired power plants as quickly as possible, to be replaced by cleaner, flexible forms of generation capacity, in a manner which does not create risks to security of electricity supply, thus helping achieve both of these objectives.

3. As explained in the 2016 Consultation Impact Assessment,[7] intervention to facilitate a transition from unabated coal-fired plant in Great Britain[8] to lower carbon alternatives is justified by two key market failures.

    i. Carbon dioxide, and other harmful pollutants, are not priced by the market at the level of their full economic cost. Without intervention, this leads to continued coal-fired power generation, which emits around twice the level of carbon per unit of electricity generated than gas power plants; and

    ii. Imperfect information about the future role of coal in the energy mix creates significant uncertainty for lower-carbon new build plant, increasing hurdle rates and discouraging investment.

[6] https://www.gov.uk/government/speeches/pm-speech-at-cop-26-launch-4-february-2020

[7] https://www.gov.uk/government/consultations/coal-generation-in-great-britain-the-pathway-to-a-low-carbon-future

[8] The policy to end unabated coal generation from 2025 applies to Great Britain but not Northern Ireland.

These market failures mean that coal-fired power generation is overvalued relative to other forms of power generation. This leads to an inefficient outcome, with the harmful and costly impacts of coal generation not accounted for by relative prices in the market.

Policy objectives

4. The objectives of intervening to accelerate the closure of unabated coal – either by 2025 or 2024 - are to:

    i. reduce emissions of carbon dioxide and other harmful pollutants from the UK power sector;
    ii. increase revenue certainty for investment in new lower-carbon, flexible generation capacity; and
    iii. demonstrate international climate policy leadership, encouraging other countries to move away from their use of coal on climate change and air quality grounds.

5. This impact assessment considers the impact of bringing forward the closure date to 2024 and provides an update of the impact assessment, which considers a coal closure date of 2025, published in January 2018.

Next steps:

6. This Impact Assessment support the Government's consultation "Consultation on closure of unabated coal generation in Great Britain" published on 10 December 2020.[9] A response to this consultation will be published in due course.

Options considered

7. Three policy options are considered:

    i. **Option 0: Do nothing**. The phasing out of use of unabated coal is expected to take place under projected market conditions and the policies in place in July 2019 (see Table 1)[10] . However, beyond 2025 there could still be some electricity produced from coal-fired plants. The impact of the legislative policy options below are compared to this do-nothing option in the cost benefit analysis.

    ii. **Option 1: Mandated closure of unabated coal plant in 2024**. There will be no coal plants operating from 1 October 2024[11] (preferred option). This option better matches the Government's increased ambition in tackling climate change. An earlier closure date is not feasible as agreements have been awarded to coal-fired plants through the Capacity Market up until 30 September 2024.

9 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/671959/FINAL_updated_unabated_coal_Impact_Assessment_Jan_2018.pdf

10 Projected market conditions and the energy policies in place affecting coal generation have altered since the previous impact assessment. See table 1 for details of the assumptions.

11 For the purposes of the modelling, the closure date is set to 1st December rather than 1st October; however, this discrepancy is not material to the estimated results as the peak winter months where changes to security of supply will have more impact are December through to February.

iii. **Option 2: Mandated closure of unabated coal plant in 2025.** There will be no coal plants operating from 1 October 2025. This is announced Government policy, albeit legislation has not been introduced to date.

Section 2: Analytical approach

8. This section explains how policy options and sensitivities were constructed to reflect underlying uncertainty over the impact of policy intervention, and the assumptions used. The analysis of the monetised impacts of policy options and power sector modelling was carried out using BEIS's Dynamic Dispatch Model (DDM)[12] .

> **Dynamic Dispatch Model (DDM)**
>
> The DDM is a comprehensive, fully integrated model covering the GB power market over the medium to long-term. The model enables analysis of electricity dispatch from GB power generators and investment decisions in generating capacity from 2010 to 2050. It considers electricity demand and supply on a half-hourly basis over a large set of sample days. Investment decisions are based on projected revenue and cash-flows allowing for policy impacts and changes in the generation mix. The full lifecycle of power generation plant is modelled, from construction through to decommissioning. The DDM enables analysis comparing the impact of different policy decisions on generation, capacity, cost, prices, security of supply and carbon emissions, and also outputs comprehensive and consistent cost benefit analysis.

9. Standard DDM analysis does not necessarily reflect the full range of uncertainty around the impact of intervention; nor does it monetise all relevant costs and benefits. For this policy, some important elements of the benefits – such as international leadership – are not monetised, but evidence for these benefits is presented.

10. The DDM projections are based on plants simulated profits and losses and using large set of assumptions and model market decisions based on prices and profitability assumptions[13]. High and low fossil fuel prices are used to reflect uncertainty.

11. The DDM models the future investment deployment and operation of electricity generating capacity and reports the various system impacts expected, categorised to estimate costs and benefits for different agents in the energy system. The policy options were analysed by restricting coal-fired generation after either 2024 or 2025. Modelling of policy scenarios is possible through adjustments to the model's various input parameters and assumptions. DDM analysis provides outputs which allow comparison to the counterfactual, and the categorisation of costs and benefits is designed for integration into policy appraisal. Tables 1 below summarises the expected impacts and are transposed directly from modelling outputs.

12. The DDM models the amount of electricity generated as well as estimates of CO_2 emissions in order to produce an estimate of carbon costs. It is important to note that electricity provided by Interconnectors do not emit CO_2 in Great Britain, but this does not mean they are

[12] See https://www.gov.uk/government/publications/dynamic-dispatch-model-ddm for more information on the DDM

[13] The analyses were performed between August and November 2019 for which the DDM 2018 reference case was used. Six coal plants were included in the analyses. As at end July 2020, there remain only three active coal plants in the GB electricity system suggesting that real impacts of the bringing forward closure would likely be smaller than presented in this assessment.

emission-free. However, it is not possible to estimate the amount of emissions due to imported electricity.

13. The appraisal period taken is 16 years (2019-2035). Although the policy measures take effect in either 2024 or 2025, the modelled impacts on industry of the proposed policy to end unabated coal-fired generation start in 2019. The chosen appraisal period allows for analysis of impacts up to the point at which the measures take effect and extends this for a suitable period to examine the effects of the policy after these measures come into force. A period of 10 years after the policy comes into force is a standard length of time in order to capture the effects fully.

