National Audit Office

Report
by the Comptroller
and Auditor General

Home Office

Progress delivering the Emergency Services Network

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Progress delivering the Emergency Services Network

Report by the Comptroller and Auditor General

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Comptroller and Auditor General
National Audit Office

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This report builds on our 2016 report on the Home Office's project to provide a new mobile communications service for the emergency services. We examined the progress made in delivering the Emergency Services Network (ESN) and the implications of the 2018 reset.

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Contents

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Key facts

£9.3bn

total amount the Home Office now forecasts that the Emergency Services Network (ESN) will cost

£1.5bn

the Home Office's estimate of the current value of financial and economic benefits it now expects ESN to produce in the period from 2015 to 2037

3 years

minimum forecast delay in switching off the current Airwave system, now scheduled for December 2022

49%	increase (£3.1 billion) between the Home Office's forecast total cost of implementing ESN in 2015 and the current forecast total cost
£1.4 billion	the increase in the ESN programme budget attributable to the cost of extending Airwave
470	organisations expected to use ESN when it is ready; this includes all 107 police, fire and ambulance services in England, Scotland and Wales, and another 363 other organisations in the public, private and third sectors also expected to use the network and contribute to its costs
July 2029	month when total financial benefits are now expected to outweigh the costs that would have been incurred by continuing with Airwave, seven years later than the prediction in the 2015 business case
5 minutes	time that the Home Office expects ESN to save each police officer on each shift, compared with current arrangements (the largest economic benefit expected)

Summary

1 The Emergency Services Network (ESN) is the government's chosen option to replace the Airwave system, which 107 police, fire and ambulance services in England, Scotland and Wales (the emergency services) use for communications between control rooms and the field. Airwave is also used by some 363 other organisations, many in the public sector. ESN is intended to:

- fully replace Airwave; matching it in all respects;
- allow users to take advantage of high-speed mobile data; and
- cost less than Airwave.

2 ESN is jointly funded by the Home Office, Department of Health & Social Care, the Scottish and Welsh Governments, and by the emergency services that will ultimately use it (**Figure 1** overleaf and **Figure 2** on page 7). It is intended to save money by sharing an existing commercial 4G network, unlike Airwave, which is fully dedicated to its users. The technology being developed therefore needs to give the emergency services priority over other users of the network, in particular at times of urgent need such as major events or in crises. ESN should also allow better use of mobile data than Airwave; for example, fire service control rooms could transmit information such as live video of incidents to firefighters on their way to an incident.

3 In 2015, the Home Office awarded the three main contracts for providing ESN to:

- EE Ltd (EE) to provide priority access to its existing mobile network and increase its coverage;
- Motorola Solutions UK Ltd (Motorola) to provide software and systems that ensure ESN meets the needs of emergency services; and
- KBR Ltd (KBR) to be the Home Office's delivery partner, supporting the programme in implementing ESN.

4 Since then, the Home Office has contracted other companies to carry out work on ESN. These include Vodafone in 2016, to link ESN to emergency services' control rooms, and Samsung in 2017, to develop handheld devices for use on ESN. It has yet to award contracts for other parts of the ESN system, such as air-to-ground communications with emergency service aircraft.

Figure 1
The costs of the Emergency Services Network programme

The Home Office now expects the programme to cost £9.3 billion

Component	Responsible	Current forecast (2015–2037) Nominal (£m)
Mobile communication service	EE	1,672
User services	Motorola	1,192
Delivery partner	KBR	162
Project management	Home Office	286
Other projects	Various	2,571
Previous service (Airwave, 2015–2022)	Motorola	2,921
Contingency		714
Income from non-emergency service users		(254)
		9,264

Notes

1 Figures are taken from the financial model underlying the Home Office's current draft business case for the programme, which has not yet been approved.

2 EE, Motorola and KBR are the current main contractors to the programme. The costs shown represent the forecast total costs of these services, not necessarily the revenues to be received by the current main contractors, since these services could be provided by others when the contracts end.

3 Further information on increases in costs is in Figure 7.

Source: National Audit Office analysis of Home Office forecast

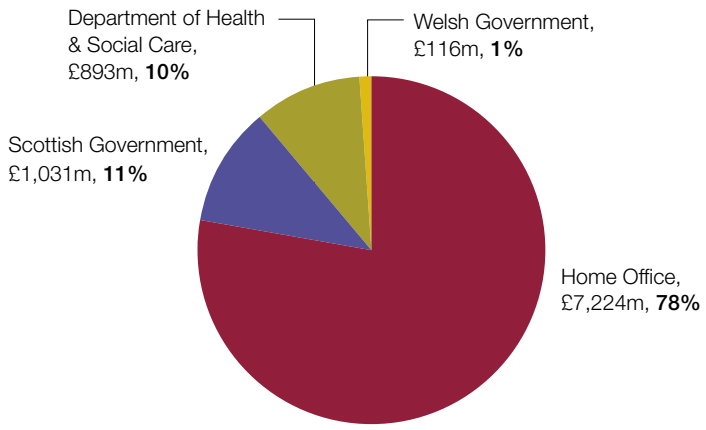
5 The Home Office previously expected that emergency services would start using ESN in September 2017, allowing Airwave to be replaced in December 2019. We reported on ESN in September 2016 and concluded that the Home Office was underrating the risks to delivering ESN successfully.[1]

1 Comptroller and Auditor General, *Upgrading emergency services communications: the Emergency Services Network*, Session 2016-17, HC 627, National Audit Office, September 2016.

Figure 2

How the Emergency Services Network programme costs are shared

The costs of building and running the programme are split between the Home Office and the other sponsors



Notes

1 Figures are taken from the financial model underlying the Home Office's current draft business case for the programme, which has not yet been approved.

2 Shows breakdown of the total cost of £9.3 billion. Costs falling to sponsor organisations include amounts that will be recharged to the 107 emergency services.

Source: National Audit Office analysis of Home Office forecast

6 By 2017, the Home Office realised that its plan for delivering ESN was not achievable. The Home Office was publicly reporting delays of nine months, and the Committee of Public Accounts recommended that it review the risks to the programme.[2] The Home Office commissioned an independent review, which identified five causes of delay:

- The failure of the delivery partner (KBR) to provide planning and collaboration between the other contractors after its role was downgraded.
- Motorola and EE had solutions based on different versions of the technical standards.
- Disagreement on the accountability for systems integration and technical design. The review found that the Home Office and Motorola had not agreed the "true scope" of Motorola's role in integrating ESN systems "end-to-end".
- Challenges in locking down the specification for software and user services. There was no effective process for signing off software developed by Motorola in a timely manner.
- Late delivery of the 'related projects', which the Home Office kept separate from the main contracts and controlled itself. These include the handsets and vehicle equipment that the emergency services will use, providing ESN on the London Underground and an air-to-ground service for helicopters and aeroplanes.

2 HC Committee of Public Accounts, *Upgrading emergency services communications – recall*, Fifty-second Report of Session 2016-17, HC 997, April 2017. Available at: https://publications.parliament.uk/pa/cm201617/cmselect/cmpubacc/997/997.pdf

7 In September 2018, the Home Office announced a 'reset' of its approach, based on a phased introduction of ESN services, rather than launching the whole programme at once. This involved revising the whole programme, for example to extend timetables and renegotiate contracts, a process which is still ongoing at the time of writing. This report examines what the 2018 reset means for the ESN programme and the extent to which the reset has addressed the programme's most significant risks. Our audit approach and methodology are described in Appendices One and Two.

Key findings

On the implications of the reset

8 **The Home Office decided to reset the ESN strategy while prioritising replacing Airwave as quickly as possible.** The Home Office considered that the only options available were to reset ESN or cancel it and continue to use the more costly Airwave. It decided to extend Airwave by three years to December 2022, with the option to extend further, and has addressed some fundamental issues, including adopting an incremental delivery approach (paragraph 9), replacing a key piece of technology (paragraph 13), and restructuring commercial relationships (paragraph 18). But the Home Office did not evaluate other options, because such changes would require an even longer extension of Airwave. The Home Office estimates that the total cost of providing Airwave is £1.7 million per day whereas a completed ESN would cost £0.7 million per day (paragraphs 1.14, 1.19, Figure 5 and Figure 8).

9 **The Home Office has introduced a staged approach to developing ESN intended to reduce risk and has also attempted to strengthen its management of the programme.** It aimed to reduce risk by incrementally launching discrete elements of the service for emergency services to test. This is intended to build users' confidence in the programme and allow lessons to be learned. This contrasts with the previous approach, which intended to provide a single solution all at once. The new approach will offer users the choice of a limited service from late 2019 or the full ESN system from 2021, but their appetite to adopt these early products is not yet known. Since the reset in 2018, the new programme director and team have been working to strengthen management processes, structures and information systems but this is not yet complete. This work has progressed in parallel with revising the programme's business case, negotiating new contracts with suppliers and launching the first of eight ESN products (paragraphs 1.16, 1.17, 2.2 to 2.7 and Figure 6).

10 Implementing ESN is now expected to cost £3.1 billion more than forecast in 2015, and the revised forecast costs are highly uncertain. ESN is now forecast to cost up to £9.3 billion to 2037, an increase of £3.1 billion (49%) from the 2015 business case. Of this, £1.4 billion is the cost of extending Airwave, £0.5 billion is an increase in contingency and the rest of the programme is now forecast to cost £1.2 billion more. The Home Office has delayed approving the business case for the reset until later this year, as the Infrastructure and Projects Authority recommended when it reviewed ESN in January 2019. The sponsors who part-fund ESN have expressed concerns about the cost increases and remaining uncertainties. The Home Office's costing uses assumptions that it has not had time to test with users. It includes £714 million for contingency (9% of total forecast costs) – enough to fund an extension of Airwave of less than two years if there are no other cost increases. The Home Office expects to revise its cost forecast later in 2019 (paragraphs 1.14, 1.18, 1.21, 1.23, and Figure 7).

