

Title: Nuclear Safeguards Regulations IA No: BEIS036(F)-18-CNRD RPC Reference No: n/a Lead department or agency: BEIS Other departments or agencies: ONR and DExEU	Impact Assessment (IA)
	Date: 09/07/2018
	Stage: Final
	Source of intervention: Domestic
	Type of measure: Secondary legislation
	Contact for enquiries: cnrdeuratomcp@beis.gov.uk
Summary: Intervention and Options	RPC Opinion: Green

Cost of Preferred (or more likely) Option						
Total Present Value	Net Present Value	Business Net Present Value	Net cost to business per year (EANDCB in 2014 prices)	One-In, Three-Out	Business Status	Impact Target
-£63m		-£1.3m	£0.1m	Not in scope	n/a	

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

Nuclear generation is to play an important role in the UK's energy security and decarbonisation objectives, and, as a responsible nuclear state, compliance with safeguards obligations is vital to allow this role to continue. Under the powers set out in the Nuclear Safeguards Act 2018 ("NS Act 2018"), it is proposed to make Nuclear Safeguards Regulations ("NS Regulations") in order to create the legal framework necessary for a new domestic nuclear safeguards regime to operate in the United Kingdom. The domestic regime will replace the current legal framework provided by the UK's membership of Euratom and will primarily involve placing legal reporting and verification obligations on UK operators of qualifying nuclear facilities to meet international obligations in relation to non-proliferation. The NS Regulations will allow the UK to give effect to its obligations under new bilateral agreements with the International Atomic Energy Agency and meet the terms of any relevant other international agreements on civil nuclear activities, concluded with other states.

What are the policy objectives and the intended effects?

Once Euratom arrangements no longer apply, the UK will need to have in place new bilateral safeguards agreements – a Voluntary Offer Agreement ("VOA") and Additional Protocol (AP) - with the IAEA. These will detail the UK's future safeguards obligations. The policy objective of the NS Regulations is therefore to ensure the continuing fulfilment of the UK's international nuclear safeguards obligations after Euratom arrangements no longer apply and to establish a new domestic safeguards regime that will provide coverage and effectiveness equivalent to that currently provided by Euratom and goes beyond international obligations. The intended effect of the proposal is to maintain the current levels of protection in the UK, therefore maintaining the confidence of the public and industry stakeholders (including international trading partners) to the UK's ongoing commitment to the global non-proliferation regime. This will enable civil nuclear trade to continue and ensure the parts of the nuclear industry reliant on this trade can continue to operate.

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

To ensure continuing compliance with international safeguards obligations and the confidence of stakeholders in the UK's continuing commitment to the global non-proliferation regime once Euratom arrangements no longer apply, the option set out below is proposed. Other options were considered in the Impact Assessment which accompanied the NS Act, that assessment resulted in taking one option forward for the consultation on the NS regulations. We continue to appraise that single option in this Impact Assessment.

Option 1: New domestic safeguards arrangements that will provide coverage and effectiveness equivalent to that provided by the existing Euratom regime. The NS Regulations will establish new safeguards which will be appropriate for the domestic legislative and operational context. The Office for Nuclear Regulation (ONR) will be responsible for the UK's compliance with nuclear safeguards. There will be a small number of additional requirements for operators and the main one will be a requirement for operators to submit to the ONR an Accountancy and Control Plan and to carry out their operations at a qualifying nuclear facility in accordance with the terms of this Plan.

We have assessed the option against 2 counterfactuals:

"Current Euratom regime": The headline counterfactual is the existing Euratom safeguards regime. This is not a feasible option, but a reference point that allows for an assessment of the proposed option relative to existing arrangements. This is the counterfactual against which Option 1 is primarily assessed.

"Do nothing": For context, we also set out the risks of not introducing legislation. In the absence of amending frameworks and not implementing safeguards measures, the UK would be without an effective nuclear safeguards

regime. Were this to occur, the parts of the nuclear industry reliant on trade (including but not limited to electricity generation) would no longer be able to operate.

Following consultation, the Government intends to implement Option 1 as it best achieves the stated policy objectives. It will provide confidence to the public, industry and international partners of the UK's commitment to demonstrating the highest non-proliferation standards. The additional administrative costs of Option 1 are heavily offset by the benefits of introducing legislation compared to the "do nothing" counterfactual.

Will the policy be reviewed? It will be reviewed. If applicable, set review date: April 2024

Does implementation go beyond minimum EU requirements?		N/A		
Are any of these organisations in scope? (under option 1)	Micro Yes	Small Yes	Medium Yes	Large Yes
What is the CO₂ equivalent change in greenhouse gas emissions? (Million tonnes CO₂ equivalent)	Traded: N/A		Non-traded: N/A	

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:	Richard Harrington	Date:	27th November 2018
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Summary: Analysis & Evidence

Policy Option 1

Description: **Safeguards arrangements providing coverage and effectiveness equivalent to the existing Euratom regime**

FULL ECONOMIC ASSESSMENT

Price Base Year: 2017	PV Base Year: 2018	Time Period Years: 10	Net Benefit (Present Value (PV)) (£m)		
			Low: -£74m	High: -£53m	Best Estimate: -£63m

COSTS (£m)	Total Transition (Constant Price) Years		Average Annual (excl. Transition) (Constant Price)	Total Cost (Present Value)
Low	£29.2m	n/a	£9.5m	£78m
High	£31.0m		£11.5m	£91m
Best Estimate	£29.8m		£10.5m	£84m

Description and scale of key monetised costs by 'main affected groups' (compared to the 'current Euratom regime' counterfactual)

The key monetised costs are transitional costs faced by operators as they adapt to the new regime. We estimate these to be between £500,000 and £800,000 in total across all operators. There will also be additional compliance costs faced by nuclear operators associated with resource required to carry out their operations at qualifying nuclear facilities in accordance with the new accountancy and control plan. Across all operators, we expect these additional costs to be between £60,000 and £100,000 per year.

To enforce nuclear safeguards regulations and ensure the UK's compliance with safeguards obligations, the ONR will incur costs to transition to the new regime. Transitional costs until December 2020 are estimated to be around £28m, which includes the procurement and development of a new IT system and the recruitment and training of new inspectors. ONR will also incur ongoing costs relating to governing a domestic safeguards regime including the cost preparing and carrying out inspections as well as monitoring information provided by operators and reporting to the IAEA. The costs associated with the administration of the domestic safeguards regime is estimated to be between £8.6m and £10.5m per year.

Some schools and hospitals hold small amounts nuclear material for educational and medical purposes. These sites will face familiarisations costs of between £190,000 and £1.2m as they read and understand the regulations. As a conservative assumption, we assume between 25% and 75% of hospitals will be required to apply to the ONR for a derogation and report regularly to ONR as a facility with a limited operation. Across all hospitals we estimate transitional costs to be between £20,000 to £500,000, and ongoing costs to be between £10,000 and £220,000 a year.

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

BENEFITS (£m)	Total Transition (Constant Price) Years		Average Annual (excl. Transition) (Constant Price)	Total Benefit (Present Value)
Low	0	0	£3.3m	£17m
High	0		£4.9m	£25m
Best Estimate	0		£4m	£21m

Description and scale of key monetised benefits by 'main affected groups' (compared to the 'current Euratom regime' counterfactual)

The key monetised benefit is that the UK will no longer contribute to the Euratom safeguards budget. We estimate that the current contribution is between £3.3 and £4.9m per annum and assume that this would remain constant in real terms going forwards.

Other key non-monetised benefits by 'main affected groups' (compared to the 'do nothing' counterfactual)

Option 1 will provide confidence to the public, industry and international partners of the UK's commitment to meetings its non-proliferation obligations and ensure the UK can discharge its international commitments as applied in new bilateral safeguards agreements between the UK and IAEA. The additional administrative costs of Option 1 are heavily offset by the benefits of introducing legislation compared to the "do nothing" counterfactual. The benefits are the avoided costs associated with the inability to trade nuclear material which would lead to wider civil nuclear industry losses. The removal of nuclear power from the electricity generation mix in the counterfactual may reduce the UK's optionality for decarbonising the power sector.

Key assumptions/sensitivities/risks	Discount rate (%)	3.5%
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We assume that an implementation period is secured and that Euratom continue to deliver the UK's safeguard regime up to December 2020. For our qualitative assessment of power sector impacts we have assumed a "business as usual" scenario for both Option 1 and the "existing Euratom regime" counterfactual. This scenario is aligned to the Department's published assumptions (e.g. level of decarbonisation, fossil fuel prices and technology costs). In the absence of nuclear generation in the 'Do Nothing' counterfactual, the risks to security of supply are partially managed through the Capacity Market. We assume a balanced and diversified approach to decarbonising the power sector with a mix of solar, wind and carbon capture technologies making up the shortfall.