Modelling assumptions and counterfactual scenarios

14. This IA compares the impact of policy intervention using a 'Central' scenario, which reflects our current view of how the UK electricity market is most likely to evolve without intervention. Table 1 compares the assumptions used in this scenario. This Central scenario is intended to reflect established Government policy and central expectations.

Table 1: Central scenario assumptions

Assumption	Central Scenario
Fossil Fuel Prices	BEIS 2018 fossil fuel price Assumptions[14] (central prices)
Industrial Emissions Directive decisions	Under the Industrial Emissions Directive (IED): At the beginning of February 2020 there were four coal plants on the system, of which one will close in March 2020. Of the remaining three plants (one of which has recently announced closure in March 2021), two will face a 17% constraint on annual load factor from 2020, equivalent to a 1500-hour annual operating limit. We are confident of this assumption, due to the associated cost and time requirement for compliance ahead of restrictions associated with the IED coming into effect.
Emissions Performance Standard (EPS)	The Emissions Performance Standard (EPS) - introduced by the Energy Act 2013 and implemented via the Emissions Performance Standard Regulations 2015 - places a limit on the carbon dioxide emissions produced by new fossil-fuel generation plants. It works alongside other policies to ensure that the construction of new coal and gas generation plants is consistent with meeting the UK's emissions reduction objectives.
Deployment of low-carbon generating capacity	Deployment of new low-carbon generation is consistent with the ambition set out in the Clean Growth Strategy.
Carbon costs	Carbon Price Floor (CPF) capped from 2021/22. Note that this level of carbon pricing is used for modelling purposes only and is not an indication of policy direction or intent. Carbon prices to 2025 were set out in the Budget in November 2017[15].
Clean Electricity Package and implementation of the CO2 emissions limit	New generation capacity which emits more than 550g of CO2 of fossil fuel origin per kWh of electricity were not able to participate in the T-1, T-3 and T-4 auctions that took place in early 2020, nor in any future CM auctions. Existing capacity that emits more than 550 g of CO2 of fossil fuel origin per kWh of electricity, and more than 350 kg CO2 of fossil fuel origin on average per year per installed kWe, will not be able to prequalify for or participate in auctions for the 2024/25 delivery year which commences 1 October 2024[16].

[14] https://www.gov.uk/government/publications/fossil-fuel-price-assumptions-2018

[15] https://www.gov.uk/government/publications/autumn-budget-2017-documents

[16] When considering early closure in 2024 the simulation performed the new Electricity Regulation are assumed to be applied from the end of 2024.

15. To test the sensitivity of the analysis against fossil fuel prices, two extra scenarios are modelled: a 'high fossil fuel price' scenario where both gas and coal prices are high and a 'low fossil fuel price' scenario where both gas and coal prices are low. A high fossil fuel price scenario could in theory create a more favourable market outlook for coal plants. Part of the rationale for the policy is to mitigate against such a scenario, whereby coal plants could continue operating into the early 2030s. We consider this is as feasible but unlikely scenario.

16. High and low forecasts of gas and coal prices are not symmetric around the medium prices. As a result, the NPV in central scenario is not equidistant between high and low scenario figures. Both 'high fossil fuel prices' and 'low fossil fuel prices' scenarios illustrate the sensitivity to commodity prices and **do not mean that the system will use more or less coal.**

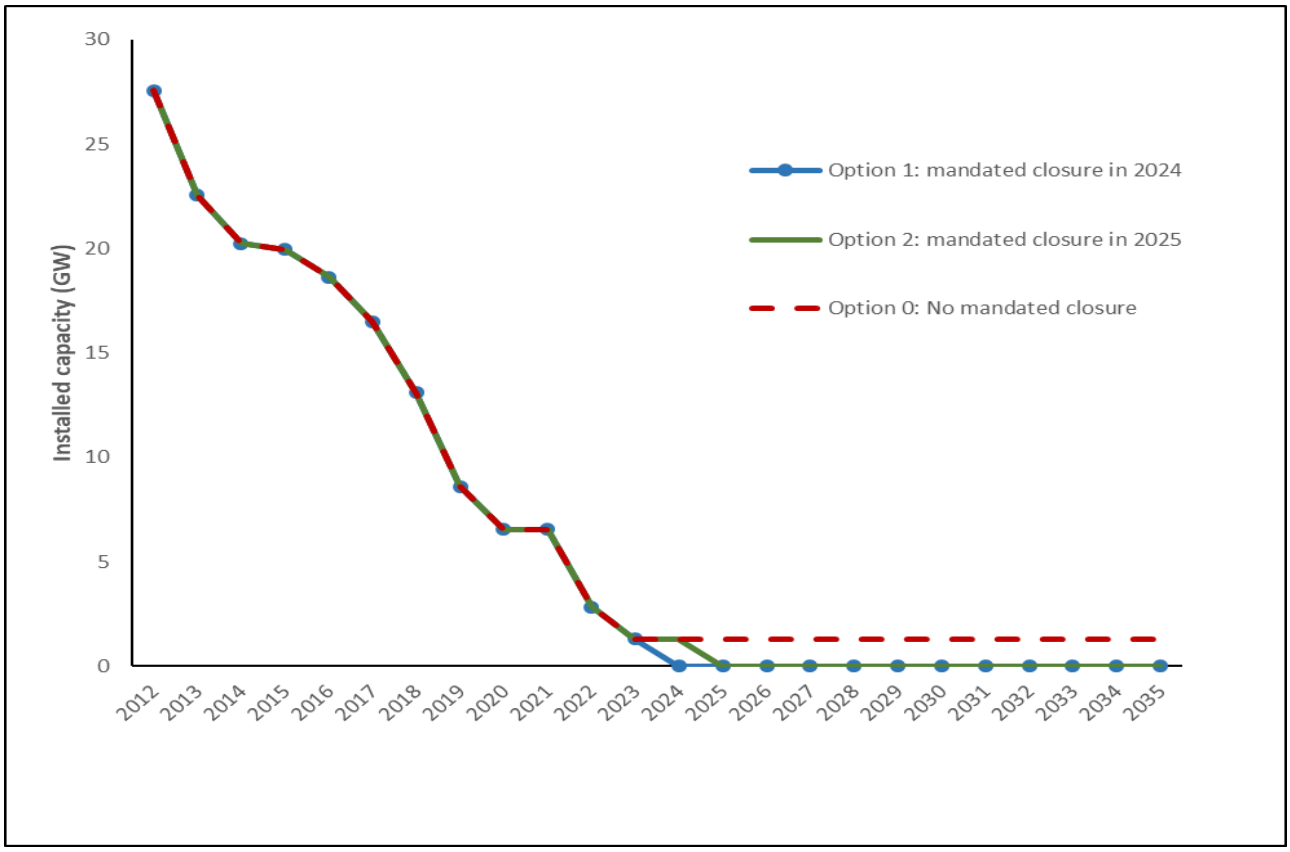
17. As of March 2020, there will be three active coal plants in Great Britain (totalling 5.3GW). However, by the end of 2023 the DDM modelling anticipates that only one plant (totalling 1.3GW) will still be active.

