

Nuclear decommissioning costs

Extract from the July 2017 Fiscal risks report

- 6.90 The uncertain future costs of safely decommissioning the UK's nuclear sites are a material source of fiscal risk. For the older sites, these are the largest single accounting provision in the WGA. Risks relate to the uncertain scope of the decommissioning work, which in turn reflects uncertainties about the amount of nuclear waste that will have to be cleared up and the technologies that will be available to do so, especially over the very long term.
- 6.91 The costs are managed in different ways, reflecting distinct phases of construction of nuclear facilities in the UK. They form three broad groups:
- **Older sites** (the Sellafield reprocessing plant and 16 of the UK's earliest nuclear sites, including the old Magnox nuclear power stations – the last of which ceased operating at the end of 2015). For these sites, future decommissioning costs fall entirely to government. They are reported as a provision in the Nuclear Decommissioning Authority (NDA) accounts. The cash flows associated with this provision are funded from the Department for Business, Energy and Industrial Strategy (BEIS) DEL.
 - **The second generation of sites** (the advanced gas-cooled reactor power stations and Sizewell B). Ownership of these power stations and the costs of decommissioning and managing their waste were transferred to the private sector through the privatisation of British Energy in 1996. British Energy was restructured and subsequently acquired by EDF Energy in 2009. As part of the arrangements for privatisation, the Government set up the Nuclear Liabilities Fund (NLF), an independent segregated trust. It has around £9 billion of assets (as of 31 March 2016), intended to meet the future costs of decommissioning. In the event that the fund's assets are insufficient to meet its liabilities, outstanding liabilities will fall to government.
 - **New generation sites** (at present only Hinkley Point C, but with seven other sites identified, including Sizewell C). The intention is that these stations will be built, owned and managed by private sector operators, who will have complete responsibility for decommissioning.¹ The contracts to build them will attempt to ensure that the prices agreed for the supply of electricity cover the future decommissioning costs.