BUSINESS ASSESSMENT (Option 1)

Direct impact on business (Equivalent Annual) £m:			Score for Business Impact Target (qualifying provisions only) £m: n/a
Costs: £0.1m	Benefits: £0m	Net: -£0.1m	

1. Overview

- 1.1 The Government proposes using the new regulatory powers, contained in the Energy Act 2013 as amended, and in the NS Act 2018 itself, to make Nuclear Safeguards Regulations ("NS Regulations") in order to create the legal framework for a new domestic nuclear safeguards regime to operate in the United Kingdom once European Atomic Energy Community ("Euratom") arrangements no longer apply to the UK.
- 1.2 The NS Regulations will create the legal framework for a new domestic nuclear safeguards regime to operate in the United Kingdom following the UK's withdrawal from Euratom. This domestic regime will replace the current legal framework provided principally by the United Kingdom's membership of the Euratom and associated regulations notably the European Commission Regulation (Euratom) No302/2005 on the application of Euratom safeguards. The NS Regulations will also take account of the domestic legislative and operational differences between the current legal framework provided by Euratom and the new domestic nuclear safeguards regime to operate in the UK to ensure the new domestic safeguards regime can operate within a UK context. For example, the ONR is the UK's independent nuclear regulatory body as opposed to the European Commission (a supranational body) and UK will be entering into new bi-lateral safeguards agreements with the IAEA.
- 1.3 The draft text of Nuclear Safeguards regulations was published alongside the consultation document in July 2018. During the consultation period, we have continued to develop the regulations which set out the nuclear safeguards regime for the UK.
- 1.4 The focus of this Impact Assessment is limited to the proposed option for the UK's domestic safeguard regime. Other areas covered by the Euratom treaty, but outside the scope of this Impact Assessment include nuclear safety, research and development, transport and waste. This Impact Assessment is being published alongside the government's response to the consultation. It builds on the Impact Assessment published with the consultation by updating estimates where new information has become available, including evidence provided by consultation responses.
- 1.5 The NS Regulations assessed by this IA impose reporting requirements on holders of qualifying nuclear material and empowers the Office for Nuclear Regulation (ONR) to regulate and ensure the UK's compliance with its international safeguards obligations, as agreed in the Voluntary Offer Agreement and Additional Protocol with the IAEA. The ONR already regulates to ensure compliance with security and safety regulations within the nuclear industry and has some limited involvement with nuclear safeguards, providing a supporting role to Euratom and the IAEA, and in fulfilling those obligations to the IAEA that are not the responsibility of Euratom. This IA assesses the likely costs that will be incurred by the ONR in regulating the domestic civil nuclear safeguards regime in the UK. It also provides indicative estimates of what the likely costs of compliance with the new domestic regime will be for the holders of qualifying nuclear material, including any additional requirements that operators will be required to undertake.

Nuclear Safeguards

- 1.6 Nuclear safeguards are non-proliferation reporting, accountancy and verification processes by which nation states demonstrate to the international community (via safeguards agreements with the IAEA and in some cases Euratom) that civil qualifying nuclear material is not diverted into military or weapons programmes. Nuclear safeguards arrangements are essential to enable civil nuclear trade and underpin Nuclear Cooperation Agreements (NCAs) with key partners such as the US, Canada, Japan and Australia. They also demonstrate that the UK is a responsible nuclear state. The NS Regulations set out how the proposed domestic safeguards regime will operate in the UK.

- 1.7 The UK is committed to leading by example by demonstrating robust international non-proliferation measures and providing the highest assurance that civil qualifying nuclear material is not diverted into military or weapons programmes. This means a level of inspections and other regulatory arrangements that go beyond the normal international obligations as applied by the IAEA, for example, additional assurance and verification activities at additional facilities.
- 1.8 The core provisions of nuclear safeguards apply to qualifying nuclear material, which includes fissionable material as defined in the Nuclear Safeguards (Fissionable Material and Relevant International Agreements) Regulations.

International Atomic Energy Agency (IAEA) and Euratom

- 1.9 The IAEA is the international body which promotes peaceful uses of atomic energy and applies safeguards to nuclear material with a view to preventing diversion of nuclear material from peaceful uses to nuclear weapons or other nuclear explosive devices. A key aspect of the international non-proliferation regime is providing mutual trust and reassurance to international partners. This is achieved primarily through compliance with international safeguards obligations as governed by the IAEA.
- 1.10 Euratom was founded with the purpose of creating a specialist market for nuclear power in Europe, developing nuclear energy and distributing it to its member states while selling the surplus to non-member states, and for ensuring common standards of safety and non-proliferation. Euratom has provisions for nuclear safeguards, common market trade arrangements for nuclear goods and products, NCAs with non-EU states, simplified export licences, free movement of workers in the civil nuclear sector, and nuclear R&D.
- 1.11 Euratom currently apply safeguards to civil qualifying nuclear material in the UK and works jointly with the IAEA to provide international assurance that the civil qualifying nuclear material in the UK that is subject to agreements with the IAEA is not diverted to non-civil activities. The Euratom safeguards regime for safeguards is more intensive, in terms of frequency of inspections and reporting and inspection requirements, than IAEA standards.
- 1.12 Leaving Euratom is the result of the decision to leave the EU as Euratom and the EU are uniquely legally joined. There are no precedents for a non-EU Member State being a Member State of Euratom, so when the UK formally notified our intention to leave the EU, the UK also commenced the process for leaving Euratom. In March, the UK and European Commission reached political agreement on the terms of an Implementation Period that will run from 30 March 2019 to 31st December 2020. This will mean that existing Euratom safeguards arrangements will continue to operate in the UK during this period, but after this period (from 1st January 2021) the new domestic safeguards regime will apply in the UK. We are on track to deliver the Withdrawal Agreement and that will provide certainty on the terms of our exit, including the implementation period. We remain confident we will agree a mutually advantageous deal with the EU, however it is the duty of a responsible Government to continue to prepare for a range of potential outcomes including the unlikely event of no deal. In such a circumstance the new domestic safeguards regime would come into effect on day one of exit.
- 1.13 As a result of the UK's withdrawal from Euratom, the UK has concluded new bilateral safeguards agreements with the IAEA (a VOA and an AP to the VOA) in connection with the Treaty on the Non-proliferation of Nuclear Weapons, which detail the UK's future safeguards obligations, including necessary inspections and monitoring activity undertaken by the IAEA on nuclear sites in the UK. These agreements will come into force once the Euratom arrangements no longer apply in the UK. The new NS Regulations will enable the UK to give effect to these obligations, and obligations contained in any relevant other international agreements on civil nuclear activities, which may be made with other states before the NS Regulations are made.

Role of the ONR

- 1.14 Once Euratom arrangements no longer apply to the UK, responsibility for ensuring compliance with international safeguards obligations will transfer from Euratom to the ONR who will become the national regulator for the UK's new domestic civil nuclear safeguards regime. In order to take on the role of regulating nuclear safeguards and overseeing the domestic regime, the ONR are undertaking significant one-off costs, associated with hiring and training inspectors, and building additional

capacity and developing necessary IT systems. ONR will also incur costs associated with the ongoing provision of domestic safeguards.

- 1.15 The ONR is in the process of expanding its safeguards function by recruiting and training additional inspectors, building additional institutional capacity and developing the necessary IT systems. The ONR requires a multi-disciplinary team to be able to deliver safeguards responsibilities. The staff essential to a safeguards function include safeguards inspectors, nuclear material accountants and information management and reporting specialists. The ONR estimates that it may require a team of around 30-35 staff to be able to deliver its functions to a standard equivalent in effectiveness and coverage as that currently provided by Euratom as set out in the NS Regulations.

Cost recovery

- 1.16 The ONR already ensures compliance with nuclear safety and security obligations. In doing so, it is able to recover the costs of such operations and inspections from the nuclear industry. The ONR estimate that 97% of its operating expenditure in 2017 was funded from cost recovery in this way (with the remaining 3% coming from their sponsor the Department of Work and Pensions). Following Euratom arrangements no longer applying, when the domestic safeguards regime is implemented by the ONR, a similar cost recovery method could be introduced for safeguards.
- 1.17 This proposal is not included in the regulations, but questions were included in the consultation document about the possibility of future cost recovery from industry for nuclear safeguards. We do not have sufficient information on these proposals, as such, we do not fully assess it here. We are keen to consider all options carefully and ensure that all costs related to nuclear safeguards are gathered fairly and in accordance with industry standards: whether this be recouping costs from industry (as is done by the ONR on security and safety costs) or paid for by Government (as done currently, via Euratom membership and support to ONR's current safeguards role).
- 1.18 If Government in the future proposes to implement a cost recovery regime for safeguards, this will be comprehensively assessed in a further Impact Assessment, together with a public consultation to gather views on a proposed fees regulation.