11 The Home Office still expects that ESN will be cheaper than Airwave in the long term. The Home Office calculates that ESN will cost up to £9.3 billion, less than its estimate of £12 billion for continuing to use Airwave. Its forecast break-even point, at which total financial benefits are expected to outweigh the costs that would have been incurred without ESN, is now in July 2029. This is seven years later than forecast in the 2015 business case and is based on the programme remaining on track from this point. Total financial and economic benefits are forecast to be £1.5 billion in the period to 2037. The Home Office has not revised its assumptions for police efficiency savings made in its 2015 business case and these are yet to be accepted by police. Greater adoption of mobile technology within the police since 2015 means the impact of ESN on police productivity (the largest forecast economic benefit) may now be less than the predicted efficiency saving of five minutes per officer per shift (paragraphs 1.19, 1.20 and Figures 7, 8 and 9).[3]

3 Numbers reflect Home Office's modelling of total costs and benefits between 2015 and the end of the modelling period. The end of the period has moved five years since the 2015 business case.

On technology risks

12 While the Home Office has made some progress, the key technology for ESN is not yet proven in real-world conditions and there are risks that parts of the system will not be available in time. Our 2016 report highlighted the significant technical challenges involved in achieving the ambitions of ESN. Some steps have been taken to prove that components of ESN are technically feasible. For example, Samsung has produced a prototype handset, and EE has successfully tested its core network's ability to prioritise emergency services' use of ESN, although this has not yet been fully tested for the ESN system as a whole or in demanding scenarios, such as major public events or disasters. Other aspects of the Home Office's plans for ESN are also based on technological solutions being available, which at present require significant work to define, develop and test, and security accreditation is not yet in place. The technology that is not yet available includes:

- how aircraft will receive an ESN signal – the Home Office will need to build a new network for aircraft and work on this has not yet started; and
- direct communication between devices (without the need for a network signal) – this is not yet supported by any device, despite being supported by telecommunications standards; the Home Office is exploring options (paragraphs 3.12, 3.28 and Figure 15).

13 The Home Office's decision to change the way the 'push-to-talk' capability in ESN is provided does not guarantee that this critical capability will be available as planned. To match Airwave, ESN must allow users to make near-instant calls at the push of a button, which is critical to the police. During development of the ESN service it became clear that Motorola's Wave 7000 'push-to-talk' product was not meeting the users' requirements. In 2017 Motorola purchased the Kodiak push-to-talk product, which is a theoretical improvement because it complies with the international telecommunication standards used by EE. However, the system still requires significant development and testing and will not meet user requirements until 2020 at the earliest (paragraphs 3.14 to 3.17 and 3.19).

14 The Home Office is not yet clear how the various elements of ESN will work together as a single, coherent system. ESN comprises multiple pieces of technology that must be made to work together. The original contracts were not sufficiently clear on who was responsible for this technical integration, and changes made since 2015 have left the Home Office with responsibility for doing and assuring this technical work. The Home Office has established a new technical working group and, at the time of writing this report, was developing plans for how it will integrate and test ESN. The Home Office does not currently have the capability it needs to fulfil this role but expects that the new contract it plans to let in mid-2019, for "programme advisory and delivery services", will include this (paragraphs 2.8 to 2.11 and 3.25).

On user take-up risks

15 The successful implementation of ESN depends on emergency services being satisfied it is an adequate replacement for Airwave, raising the risk of further delays. The engagement of users is critical to ESN's successful implementation. The Home Office will ultimately decide when to switch off Airwave. It has said it will not do so until ESN is "as good as Airwave in all respects". However, the Home Office will not mandate that anyone switch to ESN until this is achieved. The programme team has identified six major areas of concern for the emergency services. These include whether the coverage of ESN will match Airwave; whether ESN will work on the London Underground; whether the network will be as resilient as Airwave; and whether there is enough time for emergency services to integrate ESN with their control rooms. Users told us they have other concerns including whether ESN provides sufficient capacity to meet operational needs. The Home Office currently rates three of the six areas on its list red and the remainder amber (paragraph 2.12, 2.14 and Figure 12).

16 The Home Office does not yet have a coherent plan for switching off Airwave. The Home Office has developed a plan to complete ESN by the planned Airwave switch-off date of December 2022, but this contains significant uncertainty. The plan assumes ESN will be rolled out in some areas before key parts of the system, such as vehicle or aircraft devices and upgraded control rooms, become available. The emergency services consider the assumption that they can adopt ESN within 27 months unrealistic and that up to four years will be needed to address the practical challenges. The Home Office needs a better understanding of how emergency services will implement ESN in practice. In late 2018, the Home Office carried out exercises with three police forces, to examine their needs and their ability to transition from Airwave to ESN. The Home Office has now begun a wider programme of such work and expects to develop a detailed plan by autumn 2019, outlining when each emergency service will adopt ESN (paragraphs 1.21, 2.14, 2.17 and Figure 10).

17 Emergency services are concerned about the affordability of implementing ESN. Although the Home Office expects ESN to be cheaper than Airwave in the long term, the emergency services are not yet certain how much they will need to pay to invest in infrastructure to improve the coverage of ESN or to prepare control rooms to integrate with the new system. Some users are concerned that the additional costs they will need to fund will place further financial pressure on the wider range of services they must provide (paragraphs 1.7 and 2.15).

On commercial risks

18 The Home Office is taking longer than it expected to renegotiate the programme's main contracts. In mid-2018, the Home Office began negotiating interim agreements to maintain the momentum of the programme while it renegotiated detailed contract terms. This resolved some issues immediately, and project work continued throughout 2018. However, negotiations with EE and Motorola to agree the full set of contractual changes are behind schedule and the extent to which the Home Office's objectives for renegotiation will be met is unclear. According to the timetable at the start of the reset, the Home Office was to sign revised contracts with Motorola and EE by December 2018. The current estimate is May 2019. Until the scope and timescales of work are agreed and contracts are signed, the Home Office may not be able to manage suppliers effectively or hold them to account (paragraphs 3.4, 3.5 and 3.6).

19 The Home Office has not agreed who will be responsible for the ESN service once it is live. It has drafted an outline of responsibilities for supporting the ESN service as it is rolled out. During 2018, it commissioned consultants who recommended that a 'GovCo' – a government owned company – be set up to fulfil this role. But there is no detailed specification of the service that will be provided to customers, nor of the agreements between the different elements of ESN that will be needed to ensure ESN provides a coherent service that meets the needs of the emergency services (paragraphs 2.18 to 2.20).

20 The Home Office needs to manage Motorola's contractual position carefully, given that it is both a main supplier to ESN and the owner of Airwave and may therefore benefit from programme delays. Motorola owns several key components of the current and future systems for emergency services communications. It won the user services contract for ESN in 2015, purchased Airwave in 2016, and purchased Kodiak in 2017. Motorola will benefit from the successful development of ESN, but it also receives large revenues from the continued use of Airwave. The Home Office will also need to manage any conflict of interests regarding Motorola's role in accrediting products for ESN to ensure fair competition, so emergency services are not tied to Motorola's products. Motorola is a control room vendor, potential supplier of handsets and vehicle devices and in charge of accrediting devices and control rooms for ESN (paragraphs 3.7, 3.14 and 3.20).

Conclusion on value for money

21 In 2016, we highlighted both the strategic importance of the programme to introduce ESN and the high degree of risk. Ultimately, the Home Office's subsequent failure to manage these risks has led to delays in bringing the intended benefits of ESN to emergency services. The delays also mean introducing ESN is now forecast to cost £3.1 billion more than planned, and this forecast is highly uncertain. To date, the Home Office's management of this critical programme has represented poor value for money.

22 The Home Office, through its reset, has resolved only some of the issues. Its emphasis on limiting the costs of extending Airwave has meant that its plans are not sufficiently developed to give decision-makers all the information they need. The Home Office does not yet have a robust and sufficiently detailed plan that demonstrates that it understands the challenges faced by emergency services in introducing ESN, and it is also not clear how the various programme components of ESN will be integrated successfully. This lack of understanding creates a risk that poor decisions will be made and further 'resets' will be needed in future. There are still significant risks and, based on past performance, it seems unlikely that ESN can be delivered by the target date of 2022. If the Home Office is to bring this vital programme back on track and deliver the intended benefits, it must develop a comprehensive, integrated plan that addresses the significant uncertainties that remain.

Recommendations

a **The Home Office needs to test its overall programme plan, to determine whether the new schedule for launching ESN and shutting down Airwave is achievable.** It should prepare a comprehensive plan as soon as possible, covering all key elements of this complex programme, to ensure it develops realistic and tested assumptions about the time required for each element and the dependencies between them. The plan should be used to establish whether the Home Office can achieve the December 2022 date for switching off Airwave. It should be appraised by the Home Office's new supplier of "programme advisory and delivery services", expected to be appointed in mid-2019, and should be agreed by ESN's sponsors, users and suppliers.

b **The Home Office needs to decide how the vital work to integrate all the ESN technology will be carried out.** It should clearly set out whether this technical integration is part of the new contract for "programme advisory and delivery services" and if not, whether the programme team can do the technical integration itself or needs additional technical support.

c **The Home Office needs to work with other sponsors and users to develop the arrangements for managing ESN once it is fully operational.** How the ESN service will be governed and managed when it is a live service is still not clear, although we identified this risk in our report in 2016. This leads to a continuing risk that users' requirements will not be met.

d **The Home Office should develop a contingency plan that sets out what it will do if technology on which the overall ESN programme is dependent does not work.** The contingency plan should be linked to key delivery milestones for the contractors and include clear criteria for activating it.

Part One

The Emergency Services Network

1.1 This part sets out what the Emergency Service Network (ESN) is, why the Home Office decided to reset its programme to deliver it, and the key features of the Home Office's new approach, including its forecasts of costs and benefits.

The need for ESN

1.2 Emergency services need mobile communications and data to do their job. As well as talking to each other, front-line staff need contact with central control rooms, from which operations are organised and directed. This is particularly important to emergency services workers who need to call for back-up. Access to mobile data is becoming increasingly important to all services; for example, fire service control rooms want to transmit information such as live video and images of incidents to firefighters on their way to an incident.

1.3 Since 2000, emergency services have communicated using a dedicated digital radio network, called Airwave. Airwave was originally built for the police but is now used by all 107 emergency services in England, Scotland and Wales and some 363 other organisations, such as local authorities and train operating companies. Airwave provides a mainly voice-based communication service but can also carry limited data. It was built under a 20-year contract that was due to end in 2020.

