UK Government Investments

CROSS GOVERNMENT NUCLEAR DECOMMISSIONING COST REVIEW

CONTINGENT LIABILITY
CENTRAL CAPABILITY
THEMATIC REVIEW

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EXECUTIVE SUMMARY

The UK has played an important role in the development of the nuclear industry[1] and **nuclear power is a fundamental part of the UK's future** low-carbon energy mix[2]. However, nuclear activity results in the production of **hazardous waste which requires management and decommissioning**.

To maximise the net benefit of nuclear activity it is important to **minimise the cost of decommissioning**, without sacrificing the safety of the people or sites involved.

This paper summarises **government's portfolio of nuclear decommissioning cost** across the Nuclear Decommissioning Authority (NDA), the Ministry of Defence (MoD), the Nuclear Liabilities Fund and Hinkley Point C, and makes recommendations to improve understanding.

Government has a total estimated net nuclear decommissioning cost of **£257bn**[3] at March 2022, with a government spend of around **£3bn per year**[4] **and rising**. The difference between these figures reflects the **long-term nature of nuclear decommissioning** as a government spending commitment with an expected duration of over 100 years.

Beyond understanding the estimated cost of the decommissioning activity, it is also important to understand the **uncertainty in these estimates**. Across all nuclear decommissioning activity, there are some consistent sources of risk in terms of the cost of decommissioning to government. This includes liability risk, logistical risk, and sector risk.

Based on this review, the Contingent Liability Central Capability has developed **four recommendations** to improve the understanding of government's nuclear decommissioning portfolio and ultimately **reduce the cost to government**:

1. Establish a cross government nuclear decommissioning financial analysis working group to share best practice and ensure appropriate consistency.
2. Carry out more detailed analysis of cost and risk, including standard measures of risk, standard sensitivity analysis and combined analysis of total government risk.
3. Make additional cost disclosures to further improve transparency and effectiveness of spending on nuclear decommissioning.
4. Leverage knowledge and analysis of historical and ongoing nuclear decommissioning to advise on new nuclear policy.

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[1] UK government takes major steps forward to secure Britain's energy independence, November 2022

[2] The Net Zero Strategy, October 2021

[3] Discounted, as at March 2022, see page 9 for details. Discount rates and sensitivities will change on a yearly basis which will affect the total provision.

[4] Not including one off spend, such as top-ups to the Nuclear Liabilities Fund, or non-government spend, such as transfers from the Nuclear Liabilities Fund to EDF Energy. NDA and MOD 2021/22 accounts.

DISCLAIMER

Results at March 2023

When preparing this report, the most recent available annual report and accounts were based on the financial year ending 31 March 2022, and this forms the basis of CLCC's analysis. At the time of publication of this report, departments have begun releasing their 2022/23 annual report and accounts, including NDA and MoD. Due to significant changes in the financial assumptions, including an increase to the discount rate, the nuclear decommissioning spending commitment for these departments has decreased by around 50% at 31 March 2023. Despite the reduction in absolute value, nuclear decommissioning costs will continue to represent a large proportion of government's future spending commitments and the conclusions of the CLCC's analysis remains unchanged. Further detail has been provided in Annex A, and known changes to results at 31 March 2023 have been noted in Annex B and C.

Legal

This paper is intended to summarise government's portfolio of nuclear decommissioning cost and make recommendations to improve understanding and is accurate as at the date it has been prepared (unless otherwise stated). However, any recommendations or opinions made by CLCC are given in its sole judgment and may not be exhaustive and are not to be a replacement for each recipient's own views. The CLCC assumes that all of the information supplied to it for the purposes of the report is accurate, complete, and not misleading. The CLCC accepts no liability to any person for any action taken or for any failure to act, either in whole or part, based on this paper. It is recommended that you consider obtaining any further relevant specialist advice before implementing any changes based on recommendation included in this paper.

1. INTRODUCTION AND SCOPE

The Contingent Liability Central Capability (CLCC) is an analytical and advisory unit formed within UK Government Investments, the government's centre of excellence for corporate finance and corporate governance. The CLCC's purpose is to strengthen contingent liability expertise across government as well as to help government understand uncertain spending commitments, such as provisions. Contingent liabilities are costs that are uncertain but may lead to future expenditure if certain events occur[5]. As highlighted in government's Insurer of Last Resort report, in particular, the CLCC is designed to provide "the necessary expertise to quantify and price risk" and "ensure that risk has been calculated accurately".

CLCC thematic reviews target large, cross-government risks to provide analysis and advice that develops understanding and drives improvement in these areas across government. It has undertaken this review of nuclear decommissioning for a number of reasons. As highlighted in the Office for Budget Responsibility's Fiscal Risk Report 2017, the 'uncertain costs of safely decommissioning the UK's nuclear sites are a material source of fiscal risk'. Secondly, it is the largest provision in the Whole of Government Accounts[6] that arises from organisations across government. Further, there is currently limited information available about this risk on a portfolio basis.

This thematic review summarises the estimated cost to government of its nuclear decommissioning portfolio. Based on this analysis we suggest recommendations to develop this portfolio view further in order to inform future policy decisions. The annexes present detailed analyses of the cost estimates in aggregate and individually. This paper only considers the financial cost of decommissioning and we do not comment on policy, technical considerations, nuclear incidents or project delivery.

This report was prepared based on data shown in accounts to March 2022. For this reason, the figures highlighted within this report will not represent the latest position in line with accounts to March 2023. Notable changes to results at March 2023, or the assumptions used, have been noted in Annex A – C. This does not affect the underlying discussion of financial risk, which is the focus of this report, or the recommendations within it.

Nuclear decommissioning in the UK

The UK has nuclear sites from the earliest days of the post-war 1940s nuclear industry to new nuclear power stations currently under construction. The nuclear industry provides significant benefits to the UK, importantly low-carbon power[7] and the nuclear deterrent[8].

However, nuclear activity results in hazardous waste and contaminated sites which require management and decommissioning. This decommissioning ensures the site is safe for re-use and there is no risk of harm to the public. Government is currently responsible for decommissioning many

[5] The Contingent Liability Approval Framework, April 2023, contains further information on contingent liabilities, in the context of Managing Public Money and HM Treasury spending control.

[6] Whole of Government Accounts 2020-21, July 2023

[7] The Net Zero Strategy, October 2021

[8] The UK's nuclear deterrent: what you need to know, March 2023

nuclear sites and is potentially exposed to further decommissioning costs in future. In particular, the UK is home to the largest and most complex nuclear site in Europe – Sellafield[9].

In September 2016, government announced the decision to build Hinkley Point C, the first nuclear power station to be built in the UK since 1995. Further, in November 2022 government announced plans to set up Great British Nuclear, a vehicle tasked with developing a resilient pipeline of new nuclear builds, including support for Sizewell C and business involvement in the development of small modular nuclear reactors. This is designed to ensure that Britain's future energy supply includes reliable, affordable, low carbon power that is generated in this country. As a result, there will be increased nuclear activity in the UK in the future and consequently further nuclear decommissioning required.

Decommissioning nuclear sites requires complex activity which can take place over more than 100 years. This means it has a high cost and that cost can be difficult to project accurately. Understanding the risk held by government is just one key aspect of being able to implement the policies necessary to carry out this decommissioning in the most cost-effective and safe way. This is important not just for managing ongoing decommissioning, but also to be better prepared for potential future decommissioning.

[9] Nuclear Decommissioning Authority, Annual Report and Accounts 2021/22, see Sellafield Limited page 208.

2. BACKGROUND

Nuclear decommissioning activity

Decommissioning of a nuclear site is the final step in a nuclear facility's lifecycle. The process can be summarised in four broad steps as outlined below[10]. Government's portfolio of nuclear decommissioning contains all four of these steps.

Defueling

Removing the spent nuclear fuel

Deconstruction

Removing the structures

Waste removal

Removing the radioactive waste

Waste disposal

Storage and disposal of waste

Nuclear decommissioning organisations

The vast majority of the risk exposure in government's nuclear decommissioning portfolio arises from three key organisations:

Nuclear Decommissioning Authority (NDA)	Government body responsible for decommissioning the first generation of nuclear sites. 17 sites including nuclear power stations, research centres and fuel-related facilities. The largest and most complex site is Sellafield. NDA will take on responsibility for other sites from other organisations in future.
Ministry of Defence (MOD)	Government body responsible for decommissioning costs related to the Defence Nuclear Programme, including the nuclear deterrent and nuclear-powered submarines.
Nuclear Liabilities Fund (NLF)	Company and trust responsible for meeting the costs of decommissioning the second generation of nuclear sites. Includes 8 privately operated nuclear power stations. Underwritten by government, covering any deficit or surplus.

[10] The NDA's operating companies also carry out construction projects as part of the decommissioning process. For example, to extract, repack, and store waste in more modern facilities.

There is currently only one new nuclear power station under construction. While there is only a remote risk of public funds being required for decommissioning activity relating to new nuclear power, it still represents a risk for government:

Hinkley Point C (HPC)	The government announced the decision to build Hinkley Point C (HPC) in September 2016, and as of May 2022 electricity generation is expected to begin in June 2027. This is the first nuclear power station built in the UK since 1995.

HPC will be followed up by Sizewell C and further activity through Great British Nuclear, meaning there will be increased spend on nuclear activity in the UK in future.

Beyond the organisations listed above, there are a number of smaller public sector organisations exposed to decommissioning risk, such as URENCO, UK Atomic Energy Agency and historical British Energy contracts[11] held by the Department for Energy Security and Net Zero (DESNZ)[12]. This paper does not discuss these organisations or these risks as they are not large enough to materially impact the analysis and the recommendations.

Nuclear decommissioning funding and activity

The table below sets out the responsibilities held in relation to nuclear activity across government's portfolio. This includes which organisations are responsible for funding the decommissioning and who will be carrying out each type of decommissioning activity.

		Who does each type of activity			
Nuclear area	**Funder**	**Defueling**	**Deconstruction**	**Waste removal**	**Waste disposal**
First generation	NDA	NDA	NDA	NDA	NDA
Second generation	NLF	Private operator	NDA[13]	NDA[13]	NDA
Defence	MOD	MOD	MOD	MOD	NDA
HPC	Private operator	Private operator	Private operator	Private operator	NDA

[11] British Energy was a UK energy company which was restructured in 2005. The UK government assists British Energy (now EDF Energy Nuclear Generation Limited) in meeting its contractual historic fuel liabilities.

[12] We refer to DESNZ throughout this paper, this policy area was previously under the Department for Business, Energy and Industrial Strategy (BEIS), and other prior versions of that department.

[13] 1 of the 8 power stations, Sizewell B, will not transfer to the NDA. Deconstruction and waste removal will be carried out by the operator.

3. KEY RISKS

Reviewing the estimated cost to government from its nuclear decommissioning portfolio, CLCC has identified the key risks which could result in costs being higher than expected. This section covers the complexity and interdependencies of these risks.

The table overleaf presents a summary of liabilities, funding, and risks for the core government organisations, further detail and an individual summary for each organisation can be found in the Annex.

Where government is responsible for funding nuclear decommissioning it is exposed to a number of standard cross-sector risks. We describe these in detail in the subsequent section.

The table suggests that the total estimated discounted cost to government net of assets is £257bn. It is important to note that this figure is highly susceptible to changes in discount rates and other underlying assumptions. This figure compares to a current annual government spend on nuclear decommissioning across the NDA and MOD of around £3bn.

The table summarises net liabilities across four very different risks that are not directly comparable. Importantly, these figures do not reflect any potential future commercial income for the NDA, additional nuclear submarines currently planned by MOD, future contributions to the NLF from DESNZ or any costs arising from HPC.

While the table states that the net cost to government from the NLF and HPC is nil, this does not mean there is no risk of costs arising in the future. This is because if costs are higher than expected they may fall to government.

Annex A summarises and compares the basis, assumptions and analysis of these costs and the funding across the organisations. And for more detailed analysis of each organisation, including information on changes over time, see Annexes B to E. All of the analysis set out here and in the annexes have formed the basis for the proposed recommendations in Chapter 4.

Summary of liabilities, funding and risks (as at March 2022)							
Risk source	Discounted liabilities ignoring assets[14]	Discount rate	Inflation rate	Funder	Assets[14]	Estimated cost to government net of assets	Government risks
NDA	£237bn	HMT standard	HMT standard (CPI)	Government spending via DESNZ, plus commercial recoveries	£5bn	£232bn	• Cross-sector risks • Sellafield unknowns • Funding uncertainty
MOD	£25bn	HMT standard	1.8% to 8.2% pa	Government spending	None	£25bn	• Cross-sector risks • Nuclear fuel conditioning facility • Submarine dismantling uncertainty • MOD priorities
NLF	£21bn[15]	Target investment return of 4.5%[16]		Asset fund, with contributions from government and EDF	£21bn	£0	• Cross-sector risks • Investment returns • Collaboration • Incentive payments
HPC	Expected £6bn	Undiscounted	RPI	Operator contributions to fund	Expected £8bn	£0	• Early closure • Late change in funding • Waste transfer contract caps

[14] From 2021/22 annual reports and accounts, except HPC which is based on the 2016 funded decommissioning programme

[15] The nuclear liabilities are ultimately held on the EDF balance sheet, and they are met by proceeds from the NLF fund. This figure compares to a real undiscounted provision of £24.7bn, see Annex D for further detail.

[16] NLF had a target return of 4.5% for 2021/22 and has a target return of 4.7% for 2022/23, as reported at March 2022. The target represents the required average investment return that needs to be achieved over the lifetime of the fund in order for the NLF to meet it's liabilities.

Cross-sector risks

Where government is or could be responsible for funding nuclear decommissioning, there is the risk that the cost could be higher than expected. There are a number of sources of this risk that are relevant across the sector, which we have split into liability risks, logistical risks and sector risks.

Liability risk

Changes to future costs, discounting assumptions and inflation can impact the total liability of government's nuclear decommissioning portfolio. These risks arise from government's inability to perfectly predict future costs and understand the comparative value of spending at different times. Imperfect projections lead to misleading cost estimates that may increase over time.

Future costs

Estimating future costs is inherently difficult, and this means government is exposed to a large degree of uncertainty, resulting in higher costs than expected.

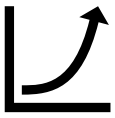
One of the main difficulties with nuclear decommissioning is the time period over which it occurs. Decommissioning can take over 100 years due to the need for long periods to allow radiological hazard to decay. There is a lot of uncertainty when predicting costs over these long periods and optimism bias can incorrectly lower cost estimates.

Discounting

Discounting can be confusing, as a change in the discount rate will result in a change in the expected cost despite no change to the expected future payments. Additionally, when different discount rates are used values are not comparable.

Discounting is the process of converting projected future costs to a single value in today's terms. Discounting is useful, as it lets us compare future costs on a consistent basis, accounting for the fact that government typically places more value on spending today than in the future. However, discounting can be misleading if not understood within a specific context.

