National Audit Office

REPORT BY THE
COMPTROLLER AND
AUDITOR GENERAL

HC 630
SESSION 2012-13

7 NOVEMBER 2012

Nuclear Decommissioning Authority

Managing risk reduction at Sellafield

Key facts

£67.5bn

is the provision for the cost of decommissioning and cleaning up Sellafield, before discounting future cash flows to their present values

£4.6bn

is the estimated lifetime cost of the 14 major projects at Sellafield, before discounting future cash flows to their present values

2120

is the target year for completing the clean-up of Sellafield

55	buildings at Sellafield have been decommissioned
1,400	buildings remain at Sellafield
£1.6 billion	spent on running and cleaning up Sellafield during 2011-12
£411 million	spent on major projects at Sellafield in 2011-12
£1.3 billion	is the estimated undiscounted lifetime cost of the largest project at Sellafield
9,231	permanent staff employed at the site on average by the site's operator (Sellafield Limited) during 2011-12
276	permanent full-time equivalent staff employed by the Nuclear Decommissioning Authority at 31 March 2012

Summary

1 Sellafield is the UK's largest and most hazardous nuclear site. The Nuclear Decommissioning Authority (the Authority) owns Sellafield and 18 other UK civil nuclear sites. The Authority is an arm's-length body sponsored by the Department of Energy and Climate Change (the Department).

2 Nuclear operations at Sellafield started in the 1940s. Successive operators of the site did not give sufficient thought to decommissioning or retrieving and disposing of radioactive waste. The Authority inherited a legacy of poor planning, neglect and gaps in information when it took ownership of Sellafield in April 2005. Around 240 of the 1,400 buildings on the site are operating nuclear facilities or legacy buildings containing radioactive materials. Some that are deteriorating or fall short of modern standards pose significant risks to people and the environment. Any significant containment failure, particularly in legacy storage ponds and silos, could result in highly hazardous radioactive material causing enduring contamination, affecting people and the environment.

3 Sellafield Limited manages the site under contract to the Authority. The Authority sets strategic objectives and Sellafield Limited develops and implements an Authority-approved 'lifetime plan'. Sellafield Limited consults on the plan with the Office for Nuclear Regulation, which regulates nuclear safety and licenses Sellafield Limited to operate the site under the Nuclear Installations Act 1965. It also consults the Environment Agency, which oversees compliance with environmental regulations.

4 In November 2008, the Authority appointed Nuclear Management Partners Limited, a consortium of private sector companies (URS, AMEC and AREVA), as the 'parent body organisation' of Sellafield Limited to improve performance by using outside expertise. The new parent body, which the Authority appointed through a competitive process, owns Sellafield Limited for the duration of the parent body agreement with the Authority. The agreement has an initial five-year term, and could be extended by up to a further 12 years, at the end of which the Authority regains ownership of Sellafield Limited.

5 The Authority reimburses Sellafield Limited's allowable costs for managing and operating the site, which in 2011-12 totalled £1.6 billion. The Authority incentivises Sellafield Limited's performance through fee payments. As at September 2012, the Authority's provisional estimate of fees for 2011-12 was £54 million. Sellafield Limited passes fees to Nuclear Management Partners Limited as dividends.

6 The Authority estimates that Sellafield Limited will clean-up Sellafield by 2120. The Authority's provision for the cost of decommissioning and cleaning up the site, before discounting future cash flows to their present values, was £67.5 billion as at March 2012 (£36.6 billion discounted to a net present value). This estimate is based on the lifetime plan for the site. The plan sets out the timescales and budgeted costs for all activities including decommissioning, commercial operations (mostly reprocessing spent nuclear fuel), and projects to treat, package and store waste. The Committee of Public Accounts (the Committee) has previously highlighted the considerable uncertainty over decommissioning costs. The costs had risen each time site operators had revised their lifetime plans, partly as they had improved their approach to preparing them.[1] The Committee recommended that the Authority publish the likely range of costs, incentivise site operators more effectively, monitor lifetime costs better and work with site operators to strengthen their supply chain.

7 This report examines the Authority's progress since the Committee's 2008 report in improving the lifetime plan for Sellafield and the performance of its portfolio of 14 major capital projects, which are key enablers of risk reduction. These projects have a total undiscounted estimated lifetime cost of £4.6 billion (in 2011-12 prices)[2] and accounted for 26 per cent of the Authority's spending at Sellafield in 2011-12. The projects have long schedules and some began before the Authority was created and Nuclear Management Partners Limited were appointed. Commercial operations, waste management and nuclear materials management are outside the scope of the report.