Section 3: Monetised costs and benefits

Option 1: Impact of a 2024 closure against no closure

18. Figure 1 shows the level of coal capacity in Great Britain under the Central scenario under option 1 (and option 2) and for the counterfactual. Poor profitability in the wholesale electricity market, due in large part to more competitive gas-fired generation displacing coal, means the majority of coal power stations are expected to close before the announced backstop on unabated coal is due to take effect in either of 2024 or 2025. However, the announcement of the commitment to legislate for the closure of unabated coal by 2025 itself is likely to have contributed to decisions to close and the timing of it.

Figure 1: Coal plant capacity in the Central scenario under Option 1 and 2 and the counterfactual (as modelled in August 2019).



19. In the Central scenario presented, installed coal capacity in Great Britain reduces from 8.6GW in 2019 to around 1.3GW in 2024 in analysis of both the counterfactual and Option 1 as modelled by the DDM. This is due to a combination of the economics of generation, Government policies and commercial decision making by firms, including the retirement of some existing coal plants due to their age. Efficiencies vary across existing plants and this, along with other aspects of the policy environment including carbon pricing, works to smooth the profile of retirements as operators exit the market at different times. In the absence of intervention, our Central scenario projects it would be commercially viable for one remaining coal generating capacity to stay on the system for a period after 2024 (or 2025 in option 2). Although the DDM assumes that the last 1.3GW coal capacity is theoretically active beyond 2035 in the counterfactual (option 0), the modelling predicts that, after 2031, the dispatches from coal plants would be lower than 10GWh per year (about 0.002% of all electricity generation). This suggests that the impact would not continue past the end of the 2019 - 2035 period in the 'no closure' scenario.

20. Under option 1, the remaining 1.3GW of coal generating capacity is forced to retire in 2024. Additional capacity is provided by new gas or by postponed retirement of existing gas power plants. A similar situation applies would the remaining 1.3GW of coal generating capacity is forced to retire in 2025.

21. We modelled the dynamics of the energy system to examine the impacts of option 1. We estimate that the monetised change to welfare resulting from mandating the closure of coal-fired plants in 2024 to cost £15m more than not imposing closure in the Central scenario over a period of 16 years (net. -£15m NPV). **However, there is considerable uncertainty around forecasting, as relatively small changes in the modelling input parameters can lead to changes in results of £100m to £200m. Although the DDM does not produce statistical margins of errors, figures below £100m are negligible in the context of power sector modelling.**

22. There are potentially large, but unquantifiable, benefits if the policy crystallises faster global emissions reductions. Non-monetised benefits – discussed in Section 5 – can offset the relatively small negative NPV from monetised costs, supporting the overall judgement that the NPV for the policy is neutral.

23. The monetised components that make up the overall NPV presented in Table 2 are as follows:

a. Carbon costs: The change in the cost of carbon emissions valued at the appraisal price.[17] The original IA on this measure, published in 2017, showed that closing coal plants in 2025 would result in a decrease of emissions over the same 2019-2035 period. This benefit was valued at £620m (in 2017 present value over the period 2017-2035) in the Central case scenario. Since 2017, in part as a consequence of policy measures and announcements from the UK Government, the level of coal plant capacity has reduced and the level of emissions is reducing at a faster pace than previously anticipated, reaching levels within the margin of error of our modelling tools.

   Our updated modelling suggests that, as coal plants retire earlier, the retirement of an old gas plant is postponed, and more electricity imported via interconnectors. Less coal capacity in the system means that interconnection imports are increased, and as emissions from interconnectors imports are considered zero (irrespective of the origin of the electricity, which could theoretically be from fossil fuels), the net effect in the modelled scenario is a slight decrease in CO_2 emissions in the UK of about 1Mt, which represents about 0.2% of the total emissions generated by the power system over the 2019-2035 period. In monetised terms the result is a reduction of carbon costs of about £10m.

b. Generation costs: this includes change in fuel costs, operating and maintenance costs and other variable and fixed annual costs. Closing coal plants in 2024 is anticipated to lead to a change in the generation mix including a net decrease in generation costs of about £110m[18] in the central scenario. Closing coal plants would result in lower gas utilisation and more imports from interconnectors. On balance, this would lead to a net decrease in generation costs.

c. Capital costs: this includes the cost of planning and development, land, construction and equipment. The policy is expected to bring forward investment in generating capacity and this would lead to increased capital costs of £45m. This is the increase of capital cost due to the development of new gas capacity.

d. System costs: Modelling does calculate some impacts to the cost of building and maintaining the transmission network and balancing the system. The modelling shows an increase in the cost of balancing the system by £100m. This is the cost of connecting new gas capacity to the system.

e. Other costs: this includes an estimation of the value associated with changes to maintain the margins and reliability of the energy system. Coal plant is replaced by a gas plant with a slightly higher capacity, reducing loss of load expectation marginally. A small net benefit (£10m) is expected.

24. The DDM-based analysis does not capture some aspects of costs or benefits including familiarisation costs and security of supply impacts, which are discussed below. We consider

[17] Details on carbon valuation can be found at: https://www.gov.uk/government/collections/carbon-valuation--2

[18] Since the impact assessment published in 2018, the DDM has changed the methodology used to calculate costs due to interconnectors. The results are therefore not easily comparable.

non-monetised benefits and costs are still likely to accrue, such as those around international leadership, and these are discussed in Section 5.