1.4 In 2011, the Home Office decided to replace Airwave with a new service called ESN (**Figure 3**). Rather than build a new dedicated network, the Home Office decided it would be cheaper to pay for prioritised access to a commercial network. The technology being developed needs to give the emergency services priority over other users of the network, in particular at times of urgent need such as major events or in crises.

Figure 3

Elements of the Emergency Services Network (ESN) programme

The programme comprises six elements delivered by multiple parties

		Main responsible parties
Devices 	• Special handsets are needed to withstand demanding operational conditions.	Samsung
	• Vehicle devices are needed for police cars, ambulances and fire engines. • Aircraft devices are needed for helicopters and aeroplanes.	Others TBC
Network infrastructure 	• A signal is needed throughout the UK over land, air and sea, and including critical locations such as the London Underground. • The network must be sufficiently resilient and reliable. • ESN users must be granted priority access over other users.	Home Office Others TBC EE

Core network and software 	• ESN must support standard features such as calls and 4G data.
	• In addition, ESN must support special features including:
	  ◦ Push-to-talk: the ability to make calls at the push of a button.
	  ◦ Group calls: communication between large numbers of users.
		Motorola

Back-office support 	• ESN needs helpdesks, billing systems, monitoring and security.	
Operational support 	• Users will need to train staff and adapt operational practices to use ESN.	Emergency services
Control rooms 	• Control rooms need to be upgraded to work with ESN.	Various

Source: National Audit Office analysis

1.5 The Home Office intended that ESN would:

- **fully replace Airwave, matching it in all respects.**

  The Home Office did not define this objective in detail. However, it expected ESN to replace Airwave completely including its devices, infrastructure, special features and upgraded control rooms.

- **allow users to take advantage of high-speed mobile data.**

  ESN would replace Airwave's limited data service with modern 4G capability. This would allow emergency services to work more efficiently and to end commercial mobile data contracts that had supplemented Airwave.

- **cost less than Airwave.**

  Because it will share a network with commercial customers, ESN is expected to be significantly cheaper than Airwave in the long term (paragraphs 1.19 and 1.20).

1.6 ESN is funded by four 'founding sponsor bodies' (sponsors) – two UK government departments, and the Welsh and Scottish governments – and the users of ESN. The Home Office (which has policy responsibility for police in England and Wales and the fire and rescue service in England) is sharing the costs with the Department of Health & Social Care (responsible for ambulance trusts in England), the Scottish Government (responsible for all three services in Scotland) and the Welsh Government (responsible for fire and ambulance services in Wales).

1.7 The emergency services will pay some costs directly. This differs by service and sponsor, but much of the cost of upgrading control rooms, buying devices and the fees for using ESN (and, until ESN is complete, Airwave) will be borne by ESN users. They could also face indirect costs if central government funding is used on ESN instead of being provided to them, placing financial pressure on the wider range of services they must provide.

The need for a reset

1.8 The Home Office's 2015 business case for ESN required it to design, build and test the entire ESN service in the 21 months ending 31 July 2017. In 2015, the plan was that users would adopt ESN in a series of regional transitions that would be completed by March 2020, the point at which the Airwave contract would have ended. ESN would then run as the sole communications system for the emergency services.

1.9 We reported on ESN in September 2016,[4] and found that the timetable for delivering it was ambitious given the technical challenges. We concluded that the Home Office was underrating the high risk that ESN would be delayed. ESN was already between five and 10 months late when we reported, but the Home Office still believed it could be completed by December 2019 (**Figure 4**).

1.10 The Home Office stated in February 2017 that ESN would be completed nine months late. In its second report on ESN, the Committee of Public Accounts recommended that the Home Office review the programme. Over seven sessions (2017 to 2019), the Committee has repeatedly called for greater transparency and clarity on the extent of the delay and impact on costs.

1.11 The Infrastructure and Projects Authority (IPA) supports, evaluates and helps reduce risk for the most complex and high-risk government projects. The IPA's 2018 annual report, based on data submitted in September 2017, downgraded its assessment of ESN to 'red', which it defined as meaning "successful delivery of the project appears to be unachievable". Prior to this, IPA's 2017 annual report (based on data submitted in September 2016) had rated ESN as 'amber', meaning "successful delivery appeared feasible but significant issues already existed, requiring management attention".

Figure 4
Timetable for delivering the Emergency Services Network (ESN)

The date at which ESN replaces Airwave has been delayed to December 2022 at the earliest

	Outline business case (December 2013)	Full business case (August 2015)	Main contract award (December 2015)	When we last reported (August 2016)	Current (April 2019)
Target date for:					
Main contract award	May 2015	October 2015	December 2015	December 2015	December 2015[1]
Transition starts[2]	September 2016	July 2017	September 2017	September 2017	June 2020
Transition complete, ESN replaces Airwave	March 2020	January 2020	March 2020	December 2019	December 2022
Time allowed for transition[2]	42 months	30 months	30 months	27 months	27 months

Notes

1 Contracts are being renegotiated (expected to complete: May 2019).

2 Transition is the period during which the emergency services will start to adopt, test and use ESN instead of Airwave. Its expected duration is expected to be revised over 2019.

Source: National Audit Office analysis of Home Office plans

4 Comptroller and Auditor General, *Upgrading emergency service communications: the Emergency Services Network*, Session 2016-17, HC 627, National Audit Office, September 2016.

1.12 Shortly after his appointment in April 2017, the Home Office's new accounting officer commissioned a review of ESN. The review, by an independent adviser with experience of large IT projects from outside government, sought to understand the extent and causes of the continuing delay. It found that the transition from Airwave to ESN was not likely to happen on time and that the ESN programme needed to be reset. The Home Office announced the reset on 21 September 2018.[5]

1.13 The independent review identified five causes of the delay to the programme:

- The failure of the delivery partner (KBR) to deliver planning and collaboration between the other contractors. The review found that KBR's role had been downgraded, "effectively to one of a recruitment vehicle… to meet the contract price".
- Motorola and EE had solutions based on different versions of the technical standards.
- Disagreement on the accountability for systems integration and technical design. The review found that the Home Office and Motorola had not agreed the "true scope" of Motorola's role in integrating ESN systems "end-to-end".
- Challenges in locking down the specification for software and user services. There was no effective process for signing off software developed by Motorola in a timely manner.
- Late delivery of the 'related projects', which the Home Office kept separate from the main contracts and controlled itself. These include the handsets and vehicle equipment that the emergency services will use, providing ESN on the London Underground and an air-to-ground service for helicopters and aeroplanes.

The decision to reset the programme

1.14 The Home Office began developing its new business case for the reset in August 2018, although this is yet to be approved. The Home Office planned to finalise its new approach by the end of 2018, but has delayed approving the business case until later this year, as the Infrastructure and Projects Authority recommended when it reviewed ESN in January 2019. The Home Office expects to revise its cost forecast as part of the business case. The sponsors who part-fund ESN have expressed concerns about the cost increases and remaining uncertainties.

5 Home Office, *New strategic direction for the Emergency Services Network (ESN)*, press release, September 2018. Available at: www.gov.uk/government/news/new-strategic-direction-for-the-emergency-services-network-esn

1.15 The business case assesses four options for resetting the programme, although it considers only two of them are viable (**Figure 5**). Of these, it prefers the incremental delivery model ('Option B'), based on delivering a series of ESN products to users, because this is expected to be significantly cheaper. The Home Office did not evaluate other options such as changes to the chosen technology, delivery model, suppliers or the transition timetable, since these would have required longer extensions to Airwave, increasing costs. The programme has continued working towards Option B despite the delay in formally approving the business case.

Figure 5

Options for resetting the Emergency Services Network (ESN) programme

The Home Office considered there were only two viable options for resetting the programme and selected incremental delivery

Option	Airwave ends	Viable?	Cost	Benefits	Implications
A – Do nothing	Dec 2019	✗	Not assessed	None, as not viable.	Not considered viable.
B – (selected) Incremental delivery	Dec 2022	✔	£9.3 billion	Benefits still achievable.	Short Airwave extension and renegotiation of ESN contracts. Delivery model changed, from full ESN service at once ('big bang') to 'incremental' delivery of various ESN products.
C – Reduce scope so ESN only provides data	Never	✗	Not assessed	Providing ESN for data is easier to achieve.	Long Airwave extension and renegotiation of ESN contracts. Significant cost increase to run both Airwave and a reduced version of ESN.
D – Cancel or pause ESN	Never	✔	£12.2 billion (worst case)	Airwave known to work for voice. But no benefits from adopting modern data.	Significant cost increase due to long Airwave extension. May need to pay to cancel contracts. Ultimately would need to re-procure something similar to ESN.

Note

1 Options A and C were not evaluated as they were not considered feasible.

Source: National Audit Office analysis of Home Office documents

The new approach

1.16 The new strategy requires the Airwave service to be extended by three years to end in December 2022. The Home Office has the option of extending the contract further. Instead of implementing ESN as a final service, users are given earlier access to eight staged 'products', increasing in functionality between 2018 and 2021, and the Home Office expects they will transition fully to ESN between 2020 and 2022.

1.17 Contractors told us that this approach is an improvement on the previous strategy because they think it is more likely to work. However, at the time of writing, the eight products are still at an early stage of development, so it is difficult to predict whether they can be delivered on time. One, ESN Innovate, does not appear on the project plan and has no specification in place. The Home Office told us that this was because Innovate was a project to allow users to adapt ESN to their needs, rather than a 'product' equivalent to the other seven products. In March 2019 the Home Office rated all of the seven products on the plan 'amber' (**Figure 6**). In January 2019, the IPA reviewed the reset programme and found that "successful delivery of the programme was in doubt with major risks or issues apparent in a number of key areas", and that these required urgent action.

The business case for the reset

1.18 The Home Office re-forecast the costs of its new strategy for ESN in February 2019 and now predicts that ESN will cost £9.3 billion (**Figure 7** on page 22). This is an increase of £3.1 billion (49%) compared with the 2015 business case, after extrapolating its forecast costs to 2037 (an additional £1.1 billion). Of this increase, £1.4 billion is the cost of extending the Airwave contract, £0.5 billion is an increase in contingency and £1.2 billion reflects a re-forecasting of all other costs.