Key findings

Planning

8 In May 2011, the Authority achieved an important planning milestone when it approved a lifetime plan for Sellafield that met its strategic priorities and funding requirements, as well as those of the regulators and the Department of Energy and Climate Change. The previous 2007 plan was designed to meet legally binding regulatory specifications but had been rejected by the Authority as undeliverable. Improving the plan was therefore a core requirement after appointing Nuclear Management Partners Limited in November 2008. The Authority accepted the revised plan in May 2011, a year later than expected, because of the time needed for Sellafield Limited to revise the plan and for the Authority to assure it. The Authority concluded that its assurance work meant the revised plan was good enough to monitor performance and assess efficiencies over the initial term of the parent body agreement up to 2014. The Authority has an option to agree a new contractual baseline with Sellafield Limited that will take effect from 2014 (paragraphs 2.4 to 2.6).

1 HC Committee of Public Accounts, *Nuclear Decommissioning Authority – Taking Forward Decommissioning*, Thirty-eighth Report of Session 2008-09, HC 370, July 2008.
2 The Authority has a specific inflation index for nuclear projects, but adjusts the provision for inflation using the retail price index. Project and provision costs are therefore not directly comparable.

9 Changes to the lifetime plan significantly increased delivery timescales and costs, as Sellafield Limited removed unrealistic assumptions and estimates from the previous unapproved plan:

- **The revised plan continued to require final clean-up of the site by 2120 but extended the date for completing waste retrieval from legacy ponds and silos by seven years to 2036.** The extended timescales were because Sellafield Limited had made limited progress under its previous management towards starting some key waste retrieval projects and used more realistic schedules in the revised plan. This increased spending on maintaining hazardous legacy facilities to safety requirements over a longer period. The revised schedules did not meet the legally binding timetables set by the Nuclear Installations Inspectorate for hazard reduction. However, they were acknowledged by the Authority, the Office for Nuclear Regulation[3] and the Environment Agency as being more realistic based on previous performance (paragraph 2.9).

- **The estimated undiscounted cost during the maximum term of the parent body agreement up to March 2026 was £24.3 billion. This was one-third higher than the £18.2 billion in the previous unrealistic plan.**[4] Sellafield Limited increased its estimates to address a lack of realism in the 2007 plan. The revised plan assumed efficiency savings of £1.4 billion over the first five years of the parent body agreement compared with the estimated costs based on Sellafield's performance under previous management (paragraph 2.10).

- **The Authority's undiscounted provision for the lifetime cost of the clean-up of Sellafield up to 2120 increased from £46.6 billion as at March 2009 (in 2011-12 prices) to £67.5 billion as at March 2012.** The Authority expects that the lifetime cost will continue to rise, as uncertainties in the lifetime plan are addressed, then plateau, and finally decline as Sellafield Limited manages the decommissioning process better (paragraph 2.10).

10 Although the revised plan is significantly better than the previous plan, uncertainties remain. The Authority's assurance of the revised plan was extensive and it challenged proposed timescales and costs. The Authority did not have robust benchmarks to make judgements on proposed levels of performance, the scope for acceleration, or the potential for efficiencies. Nor did the revised plan provide sufficient information to allow the Authority to understand programme-level risks fully. The Authority is working to understand and address the significant delivery uncertainty and scheduling risks that still remain, for example, in completing facilities to treat material from legacy ponds and silos. Many activities at Sellafield are unique, which makes it very difficult to benchmark whole project costs and timescales, particularly for legacy ponds and silos. The Authority is, however, trialling a benchmarking tool, starting with less complex sites. The Authority continues to reassess time and cost estimates for large projects, by reviewing business cases before work proceeds and monitoring Sellafield Limited's progress. Our findings on major projects, set out below, suggest there is still considerable uncertainty in the schedules and costs of the projects that account for 26 per cent of annual spending (paragraphs 2.7 to 2.8).

3 The Office for Nuclear Regulation superseded the Nuclear Installations Inspectorate in 2011.
4 Costs are adjusted for inflation to 2011-12 prices using the retail price index.