Table 2: Monetised impact of Policy Option 1 on Net Total Welfare relative to the baseline, £m discounted to 2019, rounded to the nearest £5m.

NPV of monetised changes to consumer and producer surplus, cumulative to 2035		Option 1 - 2024 stop Central	Option 1 - 2024 stop High fossil fuel price scenario	Option 1 - 2024 stop Low fossil fuel price scenario
Net Welfare	Carbon costs	10	70	15
	Generation costs (incl. interconnectors)	110	-50	75
	Capital costs	-45	90	-5
	System costs	-100	15	-15
	Other costs	10	-50	-10
Total change in Net Welfare[19] £m		**-15**	**80**	**55**

25. In summary, the results provided in Table 2 show that there are some monetised benefits in closing coal plants a year earlier, in particular in a scenario were gas and coal prices would be high. Although possible, the 'high fossil fuel price' scenario is unlikely. For both the central and the 'low fossil fuel price' scenarios, although some monetised benefits are shown, the results need to be treated with caution. We consider that there are no tangible differences in terms of costs impact and estimate the monetised change to welfare resulting from the preferred policy option to be broadly neutral (net. -£15m NPV) in the Central scenario.

26. In each of 'High fossil fuel prices' and 'Low fossil fuel prices' scenarios, fossil fuel plants face the same fossil fuel prices. As mentioned in paragraph 17, high and low forecast of gas and coal prices are not symmetric around the medium prices. The results in Table 1 presented for each 'high' and 'low' fossil fuel prices scenarios when compared to the central scenario are therefore not symmetric.

Option 2: Impact of a 2025 closure against no closure

27. **Maintaining a coal closure of 2025** (option 2) represents a very small change to the system. The capacity affected is small (only 1.3GW of coal generating capacity that we expect to be still active between 2024 and 2025), the coal load factor is very low and the timescale considered (one year) is short. The small magnitude of these changes, coupled with uncertainty over key parameters (including gas, coal and carbon prices), makes precise estimate of any impacts difficult. **The difference in monetised impact of a 2025 closure compared to bringing forward coal plant closure to 2024 is therefore likely to be both very small and subject to large uncertainty. Therefore impacts are shown as the same in the impact assessment.**

Section 4: Security of Supply Assessment

[19] Due to rounding the total change does not equal the summed costs and benefits.

28. One question about the proposed policy is whether it could make it more costly to ensure security of electricity supply. This section provides more detail on how the security of supply impacts from coal plant retirement in either 2025 or 2024 can be mitigated by the Capacity Market and the capability to build new plant or prevent the closure of existing plants. In particular, we consider whether bringing forward the closure of coal plants to 2024 as opposed to 2025 (which is the announced current Government policy) would increase the risk of supply.

29. The analysis presented below is based on DDM modelling completed before the end of the most recent Capacity Market auctions concluded on March 6 2020 where agreements were awarded to coal plants totalling 0.8GW for 2022/23 and 1.3GW for 2023/24. We consider, however, that our analysis is broadly in line with the outcome of the Capacity Market auctions. There remains uncertainty with regard to total coal capacity in the system both before and after the preferred coal closure date of 1 October 2024.

30. As well as looking at coal closure profiles and required new build estimates from our DDM modelling in the Central scenario, we also consider a security of supply "high fossil fuel price" scenario used to illustrate a 'worst case scenario'.

31. The modelled impacts on coal plant closure and old gas plants retirements and requirements for new build **under a 2025 closure** are given in Table 3 which shows that around 3.5GW of new build capacity will be needed over the years 2024 and 2025. In the "high fossil fuel" price scenario where we assume high prices for each of coal and gas, coal plants retire more slowly than in the central scenario. The modelled analysis suggests that old gas plant would retire faster than in the central scenario and replaced by around 4.5GW of new lower carbon fossil fuel plant (CCGTs, OCGTs and reciprocating engines) over the years 2024 and 2025. In such a scenario there would be less electricity imported through interconnectors than in the central scenario in 2024 and 2025.

32. If circumstances developed in accordance with a scenario more favourable to coal, policy design would allow for timely decisions to mitigate the larger negative impacts estimated. The cost of the Capacity Market would be higher as coal is replaced by more expensive plants which would increase the clearing price in the auction. We have the tools in place, through the Capacity Market, to ensure security of supply.

Table 3: Coal plant capacity and retirements and new build fossil fuel plants under mandated closure in 2025 (rounded to the nearest 0.5GW)

Central Scenario	2019	2020	2021	2022	2023	2024	2025	2026
Coal plant capacity in the system (at the beginning of the year)	8.5	6.5	6.5	3.0	1.5	1.5	1.5	0.0
Coal plant retirements (during the year)	2.0	0.0	3.5	1.5	0.0	0.0	1.5	0.0
New build Fossil fuel plant	1.0	0.5	1.5	0.5	1.0	0.0	3.5	0.0
Gas plant retirements (during the year)	0.5	0.0	2.5	0.5	3.0	3.0	0.0	0.5
"High fossil fuel prices" Scenario								
Coal plant capacity in the system	8.5	6.5	6.5	3	2.5	2.0	2.0	0.0
Coal plant retirements	2.0	0.0	3.5	0.5	0.5	0.0	2.0	0.0
New build Fossil fuel plant	1.0	0.5	1.5	0.5	3.5	1.0	3.5	1.5
Gas plant retirements (during the year)	0.5	0.0	2.5	4.0	3.5	3.0	0.0	0.0

33. The Capacity Market is designed to provide the economic incentives required to ensure there is sufficient capacity to meet peak electricity demand[20]. Auctions are held four years ahead of the delivery year to allow competition from new build technologies which need the lead time for construction, with further auctions held one year ahead of delivery year.

34. A 2014 study commissioned by DECC suggests that between 4-6 GW of new build Combined Cycle Gas Turbines (CCGT) and Open Cycle Gas Turbines (OCGT) could be brought online per year, with the key constraint being obtaining sufficient skilled labour for the construction and commissioning phase[21]. It is acknowledged that there is uncertainty around this rate of new build; BEIS considered further evidence on this matter during the consultation. There was a general consensus that these rates were feasible, but that they might not be sustainable over a period of more than 2-3 years.