2. Objectives

Rationale for Intervention

- 2.1 Once Euratom safeguard arrangements no longer apply the UK will require a new domestic civil nuclear safeguards regime to comply with international obligations on non-proliferation. The NS Act allows for the establishment of such a regime, while the NS regulations set out how the new system will operate once it is established. Nuclear safeguards are a critical component of the international nuclear industry, and vital in preventing the proliferation of nuclear weapons. Whilst the UK is a Nuclear Weapons State, and therefore has a 'security exclusion'¹ in its safeguards obligations, compliance with nuclear safeguards and non-proliferation measures allows us to demonstrate to the public, industry and our international partners that we are a responsible nuclear state and gives them assurance and confidence that civil nuclear material is not diverted into military or weapons programmes. Nuclear safeguards are also a pre-requisite for Nuclear Cooperation Agreements (NCAs), which allow the trade of nuclear goods and services between countries, including nuclear research and development. Without nuclear trade, the UK would have to be self-reliant for all aspects of nuclear power, which would make it unfeasible to continue to have a nuclear industry. It is a global industry where the supply, waste and reprocessing chains cross multiple national borders. EDF Energy, which is the operator of all electricity generating nuclear power stations in the UK, have given us commercially sensitive examples of this chain, which provides clear evidence of the complexity and mutual reliance between nations of their supply chain.
- 2.2 Central to the government's objectives is providing secure, affordable and clean electricity for UK consumers. Significant challenges in achieving this are moving to a low carbon electricity mix, the UK's aging electricity infrastructure and the potential for electricity demand to grow significantly with electrification of heat and transport sectors. Nuclear generation is an important part of dealing with these challenges as it provides continuous, reliable and low carbon electricity that is not dependent on the weather. In the absence of safeguards, the entire nuclear industry would be severely disrupted; we would be unable to import fuel or equipment needed at nuclear sites. After running down stockpiles, current plants would no longer be able to generate and it would not make sense to commission new plants. This would therefore pose threats to security of supply and affordability in the short term and threats to decarbonisation and affordability in the longer term.
- 2.3 Any significant weakening or removal of safeguards arrangements will impact on the UK's international reputation and potential negotiating capital on non-proliferation issues. For example, the UK was amongst the architects of, and has strongly supported, the Iran nuclear deal to extend IAEA coverage and verification activities in Iran. For the UK to continue to take a leading role in such discussions, it is important that it continues to demonstrate its commitment the highest standards of nuclear safeguards. Weakening or removing safeguards regulation in the UK would also undermine public confidence that civil qualifying nuclear material is not being diverted to non-civil activities.

Economic rationale for intervention

- 2.4 Safeguards correct information failures that may otherwise exist between countries whereby a seller of civil nuclear material is unclear on the intended use of that material. Without the verification procedures provided by safeguards, there is likely to be a lower level of nuclear trade as nations cannot ensure material is not used for proliferation.
- 2.5 Were the UK not to implement a domestic civil nuclear safeguards regime, it is unlikely to be possible to trade in nuclear material, equipment and technology. The parts of the nuclear industry reliant on this trade (new nuclear build, existing fleet and fuel supply) would no longer be able to operate. As such, alternative electricity generation would be required. Although the UK could still meet legally binding carbon emissions targets, in the immediate short-term it would not be possible to avoid increasing consumption of gas and other carbon emitting technologies, to meet security of supply. This would result in increased carbon emissions, as well as an expected higher wholesale price, and increase in capacity payments, both of which would lead to higher bills for consumers. Nuclear power gives the Government an option to provide low-carbon generating capacity and reduce the harmful impacts associated with carbon dioxide.

¹ Although the Non-Proliferation of Nuclear Weapons (NPT) does not require its five nuclear-weapons states (NWS) parties to adopt safeguards agreements, the states concerned have each concluded what are known as voluntary offer safeguards agreements with the IAEA.

2.6 Taking no action could lead to substantially increased energy bills and wider disruption to the economy. Thus, there is also economic rationale for intervention on the grounds of cost avoidance in the energy sector and avoidance of wider disruption to the economy.

Policy Objectives

2.7 Once Euratom arrangements no longer apply to the UK, the policy objectives for a future safeguards regime within the UK are to:

- a) Meet the UK's international obligations as applied in new bilateral agreements (the VOA and AP) between the UK and IAEA in connection with the Treaty on the Non-proliferation of Nuclear Weapons, which detail the UK's future safeguards obligations;
- b) Demonstrate the UK's stated intention to establishing a new domestic safeguards regime that will provide coverage and effectiveness equivalent to that currently provided by the existing Euratom regime, and goes beyond international obligations as applied in new bilateral safeguards agreements between the UK and IAEA;
- c) Ensure safeguards arrangements are in place that retain public, industry and international trading partner confidence to engage in civil nuclear trade with the UK. Safeguards arrangements are critical for enabling civil nuclear trade and other parts of the supply chain, which makes nuclear electricity generation in the UK possible; and
- d) Take the opportunity to ensure that the nuclear safeguards regulations align with best practice in UK regulation making i.e. are necessary, fair, effective and enjoy a broad degree of public confidence; and its enforcement meet the five principles of proportionality, accountability, consistency, transparency and targeting.

2.8 These objectives will be achieved by legislating to ensure a robust domestic nuclear safeguards regime is in place and that the ONR will be in a position to take on the required role and responsibilities in regulating a domestic safeguards regime. These roles and responsibilities are to ensure accounting and inspection of nuclear materials. These measures should provide confidence that the UK will continue to have effective safeguards and non-proliferation measures in place and support international negotiations.

3. Option Appraisal

- 3.1 In this section, we outline in more detail the policy option that we have considered for appraisal. We also give an overview as to the methodology used to assess the costs and benefits of the policy option considered and the two counterfactuals. In the Impact Assessment to the nuclear safeguards regulations consultation, we provided estimates of the cost of implementing a new regime and the cost of complying with safeguards regulation that could be imposed on industry. Below we update and refine these assessments, based on stakeholder engagement throughout the consultation period.
- 3.2 For the purpose of our analysis, we have considered three scenarios in this Impact Assessment. We have not considered any non-regulatory policy options as viable, as they would not be capable of providing the confidence required for compliance with international nuclear non-proliferation measures.

“Current Euratom regime” counterfactual

- 3.3 This counterfactual refers to continuation of the regime and safeguards obligations as currently reported under Euratom. The UK has formally notified the EU of its decision to leave the EU and Euratom. However, we include this counterfactual to compare impacts relative to the current regime under Euratom, for consistency with other EU related measures, where legislation may be dependent on the negotiated outcomes on future relationship with the EU. Comparison to this counterfactual also gives an indication the likely scale, relative to existing costs, of moving to the new domestic regime. This is the counterfactual against which the option is primarily assessed.

“Do Nothing” Counterfactual

- 3.4 This counterfactual refers to a situation where the UK no longer has nuclear safeguards in place once Euratom arrangements no longer apply. In this Impact Assessment it is assumed Implementation Period runs from 30 March 2019 to 31st December 2020. This will mean that existing Euratom safeguards arrangements will continue to operate in the UK during this period. Once Euratom safeguard arrangements no longer apply, the UK does not introduce domestic safeguards legislation and regulations to replace existing Euratom rules. This counterfactual is only used to set out the risks of not introducing legislation.
- 3.5 We assume that the UK goes without nuclear safeguards for an indefinite period. As a result of having no nuclear safeguards, the UK’s ability to trade nuclear materials, including the importation of parts and equipment required by the operators of nuclear sites and research facilities would be severely restricted. There would also likely be significant reputational damage.
- 3.6 The global nuclear industry is highly diversified and international in nature, and the UK relies on importing key nuclear material from abroad (e.g. uranium). In this scenario of no safeguards, it would no longer be able to trade with international partners, and as such the subsectors of the nuclear industry reliant on trade (new nuclear, existing fleet and fuel supply) would no longer be able to operate. This would lead to the earlier closure of nuclear power stations, nuclear supply chain businesses and research facilities.
- 3.7 The UK would continue to be bound by carbon targets and ensuring security of supply but in this counterfactual scenario would need to ensure these without access to nuclear power. We would attempt to still meet carbon targets through a mixture of renewable generation and low carbon alternatives to nuclear (for example; Carbon Capture and Storage). We would also look to ensure the security of supply through a combination of using up stocks of nuclear fuel already in the UK and procuring other capacity through the Capacity Market (largely extending the life of coal and gas CCGT plants in the immediate term and building new gas CCGT plants in the longer term) but at a higher cost and with more risks as discussed below.

Option 1: Safeguards arrangements providing coverage and effectiveness equivalent to the existing Euratom regime

- 3.8 In this option, the UK would transition to a new domestic safeguards regime with responsibilities for regulating the regime shifting from Euratom to the ONR. We would establish a new domestic safeguards regime that would provide coverage and effectiveness equivalent to that currently provided by Euratom, but which would be appropriate for the domestic context in which they would operate. In addition, there are a small number of additional requirements for operators, for example, to develop and submit to the ONR an Accountancy and Control Plan (explained further below) and a new form giving advance notification of intended withdrawal of qualifying nuclear material from civil activities.

This is in line with the Government's commitment to retain "*the highest standards of nuclear safeguards*" on leaving Euratom and retaining international confidence to the UK's commitment in meeting its safeguards and non-proliferation obligations. Such a regime would ensure that sites remain subject to detailed oversight and that safeguards would provide coverage and effectiveness equivalent to those of the existing Euratom regime.