Inflation



If inflation is higher than expected this will result in higher costs for government.

Given the long time periods involved, predicting the growth in the price of nuclear decommissioning activity is key. The price paid for construction material or labour today will not be the same as the price paid in the future. Importantly, the inflation rate applicable to each type of cost will differ, with some prices increasing faster than others.

Logistical risk

Logistical risk arises from practical issues around who is carrying out decommissioning, when work is done and the methods used. Maximising efficiency of decommissioning is incredibly complex and requires effective long-term policies to avoid these risks.

Workforce

Increased wage costs or staff shortages could result in higher costs for government.

Nuclear decommissioning involves specialist technical professionals meaning it is subject to many workforce related risks. A large proportion of nuclear decommissioning costs relate to employee salaries – representing over a third of NDA spend in 2021/22. Wage inflation could increase costs for all staff, driven by staff shortages or increased competition in the nuclear or other infrastructure sectors. This could be driven by an aging workforce or failure to train or recruit sufficient employees. Staff shortages could also impact the timing of decommissioning activity and the techniques used, introducing inefficiencies.

Contractors

Increased contractor procurement costs could result in higher costs for government.

Beyond directly employed personnel, commercial contractors can also play a significant role in carrying out decommissioning activity. As with directly employed personnel, wage inflation can increase the cost of work carried out. The cost of procurement is also subject to issues around limited competition in the sector, and contracts failing to account for the long-term, high-risk nature of decommissioning work. The sensitivity of costs to this risk will depend on the balance of direct employment to contracted work.

Timing

Changes in timing can result in changes to how decommissioning progresses, where it occurs, and the overall time required. All of this can increase costs to government.

While the time taken to carry out decommissioning is typically very long, timescales are also very important in determining costs. Seemingly small delays may impact plans for decades to come. In addition, even carrying out decommissioning faster than expected can result in increased costs, for example due to waste needing to be stored for longer.

Technological change

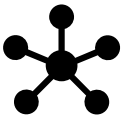
If new technology does not become available, or the cost of certain technology rises, that will result in higher costs for government.

Nuclear decommissioning is a developing area, with new techniques and technologies regularly becoming available. This means it is unclear what will be possible in the future, and how that will impact decommissioning of the sites. In particular, some decommissioning activity is not possible with current technologies and relies on the expected development of new ones.

Sector risk

Sector risk arises from government's heavy involvement in the nuclear sector. These risks require active management to avoid unnecessary costs falling to government.

Geological Disposal Facility and other interdependencies



There are interdependencies across the sector, which could significantly increase costs for government. The most important of which is the availability and cost of the Geological Disposal Facility.

As set out in the table above, the NDA is responsible for long-term waste across all nuclear activity. This is planned to be achieved through the Geological Disposal Facility, an underground facility designed for long-term safe storage of nuclear waste.

The facility is currently in planning stages, with latest plans suggesting it will be open at the earliest in 2050. The availability of this facility is key, as it determines how long waste needs to be stored temporarily elsewhere. The cost of this facility is also key, as these costs are shared across the entire sector.

The NDA also manages the Low-Level Waste Repository, which is an active facility for storing less radioactive material. Again, cost increases in the running of this facility would impact costs across the entire sector.

Regulatory or policy change

Changes in government regulation or policy concerning nuclear decommissioning may affect the costs for government.

The nuclear industry is heavily regulated due to the possibility of danger to the public. Future changes in regulation or government policy could significantly impact how and when nuclear decommissioning occurs. Importantly, this is influenced by societal expectations, which change over time.

Last resort

Other obligations may fall to government as a last resort, increasing costs for government.

While non-government entities are responsible in some circumstances for funding or carrying out decommissioning, given the long timeframe of this activity, it is not absolutely certain that they will be able to fulfil that obligation. Where a non-government entity is not able to carry out necessary decommissioning, government may be required to step in as a last resort.

4. RECOMMENDATIONS

1. Establish a cross government nuclear decommissioning financial analysis working group to share best practice and ensure appropriate consistency.

It is important to note that the government portfolio's total net estimated cost from nuclear decommissioning of **£257bn** is an aggregate figure calculated by CLCC based on each organisation's financial disclosures, with different assumptions and some inconsistencies.

While there is some collaboration between these organisations, they may benefit from a closer working relationship. This would result in best practice being shared and ensure a collective understanding of the cost of nuclear decommissioning across government.

The working group should include representatives from each organisation's finance team and could include discussions on:

- Appropriate analytical methods and standards to apply to decommissioning cost estimates, including international best practice;
- Underlying assumptions such as timelines, technological development and workforce plans;
- Benchmarking experience against past projections.

2. Carry out more detailed analysis of cost and risk. Including standard measures of risk, standard sensitivity analysis and combined analysis of total government risk.

Beyond the net cost estimate, government's nuclear decommissioning portfolio is exposed to a large amount of risk, which could mean much larger costs across its three main liabilities. There is currently no measure of this aggregate cost risk.

All the organisations produce some useful analysis of their liability, allowing for a greater understanding of the risk held. However, the exact figures produced are inconsistent between organisations and no organisation presents all of the risk measures. This needs to expand beyond accounting requirements to ensure key information is available.

These could include[17]:

- Real undiscounted liability, to show the costs in today's terms;
- Nominal undiscounted liability, to show the impact of inflation assumptions;
- Discounted liability, to show the present value of the cost;
- P50 basis and P80 basis estimates;
- Change over the last few years, with descriptions;
- And any other risk measures deemed valuable by the working group or departmental stakeholders.

[17] See Annex A for definitions.

One key aspect of presenting uncertainty is through sensitivity analysis, which can show the impact of changes in specific assumptions. This is valuable to explore and demonstrates which elements of risk will have the most impact, and importantly this can then allow for evidence-based decision making and focus mitigation and monitoring activity where it will produce the most benefit.

While detailed analysis from each individual organisation is useful, this does not necessarily produce the best cross government picture of risk. These organisations should collaborate to regularly produce an overview of cross government risk to understand the aggregate risk to government. This should be used to inform and improve policy making.

3. Make additional cost disclosures to further improve transparency and effectiveness of spending on nuclear decommissioning.

In CLCC's view, a key aspect of ensuring that decommissioning costs are minimised across government's nuclear portfolio is efficiency of spend. To maximise value for money, decommissioning activity should be driven by technical planning rather than budgetary constraints. However, government spending on nuclear decommissioning is necessarily dependent on national priorities and other funding pressures. This is especially clear in the current economic climate. Given these conflicting priorities, decisions may be made that cost more in the long-term. To understand when and why those decisions are made there needs to be greater clarity about potential decommissioning costs when making decisions on future government policy.

This could include:

- Transparency of spend, meaning that where decommissioning plans change, the impact on the total cost is shown and explained;
- Inclusion of future nuclear provisions as contingent liabilities, detailing government's future nuclear decommissioning commitments that are not yet included in the provision.

4. Leverage knowledge and analysis of historical and ongoing nuclear decommissioning to advise on new nuclear policy.

In CLCC's view, a key source of future government risk within the portfolio is construction of new nuclear power stations. Importantly, all new nuclear power stations require a Funded Decommissioning Programme agreed with the Secretary of State. This requires all decommissioning to be fully funded by the private sector operators, however this does not necessarily remove all the risk from government. Therefore, sharing learnings from historical nuclear decommissioning can be important to minimise risks for new nuclear projects.

Given that government is at risk of being the last resort where private operators do not fulfil their obligations, it is important to plan for that eventuality. Additionally, for HPC the Geological Disposal Facility remains a source of risk due to the Waste Transfer Contract caps. This demonstrates that due to the interdependencies across the nuclear sector, government will never be able to fully remove risk exposure.

Funded Decommissioning Programmes are flexible, allowing for negotiation between the operator and government. This means that lessons can be learnt from each agreement and brought forward to improve the next one. It is important to ensure that is happening as much as possible.

The working group established under the first recommendation could leverage its knowledge to facilitate this.

ANNEX A: CROSS GOVERNMENT ANALYSIS

The analysis in this annex and the individual summaries is derived from the annual reports and accounts of the relevant organisations at March 2022, unless stated otherwise. For information on methodology and sources see Annex F.

LIABILITIES:

Interpreting estimates

There are many ways to present the value of a liability. It is important to understand the basis of the calculation and the extent discounting and inflation have been allowed for when calculating a liability, as these elements can significantly influence the result. This will not directly change the actual future payments made, but it can influence decision making. Understanding how a liability has been calculated also shows how comparable other liability values are.

Basis

The basis of a liability calculation determines what the value represents in practical terms.

Where a best estimate of the liability is required, it is common to calculate a mean or a median. From their disclosures and discussions with the organisations we understand that the NDA and MOD both report a median figure. This is also known as a P50 basis, as it means that there is a 50% chance that the costs will be equal to that value or lower.

Estimates are subject to uncertainty. Where there is more potential for cost growth than cost reduction, the median cost will be lower than the mean or expected cost. Therefore, by reporting on these provisions using a median basis, the amounts could be understated compared to the expected outcome.

Where the intent is to calculate a conservative estimate, an upper end basis may be used. From CLCC discussions with NLF we understand it discloses its undiscounted provision on a P40 estimate with P80 risks and uncertainties added, which leads to a net P50 basis. This means that there is an 50% chance that the costs will be equal to that value or lower.

A conservative basis may be more appropriate to ensure the fund is sufficient to cover the liabilities which arise. This is a similar approach to that taken with funded pension schemes. HPC fund their liability on a P80 basis, with some additional contingency, this is appropriate as in this case a private operator is responsible for the fund's sufficiency. However, if the NLF ensure sufficiency on a P50 basis, this avoids requiring additional unnecessary government contributions.

Given the different bases used across the sector, the liability estimates are not directly comparable.

Discount and inflation rates

A discount rate converts expected future cashflows into an estimated cost in today's terms. This lets us compare future costs on a consistent basis, accounting for the difference in value we place on spending today compared to spending in the future.

For financial accounting purposes, all government provisions are typically discounted using standard discount rates set by HM Treasury annually. The rate applicable is dependent on the time expected until payment.

The standard rates for accounts as at March 2022 are:

HM Treasury provision discount rates (2021/22)	
Time till payment	**Discount rates pa**
0 to 5 years	0.47%
5 to 10 years	0.70%
10 to 40 years	0.95%
Over 40 years	0.66%

Inflation measures the increase in the cost of goods and services over time.

Given that these provisions are based on spending in the distant future, inflation is a very material assumption that influences expected future costs.

By default government liabilities use an annually prescribed HM Treasury inflation assumption based on the Office for Budget Responsibility's Consumer Price Index forecasts. For accounts as at 31 March 2022 this is equal to 4.0% in 2022/23, 2.6% in 2023/24, then 2.0% in all following years. However, this assumption can be changed where contract terms differ or an expert suggests an alternative is more appropriate.

Given the inflationary environment at the time of writing this report, these assumptions will likely be below experience in the short term.

The discount and inflation rate assumptions for each liability, as at March 2022, are summarised below.

Discount and inflation rate assumptions (2021/22)		
Risk source	**Discount rate**	**Inflation rate**
NDA	HMT standard	HMT standard
MOD	HMT standard	1.8% to 8.2% pa
NLF	4.5% investment return[18]	
HPC	Undiscounted	RPI

[18] NLF had a target return of 4.5% for 2021/22 and has a target return of 4.7% for 2022/23, as reported at March 2022. The target represents the required average investment return that needs to be achieved over the lifetime of the fund in order for the NLF to meet it's liabilities.

The NLF provision is based on the fund required today to generate sufficient investment returns to pay for future decommissioning costs.

If the HMT standard approach was used to value NLF's liabilities, in a similar way to government provisions, the amount would most likely be greater than the liabilities recognised by the NLF. However, the NLF's approach recognises the investment returns that can be received from the assets it holds, which wouldn't be fully reflected using the standard HMT approach.

Given the different discount rates and inflation assumptions used across the sector, the discounted liability estimates are not directly comparable.

Updated assumptions at March 2023

Discount rate and inflation assumptions are updated annually by HMT for financial accounting purposes. At the time of undertaking the analysis contained in this report, departments had not yet published their 2022/23 annual report and accounts. However, at the time of publication of this report, departments had begun publishing their 2022/23 accounts. The assumptions used for the 2022/23 accounts are set out in the table below.

HM Treasury provision discount rates (2022/23)	
Time till payment	**Discount rates pa**
0 to 5 years	3.27%
5 to 10 years	3.20%
10 to 40 years	3.51%
Over 40 years	3.00%

Given the long-term nature of the nuclear decommissioning liabilities and the compounding effect of applying discount rates over multiple years, small changes in the discount rate can have a significant impact on the value placed on these liabilities now. In isolation, the impact of this significant increase in discount rates for 2022/23 accounts will be to significantly reduce the value placed on the liabilities. Changes to other assumptions, such as inflation, may have partially offsetting impacts.

Undiscounted liabilities

Even when a liability is not discounted, i.e. the value is equal to the total estimated future cashflows, there can be differences in the calculation.

Importantly the NDA, MOD and NLF state their undiscounted provisions on different bases:

- The NDA and NLF state their total real cashflows, i.e. the money they will spend in future ignoring the effect of future inflation.
- MOD states its total nominal cashflows, i.e. the money they will spend in future including the effect of future inflation.

This has the effect that the NDA's discounted provision is larger than its undiscounted provision, while MOD's discounted provision is smaller than its undiscounted provision. Both of these are still in line with the standard government assumptions for discount rates and inflation, they are just presented differently. Consequently, it is important to recognise if undiscounted figures include or exclude future inflation.

Given the different bases used across the sector, the undiscounted liability estimates are not directly comparable.

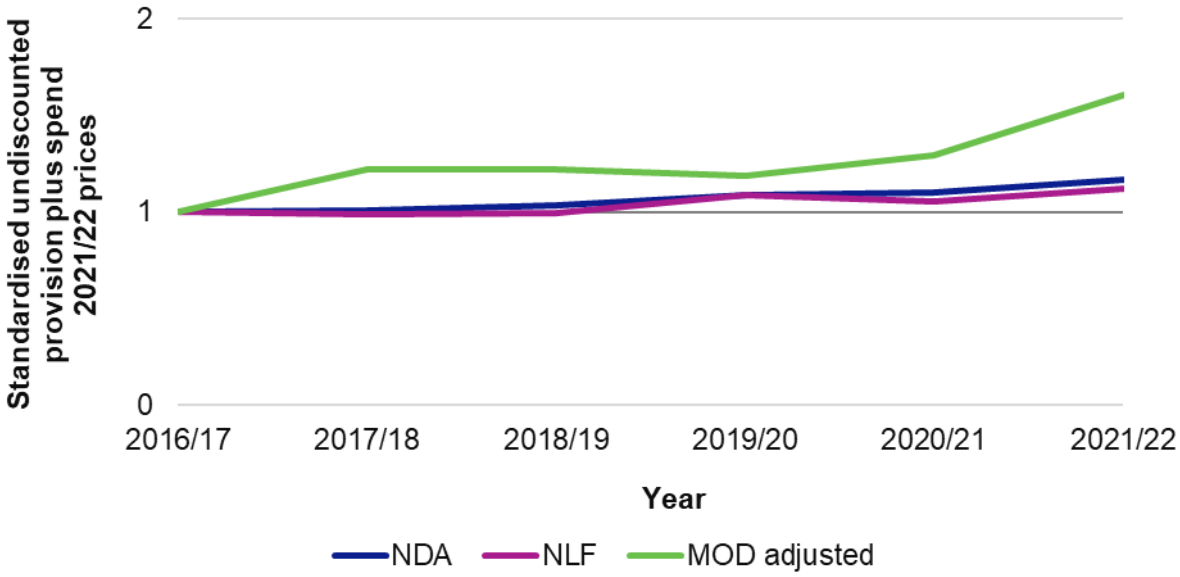
Maturity of estimates

Due to the uncertainty around nuclear decommissioning, it is expected that cost estimates will change over time. However, as estimates mature, i.e. as activity is undertaken and the understanding of future requirements develops, we would expect the number of cost revisions to reduce.