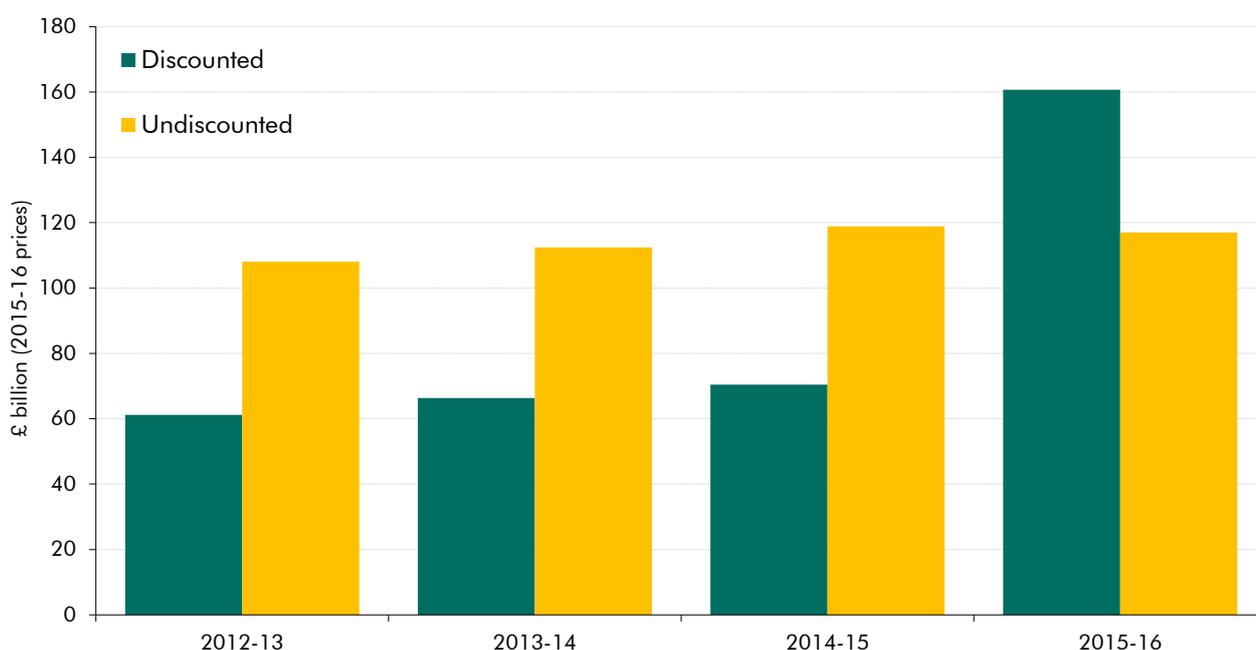
Sellafield and other older sites

- 6.92 The WGA nuclear decommissioning provision is the net present value of future estimated spending at Sellafield and other older sites over the next 120 years, assuming that all will

¹ Department of Energy and Climate Change, *Long-term nuclear energy strategy*, 2013.

have been cleared of hazardous waste by 2136. This is very sensitive to the discount rate used to convert future flows into a single current value, as illustrated in 2015-16 (Chart 6.22). The simple sum of estimated future real-terms cash flows was little changed from the previous year at £117 billion, but its discounted value – i.e. the provision – increased by 130 per cent to £161 billion due to the use of a much lower long-term discount rate.² This is one reason why we prefer to analyse fiscal sustainability from flows of spending rather than discounted balance sheet stocks.