- 3.9 The main change under this option to operators' activities would be a requirement for an operator to develop and submit an Accountancy and Control Plan to the ONR for approval and to carry out its operations at a qualifying nuclear facility in accordance with the terms of the accountancy and control plan. Under Euratom, this is contained in European Recommendation of 11th February 2009 (i.e. not a requirement) and is not included within the Euratom regulation. The NS regulations would make this Plan an obligation.
- 3.10 Although there is a small additional cost for operators to develop and submit the Accountancy and Control Plan, it is intended to achieve the following benefits:
- a) Codifying responsibilities and procedures for safeguards operators' nuclear material accountancy and control systems into a single document, facilitating more effective oversight of the systems both by the operators and by ONR (operators already do, and have written procedures for much of this, so are not starting from nothing);
 - b) Enabling a less prescriptive, more outcome focused approach to safeguards regulation - a move from 'done to' operators to 'owned by' operators;
 - c) Better alignment with ONR's approach to regulating nuclear safety and security – increasing the potential for future regulatory efficiencies;
 - d) Achieving a degree of 'future proofing' of the regulations in providing some flexibility in approach as opposed to implementing a wholly prescriptive regime;
 - e) Encouraging innovation and efficiencies in an operator's approach/operations; and
 - f) Better alignment with best practice in UK regulation making and principles.

3.11 It is noted that these regulations are what is expected to be the UK's core commitments under its future international safeguards agreements with the IAEA. For the reasons set out below, we do not consider a policy option where safeguards arrangements only meet IAEA obligations, in line with the Government's commitment to demonstrate safeguards arrangements that goes beyond the normal international obligations as applied by the IAEA.

IAEA obligations option

3.12 In the Impact Assessment which accompanied the Nuclear Safeguards Act, we considered an option where domestic safeguards arrangements only met IAEA obligations. We have now discounted this option as it does not meet the objectives of the confirmed government intention of a safeguards regime that will provide coverage and effectiveness equivalent to that currently provided by the existing Euratom regime

3.13 International safeguards obligations are currently set and administered by the International Atomic Energy Agency (IAEA). The Euratom safeguards regime has arrangements that go beyond these international obligations, requiring more frequent reporting and inspections of nuclear sites. An alternative to safeguards arrangements which provide coverage and effectiveness equivalent to Euratom arrangements would be for the UK to establish a domestic regime which complied only with IAEA obligations. Whilst it is crucial that the UK meets international obligations to discharge the UK's international commitments, this would result in a lowering of safeguards standards, in terms of frequency of inspections and inspection requirements, within the UK once the Euratom regime no longer applies. Wanting to avoid the lowering of standards and its potential consequences led to the Government's stated intention to a new domestic civil nuclear safeguards regime with arrangements that will provide coverage and effectiveness equivalent to the existing Euratom regime.

3.14 In the Impact Assessment which accompanied the Nuclear Safeguards Act, the costs and benefits of having safeguards arrangements which met only IAEA obligations were examined. Although it had lower monetised costs relative to Euratom because of less frequent and rigorous inspections, it was not the preferred option. It had the potential to diminish the UK's position as a global non-proliferation leader, as it could be seen as the UK weakening its safeguards commitments. The Act IA concluded that the benefits of preserving the UK's strong reputation and leadership in non-proliferation outweighed the minor additional administrative costs.

3.15 In a letter to the House of Lords, the BEIS Parliamentary Under-Secretary of State outlined the Government's intention to;

“...have a domestic nuclear safeguards regime with standards equivalent in effectiveness and coverage as that currently provided by Euratom. The Government made this commitment to demonstrate the highest non-proliferation standards. That means a level of inspections and other regulatory arrangements that goes beyond the normal international standards as applied by the International Atomic Energy Agency (IAEA), for example, additional assurance and verification activities at additional facilities.”

3.16 In its quarterly update to Parliament on the 26th of March on exit from the Euratom treaty, the UK government confirmed its intention for a future domestic safeguards regime that goes beyond IAEA obligations, delivering a regime which provides coverage and effectiveness equivalent to that currently provided by Euratom.

3.17 The consultation did not consult on introducing safeguards arrangements which only satisfy IAEA commitments, as this would not meet the government's stated commitment of having arrangements which provide coverage and effectiveness equivalent to those provided by Euratom. As such, we do not include an IAEA standards option in this impact assessment.

Analytical Methodology

3.18 The key monetised costs in this assessment consist of costs to the ONR of administering the scheme and the associated cost of transition and compliance for operators with the new regime. We have also undertaken a qualitative assessment of costs of the proposed policy option across the nuclear industry, including power plant, supply chain businesses and research facilities. The benefits assessed here relative to the 'Do Nothing' counterfactual relate to the avoidance of costs in a scenario where the UK has no nuclear safeguards regime in place. These costs include the loss of trade in nuclear material and equipment, and its impact on the nuclear industry (including generation costs, associated fuel industry, R&D, decommissioning) reputational impacts and the risk of nuclear proliferation.

3.19 To help determine the likely transitional costs for industry of moving to the new regime, we have engaged with key industry stakeholders. The key factors for safeguards requirements we have looked at are:

- a) Frequency of reporting requirement
- b) Number of employees required/ wage level
- c) Time taken to complete reporting requirements
- d) Any other relevant costs/ factors

3.20 To help assess the likely impact of both the transition and the ongoing costs under the domestic regime, we have engaged with industry stakeholders. We have received input and cost data from those representing ~80% of all safeguards activity². Using this data, we have developed indicative ranges for the cost of compliance, which we have extrapolated across for the rest of industry.

3.21 A 10-year appraisal period is used (2017/18³ to 2026/27) to align this assessment to standard BEIS analysis. Consistent with HM Treasury Green book, we apply a 3.5% per annum discount rate. Unless otherwise stated, we assume that the first 4 years of the period run to the end of the 'implementation period' (31 December 2020) and involve transitional costs only. The appraisal period, therefore, includes around six years of 'steady state' costs and benefits (January 2021 to April 2027 inclusive).

3.22 All figures are presented in 2017 prices and 2018 present values, except for the direct impact on business (Equivalent Annual), which is presented in 2014 price and 2015 present value to be consistent with previous business impact targets. This measure is not in scope of the BIT, however an EANCB is provided for illustrative purposes.

Assessing the Options

² In terms of number of inspections carried out in 2015

³ The nuclear safeguards project began spending money in 2017. Typically previous expenditure would be classified as a sunk cost. However we include these costs in our assessment to be conservative and to present the full cost of the option.

3.23 Option 1 is assessed against the “Current Euratom regime” and “Do Nothing” counterfactuals. As the nuclear industry in the UK is relatively wide-ranging and diverse, we disaggregate the impact into three broad categories.

- 1) **Administration costs:** these are the costs of operating within the proposed new safeguards regime to both the ONR and the civil nuclear industry.
- 2) **Power Sector Impacts:** this examines the impact the proposed safeguards regimes will have relative to the counterfactuals. In assessing the impact on the power sector, we focus mainly on the “energy trilemma” of affordability, decarbonisation and security of supply. We consider the impact on both nuclear and non-nuclear generation.
- 3) **Wider impacts:** as noted above, the nuclear industry in the UK is varied and diverse, with a significant number of supply chain industries operating within the UK. We account for the impact the Option 1 will have on these supply side industries, and the wider economy in general.

3.24 The table below outlines the main impact categories when comparing the proposed option to the current Euratom regime and a description by the main affected groups:

Impact Category	Main Analytical Approach	Summary of impacts by main affected groups
Administration Costs	Quantitative assessment based on ONR and industry estimates	A. Cost to ONR of administering the new regulatory regime. B. Cost to nuclear businesses of living under different regulatory circumstances C. IAEA Costs D. Familiarisation costs for sites that are not covered by the Euratom regime
Power Sector Impacts	Qualitative assessment	E. Changes to security of electricity supply F. Ability to meet our decarbonisation target G. Wholesale price impacts
Wider impacts: nuclear industry and reputation	Qualitative assessment and consultation with stakeholders	H. Wider Economic I. Fuel Production & Enrichment J. Other power sector impacts (e.g. Impact of withdrawing from new nuclear programme) K. Decommissioning & Waste Management L. Research & Development M. International reputation

Administration Costs

A. *Cost to the ONR of regulating the new regime*

3.25 Once the UK has left Euratom, the responsibility of ensuring compliance and for running the domestic safeguards regime will fall to the ONR. To take on this role in expanding its safeguards function, the ONR will incur both one-off transitional costs associated with establishing the new system, and ongoing operational costs. These costs will cover the recruitment and training of inspectors and the development of a Safeguards Information Management and Reporting System (SIMRS) to provide reporting data to the IAEA. The future safeguards arrangements will apply to all facilities and other such locations where nuclear material is customarily used which include power plant, fuel enrichment and fabrication, research centres and storage. The main transition costs faced by the ONR are spread among the following six elements:

- a) Support to BEIS’ development of a domestic legal framework and international negotiations;

- b) Development of SIMRS (Safeguards Implementation Management and Reporting System) in order to provide reporting data to the IAEA;
- c) Organisation capacity - recruitment of sufficient safeguards inspectors, nuclear material accountants, and other related support staff to implement an effective SSAC;
- d) Organisation capability – through the training and development of staff
- e) Developing the regulatory framework and operating model for UK SSAC.
- f) Overarching project integration and implementation.

3.26 Reports related to declarations of nuclear material, and inspections associated with the verification of this reporting will require the establishment of a State System of Accounting and Control for qualifying nuclear materials (SSAC). Broadly speaking, this will consist of 3 key functions:

- a) A safeguards reporting/accountancy handling system;
- b) Activities to support IAEA inspections; and
- c) Additional activities to provide assurance relating to operators nuclear material and the quality of reporting to the IAEA.