1.19 Although ESN is expected to be cheaper than Airwave once it is complete, the date at which total financial savings outweigh the costs that would have been incurred without ESN is now July 2029, 6.5 years after Airwave is due to be turned off. This represents a minimum delay to the break-even point of seven years compared with the prediction in the 2015 business case. The forecasts cover the period 2015 to 2037 (**Figure 8** on page 23). This analysis is based on an annual cost of ESN of £264 million per year (£0.7 million per day), whereas the total costs[6] of extending Airwave would have been £619 million per year[7] (£1.7 million per day).

6 Including the contract with Motorola plus other costs such as handsets, vehicle devices and local commercial mobile telephone contracts, which will be replaced by ESN.

7 Calculated as the total average annual cost from 2028-29 to 2036-37. ESN cost excludes income from non-emergency-service users as much of this is ultimately a cost to the Exchequer.

Figure 6
Emergency Services Network (ESN) products

ESN comprises eight products, seven are rated amber and one is not rated

Product	What it is	Intended audience	Specification exists?	Risk rating	Expected launch date
ESN Assure	Coverage testing app to check signal strength	All users, to build confidence that coverage is sufficient	Yes	Amber	Launched in November 2018 (100 devices launched with around 900 in storage due to missing security accreditation)
ESN Connect	Prioritised data-only service	Users of existing data-only devices, for example in vehicles	Yes	Amber	September 2019
ESN Connect+	Prioritised voice and data service	Fire or ambulance users who do not need specialist voice features	Yes	Amber	October 2019
ESN Direct	Prototype of ESN Prime (three versions)	Users who are prepared to trial ESN before it is complete	Yes	Amber[2]	September 2019, December 2019 and September 2020
ESN Prime	ESN service for police on the ground	Non-covert police users on the ground	Yes	Amber	October 2020
ESN Prime+	ESN service for police with special security needs	Covert police users	Yes	Amber	October 2020
ESN Air	ESN devices and coverage for aircraft	Police and ambulance aircraft	Yes	Amber	June 2021
ESN Innovate	Software development kit	All users, to build apps to take advantage of ESN data	No	Not reported	Not set

Notes

1 Shows Home Office's assessment of risk and timetable as at 15 March 2019. The programme defines the 'amber' and 'red' ratings as representing significant issues and major issues respectively.

2 Rating for ESN Direct relates to versions 2 and 3. Version 1 rated 'red'.

Source: National Audit Office analysis of Home Office data

Figure 7

Total cost of the Emergency Services Network (ESN)

The cost of the programme has increased since 2015

Component	2015 approved forecast (2015–2032) (Nominal) (£m)	Extrapolated 2015 forecast (2015–2037) (Nominal) (£m)	2019 forecast (2015–2037) (Nominal) (£m)	Change between extrapolated 2015 forecast and 2019 forecast (Nominal) (£m)	(%)
Mobile communication service (currently provided by EE)	1,184	1,579	1,672	93	6
User services (currently provided by Motorola)	817	1,141	1,192	51	4
Delivery partner (currently provided by KBR)	62	62	162	100	161
Project management and integration	141	179	286	107	60
Coverage	387	479	696	217	45
Other	49	49	117	68	139
Devices	516	746	1,070	324	43
Usage (phone calls and data)	327	461	470	9	2
Transition from previous service	107	107	156	49	46
Control rooms	62	62	62	–	–
Previous service (Airwave, owned by Motorola)	1,536	1,536	2,921	1,385	90
Total cost	**5,188**	**6,401**	**8,804**	**2,403**	**38**
Income (fees paid by non-emergency service users)	(371)	(500)	(254)	246	(49)
	4,817	5,901	8,550	2,649	45
Contingency	217	297	714	417	140
Net cost	**5,034**	**6,198**	**9,264**	**3,066**	**49**

Notes

1 All costs are shown in nominal terms and represent the project's view of cost as of February 2019, including 'actual' costs from 1 April 2015 to 31 March 2018 and forecast costs thereafter. The financial model is due to be revised later in 2019. We have not audited these numbers.

2 The 2015 programme business case was based on the period 2015–2032 while the current draft business case uses the period 2015–2037. The 2015 business case has been adjusted to allow a like-for-like comparison.

3 Airwave costs represent the complete costs of maintaining the Airwave contract.

4 'Contingency' in the 2019 business case is estimated to cover what the Home Office assesses to be the cost of 90% of the risks.

5 Income represents fees paid by the non-emergency-service users.

6 EE, Motorola and KBR lines include the costs of the contracts that will replace the current contracts when they expire – these may be let to different contractors.

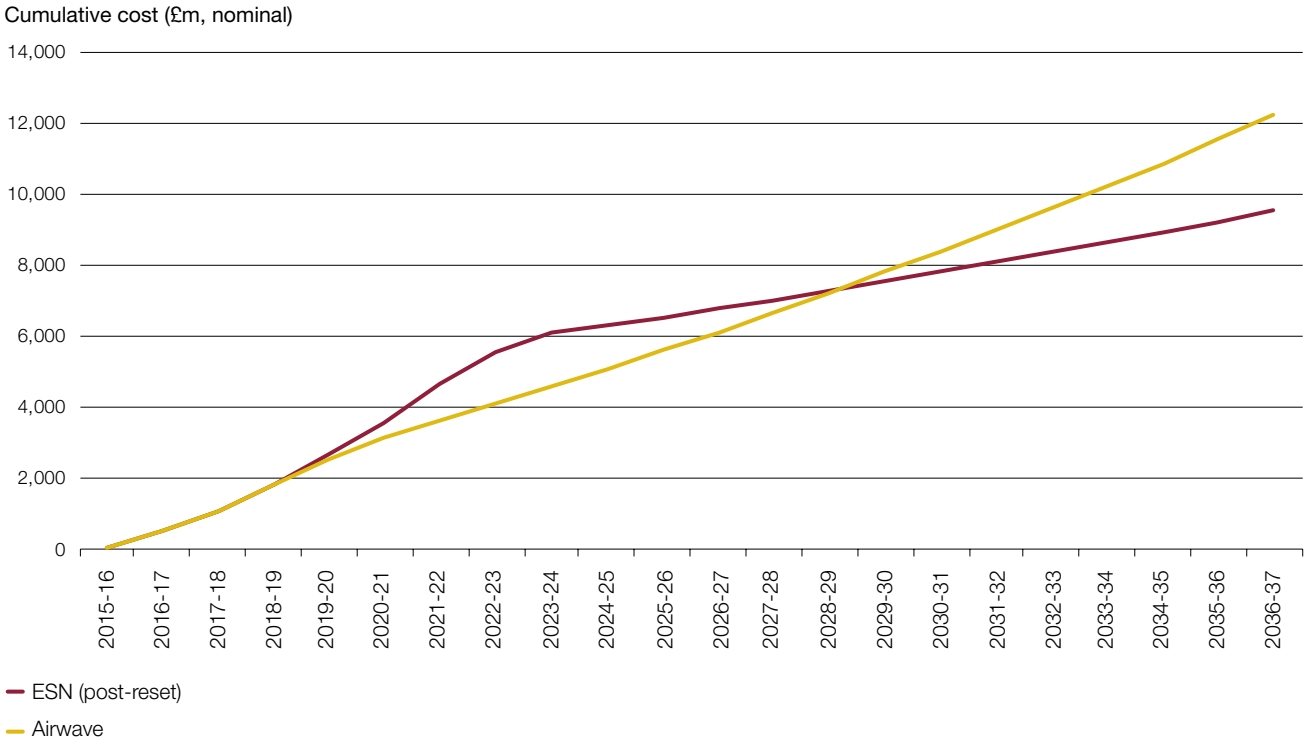
7 'Other' includes testing and other project costs.

Source: National Audit Office analysis of Home Office financial model

Figure 8

Cumulative cost of the Emergency Services Network (ESN) and Airwave

ESN will eventually be cheaper than Airwave but is more expensive in the short term



Notes

1 Shows undiscounted cumulative costs of ESN (post-reset) and maintaining Airwave as modelled by the Home Office.

2 Does not include income from non-emergency-service users.

Source: National Audit Office analysis of Home Office financial model

1.20 ESN is forecast to deliver benefits of £1.5 billion, comprising financial savings of £756 million and economic benefits of £718 million (**Figure 9**).[8] The largest economic benefit, police productivity, is estimated by assuming that ESN can save each officer five minutes per shift through administrative efficiency improvements. In 2016 we reported that the Home Office had been too optimistic in its valuation of programme benefits, and police representatives told us that they had not agreed the Home Office's estimate of benefits. Greater adoption of mobile technology within the police since 2015 means the impact of ESN on police productivity may now be less than this. The Home Office has not fundamentally changed its view of what benefits it expects ESN to deliver, but it has revised the valuation methodology. The Home Office does not yet have a plan for measuring the actual benefits it intends to achieve.

Figure 9
Predicted benefits from the Emergency Services Network (ESN)

Total benefits expected from ESN have reduced

	2015 approved forecast (2015 to 2032) (Discounted to 1 April 2015) (£m)	Extrapolated 2015 forecast (2015 to 2037) (Discounted to 1 April 2015) (£m)	2019 forecast (2015 to 2037) (Discounted to 1 April 2015) (£m)	Change between extrapolated 2015 forecast and 2019 forecast (Discounted to 1 April 2015) (£m)
Productivity	591	754	643	(111)
Other user benefits	401	472	193	(279)
Saved lives	50	71	49	(22)
Emergency spectrum	35	46	–	(46)
Other economic benefits	44	58	8	(50)
Contingency	–	–	(175)	(175)
Total economic benefits	**1,121**	**1,401**	**718**	**(683)**
Total financial benefits	**1,247**	**1,857**	**756**	**(1,101)**
Total benefits	**2,368**	**3,258**	**1,474**	**(1,784)**

Notes

1 Costs and benefits have been discounted to 1 April 2015.

2 The 2015 programme business case was based on the period 2015-2032 while the current draft business case uses the period 2015-2037. We have adjusted the benefits from the 2015 business case to allow a like-for-like comparison.