Chart 6.1: Provisions for NDA nuclear decommissioning



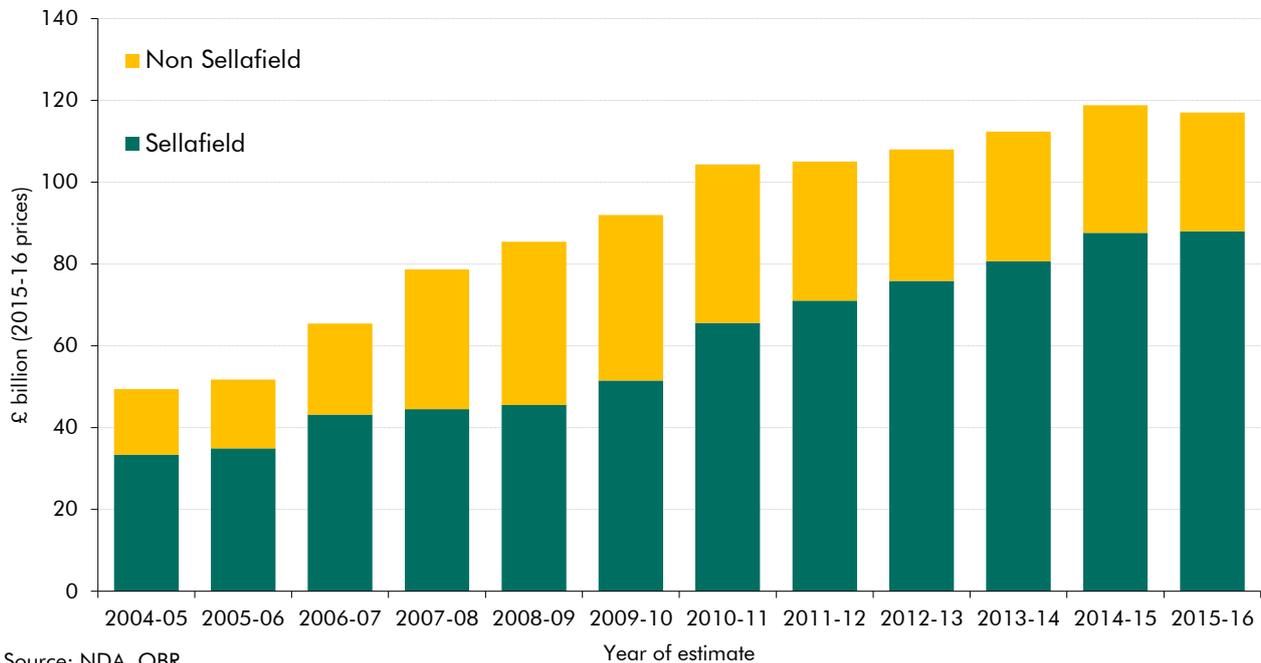
Source: NDA, OBR

6.93 Abstracting from discount rate effects, the expected cost of decommissioning older sites has been rising. This reflects the fact that when nuclear facilities were first built and operated in the UK, there were no plans for nuclear waste management. Indeed, waste was stockpiled in some parts of Sellafield without recording what was being stored. As the NDA has put it: *“In a heady atmosphere of scientific discovery, plans for future dismantling were barely considered.”*³ Expected costs have increased with successive reviews of the work involved. Chart 6.23 converts the undiscounted cash projections underpinning the provision into 2015-16 prices, showing how expected costs have more than doubled in real terms since 2004-05. Sellafield has accounted for all the rise since 2007-08.

² This issue was discussed in more detail in paragraphs 3.71 to 3.72 of our July 2016 *Fiscal sustainability analytical paper: Public sector balance sheet*.

³ Nuclear Decommissioning Authority, *Nuclear Provision: the cost of cleaning up Britain’s historic nuclear sites*, 2016.

Chart 6.2: NDA estimates of total future decommissioning spending



Source: NDA, OBR

6.94 Chart 6.24 shows how the NDA's annual spending on decommissioning has increased by nearly 70 per cent in real terms since 2005-06. Relative to GDP, it has increased by around a half. In 2015-16, the NDA spent £3.3 billion, financed by grants from DECC, largely on decommissioning. It also secured £1.1 billion of commercial income, which was surrendered to government and netted off as receipts in DECC DEL. On a net basis, the NDA therefore accounted for about 60 per cent of its parent department's DEL.⁴ Managing the fiscal risk associated with variations via the standard approach of absorbing or offsetting changes within a parent department's fixed DEL limits would clearly be challenging.⁵

6.95 Chart 6.24 also shows the latest NDA spending plans, based on the forward profile in the 2015-16 accounts. While uneven from year to year, spending generally declines from 2017-18 onwards, with a bump towards the end of this century associated with the expected dismantling of Magnox reactors and final site clearance. The 2015-16 accounts explain how the NDA expects to stabilise and ultimately reduce future non-Sellafield costs by using targeted cost incentive fee contract structures. But there are risks to this:

- The NDA's 2015-16 accounts emphasise **the scale of uncertainty around the future costs**. They estimate that the actual final costs could lie anywhere in a range from £95 billion to £218 billion, compared to the current central estimate of £117 billion (on an undiscounted basis over the full 120 years). But if total expected spending increases, annual spending would still be expected to peak at around £3 billion over the next five