3.27 The activities required to report to the IAEA and facilitate IAEA inspection remains constant. This is as the UK is required to provide the IAEA with the information necessary for the implementation of safeguards. This means that the IAEA shall be provided with the following accounting reports for each material balance area⁴:

- a) Material balance reports (MBR) showing the material balance based on a physical inventory listing (PIL) of qualifying nuclear material actually present in the material balance area, within 30 days of a physical inventory being taken; and
- b) Monthly Inventory change reports (ICR) showing all changes in the inventory of qualifying nuclear material, within 30 days of the end of the month in which the changes occurred⁵.

3.28 In addition, the ONR will be required to provide the IAEA with a list of qualifying nuclear facilities that are subject to the agreement with the IAEA and give advance notice of any additions and deletions. If the IAEA requests, the ONR will be required to provide further information on qualifying nuclear facilities.

Transitional Costs

3.29 Transitional costs are taken from internal ONR estimates, which are based on bottom up estimates of the costs across the 6 transitional elements mention above. We categorise all costs between April 2017 and December 2020 as transitional costs. The total transitional costs are estimated to be around £28m across 4 financial years. In the consultation impact assessment, these costs were underestimated as we had not considered the full cost during the implementation period. Table 3a sets out the expected costs for each financial year.

Table 3a: ONR Transitional Cost by financial year

£m	2017/18	2018/19	2019/20	2020-21 (Apr – Dec)
ONR transitional cost	1.2	8.9	10	7.5

3.30 For 2017/18 and 2018/19 the majority of transitional costs are associated with the recruitment and training of safeguards inspectors, the procurement of the SIMRS IT system and ongoing support to BEIS.

3.31 From 2019/20 onwards, ONR’s cost estimates assume that ONR will be delivering a safeguards regime. The main administrative costs will be the salary costs of new safeguards inspectors and

⁴ A term of nuclear material monitoring describing a space where the nuclear material quantity in the case of every transfer and the inventory of nuclear material in every material balance area can be determined with fixed procedures so that material balance can be established.

⁵ Subsidiary Arrangements will specify in detail, to the extent necessary to permit the IAEA to fulfil its responsibilities under new bilateral safeguards agreements with the UK (i.e. the Voluntary Offer Agreement and an Additional Protocol to the VOA) in an effective and efficient manner and how the procedures laid down in the safeguards agreements are to be applied. The entry into force of the Subsidiary Arrangements shall be subject to the United Kingdom and the IAEA concluding new bilateral safeguards agreements.

maintaining and operating the SIMRS IT system. These costs have been pro-rated for 2020/21 to apply for the 9 months until the implementation period ends. The safeguards regime will meet international standards from 1st April 2019 and the ONR will develop the regime to achieve Euratom equivalence by January 2021.

3.32 However, throughout this assessment we assume that an implementation period is secured and that Euratom continue to deliver the UK safeguard regime until December 2020. Based on discussions with the ONR, the implementation period is not expected to materially change the cost to the ONR as the activities needed to deliver a Euratom equivalence regime by Jan 2021 will not change. The major difference will be that Euratom inspectors, rather than ONR inspectors, conduct at inspections at UK sites. However, ONR will still recruit and train the same number of inspectors, who could shadow Euratom inspectors as part of their training. As such, ONR estimates are assumed to be appropriate for an implementation period scenario.

Ongoing Costs

3.33 In the 2018 and 2019 budgets, the EU has apportioned around €20m to fund nuclear safeguard operational expenditures across the EU. In addition, the administrative costs are covered within the DG Energy directorate with the European Commission, these costs are estimated to be around €15m annually. In total the estimated cost of Euratom enforcing safeguards across the EU is around €35m (£31m) per annum. Based on the proportion of person-days spent inspecting⁶, the UK is estimated to account for around 26% of these costs or €9.2m – around £8.1m per annum⁷. From 2015 to 2019 both operational and staff costs are broadly flat in real terms. We assume that these costs remain relatively constant in real terms across the appraisal period, while taking account of the expected changes to active and decommissioning nuclear generation sites.

3.34 The current UK contribution to the Euratom safeguards budget is less than the proportion of Euratom expenditure in the UK. In the last 4 years, the UK's contribution to the overall EU budget has ranged from 10.6% to 15.6%, with an average contribution of 12.8%. We apply this range to the estimated annual Euratom safeguards spend (£31m), to estimate the UK's contribution to the Euratom safeguards budget is between £3.3m and £4.9m per annum. We assume this contribution remains constant under the "Current Euratom regime" counterfactual. However, in Option 1, following the implementation period when Euratom arrangements no longer apply, we assume the UK would no longer contribute to the Euratom safeguards budget. As we expect ONR's costs to be higher than the current UK contribution to the Euratom Safeguards budget, this is the main determinant of the ongoing net cost of Option 1.

3.35 Once the ONR take responsibility for the domestic safeguards regime the cost to ONR will be broadly similar to the cost under Euratom. ONR estimate the ongoing costs to deliver a regime that will provide coverage and effectiveness equivalent to that currently provided by Euratom will be around £9.5m per annum (compared to £8.1m for Euratom).

3.36 Euratom deliver safeguards across the EU, so is likely to benefit from economies of scale. For example, administrative and management costs will be spread across a larger number of inspections, so the average long run cost per inspection is likely to be reduced. ONR will conduct substantially fewer inspections than Euratom so will not benefit to the same extent from sharing administrative costs across inspection activities. However, the ONR already regulates for safety and security, and so has established operating procedures with the nuclear industry. The ONR safeguard function will be incorporated into existing ONR buildings, utilities and support staff structures. As a result, overheads costs will be spread across a wider range of regulatory activities, allowing ONR to benefit from similar economies to scale.

3.37 There is uncertainty in ONR's ongoing costs, particularly in how ONR's economies of scale will compare to Euratom's. We test this uncertainty by applying a range to ONR's central estimate. Based on an ONR judgement on the magnitude of uncertainty, we test a 10% reduction in costs in the low scenario and a 10% increase in costs in the high scenario. This results in a range between £8.6m and £10.5m per annum for ongoing ONR costs.

⁶ 2014 Euratom Annual Report, https://ec.europa.eu/energy/sites/ener/files/documents/20151211%20Annual_Report%202014.pdf. Although Euratom will incur a proportion of fixed costs that are not directly related to inspection days, we expect the majority of costs to be related to labour and sampling that will be proportional to inspection days.

⁷ Exchange rate assumed at 1.1 EUR to £1

3.38 The main difference between Option 1 and the “Current Euratom regime” counterfactual is that under Option 1, operators will be required to maintain an Accountancy and Control Plan, for ONR approval. The accountancy and control plan will align the regulatory framework with ONR’s current practices on safety and security. In the consultation Impact Assessment we assumed that this would reduce in ONR’s ongoing costs. However, as the regime has developed, ONR no longer expect the accountancy and control plan to reduce costs. Instead the cost of reviewing operator plans and operating within the plans is included with the £8.6m to £10.5m figure.

3.39 At present these administration costs are covered by the UK Government (via Euratom) under general taxation. As noted under the “**Cost Recovery**” section, the ONR already charges industry for ensuring compliance with safety and security standards, which accounted for 97% of its operating expenditure (£71m) in 2016/17. In this IA, we assume that the costs for safeguards compliance continue to be funded through general taxation. If Government in the future proposes to implement a cost recovery regime for safeguards, this will be comprehensively assessed in a further Impact Assessment, together with a public consultation to gather views on a proposed fees regulation.

Table 3b: Summary table of additional cost estimates of administering the policy option, relative to the “current Euratom regime” counterfactual.

£m	Option 1		
	low	central	high
One-off transitional costs (total over 4 years)	27.6	27.6	27.6
Ongoing reduction in UK contribution to Euratom (per annum)	-3.3	-4	-4.9
Ongoing inspections and staff costs (per annum)	8.6	9.5	10.5

B. Cost to nuclear businesses of living under different regulatory circumstances

3.40 Similar to the ONR, administrative costs of the proposed policy option to business operating within the nuclear industry in relation to safeguards compliance can be broken down between one-off transitional costs, and continuous operating costs. Transitional costs will mostly be in relation to supplying the ONR with the relevant information in time for them to begin ensuring compliance. This will include, but is not limited to;

- a) Declaration of basic technical characteristics of existing nuclear facility;
- b) Submit to ONR an accountancy and control plan;
- c) Carry out and submit an initial book inventory; and
- d) Declaration to the ONR of basic technical characteristics and initial stock list of nuclear waste.

3.41 There are around 100 facilities that hold qualifying nuclear material and fall under the scope of the current safeguard regime operated by Euratom. These operators include sites involved in activity all through the nuclear industry. Covering fuel enrichment and fabrication, active generating plant, decommissioned sites, waste facilities and research facilities.

Transitional Costs

3.42 Based on an informal workshop with key industry stakeholders and formal consultation responses, we have estimated the likely scale and cost of the transition and familiarisation under the Option 1. Before the consultation exercise we engaged industry on both transitional costs and ongoing costs under the proposed regime. The main reporting activities for industry were identified and information on the number of staff, salaries, time required for the activity and frequency of the activity was requested. We received returns from industry representing 80% of UK safeguards activity and have extrapolated for the remaining 20%. The high/low estimates below are based on the highest/lowest cost estimates we received respectively, extrapolating as appropriate. These estimates were tested with industry during the consultation exercise.