3 Productivity benefits no longer include improvements for organisations other than the police. Police representatives told us that they had not agreed the Home Office's estimate of productivity benefits.

4 'Saved lives' refers to lives saved due to 999 calls being possible from areas covered by ESN.

5 'Emergency spectrum' refers to economic benefits from releasing spectrum used by Airwave when it is replaced.

6 'Other economic benefits' refer to greater access to 4G coverage in areas covered by ESN.

7 'Contingency' is included in the Home Office's forecast to reflect the risk that benefits will not be achieved. It is not allocated against individual benefits.

Source: National Audit Office analysis of Home Office financial model

8 All these valuations are at 2015-16 prices. The savings figure compares the total cost of ESN to the total cost of Airwave.

Uncertainties in the new cost forecasts

1.21 The Home Office's cost forecast is uncertain because it is based on a number of assumptions made by the programme team. The most significant assumption is the timetable for switching off Airwave. In February 2019, the Home Office approved, for the first time, an integrated plan (summarised in **Figure 10** on pages 26 and 27) but this is not yet complete and coherent because, for example:

- it shows only seven of the eight ESN products that the Home Office expects to launch;
- it expects transition – user organisations adopting ESN – to begin in late 2020, before all control rooms are upgraded to work with ESN, the final ESN product is launched and before all coverage is complete. The Home Office believes that users can start to transition earlier, but this assumption has not been tested or agreed with users; and
- the realism of the plan has not been tested with users. The last regional transition begins three months before notice is given to shut down Airwave, leaving limited contingency should the final planned transition (Scotland, which includes large rural areas) require further work to extend coverage.

1.22 We estimate that under a potential 'near worst-case' scenario, the Airwave shut-down could be delayed by four years, from the current date in the Airwave contract of December 2022, to December 2026, because:

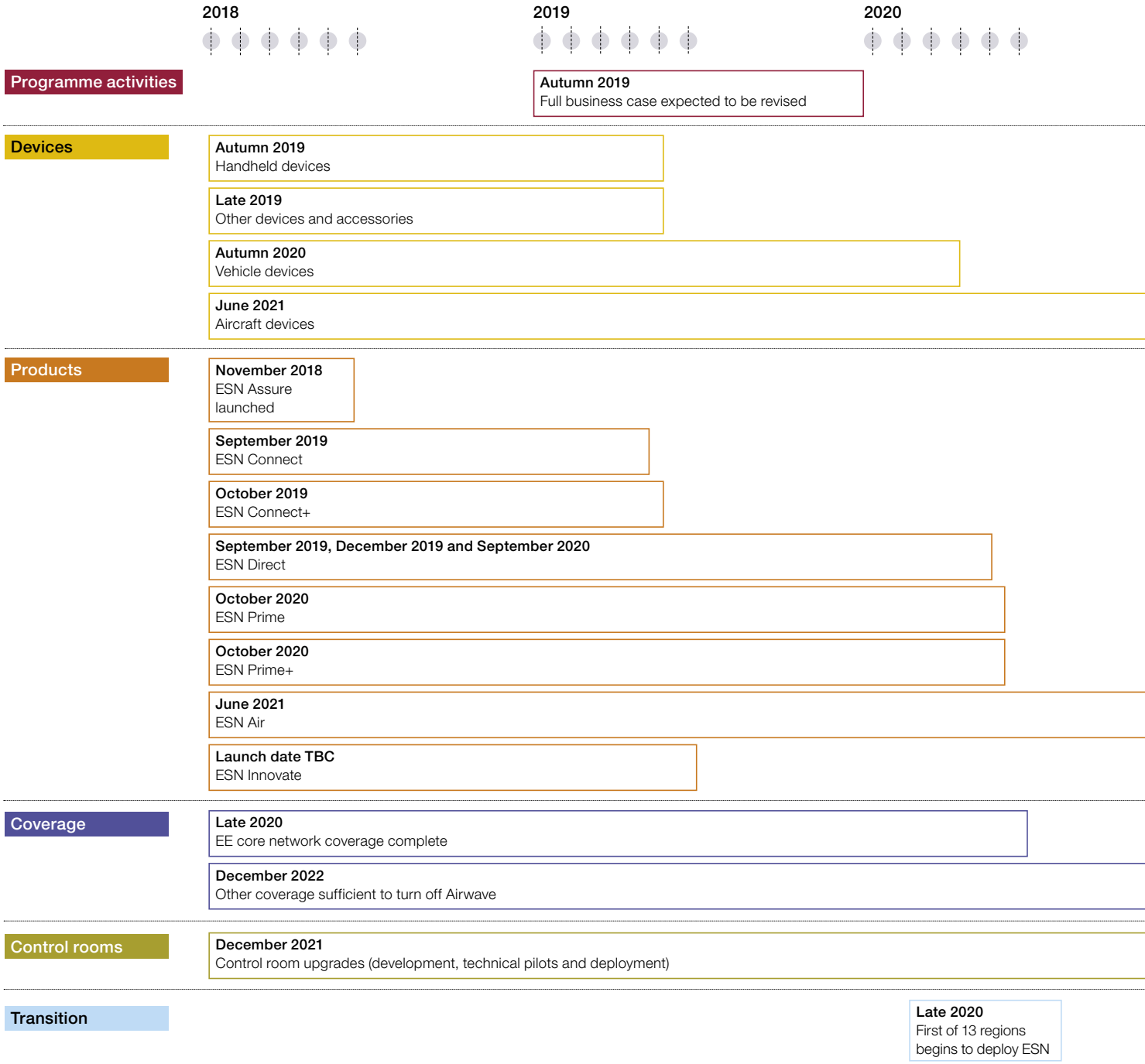
- recent Home Office risk assessments have found that emergency services may not be willing to start their transition to ESN until their control rooms are upgraded for the service, rather than doing these processes in parallel as the programme currently assumes. This means that the transition period would start in January 2022;
- users told us that they would need a transition period of four years rather than the 27 months currently assumed in the plan – meaning that transition would end in December 2025. The Home Office expects to revise the transition timescale in autumn 2019, based on its work with user organisations in the coming months (paragraph 2.17); and
- after the last emergency service had transitioned to ESN, a year's notice to turn off Airwave would be required, so the shut-down date for Airwave would be December 2026.

1.23 Even if all technology is available on time, and there are no further delays to the programme, a transition period of this length would lead to significant additional costs. The Home Office's forecast programme costs include £714 million for contingency, 9% of total forecast costs and enough to fund approximately one to two years extension to Airwave assuming no other cost increases. We therefore consider that the amount of contingency in the forecast is likely to be too low, given the risks.

Figure 10

The timetable for delivering the Emergency Services Network (ESN)

The Home Office expects that all emergency services will adopt ESN by December 2022

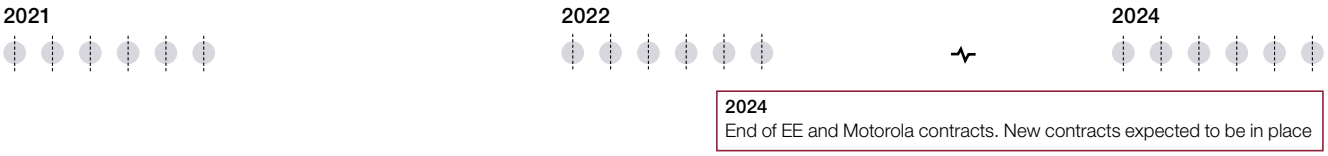


Notes

1 Shows a summary of the Home Office's full plan, which is subject to change and agreement by emergency services.

2 Work on aspects such as coverage began before 2018.

Source: National Audit Office summary of Home Office plan


2021
2022
2024
2024
End of EE and Motorola contracts. New contracts expected to be in place
Late 2021
First of 13 regions finishes deploying ESN
January to December 2022
12-month notice period to shutdown Airwave
December 2022
Deployment of ESN in all 13 regions complete
December 2022
Airwave shutdown

Part Two

The Home Office's management of the ESN programme

2.1 This part sets out how the Emergency Services Network (ESN) is managed; how this has been affected by the reset; the Home Office's progress in establishing a system of governance that can provide assurance that the programme is on track; and the Home Office's engagement with intended users of ESN.

The Home Office's management

2.2 The Home Office established a dedicated team of staff for ESN headed by a programme director. A Home Office director is the senior responsible officer for the programme and has held this role since 2011. Since we last reported, the Home Office has appointed a new programme director with experience of leading change and digital programmes. The director has seven deputies, who are responsible for: products (this post is currently vacant), technology, programme management, customer engagement, finance, commercial, and running ESN as a live service.

2.3 As part of the reset, the programme team is being reorganised. In 2018, more than 100 people left the programme team, but the team expects to recruit additional specialists with commercial and programme management skills in 2019.

2.4 A complex programme such as ESN needs effective oversight and governance to ensure progress is made and risks managed. The Home Office has identified that it needs to improve the programme's governance and has been addressing this in parallel with revising the programme's business case, negotiating new contracts with suppliers and launching the first ESN products. In October 2017, the independent review recommended that the programme needed a partnership approach with "co-location, published and visible plans, designs, story boards, operating level agreements and joint teams". During summer 2018, the Home Office commissioned a review of the role of the programme board, which found:

- that because of the focus on the programme reset, the board had had less focus on the benefits, key issues and risks of ESN itself;
- a lack of clarity on the board's role and on whether other Home Office groups and committees were needed to make decisions;

- too many attendees: the review recommended membership be reduced, but noted that it would be a "challenge" for the Home Office to do so as the board includes representatives of multiple ESN user organisations and funders; and
- a need for a different structure: the review recommended that the Home Office introduce a two-part structure to the board meetings and clarify the role of other supporting groups.

2.5 At the time of writing, the programme team had developed and begun to use a new governance approach, including a two-part 'programme working group' as the key forum for decision-making, reporting to the programme board. The team had also developed outline guidance on how the programme's operating model, including governance, would need to change as ESN progressed through its development, launch and operational stages.