Figure 1 below shows the change in total estimated decommissioning cost plus aggregate spend for the NDA, MOD and NLF from 2016/17 to 2021/22. We have standardised the estimates to equal 1 as at the start of the period, to show the change over time.

Due to a discontinuity in MOD's provision as discussed in the **MOD summary** in Chapter 3, we present an adjusted line for MOD, which ignores the entire increase between 2017/18 and 2018/19.

Figure 1 – Standardised undiscounted liability and spend by organisation over time



This shows that even when removing the discontinuity for MOD it has grown the most in the last six years. This could mean that MOD's provision is the least mature estimate, with a lot of work still in the planning stages.

However, this does not mean that we do not expect significant changes in the NDA or NLF provisions in future. All of the organisations are exposed to a significant degree of risk which could result in large cost increases in future. It could be that a review of plans and costs has not taken place recently enough to capture cost increases. The NLF in particular is exposed to cost risk as decommissioning activity is only just beginning.

It is also important to note that cost growth is not necessarily the result of previous estimates being incorrect, the underlying scope of work may increase as well. The NDA and NLF are exposed to this scope growth due to the complex and uncertain nature of first and second generation nuclear sites, and MOD has ongoing projects which increase the decommissioning required in future.

Sensitivities at March 2022

Assumptions are subject to uncertainty. Sensitivity analysis demonstrates the change in liabilities as a consequence of changes to assumptions. It demonstrates possible outcomes and helps identify the most material assumptions, and therefore the most material risks.

Below we discuss the sensitivity analysis available concerning the sources of government risk.

Currently, this analysis is carried out on an individual basis by each organisation, and there is no standardised approach or outputs. As a result there are areas where there is little to no comparability between estimates. Ultimately this means that there is no aggregate estimate of government's exposure to changes in the cost of nuclear decommissioning.

From the CLCC's summary of the available information, we can see that small changes in individual assumptions can lead to large changes in the overall provision, with costs doubling in some cases. These assumptions can be relevant across multiple sources of government risk and this can lead to large concentrations of risk that could arise simultaneously.

NDA is currently the only organisation that presents an aggregate estimate of the uncertainty in its provision. This currently ranges from £193bn to £483bn, as at March 2022.

Discount and inflation rates

The sensitivity of the NDA and MOD's provisions to changes in the discount rate, as at March 2022, is shown below:

Sensitivity to changes in discount rate at March 2022 £bn (%change)		
Change in discount rate	**+0.5%**	**-0.5%**
NDA impact	-42 (-18%)	56 (+24%)
MOD impact	-5 (-21%)	7 (+29%)

The above shows that nuclear decommissioning provisions are very sensitive to small changes to the discount rate assumptions. Looking ahead, the HM Treasury discount rates applicable for accounting disclosures as at 31 March 2023 are significantly higher, all else equal this will result in a large decrease in discounted provisions.

The MOD provision is more sensitive to changes in discount rate in percentage terms. This is likely due to MOD's expected future spending taking place at a later date than the NDA's on average. However, because the NDA provision is so much larger, the absolute impact is still much larger for the NDA.

Only MOD presents sensitivity analysis regarding inflation, it is summarised in the table below (as at March 2022):

Sensitivity to changes in inflation rate at March 2022 £bn (%change)		
Change in inflation rate	**+0.25%**	**-0.25%**
MOD impact	+3 (+13%)	-3 (-11%)

Underlying costs

Both the NDA and MOD provide sensitivity analysis around cost increases relative to specific areas. These are summarised in the table below:

Sensitivity to changes in costs at March 2022			
Organisation	**Area**	**Sensitivity**	**Effect £bn (% change)**
NDA	**Sellafield**	Cost range	-31 to +187 (-18% to +106%)
NDA	**Nuclear Waste Services**	GDF potential cost	-9 to +52 (-33% to +199%)
NDA	**Magnox and Dounreay**	±10% Magnox costs	-3 to +3 (-9% to +9%)
MOD	**Geological Disposal Facility**	Cost range	-2.5 to +10.0 (-50% to +200%)
MOD	**Atomic Weapons Establishment**	Cost range	-0.2 to +0.4 (-13% to +26%)
MOD	**Nuclear fuel management**	±1%	-<0.1 to +<0.1 (-1% to +1%)
MOD	**Submarine afloat**	±1%	-<0.1 to +<0.1 (-1% to +1%)
MOD	**Submarine dismantling**	±1%	-<0.1 to +<0.1 (-1% to +1%)

Given the different sensitivities applied both between organisations and within the same organisation, it is difficult to compare or aggregate these figures. However, the NDA does present aggregate sensitivities in its financial disclosures across each area, capturing these sensitivities and others.

What we can see is that the potential costs for specific areas can be subject to significant uncertainty, of up to 200%. This suggests that high-level sensitivities of ±1% or 10% may be underestimating the true risk if they are not considering realistic scenarios.

Timelines

The time taken to carry out an activity, or a delay to scheduled activity can have a serious impact on outcomes. This is demonstrated via two sensitivities provided by the NDA and MOD:

Sensitivity to delays at March 2022			
Asset	**Area**	**Sensitivity**	**Effect £bn (% change)**
NDA	**Magnox & Dounreay**	±1 year Dounreay interim end state	-0.2 to +0.2 (-1% to +1%)
MOD	**Submarine dismantling**	6 month delay to all submarines	+0.3 (+16%)

Geological Disposal Facility

All of the decommissioning activity discussed in this paper relies on the Geological Disposal Facility in order to store radioactive material long-term. This means that small changes in plans for the facility can have an impact across government.

A key uncertainty is when the facility will be ready to receive waste. The NDA's provisions assume the facility will be available in 2045, while MOD's assume 2043/44. While they both highlight that a small delay would have a minimal impact, sensitivity analysis is presented for a long-term delay:

Sensitivity to Geological Disposal Facility delays at March 2022			
Asset	**Area**	**Sensitivity**	**Effect £bn (% change)**
NDA	**Overall**	20 year delay	+2.1 (+8%)
MOD	**Nuclear fuel management**	10 year delay	+0.4 (+5%)
MOD	**Geological Disposal Facility**		+0.8 (+16%)
MOD	**Atomic Weapons Establishment**		+0.1 (+8%)
MOD	**Submarine dismantling**		+0.2 (+9%)
MOD	**Special nuclear materials**		+0.1 (+3%)

The NDA's latest planning assumption is the facility will be ready for intermediate-level waste from around 2050 to 2060, and high-level waste and spent fuel from 2075. Based on the sensitivities above this could increase costs across government by £bn's.

Funding:

While managing liabilities directly is key to minimising risk and therefore cost, how a liability is funded can have a significant impact on the liabilities themselves and the efficiency of any spend. The key distinction between the sources of risk here is that the NDA and MOD are largely funded on a pay as you go basis through government spending, while the NLF and HPC are funded in advance.

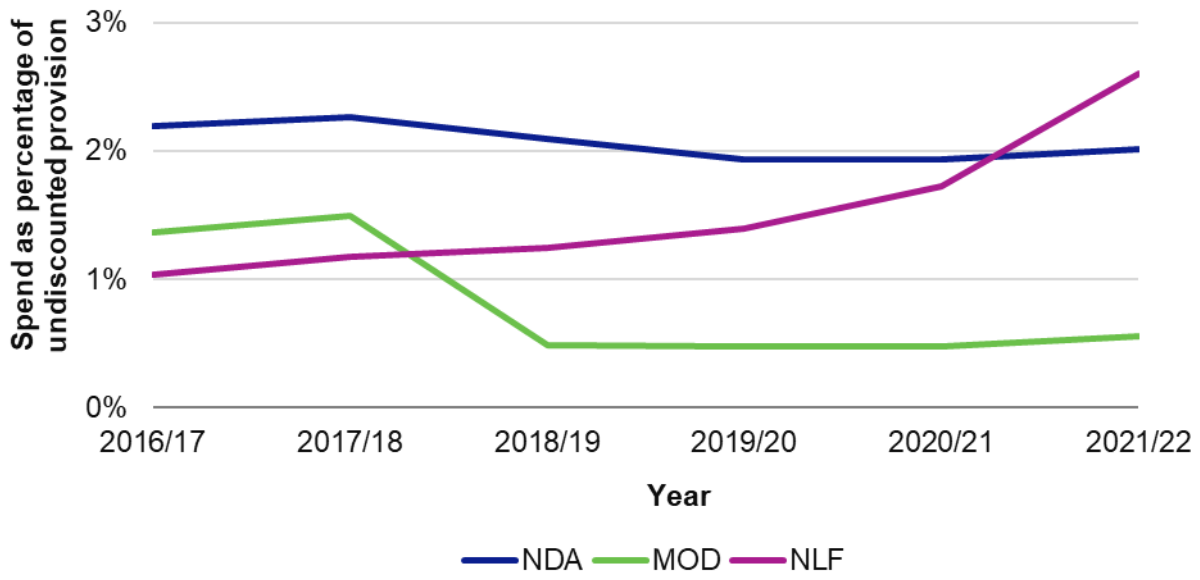
Spend

While nuclear decommissioning liabilities are very large, they reflect spend over a very long period of time. This means the spend in each year is much lower than the total liability and represents a small fraction of annual government expenditure.

Across the NDA and MOD, government spent around £3bn in 2021/22 against the nuclear decommissioning provisions. This is around 0.3% of total departmental expenditure across government in the year. Looking at projections for future spend, even in peak years nuclear decommissioning will remain a small percentage of total government expenditure.

To examine the spend relative to the liability, Figure 2 below shows the spend each year as a percentage of the undiscounted provision at that point in time for the NDA, MOD and NLF from 2016/17 to 2021/22.

Figure 2 – Spend as proportion of undiscounted liability by organisation over time



We see that the NDA has a relatively static spend profile as a percentage of its provision. MOD shows a fall, however this is due to the discontinuity in its undiscounted provision. The NLF shows a rise, reflecting the increase in spending as defueling and decommissioning activity begins.

Note that this does not include the £5bn contribution to the NLF fund from DESNZ in 2021/22. The NLF is funded in advance, and so this contribution will be spent against the provision at a future date.

Budgeting

The NDA, MOD and NLF are all funded by government, but in different ways.

NLF has the most certainty over its spend, as they utilise the fund in line with the planned decommissioning. NLF funding is provided on the basis of spending estimates provided by EDF and approved by the Non-NDA Liabilities Assurance team in the NDA. MOD has the next most control, using its budget as it sees fit to fund their planned decommissioning, however this is subject to other budgetary priorities in the department. Finally, the NDA has least control, as it is funded by DESNZ and commercial income, and so are subject to wider departmental budget priorities as well as uncertain future commercial activity.

However, it is important to note that the efficiency of decommissioning spend may differ between organisations, impacting value for money.

A key concept when considering how to achieve value for money is incentivisation. This means ensuring that the organisation carrying out the work will be rewarded for doing so in a cost-effective way.

Given the direct government oversight and control over the NDA and MOD, incentives are likely well aligned to deliver efficiency.

The NLF differs because EDF Energy is carrying out the decommissioning with all costs completely funded through the NLF. This means that beyond the small incentive payments which were recently implemented, EDF Energy has limited incentives to achieve value for money overall other than reputational concerns for the company and its activities in the new nuclear landscape. Although it is not an incentive, the EDF must go through a Reasonable and Prudent Operator Test to assess if EDF is demonstrating skill, diligence, prudence and foresight. This test is designed so that value generated from the spending incurred is being carefully considered.

HPC on the other hand relies on a contract for difference funding model. This means that the operator receives a fixed price for the energy generated. Where this price is above the market value for energy, government will pay the difference, funded through consumer energy payments. There are a number of factors influencing the price paid under the contract for difference, however in general decommissioning costs should not. This means that the operator is incentivised to minimise costs, maximising profit.

Fund management

Where a fund of assets is being held to pay for future costs, the investment strategy is a significant factor in whether the assets will be enough to pay the costs as they fall due. Both the NLF and HPC involve funds, however they are managed very differently.

As at March 2022, the NLF holds £21bn of assets. It invests around 83% of this in the National Loans Fund and the remaining 17% in a mixed portfolio of higher returning assets. The overall fund has returned 2% in the 3-year period to 31 March 2022, while the higher risk assets have returned 8.7% in the same 3-year period.

The sufficiency of the fund has previously been addressed by transferring £600m in 2018-19 and a further £250m in 2019-20 from the National Loans Fund into higher returning assets. In more recent years, when the fund has been determined insufficient, HM Treasury has instead decided to provide additional funding to be invested in the National Loans Fund. This funding was £5bn in 2020 and another £5.6bn in 2022.

This approach was made with consideration to HMG fiscal and cash management priorities, and judgement on value for money for the Exchequer as a whole. Increasing the NLF's deposit with the National Loans Fund has zero net impact on the current position of the public sector balance sheet. Government may use money retained in the National Loans Fund (which NLF is invested in) to invest in infrastructure or current spending, which generate longer term financial returns but also social and economic benefits, which are all highly valued by government. It may also be used to pay down government debt. Whilst the investment in the Mixed Asset Portfolio (MAP) might provide higher returns, it would also come with higher risk and higher transaction costs than investment in the National Loans Fund. Additionally, investment outside the central Exchequer funds requires cash to be raised, increasing government debt at the point of investment. The long term effect on the public sector balance sheet from the two approaches will depend on the returns achieved through the deployment of the assets.

The key difference with HPC is that if investment returns are less than expected the private sector operator will need to contribute more without any additional funding from government or its energy contract, removing most of the risk from government. As a result, government has less control over the investment strategy and so a larger return can be made. This is demonstrated by the NAO HPC review which found that the operator expects around 40% of the total costs of decommissioning to be funded through investment returns compared to contributions to the fund. Although the NLF was originally established in 1996 on the same basis (private operator was expected to contribute without additional funding) government now has responsibility to step in as last resort.