Delivery

11 Between May 2011 and March 2012, 12 of the Authority's 14 major projects delivered less than planned. Sellafield Limited extended estimated completion dates for seven and increased the total cost estimate by £0.9 billion. Delays in project delivery could jeopardise timetables for risk reduction and increase spending on maintaining legacy facilities. We found that between May 2011 and March 2012 Sellafield Limited:

- **Achieved less than planned in 12 of the 14 major projects, with five achieving less than 90 per cent of the planned scope. This could jeopardise target dates for risk reduction.** Five projects overran the budgeted cost of work completed, of which three exceeded it by more than 10 per cent (paragraph 3.6).
- **Brought forward the estimated completion date for one of the seven projects in the design phase. Five remained unchanged but their overall cost increased by £0.6 billion to £2.8 billion.** The complexity of these projects means that changes during the design stage are inevitable. However, Sellafield Limited did not allow sufficiently for uncertainty in the cost estimates it initially submitted to the Authority for the silos direct encapsulation plant project. It prepared these estimates before it had assessed the full cost implication of the design. The 92 per cent increase in the estimated cost of the project accounted for nearly all of the £0.6 billion increase (paragraph 3.4).
- **Put estimated completion dates back by between 2 and 19 months in six of the seven projects in construction.** This was associated with a £0.3 billion increase in the total estimated lifetime cost of these projects to £1.8 billion. Eighty-three per cent of the increase was due to cost escalation in the 'evaporator D' project (paragraph 3.5).

12 Delays and increases in some estimated project costs are partly due to the inherited conditions and inherent complexity of the hazards at Sellafield. They also reflect poor project design and delivery by Sellafield Limited and weaknesses in the Authority's oversight. We identified five factors that led to cost escalation and delays:

- **The Authority's contract requires it to reimburse Sellafield Limited for all allowable costs. This means that Sellafield Limited does not bear risks for delay and cost increases.** The Authority used a cost reimbursement contract as the complexity and risk of work at Sellafield means that there is very limited scope to transfer risk and no alternative to cost reimbursement. Even if it were possible to transfer risk, the Authority would have to pay very high risk premiums to the site operator. The Authority uses fees to incentivise efficiencies and achieve milestones. Its provisional estimate of fees across all activities at Sellafield for 2011-12 is £54 million. This is £19 million less than the maximum potential fee, largely because of major project costs escalating. This reduction is, however, far outweighed by the increased project costs and delays borne by the Authority (paragraphs 3.8 to 3.10).

- **There are gaps in the capacity of subcontractors to undertake the required work.** The supply chain lacks capacity to take on cost risks in complex nuclear projects. This means that Sellafield Limited often uses cost reimbursement contracts with its supply chain. The Authority is working with Sellafield Limited to strengthen its procurement strategies and long-term plans to help develop supply chain capabilities (paragraphs 3.11 to 3.12).

- **There has been a long-standing problem, which existed before the Authority was created in 2005, of the site operator starting construction before design risks had been sufficiently addressed.** For example, the site operator spent some £400 million between 1994 and 2002, and a further £128 million between 2006 and 2008, on building a plant to treat waste from a legacy facility. It subsequently found the design could not deal with the waste safely. More recently, after appointing Nuclear Management Partners Limited in 2008, the Authority gave approval for the construction of evaporator D to start in 2009 before design issues were resolved, which contributed to cost escalation and delays. The Authority has revised its approvals processes to try to prevent construction starting prematurely (paragraphs 3.13 to 3.16).

- **Weaknesses in cost and schedule estimation by Sellafield Limited remain significant issues for the Authority.** Sellafield Limited has included contingencies for risk and uncertainty on the major projects ranging from 0.9 per cent to 13.5 per cent of estimated costs. These are lower than historic cost increases on the major projects in construction at Sellafield, which have ranged from 10 to 117 per cent. The estimates do not include adjustments for optimism bias. There is significant uncertainty as to how Sellafield Limited can meet the performance plan target to complete the silos direct encapsulation plant project in 2017. The project plan is based on completing it later, during 2018-19 (paragraphs 3.17 to 3.18).

- **Until mid 2011, the Authority did not collect enough robust and timely information on projects from Sellafield Limited to enable timely intervention.** The Authority introduced improved major project reporting in May 2011 to identify emerging issues better (paragraphs 3.19 to 3.21).

13 **Nuclear Management Partners Limited expects to make at least 80 per cent of its planned savings of £1.4 billion.** The Authority has verified that Sellafield Limited has already saved £425 million, and is reviewing a further £270 million of reported savings. The Authority can automatically renew its parent body agreement with Nuclear Management Partners Limited if Sellafield Limited meets minimum performance standards, including making at least 80 per cent of forecast savings (paragraphs 2.14 to 2.15).