35. We are content that, even under the scenario more favourable to coal, there would be sufficient scope for new build capacity to replace the loss of 3.5GW of coal in a single delivery year (as modelled for 2021). We anticipate that in such a scenario the advised limit to new build capacity would be tested only in a single year and not over consecutive years. Stakeholders also highlighted that additional technologies such as interconnection, Demand Side Response (DSR) and electricity storage are expected to have a role in safeguarding security of supply by increasing the flexibility and responsiveness of the energy system.

36. **Should mandating coal plant closures be brought forward to 1 October 2024 instead of 1 October 2025** the coal plants retirement plan would show a capacity of 1.3GW retiring one year earlier (Table 4). The plan for the introduction of new built gas plant or to delay the retirement of existing gas plants – predicted by the DDM – shows a similar profile as presented in Table 4 below. Our modelling suggests that retiring the remaining 1.3GW coal capacity in 2024 has no visible impact on security of supply. As a result, our view is that **an earlier closure would not introduce a security of supply risk** as new or alternative capacity could be brought forward in 2024 through the Capacity Market to compensate for the early closure of coal.

Table 4: Coal plant capacity and retirements and new build fossil fuel plants under mandated closure in 2024 (rounded to the nearest 0.5GW)

Central Scenario	2019	2020	2021	2022	2023	2024	2025	2026
Coal plant capacity in the system (at the beginning of the year)	8.5	6.5	6.5	3.0	1.5	1.5	0.0	0.0
Coal plant retirements (during the year)	2.0	0.0	3.5	1.5	0.0	1.5	0.0	0.0
New build Fossil fuel plant	1.0	0.5	1.5	0.5	1.0	0.0	3.5	0.0
Gas plant capacity in the system (at the beginning of the year)	0.5	0.0	2.5	0.5	3.0	1.5	1.0	0.5
"High fossil fuel price" Scenario								
Coal plant capacity in the system	8.5	6.5	6.5	3.0	2.5	2.0	0.0	0.0
Coal plant retirements	2.0	0.0	3.5	0.5	0.5	2.0	0.0	0.0
New build Fossil fuel plant	1.0	0.5	1.5	0.5	3.5	1.0	3.5	2.5
Gas plant capacity in the system (at the beginning of the year)	0.5	0.0	2.5	4.0	3.5	4.0	0.0	0.0

[20] Further information on the Capacity Market can be found at https://www.gov.uk/government/collections/capacity-market-2016

[21] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/315717/coal_and_gas_assumptions.PDF

Section 5: Unmonetised costs and benefits

37. The figures presented in Section 3 exclude some benefits of policy intervention due to modelling restrictions. This section sets out six additional costs and benefits that could arise from policy intervention. Three are directly related to the policy objectives:

- International Climate Change leadership, which could encourage other countries to take further action to decarbonise their power sectors;
- Reduced hurdle rates for new build capacity;
- Familiarisation, implementation and monitoring costs of mandated closure;
- Impacts on the rail freight sector, port infrastructure and UK mining sector;
- Health and safety impacts; and
- Impacts on trade and investment.

International Climate Change leadership

38. Internationally, UK policy is able to encourage other countries to end or at least minimise their use of coal and take climate action through international fora, where the UK plays a leading role, including in the UN climate negotiations (UNFCCC). At COP23 in 2017 the UK, alongside Canada, launched the Powering Past Coal Alliance (PPCA), a voluntary coalition of national and sub-national governments, businesses and organisations. Through the PPCA, the UK has brought together over 100 members from across the globe, united in their desire to phase out coal.

39. In addition, we encourage the take up of lower-carbon alternatives and limit the export credit finance available for unabated coal projects through the OECD. Domestically, our proposal to close all unabated coal-fired power stations by 2025 marks the UK out as one of the first developed countries to make such a commitment, which should encourage other countries to follow this lead.

40. Amending our coal closure policy to close unabated coal generation earlier than 2025 would have positive presentational and international leadership benefits for the UK. UK leadership through the Powering Past Coal Alliance has attracted significant global attention, including from the UN Secretary General, and coal phase out is a key UK priority for COP26. Bringing forward the UK phase out date would provide important international signalling ahead of COP26 as well as demonstrating action on net zero. A closure in 2024 would mean that in 10 years we have reduced our reliance on unabated coal generation from around a third of our electricity supply to zero.

41. The extent to which the proposed policy could encourage other countries to make similar commitments is uncertain but there is some early evidence of such an impact already, with more members joining the PPCA. The policy complements other elements of the UK's leadership and assistance to other economies to decarbonise and sets an example to other countries. Rather than attempting to monetise these benefits at this stage, we therefore consider the cost of global carbon emissions in relation to the costs of this policy intervention.

42. Global carbon emissions due to coal from the power sector are forecast to be around 15 GtCO2 per year between 2024 and 2030[22]. Monetising the cost of these emissions using BEIS's social cost of carbon estimates results in an approximate NPV of £4,120bn over this time period. Even a small proportionate decrease in global carbon emissions as a result of the proposed

[22] IEA World Energy Outlook (2018)

policy would therefore have significant benefits. Although the direct benefits will accrue outside the UK's boundaries, and so are not included in NPV figures for this Impact Assessment, there would be indirect benefits for the UK from lower global emissions albeit not quantifiable.

Reduced hurdle rates for new build capacity

43. The proposed intervention should increase the level of certainty that investors have in the revenues for new build plants, such as gas plants. Coal and gas plants have in the past competed closely with each other for wholesale market revenue.

44. Mandating the closure of unabated coal plant by either 2025 or 2024 therefore helps to reduce the market failure arising from imperfect information, thus helping to reduce the hurdle rate that investors require to invest in new build plant, such as gas.

45. Attempting to monetise the reduction in uncertainty for investors in new build plant is difficult for a number of reasons. For example, uncertainty in new build plant cashflows is driven by a wide range of market risks. Where new build plants are financed through corporate debt, these financing costs will depend more on overall company investment profiles, of which new build plant will be just one issue. The policy would increase certainty for new build plant even in the central scenario, although the timeframe over which the impact will occur will be reduced.