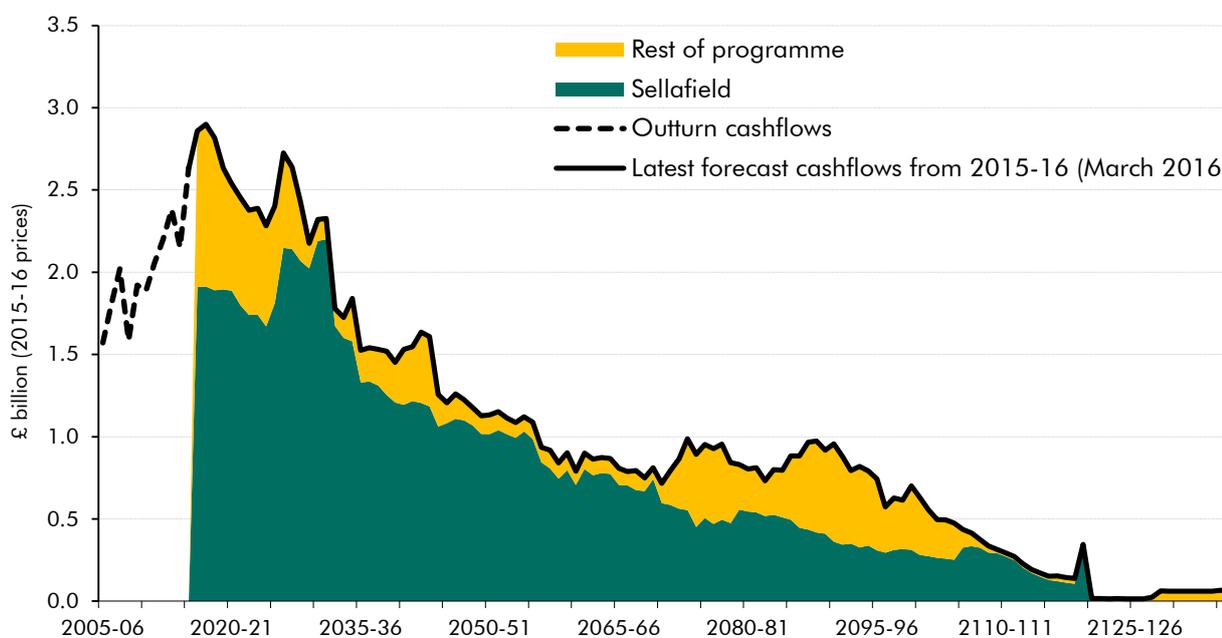
⁴ At the time, its parent department was the Department of Energy and Climate Change (DECC). Responsibility for energy policy, and therefore the NDA, has since been transferred to the Department of Business, Energy and Industrial Strategy (BEIS).

⁵ In 2010, in the run up to the 2010 Spending Review, Chris Huhne, the then Energy Secretary, was quoted in the Guardian newspaper warning that the NDA needed to increase its net spending by £4 billion over the Spending Review period, and arguing that "the costs [of decommissioning] are such that my department is not so much the department of energy and climate change, as the department of nuclear legacy and bits of other things".

years. The main uncertainties relate to decommissioning at Sellafield, including the costs associated with the planned new geological disposal facility, where some of the costs associated with these facilities could vary by *minus 50 to plus 300* per cent. Any large variations in these costs would not be expected until after the mid-2030s.

- The NDA announced in March 2017 that **a major contract had had to be terminated and will be retendered** due to “a significant mismatch between the work specified... and the work that actually needs to be done”.⁶ This related to a £6.1 billion contract awarded in 2012 to decommission the 12 Magnox sites, over a period up to 2026. The NDA judged that “the scale of the additional work is such that... it would amount to a material change to the specification on which bidders were invited in 2012 to tender.” The NDA does not expect the contract change to increase the provision.