2.6 The 2018 review of the role of the programme board also found that management information received by the programme board and other governance processes, forums and information systems needed improving. Information such as indicators and risk registers needed to be more concise and shared earlier, and some attendees found the technical information difficult to understand, increasing the risk of there not being a shared understanding of issues. At the time of writing the programme team was developing its approach to management information and producing guidance on processes and reporting templates.

2.7 Unlike other complex programmes in government, the programme's own assurance function has been ad hoc. The Home Office is still developing its assurance strategy. An April 2018 review recommended establishing an independent assurance group to ensure that there was "one version of confidence". The programme has brought in external experts and has reviewed the roles of the various bodies involved in assurance, both within the Home Office and elsewhere in government. The independent reviewer who produced the 2017 report which led to the decision to reset the programme, now chairs an assurance panel set up in December 2018.

The Home Office's responsibilities for programme integration

2.8 ESN is made up of multiple pieces of technology that must work together. This requires the various components to be integrated effectively so that they provide the seamless service customers require.

2.9 The Home Office contracted KBR Ltd (KBR) to be the 'delivery partner', to support the programme in implementing ESN in 2015. In 2016 we reported that KBR's performance was unsatisfactory. In 2017, an independent review of the ESN programme found that the Home Office had appointed less-experienced civil servants to take decisions, effectively downgrading KBR to a recruitment vehicle for project administrators and telecommunications experts. This meant responsibility for planning and collaboration across suppliers had effectively passed to the Home Office.

2.10 By mid-2018, the Home Office was increasingly using its own and sub-contracted staff for programme management and integration work. During the reset, the Home Office decided to take on contractual responsibility for integration and formalised this in heads of terms with Motorola and EE in September 2018. In these agreements it stated that it would act as the delivery integrator for ESN, take ownership of the integrated programme delivery plan and work with suppliers to produce an integrated ESN product.

2.11 The Home Office has established a technical working group to oversee technical integration and at the time of writing was developing its approach to systems integration and testing. The Home Office expects that the new contract it plans to let for "programme advisory and delivery services" in mid-2019 (paragraph 3.25) will provide capability in this area.

Addressing emergency services' needs

2.12 The engagement of users is critical to implementing ESN. The Home Office has said it will not switch off Airwave until ESN is "as good as Airwave in all respects" and that it will not mandate that anyone switch to ESN until this is achieved. The Home Office expects that all 107 emergency services will agree to use ESN because otherwise they risk not being able to communicate with each other effectively.[9]

2.13 Home Office data list around 363 other organisations (**Figure 11**) who previously used Airwave and are expected to pay some £254 million to use ESN. Engagement with those users has been paused pending a review of how ESN will be priced, but preliminary data suggest around 30 are considering withdrawing from ESN, which would lead to additional costs for those users who continue to participate.

User concerns

2.14 The Home Office's new approach to delivering ESN is intended to be customer-focused but has not yet been accepted by users. For example, emergency services told us that the assumption that they could adopt ESN within 27 months is unrealistic and that up to four years will be needed to address the practical challenges (paragraph 1.22). However, the Home Office has been slow to develop a plan for addressing users' concerns. In 2018, it identified that users had six main areas of concern that might prevent them adopting ESN (**Figure 12** on page 32). Users told us they have other concerns including whether ESN provides enough capacity to meet operational needs and whether coverage within buildings will be sufficient. As at March 2019, the Home Office has only a high-level plan for resolving users' concerns and does not expect to resolve all six issues on its list until December 2022. The Home Office has rated overall user engagement as 'amber', despite rating three of the six areas 'red'.

9 The total of 107 emergency services includes all territorial emergency services in England, Scotland and Wales, plus the National Police Air Service. Other emergency services such as the three non-Home Office specialist police forces may also use ESN – these are classed as 'other users' by the programme.

Figure 11
Emergency Services Network (ESN) users

All 107 emergency service organisations and 363 other organisations could use ESN

	England	Scotland	Wales	Other	Total	Forecast connections to ESN
Police	39	1	4	1	**45**	231,951
Fire	45	1	3	–	**49**	16,600
Ambulance	11	1	1	–	**13**	28,484
Total emergency services	**95**	**3**	**8**	**1**	**107**	**277,035**
Other potential users					363	25,000
Total potential users					**470**	**302,035**

Notes

1 The total of 107 emergency services includes all territorial emergency services in England, Scotland and Wales, plus the National Police Air Service.

2 Other potential users include the three non-Home Office specialist police forces, councils, railway companies and fire services operating at airports. There may be some duplication in this number if different parts of the same organisation have separate contracts with Airwave. The Home Office is working to identify such duplicates but it does not have a complete list as of March 2019.

Source: National Audit Office analysis of Home Office data

Figure 12

User concerns identified by the Home Office

The Home Office believes potential users of the Emergency Services Network (ESN) have six main areas of concern

User concern	Description	Summary of progress	Risk rating	Target completion date
Coverage	ESN needs to provide coverage as good as Airwave	Funding for filling gaps is unclear. The Home Office believes it is "difficult" to assess costs until coverage work is complete.	Red	December 2022
Coverage on the London Underground	Coverage is needed on the London Underground	Work has started but the Home Office still needs to agree funding for work after March 2020 with Transport for London (TfL).	Red	June 2021
Network resilience	Emergency services expect ESN to be as resilient to power cuts as Airwave	A ministerial decision is expected to approve that ESN will not be as resilient to power cuts as Airwave.	Red	June 2019
Control rooms	Systems in control rooms need to be upgraded to work with ESN	Control rooms only appeared on the Home Office's plan from February 2019. Control room vendors do not have all the information they need to plan their work.	Amber	Late 2021
Air to ground coverage	ESN needs to provide coverage in the air	The Home Office needs to build a new air network. This work has not started.	Amber	June 2021
Deployment and devices	Emergency services consider the Home Office's assumption that they can adopt ESN within 27 months unrealistic and that four years may be needed	The Home Office and users have not yet agreed how and when users will transition to ESN. The Home Office expects to resolve this by autumn 2019.	Amber	December 2022

Notes

1 Shows Home Office risk rating as at March 2019. The programme defines the 'amber' and 'red' ratings as representing significant issues and major issues respectively.

2 Users told us they have other concerns including whether ESN provides sufficient capacity to meet operational needs.

Source: National Audit Office analysis of Home Office data

2.15 The emergency services and sponsors are concerned about the affordability of ESN. Although the Home Office forecasts that ESN will be cheaper when it is ready, it has not tested with users that its model is a complete view of all the costs. Some services are concerned that they will not be able to afford to pay for ESN due to short-term budget pressures. As well as increasing the overall cost, users have already spent money preparing control rooms for the old approach – work which is lost given the change to the new Kodiak push-to-talk system (paragraph 3.17) – and some forces have begun to spend money on replacing ageing Airwave devices. However, the Home Office does not know the amount spent.

2.16 The Home Office is engaging emergency service users through senior user representatives at monthly customer boards and a fortnightly customer working group. Senior user representatives told us that the lack of direct access to suppliers hinders effective joint working. EE is independently working to understand users' needs by, for example, meeting user representatives directly and hosting visits to EE sites. As well as its work with user representatives, the Home Office is preparing to develop the way it advertises ESN to front-line emergency service users in 2019, but much of its work is at an early stage.

2.17 The Home Office's understanding of how users will make the transition from Airwave to ESN is also limited, as it is in the early stages of its planning work. In late 2018, the Home Office ran exercises with three police forces, to examine what support they need to transition from Airwave to ESN. This identified substantial work to do for the programme as well as the police forces in six areas, including addressing concerns about control room and device capabilities. In January 2019, the Home Office started similar exercises with other user organisations as well as suppliers, to refine its understanding of users' needs in the transition to ESN. During spring and summer 2019, the Home Office expects to develop a detailed plan that will set out when each emergency service will adopt ESN. It expects to complete this by autumn 2019.

Future delivery model

2.18 The Home Office does not have a plan for running ESN as a live service. Efforts to date have focused on building ESN and planning for the transition, but when ESN is complete it will need to be run as a service. It will resemble a mobile phone company with emergency services as customers. For example, the market will eventually offer capabilities such as 5G as standard and those charged with running ESN will need to decide whether, when and how ESN should do the same, which may lead to further additional costs.

2.19 The Home Office is responsible for running ESN once it is completed. To date it has done limited planning for how this will work. The Home Office has drafted a short document that describes the capabilities and processes needed. However, there is no detailed specification of the service that will be provided to customers, nor of the agreements between the different elements of ESN that will be needed to ensure ESN provides a coherent service that meets the needs of the emergency services. Without these, the Home Office will find it difficult to run ESN in a way that meets users' needs or that allows it to hold those responsible for providing the ESN service to account.

2.20 In September 2018, the Home Office commissioned consultants to assess whether an external organisation should manage ESN once it is live. The consultants considered several options including keeping ESN within the Home Office, and recommended that setting up a new government-owned organisation (GovCo) once ESN was ready offered the best mix of operational effectiveness and value for money. The Home Office has not yet decided whether to pursue a GovCo approach.

Part Three

Commercial arrangements for ESN

3.1 This part sets out the progress made in delivering the Emergency Services Network (ESN) and how the reset affects the commercial and technical risks.

Commercial structure

3.2 The Home Office has procured the services and products needed to provide ESN through multiple commercial arrangements. The ESN programme includes three main contracts (**Figure 13**) and a range of others (Figure 15 on pages 42 and 43).

Figure 13
The main commercial arrangements for Airwave and the Emergency Services Network (ESN)

ESN is delivered through three main contracts

Contract	Supplier	Scope	Estimated cost 2015–2023 (£m)	Paid April 2015 to March 2019 (£m)	Current status	Future status
Mobile communications service	EE	Mobile phone network infrastructure	630	108	Paid for work to date, contract for additional areas	Under renegotiation
User services	Motorola	Various software and systems to make ESN work as a service	328	102	Developing Kodiak (version 10 due 2020) and supporting integration	Under renegotiation
Delivery partner	KBR	Programme management	161	73	Home Office taking over responsibility	Home Office has started to tender for a new delivery partner
Airwave	Motorola	Complete service	2,486	1,016	Extension agreed to 2022 with possible further extensions	Continue to maintain system then decommission once ESN is ready

Note

1 This table does not show the other projects that are needed to deliver ESN, such as devices and control room upgrades, which will be delivered under separate contracts with a range of suppliers.