Familiarisation, implementation and monitoring costs

46. In addition to the consideration of familiarisation costs, implementing and monitoring regulations would involve further impacts for government, regulators and businesses in terms of labour, IT and resource requirements. These costs are costs that a business would need to incur through reading, disseminating and making the necessary changes to become compliant with proposed regulation[23].

47. Stakeholders provided limited information on these impacts during the consultation (none of the responses to consultation flagged significant one-off impacts from this policy change). **However, we think these impacts may be small when compared to wider NPV estimates.** This is because:

- The long forward notice provided to industry of the intention to phase out unabated coal;
- The small number of coal power station operators who operate wide energy portfolios;
- The Government is committed to minimise the implementation impacts on all stakeholders involved from this regulatory change; and
- Coal plants are not expected to operate beyond the closure date.

48. The policy change is to bring forward the deadline of coal plant closure by one year. We do not anticipate that an earlier closure of coal plants in 2024 rather than 2025 would generate extra familiarisation or monitoring costs by the operators.

Macroeconomic impacts

[23] https://www.gov.uk/government/publications/rpc-short-guidance-note-implementation-costs-august-2019

49. The DDM analysis in Section 3 presents estimated change in net present value of relevant economic activity. Whilst this provides comprehensive quantification of the costs and benefits from changing electricity sector activity, it does not take into account:

- Frictions involved in moving resources from one sector to another, which can reduce economic activity in the short term and create local impacts as described in the local impacts section below; and
- Whether the value added and the supply chain is in the UK or abroad.

50. Two sectors that may be impacted are the transport and coal mining sectors. The distributional and localised impacts in these sectors are discussed further in Section 7.

Transport

51. Coal has historically accounted for a significant portion of rail freight activity. It accounted for 7% of rail freight demand (on a net-tonne-km basis) in 2018/19, falling sharply from 29% in 2014/15. We would expect a further decline in the quantity of rail freight in future in the absence of the intervention, as shown by analysis of the expected trajectory for coal capacity in the counterfactual[24]. According to this trajectory, if other components of rail freight were maintained at 2018/19 levels, coal would account for 3-5% of rail freight demand in the period after 2025 (or 2024) in the absence of intervention. Whilst these figures include coal transport for all end uses, the power sector accounted for 78% of UK coal demand in 2015, 68% in 2016 and 62% in 2017[25] this fall in relative proportions is likely to continue.

52. Coal imports have also generated a level of activity around UK ports which we expect to decline in future along similar trajectories both for the preferred option and the counterfactual. We have already witnessed a significant fall in activity; from 2013 to 2018 coal imports fell from 51m tonnes to 8.5m tonnes. In anticipation of a further reduction in demand for coal imports, some ports have found new markets and made efforts to re-orientate their business. The effect on ports overall will depend on the opportunities presented and their ability to find new markets but there is evidence of growth potential in biomass, recycled materials and materials to support new low carbon renewable generation. For example, Peel Ports is investing £100m at Liverpool to handle biomass imports for Drax power station[26].

53. Although the prospects for demand for coal transport are negative under the proposed policy option, a similar trajectory for decline is anticipated in the counterfactual. The increased activity anticipated from alternative technologies and new generation could offset this reduction to a considerable degree.

UK coal mining

54. The power sector is the major consumer of coal mined in the UK: in 2018, 88% of the coal mined in the UK was steam coal, and the power sector accounts for 80% of steam coal consumption in the UK[27].

55. UK demand for steam coal for power generation fell by 24% in 2018 compared to 2017, and UK production fell by 15% between 2017 and 2018. We expect utilisation of steam coal to continue to fall ahead of the 2025 intervention; this decline will be correlated with the decline in coal capacity outlined in Figure 1. This evidence suggests that setting a closure date of either

[24] Office of Rail Regulation (ORR), Rail Freight Statistics http://orr.gov.uk/statistics/published-stats/statistical-releases

[25] DUKES 2017 Table 2.4 https://www.gov.uk/government/statistics/solid-fuels-and-derived-gases-chapter-2-digest-of-united-kingdom-energy-statistics-dukes

[26] Financial Times, accessed October 2017. https://www.ft.com/content/e1315d6e-29a1-11e6-8b18-91555f2f4fde?mhq5j=e5

[27] DUKES 2019 Table 2.4

2025 or 2024 is unlikely to have a significant impact on the UK coal mining sector. While there will be no demand for steam coal for power generation after either date, we anticipate there will remain demand for coal in other sectors.

Health and Safety Impacts

56. The beneficial health impacts of the proposed policy are demonstrated as a monetised benefit from air quality improvements. This benefit was valued at £50m (in 2017 present value over the period 2017-2035) in the Central case in the previous impact assessment, with the benefits concentrated in the locality of the power stations. An illustrative estimate[28] has been produced showing that closing coal plants in 2024 is expected to generate a benefit of about between £45m over the period 2019 – 2035. This indicates an overall relatively small benefit in terms of air quality impact resulting from the continuing declining activity of the coal plants and suggest an overall positive impact of the preferred policy. Given the uncertainty attached to the quantification of small variations by the DDM, this has to be considered as relatively small in the context of power sector modelling. Also, as mentioned above, in our modelled scenario, closing coal plants would result in more electricity being imported from abroad and the postponement of the retirement of an old gas plant. As for emissions, health impacts due to imported electricity are not accounted. Closing coal plants in 2025 would not produce a significantly different estimate.

57. Considerable regulation governs employment in coal-fired power stations to ensure employee health and safety. This is shown by a very strong track record on accidents and injuries at work. We anticipate that each of options 1 and option 2 will encourage the move away from coal generation among the technologies that generate electricity. The likely replacement technologies are not considered to represent working conditions which are materially more or less rigorously safe for employees. The health and safety impacts of the proposed option on current and future staff in the electricity generating industry are therefore not considered to be material.

58. Although the health impacts of coal mining have been well publicised and are historically significant, safety and working practices in the industry are now heavily regulated. The effect of updated practices, in addition to the reduction in employment in coal mining, has seen considerable reductions in the rates of injury. However, seven fatalities have been recorded in UK coal mines in the last 25 years. As highlighted above, evidence suggests the proposed policy is unlikely to have a significant impact on the UK coal mining sector and the knock-on effects through health and safety in mines are not considered to be material.