Chart 6.3: Yearly profile of NDA nuclear decommissioning expenditure

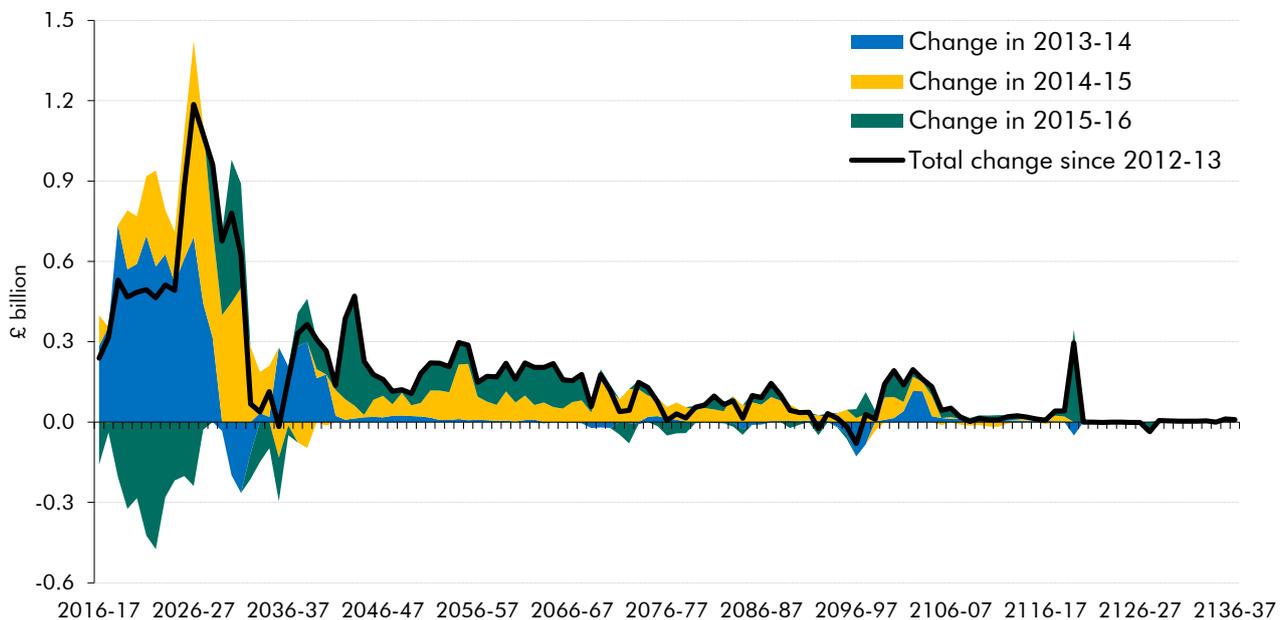


Source: NDA, OBR

6.96 Chart 6.25 shows how the future profile of estimated spending underpinning the NDA’s accounting provision changed between its 2012-13 and 2015-16 accounts. This illustrates the volatility of shorter-term projections, as the nature and scale of the decommissioning work continues to be reviewed and refined. It is the uncertainty inherent in these estimates that represents the ultimate source of fiscal risk from the older nuclear sites.

⁶ BEIS, *Nuclear Decommissioning Authority settlement, contract termination, and inquiry*, written ministerial statement to Parliament. 27 March 2017.

Chart 6.4: Changes in the spending profile for NDA nuclear decommissioning



Source: NDA

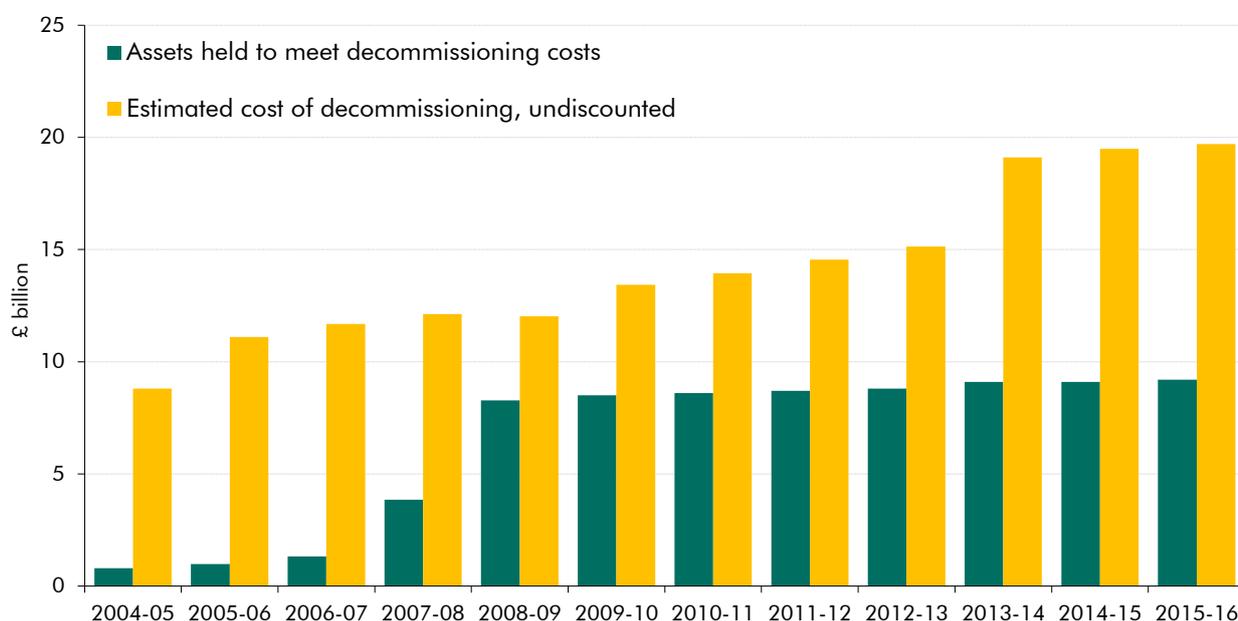
The second generation of nuclear power stations