Table 3c- Transition and familiarisation costs of moving to new domestic regime for nuclear industry, relative to the “current Euratom regime” counterfactual

£, one-off	Option 1		
	<i>low</i>	<i>central</i>	<i>high</i>
<i>Basic Technical Characteristics</i>	20,000	20,000	20,000
<i>Accountancy and Control Plan</i>	460,000	590,000	720,000
<i>Initial Book Inventory</i>	10,000	20,000	60,000
<i>BTC for Waste</i>	1,000	1,000	1,000
<i>Other costs⁸</i>	20,000	20,000	20,000
Total Transition costs⁹	510,000	650,000	820,000

Ongoing Costs

3.43 The ongoing cost of internal monitoring (carrying out nuclear material accountancy and control) under Option 1 is assumed to be the similar to the current Euratom regime. The additional cost is based on the resource required for operators to carry out their operations at qualifying nuclear facilities in accordance with the accountancy and control plan. We informally consulted with industry (representing 80% of UK safeguards activity, extrapolating for the remainder 20%) and considered consultation responses to get an assessment of the expected additional costs under Option 1. These are listed in the table 3c below, using the cost ranges provided to us. In the central scenario we estimate that the additional cost of the accountancy and control plan is around £0.08m per annum.

3.44 The cost to prepare for and receive inspections is built up from estimates of the number of days and staff required across operators. This data makes use of EU data on the average length of inspection across site type and the number of current inspections taking place. ONR will deliver a robust, proportionate, and consistent safeguards regime that is equivalent in effectiveness and coverage to that currently provided by Euratom. We assume that inspection activities be at the same level as under Euratom. As such, there is no additional cost of inspections to operators under Option 1 relative to the ‘current Euratom regime’ counterfactual.

Table 3d – Changes to Average Annual Cost of Compliance relative to the ‘Current Euratom regime’ counterfactual

£, per annum	Option 1		
	<i>low</i>	<i>central</i>	<i>high</i>
<i>Cost of Monitoring/Reporting (Accountancy and Control Plan)</i>	60,000	80,000	100,000
<i>Cost of Inspections</i>	0	0	0
Total	60,000	80,000	100,000

C. IAEA Costs

3.45 When Euratom arrangements no longer apply, the ONR will take responsibility for data reporting to IAEA (via SIMRS) and supporting IAEA inspection activities. New equipment will be required to support this process. There will be a one-off cost of around £0.9m required to purchase set-up equipment. This equipment will be purchased in 2018/19 to be ready for operation from April 2019.

3.46 There will also be an ongoing cost to cover the operation expense of IAEA inspections. Under existing arrangements this is covered through the Euratom budget. Based on initial negotiations with the IAEA the cost of IAEA inspections will be around £0.9m per year. The existing funding arrangements to the IAEA will continue to apply during the implementation period, therefore we assume that the ongoing cost will begin in Jan 2020.

D. Familiarisation and ongoing costs for sites that are not covered by the Euratom regime

3.47 Some schools and hospitals hold very small amounts nuclear material for educational and medical purposes. For example, radiation sources are a resource for teaching the fundamentals of ionising radiation to students through hands on experience. Radiotherapy machines, used to treat cancers, are among the most common sources of radioactive material in the medical sector.

⁸ Including updating of internal regulation, new equipment requirements, etc.

⁹ Numbers may not sum due to rounding.

- 3.48 These sites are currently not subject to Euratom safeguards obligations under informal agreements with Euratom. The policy intention is for the majority (if not all) of schools to remain out of scope of the safeguards regime when Euratom arrangements no longer apply. Schools will be exempted based on the quantity of nuclear material held. The threshold defined in regulation is holding less than 0.01 effective kilograms, and no Plutonium or Uranium where the mass of Uranium 233 plus Uranium 235 exceeds 1% of the total mass of Uranium and is a relevant educational institution. Based on information from the Institute of Physics we expect all schools to hold less than this quantity, and therefore be eligible for an exemption.
- 3.49 Hospitals will not receive an explicit exemption in the regulations. Such establishments will be able to apply for and benefit from the derogation for facilities with limited operation, which is set out in regulation 31. In addition, a number of these establishments may be able to use the 'exemption' provisions of Regulation 32(1), if the qualifying nuclear material in question is, in practice, irrecoverable. Establishments will be able to seek advice from the ONR about their position with respect to regulations 31 and 32. ONR will consider factors such as qualifying nuclear material category, form, amount, use, mobility, accessibility and whether the inventory concerned fluctuates over time in determining the application of these regulations. This may, in practice, mean that some categories of establishments will be considered by ONR as meeting the requirements of regulation 32(1).
- 3.50 We assume that all sites holding nuclear material will incur the familiarisation cost of reviewing and understanding the regulations. All schools will be exempt from the regulations, we therefore assume that there are no additional on-going costs to these sites. Some hospitals will also receive an 'exemption' if material held is practically irrecoverable. The remaining hospitals will incur the one-off cost of making an initial derogation application to ONR. For these sites there will also be an ongoing cost to report to the ONR as a facility with a limited operation.
- 3.51 There is uncertainty around the number of schools and hospitals holding nuclear material, and the resource needed for familiarisation. We test this uncertainty by using low and high ranges for our assumptions. The impact on schools and hospitals is small relative to the total cost of the option, therefore we judge this a proportionate approach to uncertainty analysis.
- 3.52 There are around 6,500¹⁰ secondary and non-maintained schools and 2,400 hospitals¹¹ in the UK. We do not have information on the number of these sites that hold nuclear material. As a conservative estimate we assume that all sites hold nuclear material and will incur familiarisation costs. Based on information from stakeholder engagement, we assume that it will take schools and hospitals around 3.5 hours (half a day) training to familiarise themselves with the regulations, with a low and high estimate of 1.75 and 5.25 hours respectively. The Government are planning engagement activities with these sites and their representative bodies in early 2019. Engagement should help mitigate the familiarisation costs for these institutions, however as the impact of engagement is not known we conservatively assume no change in familiarisation time. For wage costs we use the 25th to 75th percentile for the education and health sectors from the Annual Survey of Hours and Earnings (ASHE) statistics¹². Using these assumptions we estimate a one-off familiarisation costs of between £190,000 and £1.2m across all sites.
- 3.53 The derogation application undertaken by hospitals will be similar to transitional activities undertaken by the rest of the industry. For example, sites will have to complete part of the basic technical characteristics form and will be required to submit an initial stock list, which is similar to the initial book inventory. As hospitals will not be used to operating within the nuclear safeguard regime, we expect these sites to take longer than the estimates provided by the rest of the industry. Taking a conservative approach based on the information provided by the rest of industry we assume that derogation application will take sites between 3 hours and 12 hours. We do not know the number of hospitals who will require a derogation application (i.e. will not receive an exemption as material is practically irrecoverable). The Government will be undertaking further engagement to ascertain more evidence on the number of hospitals that will be affected. As a conservative assumption, we assume between 25% and 75% of hospitals will require a derogation application. Using these assumptions

¹⁰ Schools figures taken from Department for Education published statistics:

<https://www.gov.uk/government/statistics/education-and-training-statistics-for-the-uk-2017>

¹¹ Care Quality Commission, The state of health care and adult social care in England 2017/18,

https://www.cqc.org.uk/sites/default/files/20171011_stateofcare1718_report.pdf . Figures have been extrapolated for Scotland, Wales and Northern Ireland using total healthcare expenditure.

¹² Uplifted for non-wage costs using Eurostat estimates for the UK.

https://ec.europa.eu/eurostat/statistics-explained/index.php/Hourly_labour_costs

and the wage rates stated above we estimate a one-off derogation application cost of between £20,000 and £500,000.

3.54 Following the initial application to the ONR, institutions may be required to regularly report to ONR as a facility with limited operation. Based on the expected level of information required, we assume reporting to take between 2 hours and 5 hours per year for sites to gather the required information, develop the report and submit the report to the ONR. Using the assumption of 25% to 75% of hospitals needing a derogation and the same wage rates as above, we estimate the cost of between £10,000 and £220,000 per year.

Table 3e – Costs to sites not covered by the Euratom regime, relative to the “current Euratom regime” counterfactual.

	Option 1		
	<i>low</i>	<i>central</i>	<i>high</i>
Number of sites requiring familiarisation (schools and hospitals)	8,900		
Total cost of familiarisation (one-off)	£190,000	£480,000	£1,200,000
Number of sites requiring a derogation application (hospitals)	600	1,200	1,800
Total cost of derogation applications (one-off)	£20,000	£120,000	£500,000
Total cost of annual reporting (per year)	£10,000	£70,000	£220,000

Power Sector Impacts

3.55 In this section we qualitatively assess Option 1 against both “Current Euratom regime” and “Do Nothing” counterfactuals. Relative to existing Euratom arrangements we do not expect significant impacts on the power sector. The assessment against the “Do Nothing” counterfactual provides wider context and examines the risk associated with not introducing legislation.