Source: National Audit Office analysis of Home Office information

3.3 The Home Office awarded the three main contracts in 2015 to: EE Ltd (EE), mobile communications service; Motorola Solutions UK Ltd (Motorola), user services; and KBR Ltd (KBR), delivery partner. In June 2018 the ESN programme team found that the contractual agreements with EE and Motorola were "…complex, in places inconsistent within and between them and ultimately now undeliverable".

3.4 At the same time as resetting the strategy and timetable for delivering the programme (Part One), since mid-2018 the Home Office has been renegotiating its contracts with EE and Motorola. It has agreed temporary working arrangements under heads of terms with both suppliers, to enable work to continue during the renegotiations. The Home Office expects the revised contracts will establish consistent principles, resolve immediate contractual issues and maintain the programme's momentum. The Home Office did not change or re-let the delivery partner contract with KBR because, having taken over much of this role itself, it did not consider there was a need to do so (paragraph 2.9).

3.5 The intended contractual changes are wide-ranging, covering changes to existing schedules, financial conditions, project responsibilities, service agreements and governance arrangements. They aim to bring the contracts into line with ESN's revised approach by, for example, revising delivery and payment milestones and clarifying the Home Office's responsibility for programme management and integration. According to the timetable at the start of the reset, the Home Office was to agree all contractual changes with Motorola and EE by December 2018. However, this deadline was missed, requiring the Home Office and its contractors to continue working under the heads of terms. By March 2019, the Home Office reported that most changes were agreed and it expects to complete the renegotiation by May 2019.

3.6 The progress of the reset depends on these changes to the contracts. Until the scope and timescales of work are agreed and contracts are signed, the Home Office may not be able to manage suppliers effectively or hold them to account if issues arise in the work they are currently doing. If requirements are not tied down sufficiently in contracts, changes are likely to be progressed as change requests at extra cost. In addition, renegotiation and contract changes could expose the Home Office to potential legal challenge under UK and European law.

3.7 While the ESN service is being developed, the original Airwave service continues to support the emergency services. In December 2018, the Home Office extended the Airwave contract with Motorola (who had purchased Airwave in 2016) by three years to December 2022, at a forecast cost of £1.4 billion. The Home Office has the option to extend the contract further. Motorola offered a 5% discount on part of the new Airwave contract, on condition that the renegotiation of Motorola's ESN contract was completed by March 2019. This deadline was missed but Motorola told us they would apply the discount if the ESN contract was signed by 30 May.

The main contracts for the ESN programme

Mobile communications service (contracted to EE)

3.8 EE is responsible for developing an enhanced mobile telecommunications network that meets the needs of emergency services. This includes providing coverage to areas not currently served by existing commercial networks and ensuring the emergency services have priority over other users. EE is also responsible for providing technical interfaces to the user services provided by Motorola (paragraphs 3.14 to 3.21).

Progress

3.9 EE's progress in rolling out the physical network is slower than originally planned. In 2015 EE was contracted to build and upgrade masts and ensure these were ready to provide coverage on the ground, 12 nautical miles out to sea and up to 500 feet in the air by September 2017. This date was extended twice by the Home Office, in a re-planning exercise in 2017 and in the 2018 reset. EE reports that it has completed most of the contracted work (**Figure 14** overleaf) and the Home Office expects the rest to be finished by 2020.

3.10 EE's contract does not include all aspects of ESN coverage. For example, the Home Office is responsible for commissioning 292 masts to be built in areas not covered by the market. By March 2019, only two were reported as complete. Work had started on building coverage for the London Underground, and work on a network to provide coverage in the air (above 500 feet) has not started.

3.11 The Home Office is testing the network for coverage and signal strength. However, it had to reduce its testing exercise from 1,000 handsets to 100 because security accreditation was not in place. To date, only preliminary results of this testing exercise are available. While these results suggest coverage is available in 99% of the area that EE promised, the exercise is mostly limited to testing coverage along roads. The contracts for both ESN and Airwave define coverage with respect to roads, although ESN uses a less detailed database, but coverage will need to be tested off-road. More detailed results are expected to be available later in 2019.

3.12 EE has reported that, where coverage is available, its network is ready and able to support preferential network access for emergency services. It ran a demonstration of this capability at a police conference in March 2018.

Figure 14

The Emergency Service Network (ESN) programme's progress in providing coverage

In March 2019, the programme's coverage was still being developed

Area	Location	Responsible	Required	Complete	Complete (%)	Risk rating (March 2019)
Ground	Site upgrades	EE	20,531	20,494	99.8	Amber
Ground	New sites[3]	EE	401	395	98.5	Amber
Ground	Additional locations such as tunnels specified in the contract	EE	71	36	50.7	Red
Ground	Coverage predicted to reach 98% of the population	EE	98%	98%	100.0	Not reported
Ground	Outdoor handheld coverage on roads	EE	100%	100%	100.0	Not reported
Ground	Coverage on roads in extended area	EE	100%	100%	100.0	Not reported
Ground	Additional masts required to comply with contract under revised measurement methodology[4]	EE	TBC	–	0.0	Not reported
Ground	New masts in areas not covered by the market	Home Office	292	2	0.7	Red
Ground	Other locations regarded as critically important to users	TBC	TBC	–	0.0	Red
Ground	Other locations to fill gaps in coverage	TBC	TBC	–	0.0	Red
Underground	Cable laid in tunnels (subject to final fixing)	Home Office/ Transport for London	422km	323km	76.5	Red
Underground	Coverage at stations	Home Office/ Transport for London	127	25	19.7	Red
Sea	Coverage at sea	EE	100%	100%	100.0	Not reported
Air	0 to 500ft	EE				Not reported
Air	Above 500ft	Home Office				Not reported
Overall						Red

Notes

1 Home Office risk rating as at March 2019. The programme defines the 'amber' and 'red' ratings as representing significant issues and major issues respectively.

2 Information on completeness of EE contract is taken from data provided by EE to support its March 2019 invoice. We have not audited these data.

3 'New sites' may include sites built but not yet activated.

4 The 'completion' data are based on modelled predictions, and changes to the measurement methodology in 2019 may mean an unknown number of new masts or sites are needed.

Source: National Audit Office analysis of Home Office data

Remaining risks following the reset

3.13 As part of the renegotiation of the EE contract, the Home Office removed the requirement that EE should not be paid its fixed monthly fee until it has provided full ESN coverage. Since July 2018, the Home Office has paid EE a monthly fee of around 93% of the amount allowed under the contract, based on the amount of contracted coverage completed. This may reduce incentives for EE to provide the full service. EE has agreed to improve coverage where it is agreed that this is below required levels and to pay a monthly charge if it misses agreed delivery dates. The Home Office and EE are currently negotiating terms, under the new contract, to set binding timelines that assure delivery of the network by September 2020.

User services (contracted to Motorola)

3.14 Motorola is contracted to provide user services for ESN, including systems for billing and reporting, accrediting devices and control rooms for connection to ESN, a 'virtual network' to work with the ESN physical network, and specialist public safety features. Of these, the push-to-talk specialist public safety feature is of critical importance as it is needed to allow police users to contact control rooms quickly in emergency situations. Push-to-talk is the ability to make near-instant calls at the push of a button without having to wait for the recipient to answer.

Progress

3.15 At a Committee of Public Accounts evidence session in November 2016, Motorola said that its development of user services, data centres and technology was on track and testing would begin that spring. However, by October 2017, an independent review of the ESN programme noted that the Home Office had yet to see a complete software solution in action.

3.16 The original plans from Motorola and EE had made incompatible assumptions about how Motorola would implement PTT, which the Home Office did not identify before contracts were signed in 2015. As Motorola and EE shared designs, it became clear that each had based their designs on different versions of international standards. The Home Office's independent reviewer found that "…it took many months for the programme to properly comprehend the impact of the design mismatch".

3.17 Motorola is developing a different product to provide PTT. In August 2017 it bought a company, Kodiak Networks, for $225 million (£174 million). The purchase includes a push-to-talk system (generally referred to as Kodiak), which conforms to common industry standards. Kodiak is not currently used by emergency services but is expected to be adopted by the national FirstNet project for emergency services in the USA.

3.18 Motorola's work is central to the delivery of the eight ESN products (Figure 6 on page 21) introduced under the new programme approach following the reset. The first of these, ESN Assure, was launched in November 2018. Further launches are planned from autumn this year. The Home Office considers that the first real proof of Motorola's work will be the delivery of the first version of ESN Direct, planned for September. At the time of this report the Home Office told us that the product was on track.

Remaining risks following the reset

3.19 The Kodiak technology is a theoretical improvement on the previous approach because it complies with the same version of telecommunication standards used by EE. However, the system still requires significant development and testing and will not meet user requirements until March 2020. There is a risk that late or under-delivery of requirements will cause further delays to when ESN can be adopted by the emergency services.

3.20 The Home Office will need to manage carefully the commercial consequences of renewing Airwave before changes to the Motorola contract have been agreed. Motorola will benefit from the successful development of ESN, but it also receives large revenues from the continued use of Airwave. Following its acquisitions of Airwave and Kodiak, Motorola owns several key components of the current and future emergency services communications systems, putting it at an advantage over any competitors when the ESN contract is renewed in 2024. Motorola is also a control room vendor, potential supplier of handsets and vehicle devices and in charge of accrediting devices and control rooms for ESN.

3.21 During the period up to the reset, the Home Office had hoped to make Motorola responsible for aspects of technical integration, such as ensuring that user control rooms could be connected to ESN, and that Motorola and EE networks would integrate seamlessly. However, the 2017 independent review found that ambiguities in the contracts and a lack of attention to detail in procurement had allowed Motorola to disclaim such responsibility, and therefore the Home Office took on this role. Contractual changes, when agreed, should define Motorola's technical integration role more precisely, but should there be incompatibility between systems during testing, it is not yet clear who would bear the costs.