Impact on Trade and Investment

59. Imports of steam coal in the UK – the form of coal mainly used for electricity generation[29] – show a general downward trend since 2013. This is due to a reducing demand for coal-fired electricity generation, which fell from 39% of electricity in 2012 to 3% in 2019 and there are now regular coal free periods – a new record for the longest period of coal-free electricity generation in Great Britain was set on 16 June 2020 at 67 days.

60. Imports of steam coal fell 23 per cent in the first quarter of 2019 compared to a year earlier. Russia (42 per cent), the USA (38 per cent) and Colombia (11 per cent) represented 91

[28] The air quality impacts are estimated on the basis of bespoke modelling of coal powered generation in GB. https://www.gov.uk/government/publications/green-book-supplementary-guidance-air-quality

[29] https://www.worldcoal.org/coal/uses-coal/coal-electricity

per cent of steam coal imports[30].The trend is anticipated to continue its downward course and agents involved in the trade are likely to be impacted. By the time the policy comes into force in either 2025 or 2024, it is anticipated that only one coal power plant would still be active and therefore the impact on trade is likely to be relatively small.

Section 6: Distributional Impacts

61. In the Central scenario, the policy options will have some distributional impact on market participants although we consider that there is an uncertainty around the numbers given the small magnitude of the change considered. Policy Option 1 will lead to a transfer from producers to consumers. As for the cost benefit analysis in section 3, table 6 below presents the distributional impacts of a 2024 closure. The monetised distributional impacts of coal plant closure in 2025 are not significantly different from those of a 2024 closure and therefore shown as the same.

62. Table 5 below indicates that overall in a scenario mandating coal plant closure in 2024 the consumer surplus increases by £140m and producers surplus decreases by £140m. The DDM predicts the delay of the retirement of an old gas plant rather that the development of a new plant and that more electricity will be brought via interconnectors resulting in a reduction of producer surplus and an increase of the consumer surplus.

63. As a result, on average, the policy to end unabated coal electricity generation accounts for an annual decrease by around 70p per year on average of a household energy bill. For businesses the expected impact is also very small, also accounting for slightly less than 20p of energy bills on average over the appraisal period.

64. Interconnectors compete with other technologies, including new CCGTs plants that are relatively efficient. As a result, the wholesale price reduces. New more efficient capacity comes online when coal plants close but increases capital cost. However, it should be noted that this result is highly sensitive to assumptions and modelling approach.

65. Should the coal closure be moved forward to 2024 rather than 2025, some savings in capital costs are expected.

66. The detailed impacts of these changes to consumer and producer surplus on consumer bills are presented below.

Table 5: Distributional impacts, mandatory closure in 2024 (option 1) or 2025 (option 2) relative to non-closure in central scenario, £m discounted to 2019, rounded to the nearest £5m.[31]

NPV of changes in societal welfare, cumulative to 2035		Option 1 - 2025 closure / Option 2 – 2024 closure Central Scenario
Consumer Surplus	Wholesale price	90
	Low carbon payments	-60
	Capacity payments	155
	System costs (demand)	-60
	Other costs	10

[30] Energy Trend 2018 Table 2.4.

[31] Figures in the table have been rounded and therefore may not sum exactly.

	Change in Consumer Surplus	**140**
Producer Surplus	Wholesale price	45
	Low carbon support	60
	Capacity payments	-125
	Producer costs	-120
	Change in Producer Surplus	**-140**
Environmental Tax	**Change in Environmental Tax Revenue**	**-10**
Societal benefit	**Change Carbon Externality**	**10**

Local Impacts

67. It is important to consider the local impacts of the policy option to close coal plants as the frictions involved in the changes in economic activity resulting from coal closure can have significant impacts at a local level where this activity was previously concentrated. A qualitative approach is used to examine the local impacts of the policy to close coal, with reference to the additionality of the policy against the counterfactual.

68. Direct employment at coal fired power stations was estimated as 2,900 in 2015, based on published employment figures by operators. This figure likely to have fallen due to further plant closures. As at end July 2020, direct employment at coal fired power station could be estimated at about 1,000. Latest figures obtained from the Coal Authority show that employment in both surface and underground mines in the GB total about 710 employees as at end May 2020. Given the decline in coal generation and predicted retirements of coal plants prior to 2025 in the central scenario, **we therefore expect the additional reductions in power generation employment as a direct result of the proposed policy to be limited.** Furthermore, more employment may potentially be created in less carbon intensive power generation sectors.

69. We have examined the local labour market impacts of the proposed policy around selected coal fired power plants in England and Wales and expect them to be small. This is due to the number of workers employed in the production of electricity being relatively small, representing 0.1% of the working age populations in the areas analysed. Furthermore, the possibility of job creation through increased investment in less carbon intensive forms of electricity generation as a result of the policy has not been accounted for. New build generation is being considered at a number of the sites of existing coal generation. The Energy White Paper, published alongside this consultation, outlines the Government's plans for growing areas of the economy, particularly in clean energy.

70. In May 2020 there were 11 coal mines operating: 4 underground mines and 7 surface mines. Total employment was 710[32]. UK domestic coal production in 2019 was at a record low of 2.2 million tonnes. This compares to around 30 million tonnes at the beginning of the 2000s.

[32] Coal authority data provided to BEIS

Section 7: Overall assessment

71. The impact of the preferred policy depends on the balance between two sets of factors:

i. The monetised costs and benefits on the electricity system, impact on new build plant and security of supply.

ii. The non-monetised benefits and costs, including international climate leadership, localised economic impacts and effects on capital costs.

72. The preferred policy 'Option 1' affects the electricity generation mix by eliminating coal-fired generation by 2024. Overall our view is that closing unabated coal-fired power plants in 2024 will bring benefits compared to 2025. Coal generation will be replaced by cleaner, flexible forms of generation capacity without increased risks to security of electricity supply. In addition, it will have a positive impact on the international climate change arena by making the UK one of the first developed countries to close unabated coal generation. We do not believe that there is likely to be a significant impact on costs of closing in 2024 compared to 2025.