E. Changes to the Security of Supply

3.56 We do not expect there to be any differences between Option 1 and the “Current Euratom regime” counterfactual in regard to security of supply. The UK will continue to comply with international safeguards obligations once Euratom arrangements no longer apply, and we expect no change to nuclear generation as operators and businesses would still be able to import necessary qualifying nuclear material.

3.57 In the “Do Nothing” counterfactual, the UK would no longer comply with international safeguards, and the subsectors of the nuclear industry reliant on trade (new nuclear, existing fleet and fuel supply) would no longer be able to operate. In the short term, this would impact the existing nuclear fleet, which has a derating factor¹³ of 90% (as set out by National Grid) and currently supplies around 20% of the UK electricity demand annually. We assume that under a “Do Nothing” scenario, these plants would continue to operate until they had used up the fuel within the reactor and also any stockpiles they kept. After this point, we anticipate that the shortfall in electricity generation could be supplied in the short term mainly by increased generation from coal and gas, although with increased risk of unmet demand and increased carbon emissions.

3.58 In the longer term, we assume no nuclear safeguards could mean that no new nuclear plants would be built. Although some of nuclear could be replaced by additional renewable and low carbon technologies, as these are largely intermittent, we might still require a form of low carbon baseload alternative if we were not to risk breaching carbon targets. One alternative would be to deploy gas power with Carbon Capture, Usage and Storage (CCUS). The Government’s ambition for CCUS, set out in the Clean Growth Strategy, is to have the option to deploy at scale during the 2030s, subject to sufficient cost reduction.

¹³ Derating factor reflects the proportion of an electricity source which is likely to be technically available to generate at times of peak demand

3.59 Although the “Do Nothing” option would impose significant challenges and limitations, we expect that the UK’s security of supply standard would be maintained. In the longer term the “Do Nothing” counterfactual could create a high amount of intermittent capacity to meet decarbonisation targets, resulting in higher costs of ensuring security of supply and reliance on a less diverse technology supply chain. Relative to this counterfactual, we believe that Option 1 would provide for cheaper alternatives for meeting security of supply than in the scenario where we operate without safeguards.

F. Ability to meet our decarbonisation target

3.60 We do not anticipate there to be any difference in our ability to meet our decarbonisation target between Option 1 and the “Current Euratom regime” counterfactual. Nuclear generation would continue to play an important role in meeting carbon targets.

3.61 In the “Do Nothing” counterfactual scenario, the UK would still be legally bound to meet its carbon targets but would have to do so without the aid of nuclear. This would provide a significant challenge to overcome; as highlighted above, nuclear is highly useful from a decarbonisation point of view, as it is able to provide constant power output (as opposed to say electricity generated from wind, which provides power only intermittently, and is not dispatchable¹⁴). One approach would be for the UK to build a large amount of renewable capacity, in order to minimise the risk associated with intermittency. However, this would provide a significant logistical challenge, as well as having the potential to be significantly more expensive than using renewables with nuclear and/ or other low-carbon baseload power. If flexible technologies such as battery storage or demand side response could be deployed cheaply, then this could reduce these costs, although this is currently uncertain.

3.62 An alternative to the above would be to make use of gas power with carbon capture, usage and storage. One configuration of a CCUS plant would be similar to a standard gas CCGT plant, with the difference that the majority of the carbon emitted (~90%) would be captured, transported and then injected in to a geological store for permanent storage (usually a depleted offshore oil or gas field, or a saline aquifer). One advantage of CCUS is that it is able to operate as baseload and is dispatchable, which would help mitigate some of the problems associated with a renewables-heavy energy mix.

3.63 In the “Do Nothing” counterfactual scenario, we assume that enough Offshore Wind, Onshore Wind, Solar and CCUS are brought online to replace generation from nuclear. This allows us to meet a trajectory for decarbonisation that is consistent with our 2050 decarbonisation targets, although this may be at a significantly higher cost than if nuclear generation were present. However, there is uncertainty over the feasibility of delivering this volume of these types of new electricity generation capacity due to pressures on site availability and supply chain capacity. This could result in higher wholesale prices and capacity market payments, which would in turn lead to higher consumer bills in the short term. Option 1 avoids this outcome.

3.64 While nuclear generation has higher capital costs per MW compared to other low carbon technologies, this is offset by higher costs of the electricity network (particularly due to onshore and offshore wind) and balancing market costs (particularly for offshore wind and solar). In addition, the marginal amount of generation provided by renewable generation decreases significantly at the volumes required to replace nuclear to still meet 2050 decarbonisation targets. As such, although the UK would still meet its carbon targets, it would be able to do so at a lower cost and challenge under the Option 1 than in the “Do Nothing” counterfactual.

G. Wholesale price impacts

3.65 We do not expect there to be any differences between Option 1 and the “Current Euratom regime” counterfactual with respect to consumer bills. Nuclear generation would continue to form part of the wholesale market in both scenarios.

3.66 In Option 1, having generation from nuclear maintains lower prices in the short term leading to importing less electricity through interconnectors. In the “Do Nothing” counterfactual, nuclear is no longer able to fulfil this role. As outlined in the previous section, we would still expect security of supply to be maintained (although at increased risk), through the use of Coal and Gas. However, both of these technologies have a higher marginal cost of producing electricity when compared to nuclear, and as such, would likely lead to higher wholesale prices.

¹⁴ Dispatchable generation refers to sources of electricity that can be used on demand and dispatched at the request of power grid operators

3.67 In the longer term, the impact of the “Do Nothing” counterfactual is more ambiguous. The large amount of renewable technologies required could depress the wholesale price for longer periods, but may also lead to a more volatile market, with peaking generation being required more often.

Wider impacts: Nuclear Industry, Research and Reputation

3.68 In this section we qualitatively assess Option 1 against both “Current Euratom regime” and “Do Nothing” counterfactuals. Relative to existing Euratom arrangements we do not expect significant wider impacts. The assessment against the “Do Nothing” counterfactual provides wider context and examines the risk associated with not introducing legislation.

H. Wider economic effects

3.69 The nuclear industry makes a significant contribution to the UK economy. We do not expect there to be any difference in the impact on the UK economy between Option 1 and the “current Euratom regime” counterfactual. However, Option 1 relative to the “Do Nothing” counterfactual of no nuclear safeguards provides for substantial macroeconomic benefits.

3.70 In 2014, the GVA (Gross Value Added) of the UK’s civil nuclear energy sector was £3.5bn (0.2% of total UK GVA in that year)¹⁵. Nuclear electricity generation accounts for around a fifth of the total UK electricity generation, which in turn has an estimated GVA of £18bn (1.1% of UK total)¹⁶. ONS statistics show that all sectors of the economy save one have positive intermediate consumption of goods and services produced by the electricity sector and therefore depend on its effective functioning. In particular 3.7% of total intermediate demand is spent on the electricity, distribution and transmission sector (Sector 35.1 in official ONS labelling).¹⁷

3.71 It is estimated that the nuclear industry employed around 87,000 people in 2017 across the civil and defence sectors¹⁸. The estimated median average salary for a nuclear engineer is £47,000, which is significantly higher than the UK median average salary (£28,200)¹⁹. It should also be noted that geographically the nuclear sector is concentrated in the North West of England, including west Cumbria (44%), the South West (13%) and South East (9%)²⁰. Therefore, disruption to the nuclear industry would affect these areas more heavily.

I. Fuel Production & Enrichment

3.72 In the absence of safeguards in the “Do Nothing” counterfactual, we would not expect the UK to be able to trade nuclear materials required for the nuclear fuel cycle, therefore we would expect the loss of this sector to the UK. Fuel service providers could consider moving their UK based operations to their sister facilities overseas to avoid disruption. Option 1 is preferred, as safeguards standards are largely the same as existing arrangements. Option 1 is less likely to cause disruption as processes will closely align to what the UK and its trading partners are used to.

J. Other power sector impacts

3.73 In the absence of safeguards, we expect that nuclear power generators would be severely disrupted by the inability to import fuel or parts and equipment needed at nuclear sites. Current plants would be forced to cease generating and new plants would not commission. In addition this would have an impact on the UK’s plans for future nuclear new build, impacting construction timetables for Hinkley Point C and investor confidence in the viability of other proposed projects. As discussed above, this would therefore pose potential threats to security of supply and affordability in the short-term and threats to decarbonisation and affordability in the longer-term. Option 1 avoids these costs.

¹⁵ <https://www.ons.gov.uk/economy/environmentalaccounts/articles/ukenvironmentalaccounts/uknuclearpowersector2014> [note that this definition of the nuclear power sector includes businesses producing electricity and also those supporting these activities through consultation, producing or installing infrastructure. This includes operations and maintenance. However, decommissioning and waste processing activities are excluded.]