The fund's investment strategy is still subject to some controls however. Early on these are relatively broad, largely limiting concentration of risk and prohibiting certain risky or potentially unethical investments. But close to the end of the funding periods de-risking is planned to ensure the fund is fully funded and not subject to too much investment risk. This de-risking occurs progressively, removing equities from the portfolio, resulting in 50% government securities by end of the first 37 years, with the rest made up from corporate bonds. From year 60 to site end state, the fund will be comprised of 100% government securities, other than cash or permitted derivatives.

ANNEX B: NUCLEAR DECOMMISSIONING AUTHORITY

The analysis in this annex and the individual summaries is derived from the annual reports and accounts of the relevant organisations at March 2022, unless stated otherwise. For information on methodology and sources see Annex F.

Summary at March 2022

Background

The Nuclear Decommissioning Authority (NDA) is responsible for decommissioning the first generation of nuclear sites. These 17 sites include nuclear power stations, research centres and fuel-related facilities. The largest and most complex site is Sellafield.

Liabilities

£237bn[19] The NDA's estimated future cost of its future decommissioning activities, reflected in its nuclear provision as at 31 March 2022 on a P50 basis using the standard government discount rate and inflation assumption.

This is split into 4 key areas:

Sellafield – £177bn

The largest and most complex nuclear site managed by the NDA. Activities include reprocessing spent fuel, interim storage of materials before transfer to the Geological Disposal Facility, and decommissioning and demolition of facilities.

Magnox and Dounreay – £34bn

Electricity generation at the final Magnox site ended in 2015, and these sites have all been defueled. The Dounreay site is currently being decommissioned, with an interim end state scheduled for 2033. Activities now include interim storage of materials before transfer to the Geological Disposal Facility, and decommissioning and demolition of facilities.

Nuclear Waste Services – £26bn

Activities include planning, construction and operation of the Geological Disposal Facility, operation of the Low-Level Waste Repository, and the management of residual liabilities at the Springfields and Capenhurst sites. Note this liability excludes disposal facility costs funded by other organisations, which we discuss elsewhere in this report.

Nuclear Transport Solutions – £0.1bn

Activities include decommissioning assets used in the transportation of nuclear materials.

[19] As noted in earlier sections of this report, this report uses Annual Report and Accounts to March 2022 as subsequent Annual Reports and Accounts were not prepared at the time.

The NDA also records a contingent liability reflecting its future responsibilities for the second generation of nuclear sites. We discuss this liability in detail in the **NLF section**.

Funding

The NDA is funded through government spending, as an arm's length body of DESNZ, as well as some income from commercial activity. In 2021/22 DESNZ funded £2.8bn of spend and there was £0.7bn of commercial income, £3.0bn of this was spent towards the provision. The funding available reflects only current commercial agreements and is expected to be supplemented by additional commercial income in future.

£5bn[20] The NDA's estimated recoverable contract costs, reflecting commercial agreements meaning some nuclear provision spend will be recovered from third parties.

Risks

Beyond the cost risks which impact the whole sector, the NDA is exposed to the following risks:

Sellafield unknowns

Sellafield is the largest and most complex nuclear site in the UK. Due to a complex history of activity and incomplete records, the exact nature of the decommissioning work required at Sellafield is unknown. This means there is a significant risk that the scope of work required grows over time and costs increase.

Funding uncertainty

As the NDA receives its budget from DESNZ and commercial activity, it is not in direct control of the funds available to it. The NDA has to adjust its decommissioning activity in light of the budget it is granted, and does not have certainty over its future budget. It also may need to react to a fall in commercial activity. The available budget can have a significant impact, influencing when and how decommissioning occurs. If this introduces any inefficiencies in the decommissioning process, this will result in increased overall costs for government. However, we understand from discussions with the NDA that broadly, decommissioning is carried out in line with its plans.

[20] There exists other offsetting NDA costs that are outside of the scope of this report which means that NDA's recoverable contract costs, as presented on its balance sheet at 31 March 2022, are less than £5bn.

Analysis

Change in undiscounted cost over time, by area

If provisions were perfectly accurate and there was no growth in the underlying costs, you would expect the undiscounted value plus the cumulative actual spend to stay largely constant over time. This is because the provisions reflect the total estimated future yearly costs. Figure 3 below shows the actual experience for the NDA provision since 2004/05, split by Sellafield and non-Sellafield costs. The NDA expresses its undiscounted provision on a real basis, i.e. ignoring future inflation.

Figure 3 – Undiscounted provisions by area and spend for the NDA nuclear decommissioning over time

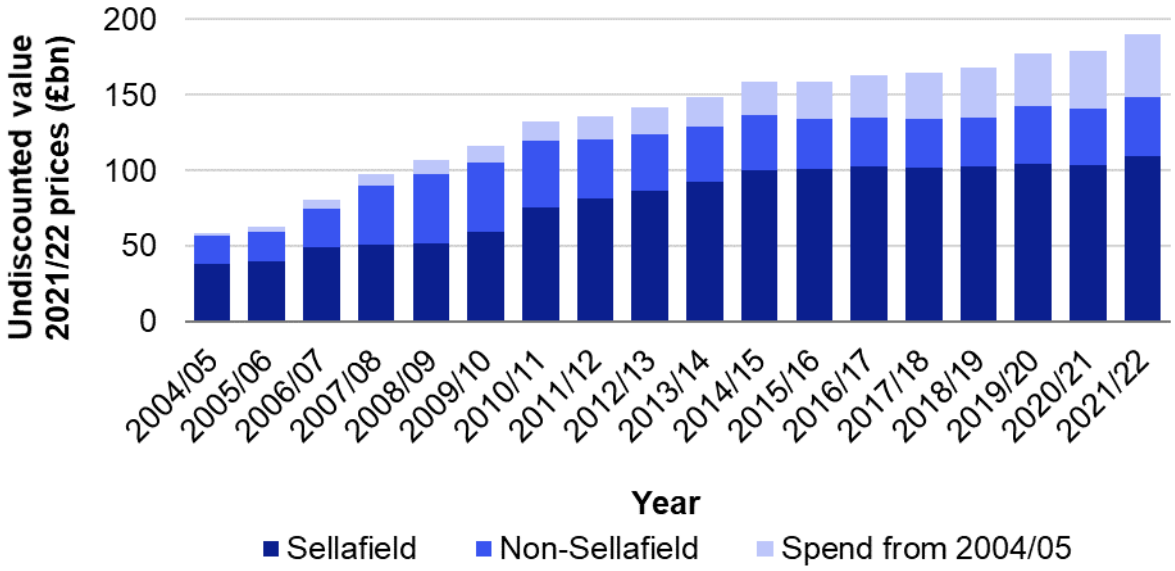


Figure 3 shows that the estimated cost of decommissioning older sites has risen over time. The change in the early 2000s was due to estimated costs at Sellafield being increased following successive reviews of the work involved. In addition, the cost of the Geological Disposal Facility was added to the non-Sellafield provisions in 2007/08. This highlights that cost increases in nuclear decommissioning estimates are due to both increased costs for carrying out a defined scope and increases in the scope of work.

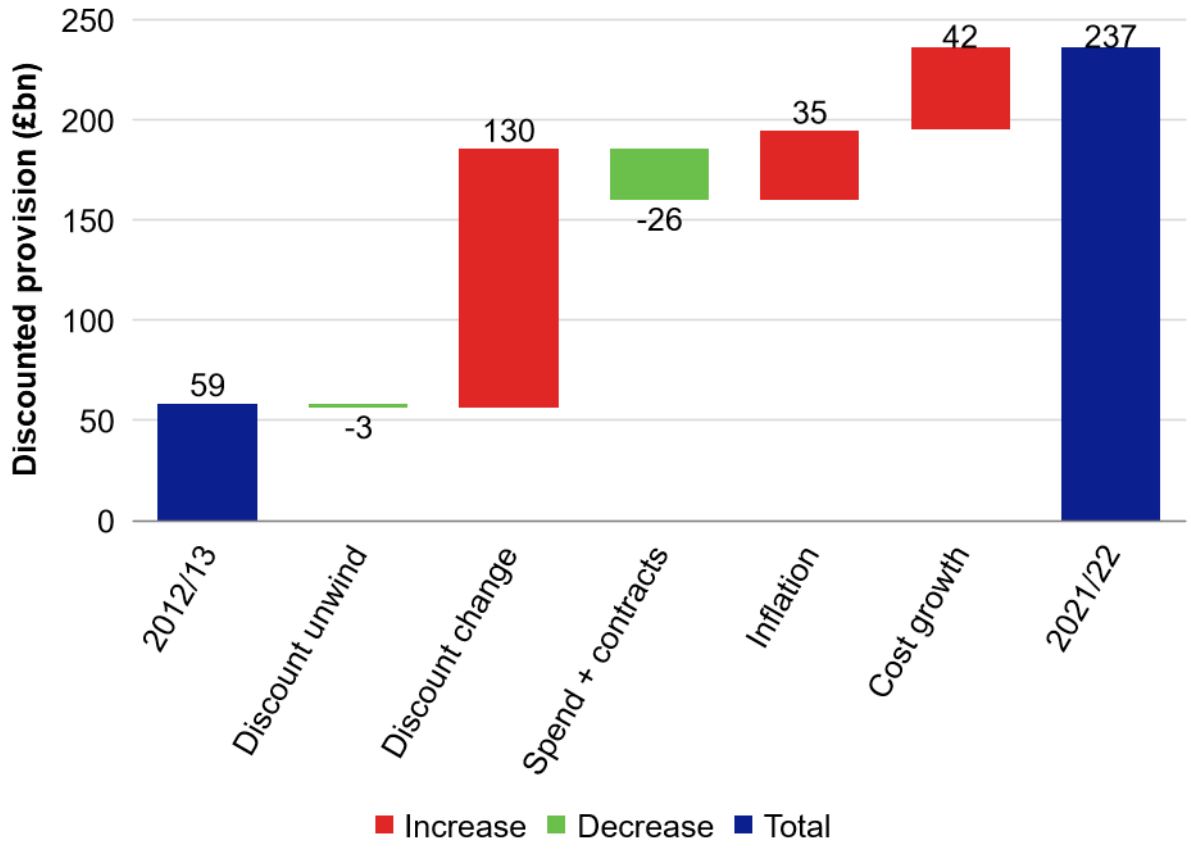
In the last few years provisions have stabilised, suggesting that estimates have matured to the point that they are no longer as uncertain. However, this ignores that spending is ongoing, meaning that the actual total cost is still increasing. Including spend, the total undiscounted cost has increased by £27bn in real terms over the last 5 years.

Some of the costs above are not held by the NDA, as it has entered into commercial agreements resulting in recoverable contract costs. The value of these assets is not reflected in Figure 3 above.

Cumulative change in cost over time

Figure 4 below shows the source of movements in discounted provisions, over the period where this detailed information is available.

Figure 4 – Cumulative change in discounted the NDA provision over time, by source

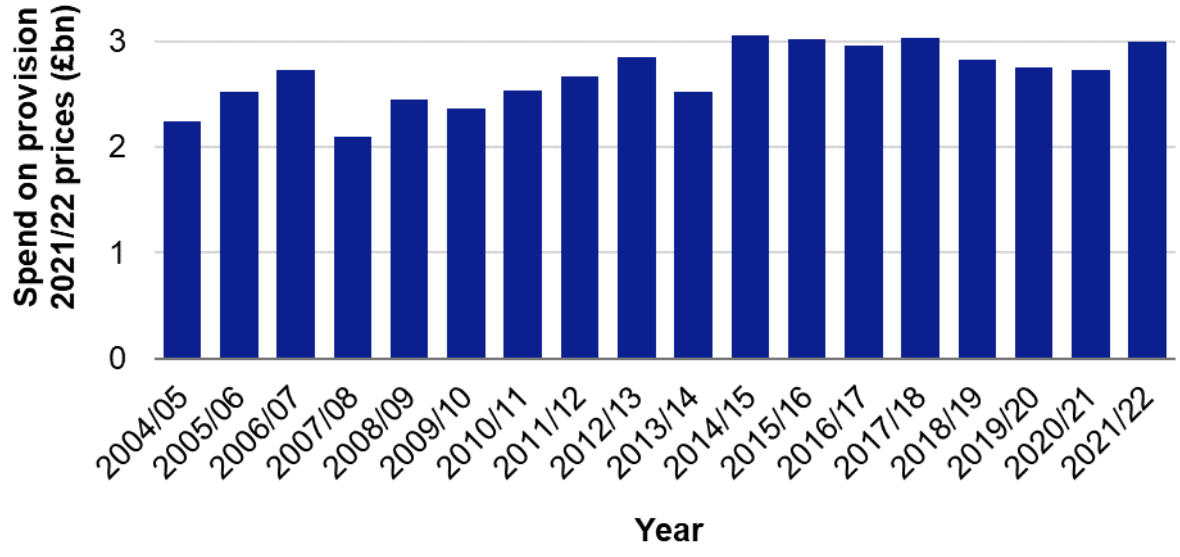


We can see that the largest impact over the period has been the falling discount rate, although this has no impact on expected future cashflows. Beyond that, inflation and other cost increases arising from revisions to planned programmes have resulted in an increase of around £75bn.

Actual and projected spend on decommissioning

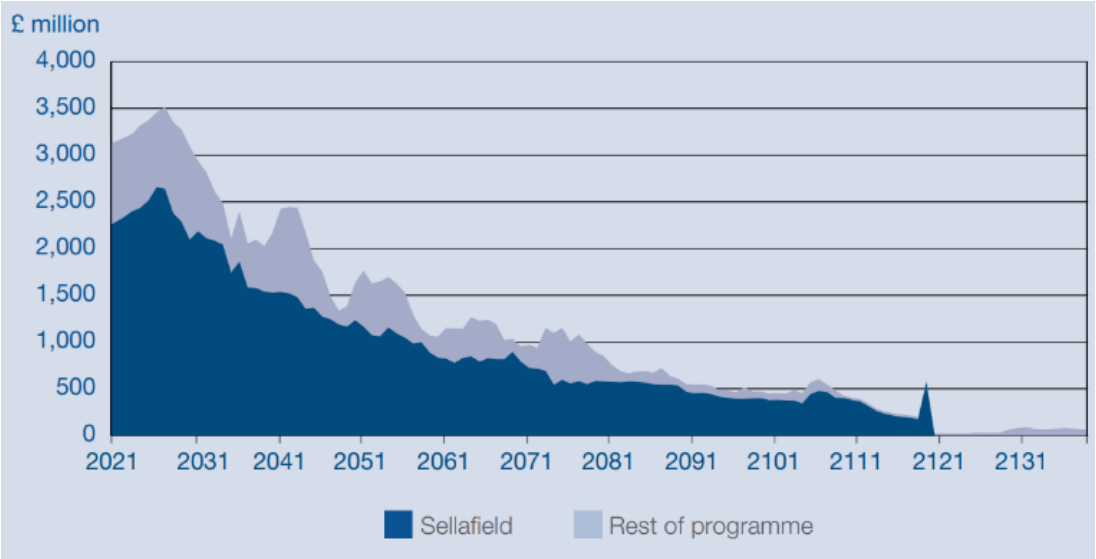
Figure 5 shows that the NDA's spend has been on average slightly increasing in real terms over the last 18 years and has been fairly level over the last 8 years.