Delivery partner (contracted to KBR)

3.22 The Home Office appointed KBR as delivery partner in August 2015 for a term of five and a half years at an estimated cost of £49.7 million to provide programme management and oversee testing across the full ESN service, manage the transition from Airwave to ESN and support training and vehicle installation design and assurance.

Progress

3.23 As noted in paragraph 2.10, by mid-2018 the Home Office was increasingly using its own and sub-contracted staff for programme management and integration work, but has not terminated its contract with KBR. It has continued to employ KBR staff and associates through the original contract to fill capability gaps. In March 2019 the Home Office estimated it had approximately 140 KBR staff and associates working on ESN, and that spend on the contract to date was £73 million, much higher than the £50 million total cost originally forecast.

3.24 The Home Office is currently moving people contracted through KBR to a framework for contingent labour. The Home Office has recruited full-time programme management and procurement specialists, and sourced additional temporary programme management staff from Deloitte. However, in March 2019, 27 programme roles out of a total planned headcount of 232 were unfilled.

3.25 The Home Office plans to let a new contract for "programme advisory and delivery services" but does not expect to procure a supplier until mid-2019 and still requires consultants and contingent labour to perform project activities that may be better managed under a delivery partner contract as originally intended.

Remaining risks following the reset

3.26 Although the Home Office has recruited experienced project delivery and assurance staff to strengthen its own programme delivery capability, the need for a delivery partner with breadth and experience in major programmes such as ESN remains. The Home Office has been putting together detailed plans and defining responsibilities and activities since the reset decision in mid-2018 but has not yet finished this work and continues to recruit additional resources.

Other ESN components

3.27 In addition to the main contracts, ESN includes several other projects and products that must be procured and, if necessary, developed or configured. The 2017 independent report concluded that focusing on the issues with EE and Motorola had resulted in the Home Office paying less attention to the parts of the programme for which it was responsible, with such projects running late and over budget. Progress on these projects is summarised in **Figure 15** on pages 42 and 43.

3.28 Key risks associated with these project components include:

- **Devices**

  Contracts are still pending for in-vehicle (including aircraft) device technology and, despite being covered by telecommunications standards, there are currently no devices on the market that support direct device-to-device communication without the need for a network signal.

- **Air-to-ground**

  The Home Office intends to build a new network to provide a signal for aircraft. It plans to launch this by June 2021, but work has not yet started.

- **Control rooms**

  The Home Office will not be able to switch Airwave off until all control rooms are upgraded, which depends upon work done by the emergency services, their control room suppliers and suppliers of associated systems, but it has no way to ensure this work aligns with ESN plans. Any changes will be managed and contracted by the emergency services, under various funding arrangements.

Figure 15

Emergency Services Network (ESN) projects outside the main contracts

The other projects required for ESN are not yet ready

Contract	Description	Contractor	Estimated cost April 2015 to March 2023 (£m)	Current status
Handheld devices	Ruggedised handsets with device-to-device and push-to-talk capability for emergency services	Samsung	214 (devices) 50 (accessories)	1,500 prototype devices produced No support for device-to-device communications
Fixed vehicle devices	Equipment for use in emergency service vehicles	TBC	125	Exploring possibility to use Samsung contract to develop proof of concept (handset device in cradle), then decide procurement route
Vehicle installation	Procure and coordinate installation of equipment in emergency service vehicles	TBC	29	Procurement not started ESN programme working with industry to understand capacity and any constraints
Network resilience	Capability to maintain an acceptable level of service following disruption to the network such as power/ equipment failure	TBC	77	Estimate includes construction costs and service charges up to 2023 A ministerial decision is expected on this (see Figure 12)
Extended area services	292 sites in areas not covered by the EE network need to be built and connected to EE's network	Various	120	Only two sites (out of 292) currently live Main contract awarded to Lendlease Plan assumes all complete by June 2020
Air-to-ground network	ESN coverage for emergency service aircraft	TBC	30	Testing in 2019 confirmed that a new network is needed. Around 85 sites required. Work not yet started
Aircraft communication system	Devices for emergency service aircraft	TBC	100	Procurement started Installation of equipment for trials in police aircraft planned for 2021
London Underground coverage	Provide ESN coverage across the London Underground network including tunnels and stations	Transport for London and subcontractors	163	Cable being laid – more than 75% placed in tunnels with remainder expected by March 2020 Contract for subsequent work not yet let, and agreement over funding not yet in place
ESN Link	Network connection between control room equipment and ESN	Vodafone	15	Contract awarded in 2016

Figure 15 *continued*
Emergency Services Network (ESN) projects outside the main contracts

Contract	Description	Contractor	Estimated cost April 2015 to March 2023 (£m)	Current status
Control room upgrades	Upgrading control room software to work with ESN	Various	60	Significant work needed by control room vendors to upgrade 85 discrete system installations in user control rooms Estimate only covers Airwave costs and does not cover modernisation costs for ESN
Coverage assurance	Services to test ESN coverage	Telent	19	100 Samsung devices used for testing (instead of 1,000 planned due to security concerns)
Programme support	Resource to support ESN	Internal staff and contractors	147	Includes payroll and contractor costs, office accommodation and travel costs and re-procurement costs

Note

1 Costs are drawn from a range of sources including the project financial model.

Source: National Audit Office analysis of Home Office information

Appendix One

Our audit approach

1 This report builds on our 2016 report[10] on the Home Office's project to provide a new mobile communications service for the emergency services. We examined the progress made in delivering the Emergency Services Network (ESN) and the implications of the 2018 reset (**Figure 16**).

2 We considered what the reset meant for the programme, including whether it would reduce the risks relating to technology, user engagement or contracts not delivering, and whether the Home Office was now able to govern and manage those risks better.

3 Our evidence base is described in Appendix Two.

10 Comptroller and Auditor General, *Upgrading emergency service communications: the Emergency Services Network*, Session 2016-17, HC 627, National Audit Office, September 2016.

Figure 16
Our audit approach

The objective of government

The Home Office, the Department of Health & Social Care, the Scottish and Welsh governments and the emergency services jointly fund the emergency services mobile communications system. This is a mission-critical capability that is vital national infrastructure. The Home Office, through the police, is responsible for most of the funding and the users. It has taken the lead in developing the successor (ESN) to the existing system (Airwave).

How this will be achieved

ESN will see users share access to a commercial network, supplemented by public funds and infrastructure. Suppliers have been appointed to build ESN.

ESN was due to go live in December 2019, but delays occurred. In September 2018 the Home Office announced that the ESN programme would undergo a reset to put the programme back on track.

Our study

Our study examines what the reset means for the ESN programme, whether the reset has reduced the risks and how well placed the Home Office is to manage the programme following the reset.

Our analytical framework

We assessed what the reset means for the programme.	We evaluated the remaining risks for ESN, including technical, commercial, and risks relating to user engagement.	We examined whether the Home Office is well placed to manage the remaining risks.

Our evidence (see Appendix Two for details)

• Key project documents including the draft business case for the reset. • Analysing the financial model and forecast of costs. • Interviewing project officials.	• Risk registers. • Programme implementation plans. • Interviews with suppliers, user representatives and officials.	• Risk management information. • Reviews of programme governance. • Project board minutes.

Our conclusions

In 2016, we highlighted both the strategic importance of the programme to introduce ESN and the high degree of risk. Ultimately, the Home Office's subsequent failure to manage these risks has led to delays in bringing the intended benefits of ESN to emergency services. The delays also mean introducing ESN is now forecast to cost £3.1 billion more than planned, and this forecast is highly uncertain. To date, the Home Office's management of this critical programme has represented poor value for money.

The Home Office, through its reset, has resolved only some of the issues. Its emphasis on limiting the costs of extending Airwave has meant that its plans are not sufficiently developed to give decision-makers all the information they need. The Home Office does not yet have a robust and sufficiently detailed plan that demonstrates that it understands the challenges faced by emergency services in introducing ESN, and it is also not clear how the various programme components of ESN will be integrated successfully. This lack of understanding creates a risk that poor decisions will be made and further 'resets' will be needed in future. There are still significant risks and, based on past performance, it seems unlikely that ESN can be delivered by the target date of 2022. If the Home Office is to bring this vital programme back on track and deliver the intended benefits, it must develop a comprehensive, integrated plan that addresses the significant uncertainties that remain.

Appendix Two

Our evidence base

1 Our independent conclusions on the programme to deliver the Emergency Services Network (ESN) were reached following our analysis of evidence collected between December 2018 and March 2019.

We assessed what the reset means for the programme

2 We examined the draft business case for the reset, associated submissions and other project documentation to understand what options were considered and why the new approach was taken. We analysed the revised financial model to understand how and why the programme's costs and benefits had changed.

We evaluated the remaining risks for delivering ESN

3 We reviewed key documentation, including risk registers, the new timetable and project plans. We drew on knowledge from our communities of practice.

4 To understand the **technical risks**, we reviewed technical specifications and detailed risk registers. We also interviewed the main contractors (Motorola, EE), the delivery partner KBR, and device contractor Samsung and a selection of control room vendors to understand the market's ability to deliver the various parts of ESN.

5 To evaluate the **commercial risks**, we made use of the insights from the National Audit Office's (NAO's) *Commercial and contract management: insights and emerging best practice*[11] and reviewed the revised draft contracts between the Home Office and its suppliers, EE and Motorola.

6 To evaluate user **engagement risks**, we reviewed the Home Office's customer engagement strategy and plans and interviewed user representatives of the police, fire and ambulance services to understand how the potential users perceived the reset.

11 National Audit Office, *Commercial and contract management: insights and emerging best practice*, November 2016. Available at: www.nao.org.uk/report/commercial-and-contract-management-insights-and-emerging-best-practice/

We examined whether the Home Office is well placed to manage the remaining risks

7 We interviewed project members, user representatives and representatives of other sponsors to understand their perspective on the programme. We made use of the NAO's *Framework to review programmes*[12] to review project documentation, including internal reviews of governance and management, staff planning information, management information and reports to the project board.

12 National Audit Office, *Framework to review programmes*, September 2017. Available at: www.nao.org.uk/wp-content/uploads/2017/09/Framework-to-review-programme.pdf

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