- 6.97** Steps were taken to transfer some of the risks associated with decommissioning the second generation of nuclear power stations – specifically, the eight owned by EDF Energy Nuclear Generation Group Limited, formerly known as British Energy Group plc. The first plant is expected to retire in 2023, with the rest to be closed progressively up to 2035. Decommissioning is assumed to continue until 2126.
- 6.98** In 1996, the Government established the Nuclear Liabilities Fund (NLF) to cover certain expected costs of decommissioning and waste management activities for these plants. Future costs of the remaining activities fall to EDF Energy. The Fund’s objective is to generate sufficient returns to meet the future costs for which it is responsible, and in doing so to avoid crystallising any shortfall that would be passed in full to government through the terms of a guarantee agreed in 2002. It currently has assets of around £9 billion and receives ongoing quarterly contributions from EDF.
- 6.99** The NLF approach creates risks on both the liability and asset side, with the Fund in effect aiming to have sufficient assets by the mid-2020s to start meeting the uncertain costs for which it is responsible. In terms of liabilities, the costs of decommissioning could end up being greater than expected, as with the older sites. In terms of assets, the Fund’s investment return could be lower than required to meet the future costs. A sixth of the Fund is held in a growth portfolio that is subject to various investment risks (e.g. movements in equity prices, exchange rates and interest rates). The rest is held in the National Loans Fund and is therefore subject to limited investment risk, but with relatively low expected returns.
- 6.100** Chart 6.26 shows the evolution of estimated future decommissioning costs against the assets held by the NLF. Since the fund has many years in which to grow before any

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decommissioning costs are incurred, it shows a large funding gap on an undiscounted basis in all years. Future investment returns on NLF assets will contribute towards meeting the eventual costs, so any future shortfall will depend on both investment returns and changes in estimated costs. The gap shown in the chart has risen from £3.8 billion in 2008-09 (when British Energy was sold to EDF Energy) to £10.5 billion in 2015-16. The NLF's Trustees warned in the 2015-16 Annual Report that "Recent changes in actual and expected interest rates lead the directors to believe that expected investment returns may be insufficient to meet the currently projected nuclear liabilities, based on current assumptions and current investment policy".⁷ It also set out a number of steps that it is taking to mitigate these risks.

Chart 6.5: Assets of the NLF and estimated cost of associated decommissioning



Source: DECC (now BEIS), NLF

New nuclear power stations

6.101 The Energy Act 2008 requires operators of new nuclear power stations to meet the full cost of decommissioning, waste management and disposal.⁸ Hinkley Point C is the first station to be approved. It is being built and operated by a subsidiary of EDF, which will receive a 'strike price' of £92.50 (in 2012 prices) for each megawatt hour (MWh) of electricity produced for the first 35 years of operation. The company that will build and operate it expects decommissioning and waste management to cost £7.3 billion (in 2016 prices).⁹

6.102 The approval process included a funded decommissioning programme comprising:

⁷ Nuclear Liabilities Fund, *Annual Report and Accounts for the year ended March 2016*, 2016.