Figure 5 – Actual NDA spend on provision over time



Looking forward, Figure 6 demonstrates that currently, spending is expected to peak near the end of the decade, and then slowly decline over the remaining period.

Figure 6 – Total projected NDA expenditure profile, source DESNZ annual accounts 2021/22



It is important to note that the peak spend is £3.5bn, which while large is much smaller than other government in year spending items. This demonstrates that while the nuclear provisions held by government are large, this cost is spread over many years. Also, given the NDA's commercial income, some of this spending will not be funded by taxpayers.

Results at March 2023

The Nuclear Decommissioning Authority published their 2022/23 annual report and accounts just ahead of publication of this report. The total liability has decreased from £237bn at March 2022 to £124bn at March 2023, with the change in discount rate reducing the liability by £134bn. Other notable changes include an increase of around £9bn resulting from a change in the underlying cost estimate of the Magnox and Dounreay programme. This reflects an updated estimate of the cost, duration, and timing of the decommissioning of the sites following the merger. The table below sets out a comparison of the discounted liabilities at March 2023 against results at March 2022.

NDA liabilities at March 2023

Provisions	2021/22	2022/23
Total liabilities	**£237bn**	**£124bn**
Sellafield	*£177bn*	*£84bn*
Magnox	*£34bn*	*£30bn*
Nuclear Waste Services	*£26bn*	*£10bn*
Nuclear Transport Solutions	*£0.1bn*	*£0.1bn*

ANNEX C: MINISTRY OF DEFENCE

The analysis in this annex and the individual summaries is derived from the annual reports and accounts of the relevant organisations at March 2022, unless stated otherwise. For information on methodology and sources see Annex F.

Summary at March 2022

Background

The Ministry of Defence (MOD) is responsible for decommissioning costs related to the Defence Nuclear Programme, including the nuclear deterrent and submarines.

Liabilities

£25bn[21]	MOD's estimated future cost of its decommissioning activities, reflected in its nuclear provision as at 31 March 2022 on a P50 basis using the standard government discount rate with some adjusted inflation assumptions.

This is split into 6 key areas, excluding some 'non-significant' provisions that total £3bn:

Nuclear fuel management – £7.4bn
Storage of irradiated fuel from submarines at Sellafield and the MOD's contribution towards the subsequent costs of building the conditioning facility to prepare the material for safe storage.
Geological Disposal Facility – £5.0bn
A share of the cost to build and operate the facility based on the proportion of the total inventory.
Submarine afloat – £4.1bn
Maintenance and storage of out of service submarines before disposal.
Atomic Weapons Establishment – £1.7bn
Decommissioning of facilities, decontamination and storage of materials relating to the warhead programme managed by the Atomic Weapons Establishment.
Submarine dismantling project – £1.7bn
Dismantling of 27 nuclear-powered submarines, not including the current four Astute class.
Special nuclear materials – £2.1bn
Storage cost for materials of no further strategic use.

[21] As noted in earlier sections of this report, this report uses Annual Report and Accounts to March 2022 as subsequent Annual Reports and Accounts were not prepared at the time.

Funding

MOD is entirely funded through government spending, and MOD has authority to use its budget to achieve its objectives as it sees fit.

Risks

Beyond the cost risks which impact the whole sector, MOD is exposed to the following risks:

Irradiated fuel conditioning facility

In order to safely store irradiated fuel, a conditioning facility is required. This will be an NDA project, with the cost to MOD based on the estimated usage. The construction of this facility will begin in over fifty years' time. Estimates of the cost of building and operating this facility are necessarily subject to a lot of uncertainty.

Submarine dismantling uncertainty

MOD has not yet fully dismantled any of its nuclear-powered submarines and does not expect to have fully developed the process until 2026. Estimates of the cost of carrying out this dismantling are necessarily subject to a lot of uncertainty.

MOD priorities

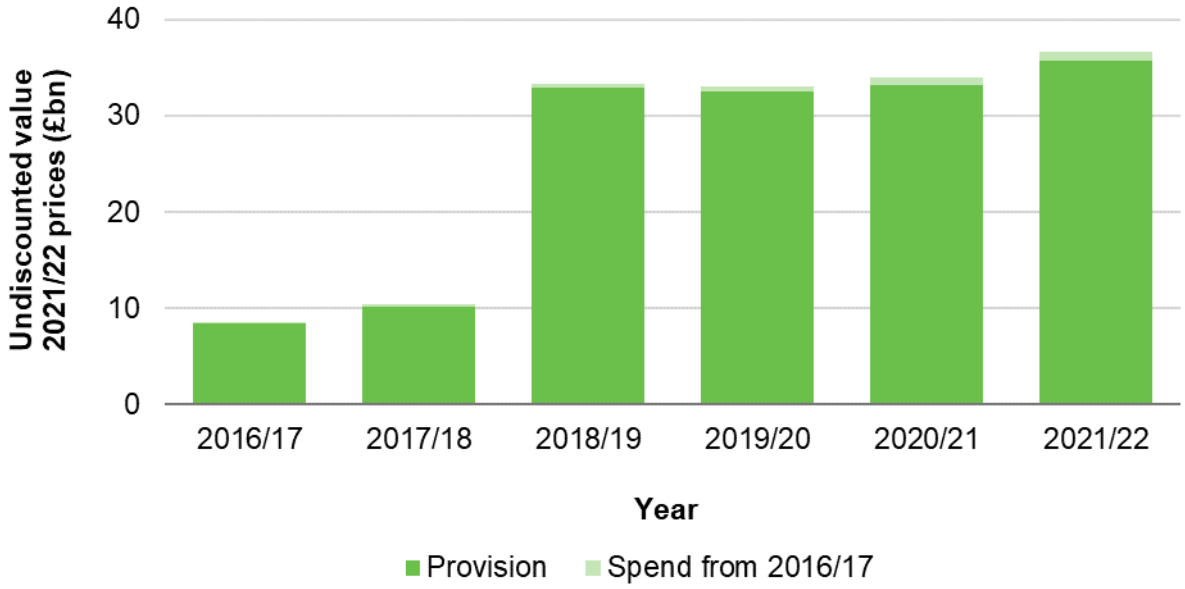
As decommissioning is funded from the overall MOD budget, this means it is competing with other spending priorities for funding. MOD is incentivised to manage the decommissioning spend as much as possible to avoid unexpectedly large costs arising in future years. However, there may be circumstances where MOD's other objectives take priority, this could lead to inefficiencies in decommissioning increasing the total cost for government. Although MOD will be bound by the requirement to maintain safety at the relevant sites.

Analysis

Change in undiscounted cost over time

If provisions were perfectly accurate and there was no growth in the underlying costs, you would expect the undiscounted value plus the cumulative actual spend to stay largely constant over time. This is because the provisions reflect the total estimated future yearly costs. Figure 7 below shows the actual experience for the MOD provision since 2016/17. MOD expresses its undiscounted provision on a nominal basis, i.e. allowing for expected future inflation

Figure 7 – Undiscounted provisions and spend for MOD nuclear decommissioning over time



This figure reveals a large jump in the undiscounted provision between 2017/18 and 2018/19. From discussion with MOD we understand this is a result of changing how the undiscounted liability is presented, from a real to a nominal basis. This means the increase reflects the costs related to future inflation, but does not reflect an increase in the actual underlying cost estimate. This is shown by the fact that the discounted provision only increased by £3.3bn in that year due to influences other than discounting. The figure also shows that MOD currently has minimal spending relative to its total provision.

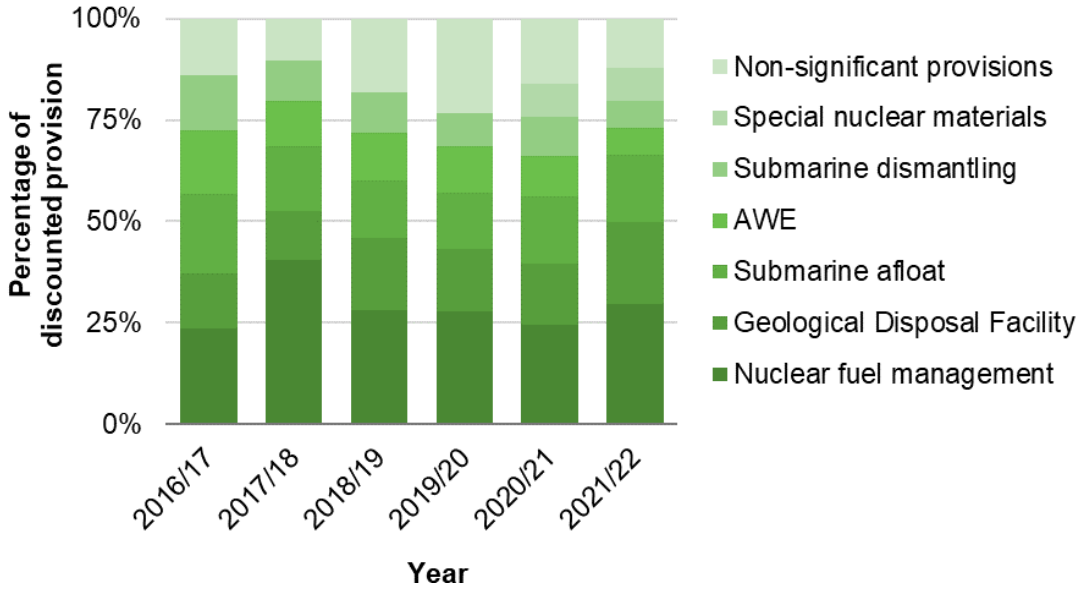
Ignoring the large jump, there does appear to be some growth in the provision over time, with an increase of £3bn since 2018/19.

Change in discounted cost over time, by area

Figure 8 below shows the percentage of the total provision constituted by each area over time. MOD splits its significant provisions into categories, the non-significant provisions represent all activity outside of these categories.

MOD accounts do not provide a breakdown of undiscounted provisions by expected timings of cashflows or significant projects, only for discounted figures. Therefore, we have not been able to split out the impact of changes in discount rates from the changes in actual future cashflows by area.

Figure 8 – Percentage of MOD discounted provisions by area over time



There were large changes in the discount rate applied in the years 2018/19 and 2021/22, and this could be driving some of the patterns we can see above. This happens because some areas will expect spending to occur further in the future, and these areas will therefore be more affected by changes in the discount rate. However, from background information we can also see the impacts of other changes.

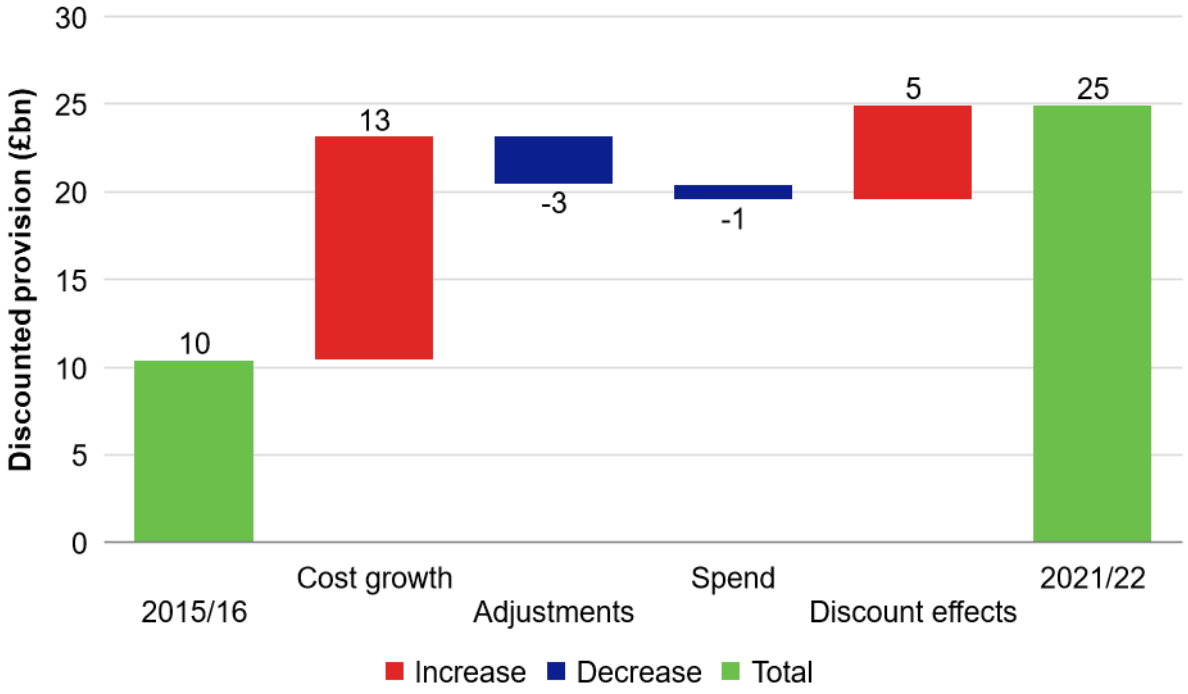
The Geological Disposal Facility provisions changed in 2019/20 when MOD updated the methodology. Previously the provision assumed MOD's ongoing contribution to the NDA would be 6% of the facility's programme costs. A review more accurately forecast the longer-term costs of storing waste within the facility and in particular considered the costs of high heat generating waste. This led to the provision being based on the total inventory to be held within the facility.

Special nuclear materials were introduced as a significant area in 2021/22 (with the value as at 2020/21 restated). This area has become significant enough to report recently due to changes in inflation and discounting.

Cumulative change in cost over time

Figure 9 below shows the source of movement in discounted provisions from 2015/16 to 2021/22.