73. In theory, coal plants could invest in abatement technology such as CCS (carbon capture and storage) to reduce CO2 emission below the 450g per kWh threshold and continue to generate. We believe this is unlikely though due to the high costs associated with CCS and other abatement technologies.

Section 8: Small and micro business assessment

74. The policy will apply to SMEs; however, **none are expected to be affected by the policy change, as coal plant owners and operators are large business.** SMEs are therefore not analysed within this Impact Assessment as no coal plants operators qualify as a small or micro business, which under the Better Regulation framework are businesses that employ fewer than 50 FTE employees. As at end July 2020, the three remaining active coal plants operators are: Drax Power (Drax), Unileper UK Ltd (Ratcliffe) and EDF Energy (West Burton).

Section 9: Business Impacts

75. The Business Impact Target for this parliament has not yet been set.[33] Table 6 below shows the indicative impact to businesses in the Central and high and low coal prices scenarios, relative to the counterfactual where it has been possible to monetise them. A positive EANDCB value means an increase in business costs relative to the counterfactual and a negative value means a saving. By 'direct' we mean that the impact is incurred as a result of the policy option without further actions by government or industry as a conscious response. The analysis

[33] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/735587/better-regulation-framework-guidance-2018.pdf?_ga=2.205562003.1823469439.1566488003-486085000.1564584201.

includes GB generators and exclude interconnectors in the calculation.

76. Impacts relating to electricity generator profits and electricity consumer costs have been calculated using the outputs from the DDM power sector Central and high and low fossil fule prices scenarios described in Section 2. It is important to note that the financing costs for new build plant are not accounted for below as our current view is that they are not classified as a direct impact. The appraisal period is 16 years (2019-2035) as although the policy measures take effect in 2025 or 2024 the modelled impact on industry of the planned policy to close unabated coal starts in 2019.

77. Closing coal plants **under Option 1** will lead to an decrease in profits – through Capacity Market payments – for all forms of electricity generation which in some cases will be owned by the same companies that own coal plants – for which a small loss of £30m is estimated. The resulting change in profitability could be classed as a transfer between businesses. The estimated impact on profits in the Central scenario is an increase of £145m.

78. As mentioned above the results obtained under **Option 2** do not show significant changes regarding impact on businesses.

79. Familiarisation costs have not been included as this is expected to be very small compared to other impacts.

Table 6: Net direct costs and benefits to plants under the option 1 and option 2, NPV and EANDCB, £m, rounded to the nearest £5m[34].

	NPV			EANDCB (net cost to businesses)		
	Central	High Fossil Fuel Price Scenario	Low Fossil Fuel Price Scenario	Central	High Fossil Fuel Price Scenario	Low Fossil Fuel Price Scenario
Coal generators	-30	-10	-5	0	0	0
Other generators	180	-100	-125	-15	10	10
Total generators	145	-115	-130	-10	10	10

[34] Figures in the table have been rounded and therefore may not sum exactly.

Annex A: Impacts on consumer bills

1. Impacts of **policy Option 1** on consumer electricity bills have been estimated using BEIS methodology. Price and bill impacts have been estimated for an average consumer in each consumer group based on consumption. Actual impacts for the individual consumer will differ depending on the consumer's energy behaviour. The analysis covers the appraisal period.

2. The average bill is comprised of the average price a consumer faces and the corresponding average annual electricity consumption for that consumer. The policy results in no change to consumption for any consumer group so all bill savings result from decreased electricity prices. The retail electricity price is comprised of the following components: wholesale prices set by the marginal generator in the electricity wholesale market; the costs of maintaining the electricity networks that transport electricity from generator to consumer; the operating costs and profit margins of energy suppliers; and the additional support costs for government policies that are recovered through electricity bills, such as the Contracts-for-Difference scheme and the Capacity Market.

3. The consumer bill impacts estimated to result from the policy intervention in the Central scenario are expected to be minimal. On average, the policy to end unabated coal electricity generation accounts for an annual decrease by around 70p per year on average of a household energy bill. The maximum impact on household bills in this scenario is projected to occur in 2030, in which the average bill decreases by around £1.80. This is driven primarily by lower policy costs, specifically lower carbon costs (as a result of lower emissions upon electricity generation) and lower support costs for the Capacity Market.

4. For businesses the expected price impact is also very small, increasing at slightly less than 20p per MWh on average over the appraisal period.

Annex B: Dynamic Dispatch Model

The DDM is an Electricity Supply Model, which allows analysis of the impact of different policy decisions on dispatch and investment decisions.

The DDM models the power sector in Great Britain in the medium to long term - out to 2050.

This allows us to answer questions about the impact of policies on:

- Electricity supply
- Emissions
- Wholesale electricity prices
- Balancing costs
- Network costs

The DDM employs two key algorithms:

Dispatch algorithm:

- Determines which plants generate electricity in each half hour based on their running costs/short run marginal cost.
- Makes adjustments to generation levels to maintain system security.

Investment algorithm:

- Determines the amount of capacity based on expected costs and revenues.

The model can run up to 2050 (although assumptions after 2030 are particularly difficult). The wide range of outputs from the model includes:

- Generation by technology (N.B. total demand is an input)
- Total capacity
- Retirements (economic and regulatory)
- New build
- Wholesale prices
- Emissions
- Policy costs
- CBA - cost benefit analysis

Limitations

- Deterministic – assumes certainty about the state of the world – investment decisions based on 5-year foresight from decision point
- Does not model generator portfolios
- Does not tell us the optimal mix of technologies to decarbonise or ensure security of supply – strike prices are a user-defined input.
- Modelling of interconnectors is simplistic. European prices are not modelled.
- It can be sensitive to small changes in assumptions - results are highly dependent on initial parameters.
- There are many assumptions. The model is reliant on a possibly suboptimal evidence base for some assumptions

- CBA excludes costs post-2050, so need similar decarbonisation trajectory between scenarios (otherwise delaying decarbonisation looks good as more costs post-2050)

- The uncertainty inherent in energy modelling mean that results should be used to explore the possible impact of different scenarios / test the impact on a proposed policy; not to predict the future. This is why we try to look at the difference in model outputs (particularly CBA) not absolute values.