⁸ Department of Energy and Climate Change, *The Energy Act 2008 Funded Decommissioning Programme Guidance for New Nuclear Power Stations*, 2011.

⁹ National Audit Office, *Report on Hinkley Point C*, 2017.

- A **decommissioning and waste management plan**: this sets out the operator's expected liabilities, to be reviewed every five years and independently verified.
- A **funded arrangements plan (FAP)**: this sets out how the operator will aim to meet these liabilities by paying into an independently managed fund. The Nuclear Liabilities Financing Assurance Board concluded in 2016 that it provides 'prudent provision'.
- **Waste transfer contracts (WTCs)**: these determine the price the operator will pay the Government to dispose of spent fuel in a yet-to-be-built facility. The cost of disposal is currently estimated at £2.9 billion (in 2016 prices). The price is capped at £5.9 billion, including a fee paid to insure against the possibility of the costs exceeding the cap.

6.103 There is a risk that the cost of the disposal of spent fuel will be higher than provisioned for in the WTCs. In that case, the Government would have to make up any shortfall. The Government judged the likelihood of that as 'very low', but if it increased this could result in a contingent liability or provision.¹⁰

6.104 There is also a risk that the plant has to be shut down for some reason before the decommissioning fund has been built up sufficiently to meet the costs. A 'Secretary of State Investor Agreement' (SOSIA) sets out the obligations of parties in the event that it is shut down for political or other reasons not related to the economic performance of the operator or environmental concerns. According to this agreement, the investors have the right to transfer their shares in the operator to the Government – along with the associated decommissioning and waste management liabilities. In effect, this means that if the Government or an international body requires the plant to be shut, the Government would have to nationalise it with full compensation to EDF investors. If the plant was forced to shut down for technical reasons, the company is liable for any outstanding liabilities, but if they were unable to do so the Government would ultimately be responsible.

6.105 The NAO has noted that the contract provides for the Government to acquire ownership in the event that generation becomes uneconomic or unfeasible as a result of the generator's own decisions.¹¹ DECC reported to Parliament that the SOSIA "sets out the process for the transfer of the Generator (to the UK Government) in the circumstance where investors are no longer willing to fund the Generator and no-one else is willing to do so either."¹²

6.106 As well as risks associated with decommissioning, the NAO also highlighted a range of other risks. In particular, it noted that other projects using the type of reactor planned at Hinkley Point C are experiencing problems, creating a risk that the company could require government support, notwithstanding the agreed terms of the project. Pressures on the timetable and cost of construction have also been reported.