Figure 9 – Cumulative change in discounted MOD provision over time, by source

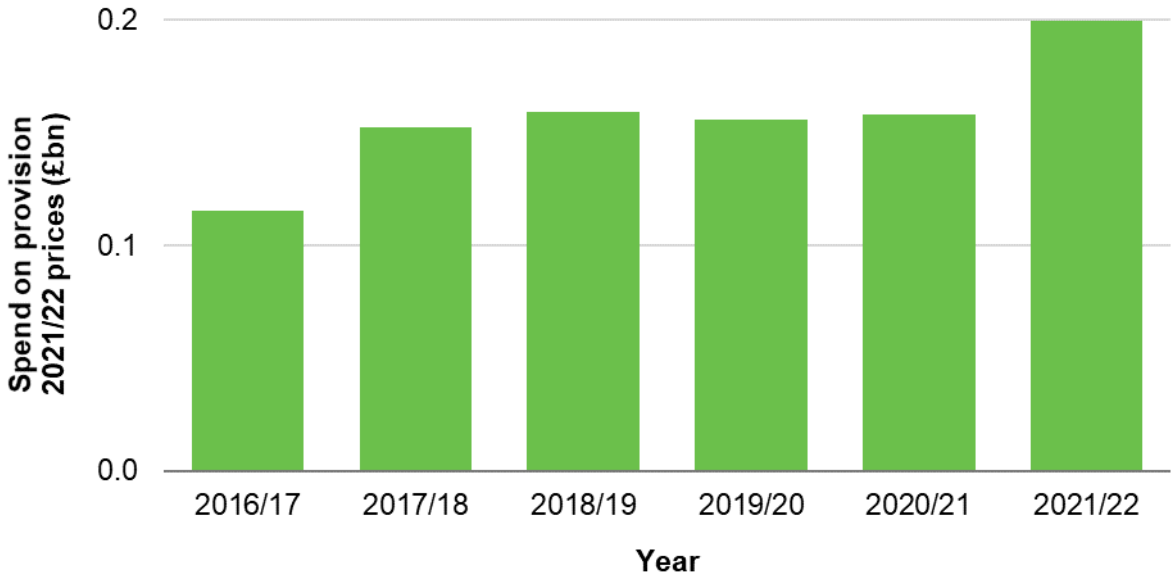


Here we can see that while the discount rate has driven large increases in the provision over time, the largest factor is increasing estimates. As set out earlier, the large increase seen between 2017/18 and 2018/19 is not reflected here, as that was a result of a change in accounting treatment rather than underlying costs.

Actual and projected spend on decommissioning

Figure 10 shows that MOD's spend has been increasing over the last 6 years.

Figure 10 – Actual MOD spend on provision over time



MOD does not provide detailed information on its projected decommissioning cashflows in its annual accounts. However, it does state that it currently expects decommissioning to take 116 years.

Results at March 2023

MoD published their 2022/23 annual report and accounts ahead of publication of this report. The total liability has decreased from £25bn at March 2022 to £11bn at March 2023, with the change in discount rate reducing the liability by £16bn. There were other partially offsetting increases, including updated inflationary and cashflow assumptions.

The table below sets out a comparison of the discounted liabilities at March 2023 against results at March 2022.

Split of Liabilities		
Provisions	**2021/22**	**2022/23**
Total liabilities	**£25.0bn**	**£11.3bn**
Nuclear fuel management	*£7.4bn*	*£2.1bn*
Geological Disposal Facility	*£5bn*	*£1.3bn*
Submarine Afloat	*£4.1bn*	*£2.6bn*
Atomic Weapons Establishment	*£1.7bn*	*£1.8bn*
Submarine Dismantling Project	*£1.7bn*	*£1bn*
Special Nuclear Materials	*£2.1bn*	*£0.4bn*
'Non-significant' provisions	*£3.0bn*	*£2.1bn*

ANNEX D: NUCLEAR LIABILITIES FUND

The analysis in this annex and the individual summaries is derived from the annual reports and accounts of the relevant organisations at March 2022, unless stated otherwise. For information on methodology and sources see Annex F.

Summary at March 2022

Background

The Nuclear Liabilities Fund (NLF) is responsible for meeting the costs of decommissioning the second generation of nuclear sites. These sites consist of Sizewell B and 7 advanced gas-cooled reactors, they are all currently operated by EDF Energy (EDF). Once the stations stop generating power, EDF will defuel them before transferring the responsibility for the advanced gas-cooled reactors to the NDA for decommissioning. Sizewell B will be decommissioned by EDF.

Liabilities and funding

£21bn NLF's asset fund, which it deems sufficient to meet the future cost of decommissioning, as stated in its accounts dated 31 March 2022.

This liability is split into four key areas:

Spent fuel
Ongoing storage and treatment of spent fuel.
Transport and disposal
Transport and disposal of waste arising from decommissioning.
Retrieval and processing
Management, processing, and packaging of high and intermediate-level waste.
Decommissioning
Power station decommissioning.

The fund compares to the current real undiscounted provision of £24.7bn on a P50 real basis. This difference, and cost associated with future inflation, is expected to be made up through investment returns. Currently the majority of the fund is invested in the National Loans Fund, with the remaining amount invested in a Mixed Assets Portfolio (MAP) that has a higher return. See the Fund management section for more details on this.

When the NLF was created it was given an initial endowment of £0.2bn and through the sale proceeds from private assets (British Energy shares) the fund received an additional £2.3bn and £4.4bn between 2007 and 2009. Since 2005 EDF has made regular contractual contributions into the fund, and DESNZ has also made the policy decision to contribute to the fund to ensure it is sufficient. Since 2020 an agreement has been in place whereby whenever a shortfall of over £300m

is identified government is offered the choice of providing additional funds or allowing the NLF to move some of its investments from the National Loans Fund to its Mixed Assets Portfolio.

Accounting treatment

The NLF discloses a decommissioning provision equal to the current asset fund value minus other liabilities and the NLF's liability is always limited to the assets available. As a result, DESNZ also holds a contingent liability to provide additional funding if there is a shortfall in the fund.

Where NLF's assets are invested in the National Loans Fund there is zero net impact on the current position of the public sector balance sheet. Government may use money retained in the National Loans Fund (which NLF is invested in) to invest in infrastructure or current spending, which generate longer term financial returns but also social and economic benefits, which are all highly valued by government. It may also be used to pay down government debt.

Investments in the MAP may provide higher returns, there is also the higher risk and higher transaction costs than investment in the National Loans Fund. Additionally, investment outside the central Exchequer funds requires cash to be raised, increasing government debt at the point of investment. The long-term effect on the public sector balance sheet from the two approaches will depend on the returns achieved through the deployment of the assets.

Risks

While the NLF fund is currently sufficient to meet the future cost of decommissioning, in the event that costs are larger than expected government could be required to meet the costs. These cost risks impact the whole sector and were outlined in the introduction. Beyond the risks which impact the whole sector, NLF is exposed to the following risks:

Investment returns

The funding available to meet the cost of decommissioning relies on investment returns on the assets held. If asset returns are lower than expected, e.g. due to volatile market conditions, and consequently the size of the fund is no longer sufficient, government would need to fill the gap. However, it is worth noting that the long life of the fund may mitigate this risk to an extent and returns are achieved by investing in a number of different asset types.

Collaboration

As part of the agreement that the advanced gas-cooled reactor sites will transfer to the NDA after EDF has defueled them, EDF will need to collaborate with the NDA to ensure a smooth handover and transfer of institutional knowledge. If this isn't achieved, it could result in higher costs due to inefficiencies.

Incentive payments

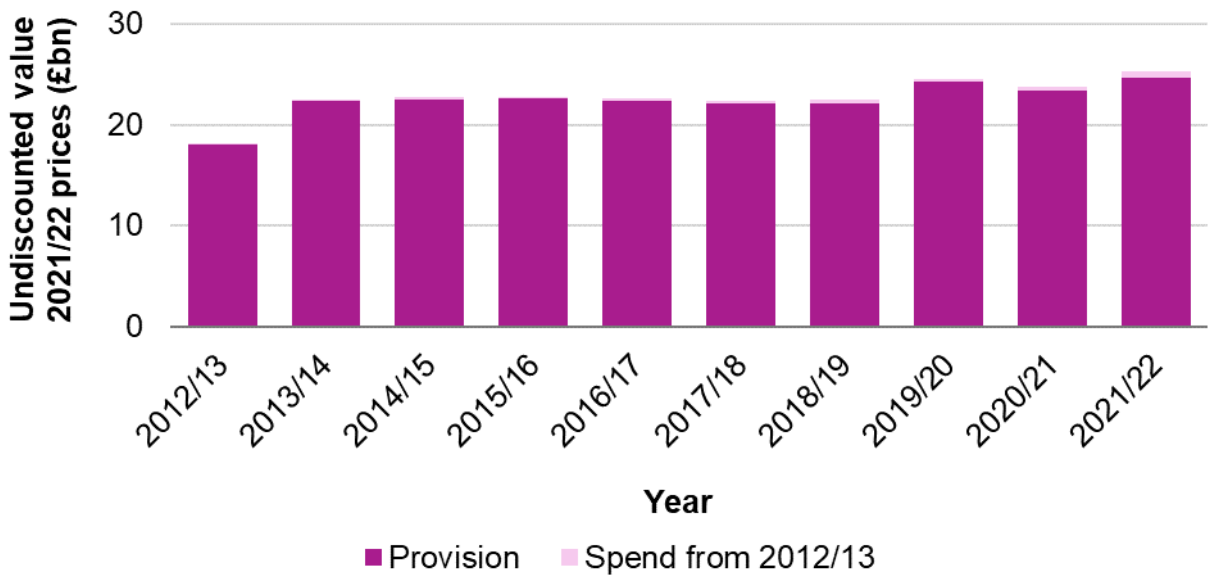
As part of a renegotiation with EDF in 2021, an agreement was reached such that EDF has the potential to earn incentive payments of up to £100m if they meet defueling and transfer performance targets. This is balanced by payments due from EDF of up to £100m if they fail to meet minimum defueling targets. However, this is not a significant risk in the context of the total provision.

Analysis

Change in undiscounted cost over time, by area

If provisions were perfectly accurate and there was no growth in the underlying costs, you would expect the undiscounted value plus the cumulative actual spend to stay largely constant over time. This is because the provisions reflect the total estimated future yearly costs. Figure 11 below shows the actual experience for the NLF liability since 2012/13. NLF expresses its undiscounted provision on a P50 real basis, i.e. there is an 50% chance that the costs will be equal to that value or lower and they ignore future inflation.

Figure 11 – Undiscounted liability and spend for NLF nuclear decommissioning over time



We can see that the liability has been relatively flat over the period, after a relatively large jump from 2012/13 to 2013/14. A portion of this change can be explained by an update to the decommissioning plans.

Change in asset fund over time

Figure 12 below shows the change in the value of the asset fund over time. The NLF does not disclose a detailed breakdown of the sources of change in its nuclear liability. However, changes to the asset fund are driven by the need to ensure sufficiency to meet the future costs of decommissioning. This means that changes in the fund over time provide some information on changes to the expected costs.

The Figure shows that there is generally steady growth, however significant changes occurred between 2006 and 2009, in 2020 and in 2022.

The funds provided between 2006 and 2009 relate to the corporate activity involving the NLF, British Energy (who previously operated the sites), and EDF. The increases in 2020 and 2022 were due to contributions from DESNZ. In 2020 this was intended to ensure the fund was sufficient to meet the liabilities after updated cost estimates. In 2022 £4.6bn of this was due to the increase in corporation tax payable over the lifetime of the fund. As this cost is due to tax, it is largely cost neutral on a whole of government basis.

Figure 12 – Change in value of asset fund over time, source NLF annual accounts 2021/22

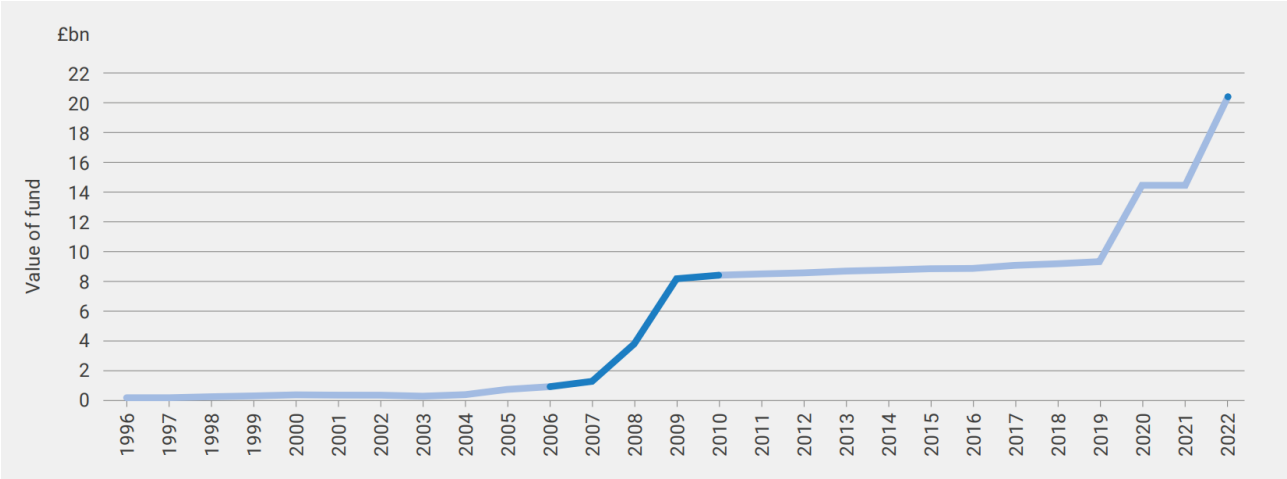
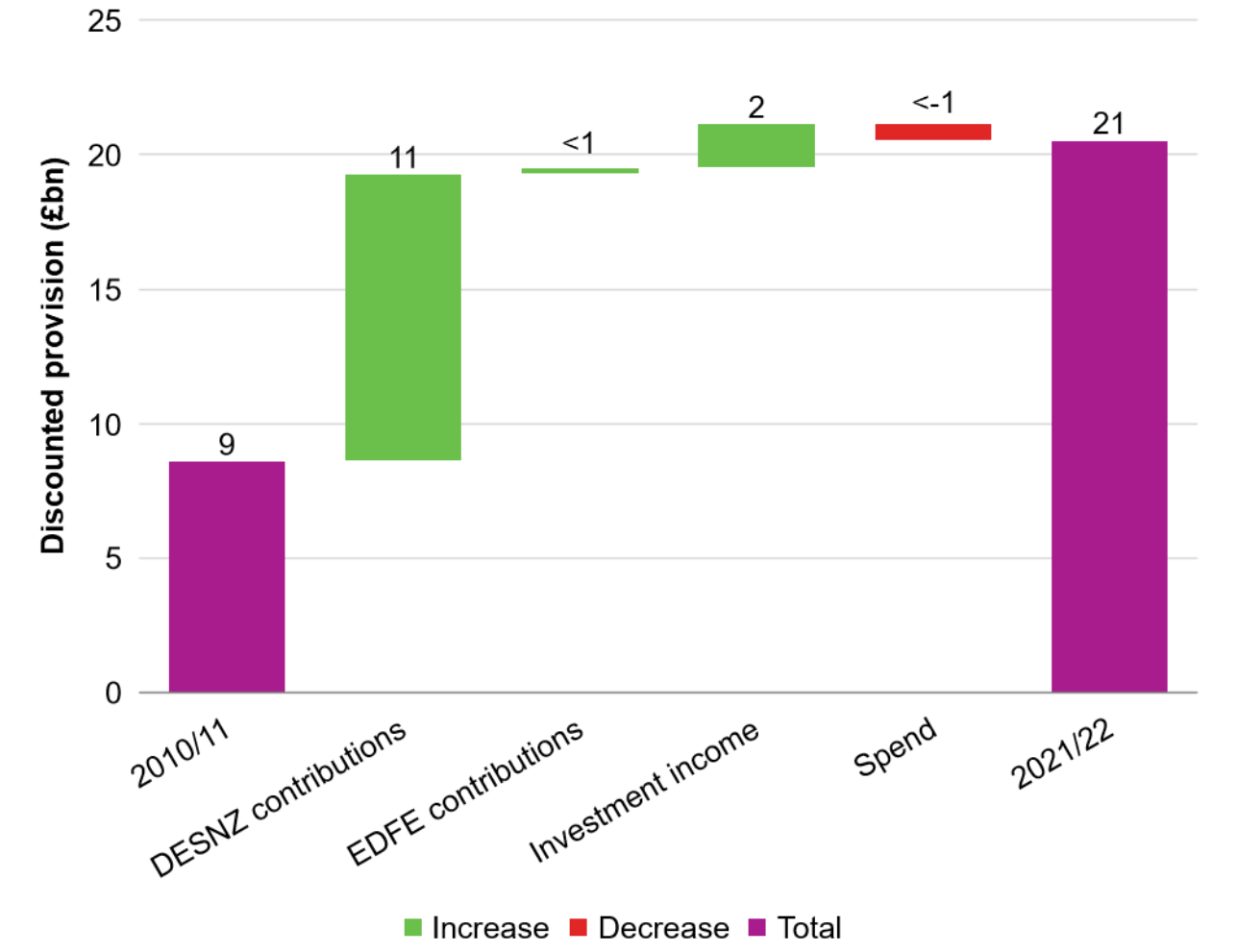


Figure 13 below shows the cumulative sources of funding changes over the last 11 years. It again demonstrates that the vast majority of the change to the fund's value is due to DESNZ contributions. It also shows that EDF contributions are small relative to investment income and spend on the liability.