¹⁶ <https://www.ons.gov.uk/economy/grossdomesticproductgdp/datasets>

¹⁷ <https://www.ons.gov.uk/economy/nationalaccounts/supplyandusetables/datasets/inputoutputsupplyandusetables>

¹⁸ Nuclear Workforce Assessment 2017, https://www.cogentskills.com/media/76523/nwa2017_public.pdf

¹⁹ <https://nationalcareersservice.direct.gov.uk/job-profiles/nuclear-engineer> (mean £47,000)

²⁰ https://www.niauk.org/wp-content/uploads/2017/06/NIA_Jobs_Map_FINAL1.pdf

3.74 We do not anticipate any difference for these non-monetised costs between Option 1 and the “current Euratom regime” counterfactual. While there will be some transitional costs related to familiarisation with the new regime, we anticipate these will be relatively minor, and have a negligible impact on future investment decisions.

K. Decommissioning and Waste Management

3.75 In the absence of safeguards, short-term costs in this sector could increase as the decommissioning of some sites would be brought forward. As nuclear plant and other active nuclear sites would not continue due to not being able to import nuclear fuel and would need to be decommissioned earlier. Decommissioning plans for new nuclear projects facilitate cost reduction for existing plant. Whilst funding plans for new builds are such that they are able to independently finance their own decommissioning, certain contributions, particularly towards a geological disposal facility, would reduce equivalent costs for current plants.

3.76 In the absence of safeguards, were new plants not constructed, economies of scale may be lost. UK waste management sites also reprocess, and store spent fuel for other countries. In the absence of safeguards, the UK could expect to lose this business as international partners would not be able to send their spent fuel to us.

L. Research and Development

3.77 In the absence of nuclear safeguards, the subsectors of the nuclear industry reliant on trade (new nuclear, existing fleet and fuel supply) would no longer be able to operate. In addition, the inability to import fuel or equipment could mean severe disruption to international collaborative research programmes.

M. International Reputation

3.78 If the UK were not to establish a domestic safeguards regime, we anticipate that this would have a significant adverse impact on the UK’s international reputation as a non-proliferation leader. This would significantly weaken its negotiating capital with international partners. For example, the UK was also amongst the architects of, and has strongly supported, the Iran nuclear deal to extend IAEA coverage and verification activities in Iran. For the UK to continue to take a leading role in such discussions, it is important that it continues to demonstrate its commitment to a high standard of nuclear safeguards. It may also undermine public confidence that nuclear material is being responsibly controlled.

3.79 Under Option 1, the UK would adopt a small number of additional requirements for safeguards standards than is required by Euratom. As such, relative to the “Current Euratom regime” counterfactual, we anticipate that this will enhance the UK’s international reputation as a non-proliferation leader. This will provide confidence to the public and international partners of the UK’s commitment to be a non-proliferation leader.

Impacts to Businesses

3.80 This section identifies the costs of Option 1 that would be incurred by business. The Government confirmed its manifesto commitment £9bn Business Impact Target (BIT). However, a decision has been taken not to set individual Departmental targets. EU exit legislation has been categorised as Non-Qualifying Regulatory Provisions (NQRPs). Table 3f below shows indicative impacts from the domestic regime to businesses (where they have been monetised), and a qualitative description and direction of impact for those we have not monetised.

3.81 Relative to the “Current Euratom regime” counterfactual the main direct costs to businesses are the cost of compliance from site inspections, monitoring and reporting. These transitional and ongoing costs are discussed in the “*Cost to nuclear businesses of living under different regulatory circumstances*” section above. These are estimated to be a one-off cost of between £500,000 and £800,000 and an ongoing cost of between £60,000 and £100,000 per year.

3.82 We also include the transitional impact on private schools and private hospitals as discussed in the “*Familiarisation costs for sites that are not covered by the Euratom regime*” section above. Private schools and hospitals will be exempt from the regulations and only incur familiarisation costs. Across these sites we estimate there will be a one-off cost of between £50,000 and £360,000.

3.83 Additionally, a number of private hospitals may be required to submit a derogation application and report as a facility with limited operation. Based on 25-75% of private hospitals requiring a derogation

and using the same assumption as stated in the section above, we estimate a one-off cost of between £2,000 and £50,000 and an ongoing cost of between £1,000 and £20,000 per year.

- 3.84 The regulations have been developed in consultation with industry which should help to mitigate the familiarisation impact on businesses. The Government will be discussing with the ONR the need for guidance across all aspects of the nuclear safeguards regulations (including specific for holders of small amounts of nuclear material), but decisions on the guidance to be published is for the ONR to make.
- 3.85 In net present value (NPV) terms this is a cost of around £1.3m to 2026/7 under Option 1. We expect no impact on nuclear generation, or the wider power sector. As such, the costs to Nuclear and non-nuclear operators is zero, and there is no impact on consumer bills.

Table 3f– Impact to businesses relative to “current Euratom regime” counterfactual. Costs are represented as negative numbers and benefits as positive numbers

£m	NPV to 2026/7		
	Low	Central	High
Option 1– Cost of transition and compliance	-£1.9m	-£1.3m	-£0.9m
Nuclear businesses profits	Zero		
Non-nuclear plant profits	Zero		
Business consumer bills	Zero		

- 3.86 In the “Do Nothing” counterfactual, where nuclear generation does not operate, existing nuclear generators would forgo profits, but non-nuclear generators would benefit from increased demand for their services. We also consider the impact to business consumers of energy. Consumers are largely affected by the pass through of costs in energy markets that are relatively automatic. For example, in the short term should less nuclear be available, we would expect bids for more expensive electricity from other forms of generation in the market to be accepted by suppliers and passed on to consumers energy bills. However, there are a number of steps here before it impacts the consumer and so it not considered as direct.

Small and Micro Business Impact

- 3.87 This section identifies the costs of Option 1 that would be incurred by small and micro businesses. Relative to the ‘current Euratom regime’ counterfactual we do not expect any significant impacts on businesses. As described in the sections above, the main direct costs to business are the transitional costs and the ongoing additional cost of monitoring and compliance. These are estimated to be a one-off cost of between £500,000 and £800,000 and an ongoing cost of between £60,000 and £100,000 across all affected businesses.
- 3.88 In 2015, around 3% of Euratom inspections were conducted at research sites and small users. We do not hold information on the number of staff at each institution but assume all these operators could be classified as small and micro businesses. The cost of facilitating inspections is likely to be directly related to the number of inspections, as more staff resource is required as the number of inspections increases. Larger sites with more inspections are also likely to need a greater number of staff to undertake monitoring and compliance activities. We therefore assume that both transitional costs and ongoing costs are proportional to the number of inspections at each site and that 3% of the total industry cost is borne by small and micro businesses. This equates to a transitional cost of between £15,000 and £24,000 and an ongoing cost of between £2,000 and £3,000 per annum in total across all research sites and small users.
- 3.89 There will also be costs to sites that were not previously covered under the Euratom regime. We do not hold information on the number of staff at each institution but assume that private schools could be classified as small and micro business. In 2015/16 there were around 2,400 non-maintained schools. To ensure the impact is not disproportionate, these sites will be exempt from the regulations. As such, there will be no ongoing costs to these institutions, but they will face some familiarisation costs. Across all private schools we estimate the one-off familiarisation costs to be between £50,000 and £330,000.
- 3.90 Relative to the “Do Nothing” counterfactual, we expect short-term wholesale electricity prices to be lower as nuclear generation would replace more expensive forms of electricity. As such, small and micro businesses would benefit from lower electricity bills.

Equalities impact

3.91 We have considered the impacts of the policy on the groups with protected characteristics as defined within the Equalities Act 2010 and do not consider that there would be disproportionate impact on them. This is because this policy is not expected to incur any costs on these groups directly and direct costs of implementing this regime are not expected to be significantly different to the cost of safeguards as currently provided through Euratom. However, relative to the “Do Nothing” counterfactual generally Option 1 may result in lower short-term energy bills for consumers and therefore benefit consumers across all groups.

Summary

3.92 Overall, relative to the “Current Euratom regime” counterfactual, Option 1 has additional administration costs due to establishing a domestic safeguards regime. The nuclear industry will also incur transitional and compliance costs associated with a small number of additional requirements compared to the existing regime, these costs are not expected to be significant.

3.93 The costs of Option 1 are heavily offset by the benefits of introducing legislation compared to the alternative. Option 1 will provide confidence to the public, industry and international partners of the UK’s commitment to meeting its non-proliferation obligations and ensure the UK can discharge its international commitments as applied in new bilateral safeguards agreements between the UK and IAEA.

3.94 Relative to the ‘Do Nothing’ counterfactual Option 1 has significant benefits associated with avoiding significant disruption across the nuclear industry consisting of around 87,000 jobs heavily concentrated in particular regions, maintaining the UK’s international reputation in meeting its safeguards obligations and concluding international agreements on civil nuclear trade activities with other states, including on the subject of nuclear research and development. We have assessed that there could be significant power generation benefits relative to a “Do Nothing” scenario of no future safeguards and therefore no future nuclear generation. These benefits are largely avoided costs attributable to needing large volumes of renewable generation in the counterfactual to still meet decarbonisation objectives, and the associated costs of connecting it from distant locations and operating a more intermittent system. The costs we estimate of administering the scheme and compliance incurred by ONR and operators respectively are far outweighed by these benefits.

Monitoring and Evaluation

3.95 The Nuclear Safeguards regulations include a review clause. The clause sets out a requirement for a review of the regulatory provisions contained in the regulations and for the conclusions from the review to be published. The first review must be carried out so that the first report is published within the five years from the commencement date of the regulations.