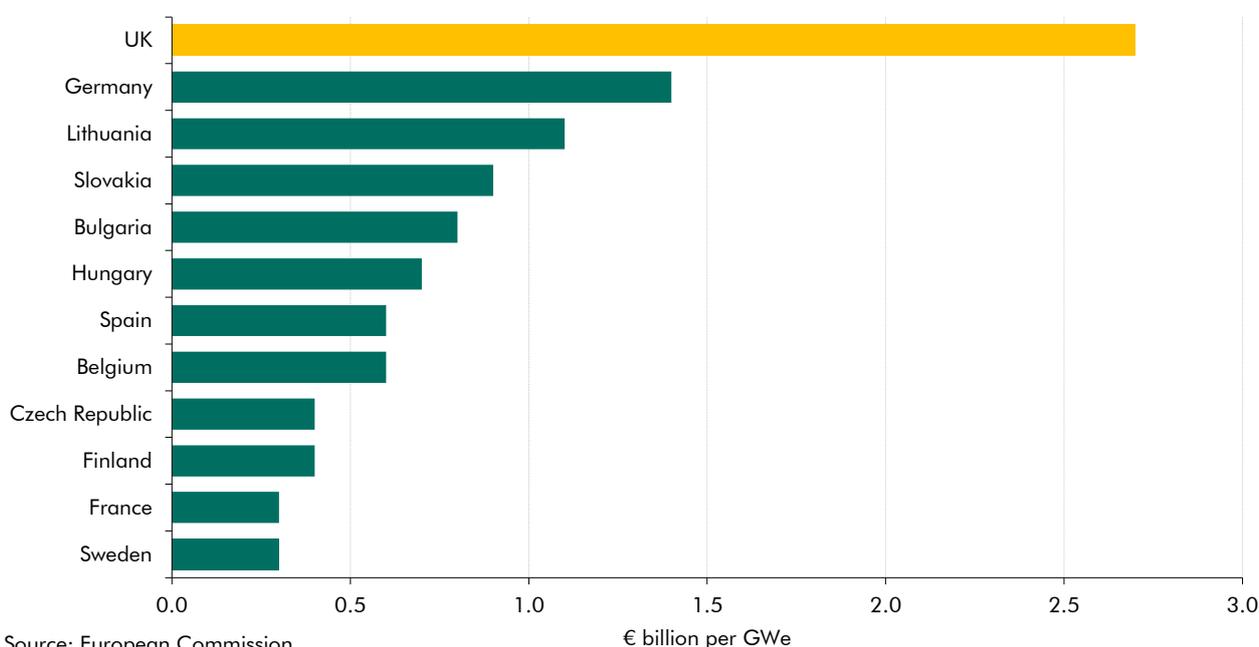
¹⁰ Department of Energy and Climate Change, *Notification That The Secretary Of State May Approve The Entering Into Of Contracts Regarding The Hinkley Point C Power Station That Could Give Rise To Liabilities*, Departmental Minute, 21 October 2015.

¹¹ National Audit Office, *Report on Hinkley Point C*, 2017.

¹² Department of Energy and Climate Change, *Notification That The Secretary Of State May Approve The Entering Into Of Contracts Regarding The Hinkley Point C Power Station That Could Give Rise To Liabilities*, Departmental Minute, 21 October 2015.

6.107 Across countries, the normal approach to future decommissioning costs is to make the operator or owner responsible for them.¹³ Financing methods vary, but the most common include funds being set aside in a dedicated trust. The funds for this purpose are typically raised by charging consumers a levy set as a percentage of electricity prices charged. Practice varies as to whether to assess the adequacy of funds using discounted or undiscounted measures of future decommissioning costs.¹⁴ The relative costs in EU member states with the largest nuclear generating capacity are shown in Chart 6.27. These vary widely depending, for instance, on the age and type of nuclear power plant. They are particularly high in the UK, where the first generation of nuclear plants were built with less consideration of the ultimate method and cost of decommissioning.

Chart 6.6: Nuclear decommissioning costs by country relative to energy generated



Conclusions

6.108 Fiscal risks from nuclear decommissioning are generally continuous, isolated from other risks, and endogenous, in that the Government can to some extent choose when to incur the costs. In terms of the ‘four Ts’ of fiscal risk management, the Sellafield approach *tolerated* the risk, with the uncertain costs borne by the public sector. To differing extents, the second- and third-generation approaches seek to *transfer* the costs and risks to the private sector. Nuclear decommissioning is the biggest source of provisions in the WGA, but the costs are spread over more than a century and spending is currently expected to peak at £2.9 billion a year in 2017-18. So while the numbers are big from the perspective of the department managing them they are less so from the perspective of the public sector as a whole. That

¹³ OECD Nuclear Energy Agency, *Costs of Decommissioning Nuclear Power Plants*, 2016.

¹⁴ According to the European Commission’s Working Document on *Nuclear Illustrative Programme presented under Article 40 of the Euratom Treaty for the opinion of the European Economic and Social Committee*, 2016, EU countries are split roughly half and half as to whether they use discounted or undiscounted future decommissioning costs.

said, as the range of estimates prepared by the NDA shows, the risk that annual spending rises by more than £1 billion in any year is far from negligible.