Figure 13 – Cumulative change in NLF asset fund over time, by source

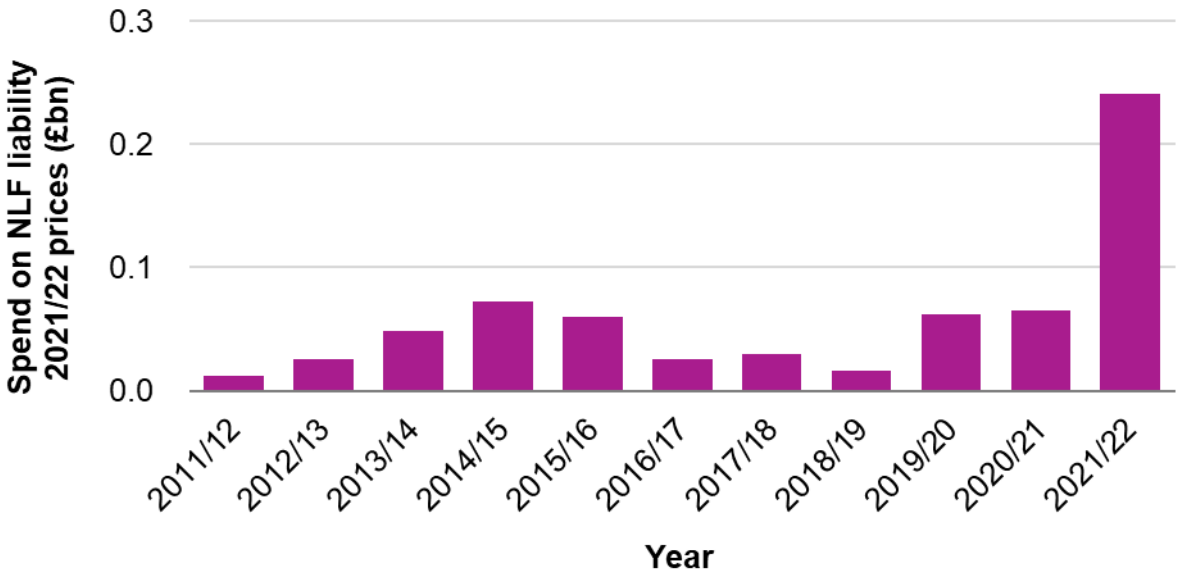


Actual and projected future spend

Figure 14 shows NLF's spend related to the nuclear provision obligation. Over 2021/22 there was a large increase in spend, reflecting that defueling and decommissioning activity is increasing.

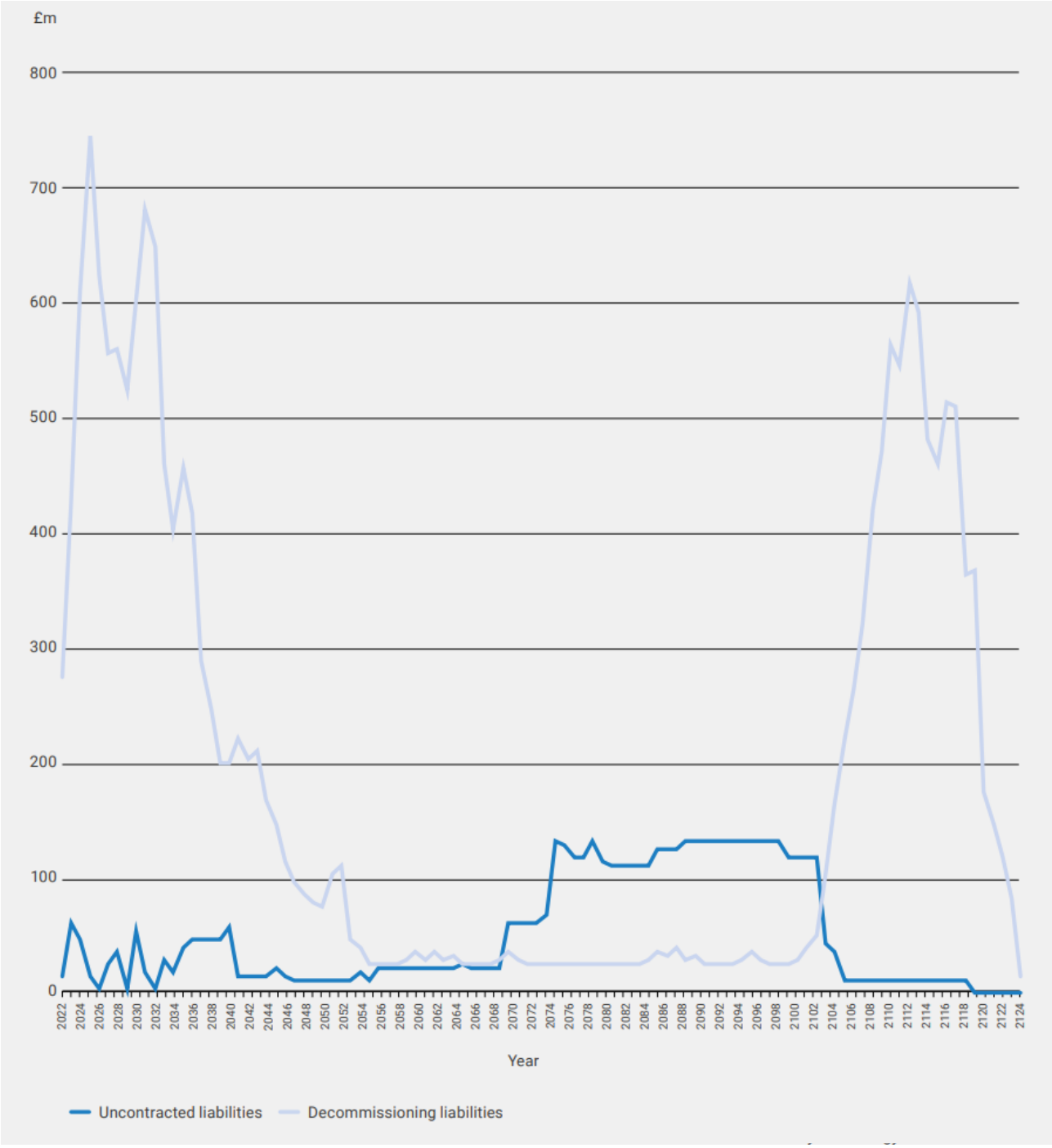
Note we have relied on the payment data relating to the nuclear provision, rather than the figures disclosed as payments to EDF in the statement of cashflows. Cumulatively over the 11 years the difference between these measures is less than £1m. However, the differences vary year to year, with some individual years showing a difference of around £20m and this can represent a significant percentage of the payment.

Figure 14 – Actual NLF spend on the liability over time



Looking forward, Figure 15 shows the NLF's projected future payments from the fund. This predicts a continuation of the large increase in spend, peaking around 2030, before falling again and eventually peaking once more around 2124. This reflects the nature of short-term waste storage and the need to allow the material to cool before final decommissioning can commence.

Figure 15 – Total projected liability cost profile, P50 basis, source NLF accounts 2021/22



ANNEX E: HINKLEY POINT C

The analysis in this annex and the individual summaries is derived from the annual reports and accounts of the relevant organisations at March 2022, unless stated otherwise. For information on methodology and sources see Annex F.

Summary at March 2022

Background

The government announced the decision to build Hinkley Point C (HPC) in September 2016, and as at May 2022 electricity generation is expected to begin in June 2027. This is the first nuclear power station built in the UK since 1995. The builder and operator is NNB Generation Company HPC Limited (NNBG), which is owned by EDF (66.5%) and China General Nuclear Power Group (33.5%).

Under the Energy Act 2008, before construction begins, all new nuclear power stations require a funded decommissioning programme (FDP) to be approved by government. This FDP needs to set out the expected plan for decommissioning and waste management, and how those plans will be funded. The objective of this is that operators make prudent provisions for the full costs of decommissioning and waste management so that the likelihood of public funds being used for this is remote.

Liabilities

£6bn HPC's estimated future cost of activity funded through the decommissioning fund, as set out in the 2016 funded decommissioning programme on a P50 basis undiscounted.

For the FDP, the decommissioning and waste management liabilities related to HPC are split into two categories, those carried out during the operational lifetime of the site and therefore funded through operational expenditure, and those funded through the decommissioning fund.

Key activities include pre-closure planning, decommissioning, intermediate-level waste disposal, spent fuel management, and spent fuel disposal.

Funding

£8bn HPC's estimated required total funding, which will be built up over the course of its operational lifetime, as set out in the 2016 funded decommissioning programme.

The liabilities funded through operational expenditure are thought to be secure due to the income generated by the site through its operation. However, the liabilities which are not funded through operational expenditure need a more secure form of funding.

The HPC FDP is designed so that an independent company manages a fund built up through contributions over the operational life of the site. Contributions to the fund are set on a conservative basis, such that there is an 80% chance that the liabilities are equal to or less than that estimate. Certain costs have an additional 25% contingency loading on top of this.

Key risks

Unlike the other risks summarised in this report, if decommissioning costs increase for HPC then there is only considered a remote possibility that government will be required to cover the shortfall. While FDP has been judged as leaving only a remote risk of public funds being required to complete the decommissioning, there are still some risks to government:

Early closure of site

The funds required to decommission the site fully will not be in place until the end of the first 37 years of operation. Funding is secure over this period through a guaranteed price for the energy produced, however there are some risks with this.

Firstly, a legislative change or safety concerns could force the site to close. Secondly, if the costs of running the site become too high in comparison to the contract for difference payments, NNBG could shut down. Finally, a force majeure event could suspend the agreement.

Late change in funding

Large changes in the required funding level or severe underperformance of the fund near the end of the primary funding period could mean a large payment is required from the operator. This may be in excess of the funds available, potentially resulting in government being required to fund the difference.

Waste transfer contract caps

While NNGB is responsible for ensuring the fund fully covers all decommissioning and waste management costs, the intermediate-level waste and spent fuel is subject to a Waste Transfer Agreement.

This agreement sets out that the government will dispose of this waste in the Geological Disposal Facility, in exchange for a payment. This payment will be calculated by the NDA to reflect the price of building and operating the facility, however these contracts are capped.

Each contract has a specified cap on the price per unit of waste, equal to almost triple the estimated cost for intermediate-level waste and around double for spent fuel. These caps are inflation linked, increasing in line with RPI. If the actual cost of this disposal is higher than the caps, government will be responsible for funding the difference.

Analysis

Decommissioning liabilities

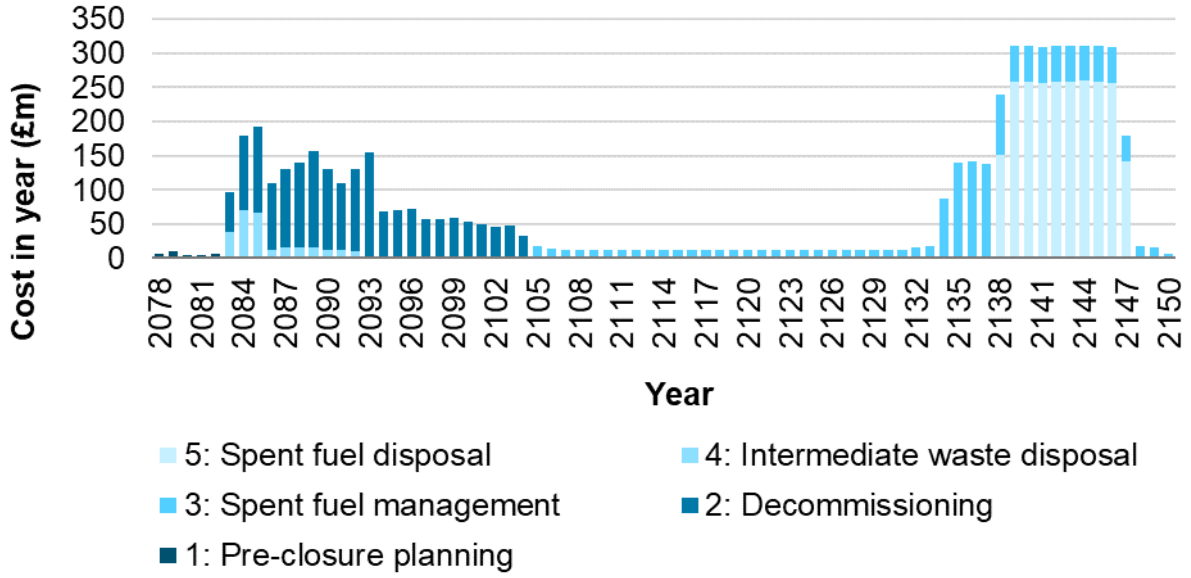
The decommissioning and waste management activities funded by the decommissioning fund are shown in the table below along with their base cost, P80 cost and funding target on an undiscounted basis.

The base cost represents the estimated cost of carrying out the activity. The P80 cost represents the value where there is an 80% chance that the liabilities are equal to or less than that estimate. The funding target is equal to the P80 cost +25% contingency for decommissioning and spent fuel management.