14 The Authority does not report externally on the performance of its major projects. It is accountable to the Department of Energy and Climate Change for performance, but these projects are outside the scope of the central government assurance from the Major Projects Authority. The Nuclear Decommissioning Authority's annual report and online reporting show measures of performance against costs and schedules but only selective references to the performance of individual major projects. The Nuclear Decommissioning Authority has not always kept its online reporting up to date. It routinely reports on performance to the Department of Energy and Climate Change and is reviewing the indicators it reports to the Department to ensure that they cover the full range of issues at Sellafield. Most major projects require approval from the Department of Energy and Climate Change, but are not reviewed by the Major Projects Authority (paragraph 3.21).

On the Nuclear Decommissioning Authority's response

15 The Authority is taking appropriate steps to improve Sellafield Limited's performance on major projects and its own capacity to oversee delivery, but it is too early to identify the impact of these changes. From September 2011, the Authority established a programmes and projects review group to identify and address underperformance and to work with Sellafield Limited on improvement plans for key projects. Since April 2012, the Authority has also increased the direct involvement of its Chief Operating Officer in overseeing Sellafield. The Authority has reviewed the increase in staff seconded by Nuclear Management Partners into Sellafield Limited, which cost the Authority £76 million between November 2008 and March 2012. The Authority is considering how to strengthen the existing fee incentive framework if it chooses to renew the parent body agreement in 2014 (paragraph 2.16).

Conclusion on value for money

16 The Authority faces a considerable challenge in decommissioning at Sellafield owing to past neglect. Since 2008, it has made progress by appointing a parent body to the site and agreeing with Sellafield Limited a more robust lifetime plan. The plan, which was agreed in May 2011, still contains uncertainties about delivery schedules and costs in the short and long term. The Authority does not yet have adequate external benchmarks to assure whether the plan is sufficiently challenging.

17 It is too early to judge whether the Authority's appointment of Nuclear Management Partners Limited as the parent body of Sellafield Limited is value for money. Sellafield Limited has saved £425 million, compared to previous expected costs, and it has reported further savings that the Authority is reviewing. However, the portfolio of 14 major projects at Sellafield has so far not provided good value for money, with significant lifetime cost increases and delays of between 2 and 19 months during 2011-12. The Authority is working with Sellafield Limited and Nuclear Management Partners Limited to understand

and address project underperformance. Other activities on the site have improved, notably the increase in the amount of spent nuclear fuel reprocessed each year. Securing value for money will depend on how well the Authority develops its intelligent client capability by benchmarking Sellafield Limited's proposed performance and strengthening contract levers to incentivise progress towards risk reduction.

Recommendations

a **The Authority must better understand how Sellafield Limited has prepared cost and schedule estimates in the lifetime plan and business cases. Where possible, it should benchmark them against previous experience and externally; for example, for support and overhead costs, or materials and labour.** Identifying and routinely collecting data is essential for internal and external benchmarking. The Authority should ensure Sellafield Limited's processes include gathering market data for benchmarking, including from its parent body, and for other sites in its estate if possible. It should also require Sellafield Limited to consider the evidence on optimism bias based on past performance. This would allow the Authority to get stronger assurance that future plans are deliverable but stretching.

b **To gain better value for money from its cost reimbursement contract with Sellafield Limited, the Authority should gather lessons from other organisations that use this type of contract.** The end of the initial term of the parent body agreement in 2014 provides an opportunity for the Authority to strengthen existing incentives, which so far have not improved project performance as the Authority expected. The Authority needs incentives for risk reduction that sufficiently emphasise the timely completion of projects that meet quality standards for nuclear facilities.

c **The Authority should obtain assurance that Sellafield Limited has fully assessed risks to time and cost from its approach to supply chain management and put sufficient mitigations in place, with clear individual responsibilities.** Sellafield Limited has typically used cost-reimbursement or target-cost contracts for major projects, involving limited risk transfer to the supply chain. The Authority has approved Sellafield Limited's decision to re-compete the contract for the single largest project at Sellafield – the silos direct encapsulation project. This is an attempt to transfer some risk to the supply chain. However, it has the potential to introduce further risk to achieving an already uncertain timetable for this project.

d **The Authority should routinely report externally on its major projects, with performance information against original schedules and budgeted costs.** This will enable Parliament and the public better to hold the Authority to account for important work which is at considerable cost to the taxpayer.