HPC decommissioning liabilities by area			
Area	**Base cost (£bn)**	**P80 cost (£bn)**	**Funding target (£bn)**
Pre-closure planning All decommissioning activity prior to end of generation, such as planning, excluding intermediate-level waste disposal.	<0.1	<0.1	<0.1
Decommissioning The decommissioning of all plant, equipment, buildings and facilities at the site, and management of waste arising from this process, up to 31/12/2104, excluding intermediate-level waste disposal costs.	1.9	2.6	3.2
Intermediate-level waste disposal The disposal of intermediate-level waste after on site storage after the end of generation. The waste will be packaged in a disposal container before being transferred to the Geological Disposal Facility. Includes cost up to the transfer date for spent fuel.	0.3	0.3	0.3
Spent fuel management The interim management and storage of the spent fuel generated over the lifetime operation of the site. This involves the cooling of fuel after the end of generation for ~3 years before transfer to the on site interim spent fuel store where it will cool for another ~55 years before disposal. Also includes the disposal of intermediate-level waste after the transfer date for spent fuel.	1.5	1.7	2.2
Spent fuel disposal The disposal of the spent fuel after on site cooling. The waste will be packaged in a disposal container before being transferred to the Geological Disposal Facility. This transfer is estimated to take less than 10 years.	2.4	2.5	2.5
Total	**6.0**	**7.2**	**8.2**

The base cost cashflows underlying these estimates are shown in Figure 16 below.

Figure 16 – Projected base cost spending profile



It is important to note that all of the figures presented here are those stated in the 2016 Funded Decommissioning Programme, and are therefore likely no longer in line with latest estimates.

Liability funding

The decommissioning fund is intended to reach the funding target as set out in the table above over two periods:

- **The primary funding period** – The first 37 years of operation, over which time the fund is built up in a non-linear fashion. This aligns with the contract for difference, ensuring its funding.
- **The secondary funding period** – The remaining operational life of HPC (expected to be 23 additional years), over which time the fund is maintained and any additional waste generated is funded. This occurs linearly.

The primary funding target is set equal to the amount required to decommission the plant and manage, store and dispose of the waste if the plant were to close at that point.

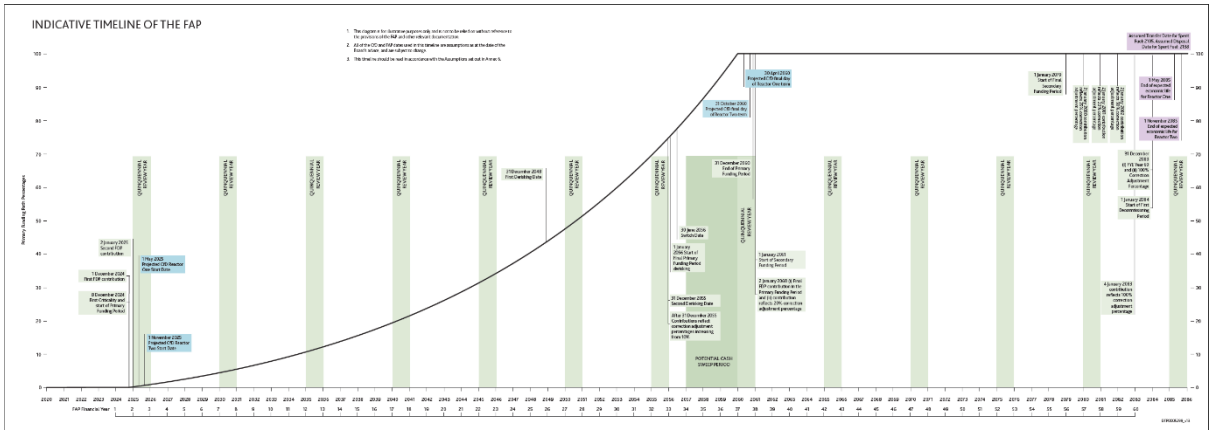
The secondary funding target is equal to primary funding target:

- Plus any additional waste created.
- Minus any contingent built into the primary that is no longer needed.

These contributions are set through annual and quinquennial reviews. Annual reviews just account for inflation (RPI), while quinquennial reviews reflect real cost increases.

The build-up of the fund is demonstrated in Figure 17 below, to read the detail please refer to the source document.

Figure 17 – Indicative timeline of decommissioning fund growth, source Nuclear Liabilities Financing Assurance Board advice to the Secretary of State



Where there is a difference between the target funding level at a certain point and the actual funding level, a correction contribution is paid. The percentage of the correction contribution paid depends on the year, starting at 10% in years 1 to 32 and rising to 100% in year 60. This includes corrections for both deficits and surpluses.

When the discount rate changes, it could cause a large deficit to appear. To correct for this there is a 4-year period where 50% of available cash is reserved to repair any deficit.

The payment of these contributions is protected via provisions in the agreement such that NNGB cannot make debt repayments while any contributions are outstanding. Where NNBG fails to make a payment, or in some other circumstances where NNBG is not in a position to uphold the FDP terms, a separate standstill agreement applies. When triggered this agreement gives creditors of NNGB a period of 12 months to consider its positions before the government can request its accelerated decommissioning contributions amount, which is calculated to fully fund the FDP.

ANNEX F: METHODOLOGY AND SOURCES

In this annex we describe the methodology and sources used to prepare this paper. First we list all the sources used. Then we list each figure and the underlying methodology and source. To note, we have also relied on conversations with working level contacts within each organisation.

Sources

DESNZ

Source	Link
DESNZ – Impact Assessment. Amendment of regulation of nuclear sites in the final stages of decommissioning and clean-up: government response	https://www.gov.uk/government/consultations/the-regulation-of-nuclear-sites-in-the-final-stages-of-decommissioning-and-clean-up

NDA

CLCC analysis of the NDA has been driven by its annual accounts. However, where these were not easily accessible we have relied on figures underlying the OBR paper listed below. We have also referred to other NDA publications on its nuclear decommissioning relevant NAO reports.

Source	Link
NDA – Annual accounts 2022/23	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1185961/NDA_ARAC_2022_FINAL_web.pdf
NDA – Annual accounts 2021/22	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1090874/NDA_ARAC_2021_22_-_130722.pdf
NDA – Annual accounts 2020/21	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1004159/NDA_Annual_Report_and_Accounts_2020_to_2021.pdf
NDA – Annual accounts 2019/20	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/902764/ARAC_2019-20_amended_210720_reduced.pdf
NDA – Annual accounts 2018/19	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/814716/NDA_Annual_Report_and_Accounts_2018_to_2019v2.pdf

Source	Link
NDA – Annual accounts 2017/18	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/724011/NDA_annual_report_and_accounts_2017_to_18.pdf
NDA – Annual accounts 2016/17	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/630177/NDA_Annual_Report_and_Accounts_2016_to_2017.pdf
NDA – Annual accounts 2015/16	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/537397/NDA_Annual_Report_and_Accounts_2015_to_2016.pdf
NDA – Annual accounts 2014/15	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/440238/NDA_Annual_Report_and_Accounts_2014_to_2015.pdf
NDA – Annual accounts 2013/14	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/323982/Annual-Report-and-Accounts-2013-to-2014.pdf
NDA – Annual accounts 2012/13	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/246738/0236.pdf
OBR – Nuclear decommissioning costs	https://obr.uk/docs/dlm_uploads/NDA.pdf
NDA – Nuclear Provision: the cost of cleaning up Britain's historic nuclear sites	https://www.gov.uk/government/publications/nuclear-provision-explaining-the-cost-of-cleaning-up-britains-nuclear-legacy/nuclear-provision-explaining-the-cost-of-cleaning-up-britains-nuclear-legacy
NAO – The NDA: Progress with reducing risk at Sellafield	https://www.nao.org.uk/wp-content/uploads/2018/06/The-Nuclear-Decommissioning-Authority-progress-with-reducing-risk-at-Sellafield.pdf

MOD

CLCC analysis of MOD has been driven by its annual accounts, we have also referred to other MOD publications on its nuclear decommissioning and relevant NAO reports.

Source	Link
MOD – Annual accounts index	https://www.gov.uk/government/collections/mod-annual-reports

Source	Link
MOD – Nuclear Liabilities Management Strategy 2022	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1078524/Nuclear_Liabilities_Management_Strategy.pdf
NAO – The Defence Nuclear Enterprise: a landscape review	https://www.nao.org.uk/wp-content/uploads/2018/05/The-Defence-Nuclear-Enterprise-a-landscape-review.pdf
NAO – Investigation into submarine defueling and dismantling	https://www.nao.org.uk/wp-content/uploads/2019/04/Investigation-into-submarine-defueling-and-dismantling.pdf

NLF

CLCC analysis of NLF has been driven by both its annual accounts and those of EDF. We have also referred to relevant NAO and Public Accounts Committee reports.

Source	Link
NLF – annual accounts index	https://www.nlf.uk.net/about-us/annual-reports
EDF – annual accounts 2021	https://www.edfenergy.com/sites/default/files/edf_energy_holdings_limited_fy21_signed_financial_statements_full.pdf
EDF – annual accounts index	https://www.edfenergy.com/download-centre?keys=&tid=160&year%5Bvalue%5D%5Byear%5D=
NAO – The decommissioning of the AGR nuclear power stations	https://www.nao.org.uk/reports/the-decommissioning-of-the-agr-nuclear-power-stations/
PAC - The future of the Advanced Gas-cooled Reactors	https://committees.parliament.uk/committee/127/public-accounts-committee/news/170906/taxpayer-on-the-hook-for-billions-in-extra-nuclear-plant-decommissioning-costs/

HPC

CLCC analysis of HPC has been driven by the contractual and regulatory documents available on gov.uk, alongside relevant NAO reports.

Source	Link
HPC – Funded Decommissioning Programme index	https://www.gov.uk/government/publications/hinkley-point-c-funded-decommissioning-programme

Source	Link
HPC – contractual documents index	https://www.gov.uk/government/publications/hinkley-point-c-documents
NAO – Hinkley Point C	https://www.nao.org.uk/wp-content/uploads/2017/06/Hinkley-Point-C.pdf

Others

We have also used some other sources across the paper.

Source	Link
GDP deflator	https://www.gov.uk/government/collections/gdp-deflators-at-market-prices-and-money-gdp
Public spending statistics: November 2022	https://www.gov.uk/government/statistics/public-spending-statistics-release-november-2022/public-spending-statistics-november-2022#:~:text=Total%20departmental%20expenditure%20(Total%20DEL,493.0%20billion%20in%202020%2D21
NAO – Nuclear power in the UK	https://www.nao.org.uk/wp-content/uploads/2016/07/Nuclear-power-in-the-UK.pdf

Figures

Figure	Methodology	Source
Figure 1 – Standardised undiscounted liability and spend by organisation over time	Undiscounted provision and spend, in line with Figures 3, 7 and 11, standardised such that the earliest year is equal to 1. MOD adjusted was calculated such that the difference between 2017/18 and 2018/19 was removed from all future years.	Figures 3, 7 and 11
Figure 2 – Spend as proportion of undiscounted liability by organisation over time	Spend as a percentage of undiscounted provision, in line with Figures 3, 7 and 11	Figures 3, 7 and 11
Figure 3 – Undiscounted provisions by area and spend for NDA nuclear decommissioning over time	*NDA Group undiscounted provision* split into Sellafield and non-Sellafield plus the cumulative *decommissioning costs utilised in year*, since 2004/05. Adjusted to 2021/22 prices using the GDP deflator.	NDA accounts 2016/17 to 2021/22 OBR report – Nuclear decommissioning costs GDP deflator

Figure	Methodology	Source
Figure 4 – Cumulative change in discounted NDA provision over time, by source	Cumulative movements in *NDA group discounted provision* between 2012/13 and 2021/22. Including *unwind of discount* (discount unwind), *discount rate change* (discount change), *released in year* (spend + contracts), *inflation*, and *other cost change* (cost growth).	NDA accounts 2013/14 to 2021/22.
Figure 5 – Actual NDA spend on provision over time	*Decommissioning costs utilised in year* since 2004/05. Adjusted to 2021/22 prices using the GDP deflator.	NDA accounts 2016/17 to 2021/22 OBR report – Nuclear decommissioning costs GDP deflator
Figure 6 – Total projected NDA expenditure profile, source DESNZ annual accounts 2021/22	Direct copy.	DESNZ accounts 2021/22
Figure 7 – Undiscounted provisions and spend for MOD nuclear decommissioning over time	*Undiscounted nuclear decommissioning provision* plus the cumulative provisions utilised in-year, since 2016/17. Adjusted to 2021/22 prices using the GDP deflator.	MOD accounts 2016/17 to 2021/22 GDP deflator
Figure 8 – Percentage of MOD discounted provisions by area over time	*Significant provisions* as a percentage of the total *discounted nuclear decommissioning provision*, since 2016/17. Remaining provision labelled non-significant provisions.	MOD accounts 2016/17 to 2021/22
Figure 9 – Cumulative change in discounted MOD provision over time, by source	Cumulative movements in the *discounted nuclear decommissioning provision* between 2015/16 and 2021/22. Including *increase in provisions in-year* (cost growth), *provisions written back and reclassifications* (adjustments), *provisions utilised in-year* (spend), and *unwinding of and changes in discount rate* (discount effects).	MOD accounts 2016/17 to 2021/22
Figure 10 – Actual MOD spend on provision over time	*Provisions utilised in-year* since 2016/17. Adjusted to 2021/22 prices using the GDP deflator.	MOD accounts 2016/17 to 2021/22 GDP deflator
Figure 11 – Undiscounted provision and spend for NLF nuclear decommissioning over time	*Undiscounted nuclear liability provision* plus the cumulative *payments in the period*, since 2012/13. Adjusted to 2021/22 prices using the GDP deflator.	NLF accounts 2012/13 to 2021/22 GDP deflator

Figure	Methodology	Source
Figure 12 – Change in value of asset fund over time, source NLF annual accounts 2021/22	Direct copy.	NLF accounts 2021/22
Figure 13 – Cumulative change in NLF asset fund over time, by source	Cumulative movements in the *qualifying liabilities provision* between 2010/11 and 2020/21. Including *BEIS funding* (DESNZ contributions), *EDFE contributions* (EDF contributions), *transfer from statement of comprehensive income* (investment income), and *payable to EDFE* (spend).	NLF accounts 2011/12 to 2021/22
Figure 14 – Actual NLF spend on liability over time	*Payable to EDFE* since 2011/12. Adjusted to 2021/22 prices using the GDP deflator.	NLF accounts 2011/12 to 2021/22 GDP deflator
Figure 15 – Total projected liability cost profile, P80 basis, source NLF accounts 2021/22	Direct copy.	NLF accounts 2021/22
Figure 16 - Projected base cost spending profile	*Summary funding arrangements plan cashflow* using *base costs*.	HPC decommissioning and waste management plan
Figure 17 - Indicative timeline of decommissioning fund growth, source Nuclear Liabilities Financing Assurance Board advice to the Secretary of State	Direct copy.	Nuclear Liabilities Financing Assurance Board advice to the Secretary of State