



National Audit Office

**REPORT BY THE
COMPTROLLER AND
AUDITOR GENERAL**

**HC 1091
SESSION 2010–2012**

30 JUNE 2011

Department of Energy and Climate Change

Preparations for the roll-out
of smart meters

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National Audit Office

Department of Energy and Climate Change

Preparations for the roll-out of smart meters

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Amyas Morse
Comptroller and
Auditor General

National Audit Office

28 June 2011

This report provides an early assessment of the Department's progress in preparing for the mass roll-out of smart meters, which is due to start in 2014 after the completion of the next, 'foundation' stage, and the risks to securing value for money for taxpayers and consumers.

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This report can be found on the National Audit Office website at www.nao.org.uk/smart-meters-2011

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Key facts

£11.3bn

to install and operate the smart metering system across Great Britain

53m

existing gas and electricity meters to be replaced with smart meters by 2019

£23

estimated annual saving for the average dual fuel customer in Great Britain in 2020

- £18.6 billion** in total estimated benefits during the next 20 years from installing smart meters
- £11.3 billion** total estimated cost of installing and operating smart meters during the next 20 years
- £7.3 billion** estimated net benefit during the next 20 years
- £23** estimated annual saving for the average dual fuel customer in Great Britain in 2020
- £11.2 million** the cost of managing phase 1 of the smart metering programme
- £10 million** public spending on consumer trials of energy reduction using smart meters and existing meters
- £56 million** the Department's latest estimate of the budget it will need for programme management and consumer engagement during the period 2011-12 to 2014-15.
- 100** proposed average number of full-time equivalent staff in the Department's smart metering programme management team from 2011-12 to 2014-15
- 53 million** existing electricity and gas meters to be replaced
- 30 million** homes and smaller non-domestic premises across Britain to have smart meters by 2019

Summary

Introduction

1 On 30 March 2011, following the completion of the first phase of its smart metering programme, the Department of Energy and Climate Change (the Department) published its plans for installing ‘smart’ electricity and gas meters in all homes and smaller non-domestic premises in Great Britain by 2019. Smart meters, together with real time in-home displays, can provide consumers with detailed information on their energy use and access to a wide range of off-peak tariffs. Smart meters also allow suppliers to collect meter readings electronically, provide more accurate bills and cut costs. In the longer term, the Department expects smart meters to facilitate the development of smart electricity grids, which could allow the operators of electricity transmission and distribution networks to better manage supply and demand. In due course, the aim of smart meters and smart grids is to support reduced energy use and the maximisation of the use of low carbon energy to support the achievement of national statutory carbon budgets.

2 The roll-out of smart meters is a major national programme that will involve meter installers visiting every home and most smaller non-domestic premises in Great Britain, and the replacement of around 53 million gas and electricity meters. The Department has established a smart metering programme to oversee the creation of an organisational and regulatory framework for the roll-out. The Department is not contracting for the supply and operation of the smart metering system itself, but will place obligations on energy suppliers to supply their customers with smart meters.

3 All member states are required under European Directives to roll-out ‘intelligent metering systems’ to at least 80 per cent of domestic electricity consumers following an assessment of costs and benefits; and to consider the cost and timetable for installing intelligent gas metering. The Department estimates that installing smart electricity and gas meters with in-home displays will cost £11.3 billion and deliver economic benefits totalling £18.6 billion between 2011 and 2030, so achieving a discounted net present benefit of £7.3 billion. Public expenditure on smart meters will be limited to the cost of programme management and consumer engagement work. The cost of manufacturing, installing and operating the smart metering system will be determined by energy suppliers and their contractors, and the Department expects the cost and cost savings to be passed down to customers through their energy bills.

4 This report provides an early assessment of the Department's progress in preparing for the mass roll-out of smart meters and the risks to securing value for money for taxpayers and consumers. We examined the Department's management of Phase 1 of the programme, completed in March 2011, through which it developed its overall strategy for mandating the roll-out of smart meters from 2014, after the completion of the next 'foundation' stage and completing it across Britain by 2019. We also examined the Department's approach to technical design and managing the costs and benefits of the programme.

Key findings

5 The Department is developing a Government-mandated, comprehensive, electricity and gas smart metering programme, which goes beyond the EU's minimum requirements, on the strength of its cost-benefit work. It estimates the programme will deliver efficiency savings to energy suppliers; and enable energy consumers to change and reduce their energy use, resulting in savings on their bills and environmental benefits. There is, however, uncertainty over how much, and for how long, consumers will change their energy use and therefore whether the benefits will be fully realised. The Department's assessment that consumers with smart meters will annually use 2.8 per cent less electricity and 2 per cent less gas than consumers who do not have smart meters is based on estimates contained in a 2008 review of trials and international experiences, but is also informed by more recent reviews. International experiences indicate that greater reductions are possible, but may not be relevant to Great Britain due to differences in climates and cultures of energy use, and evidence on sustained behaviour change is limited. Trials of smart metering in Great Britain, which the Department and its predecessors co-funded, in part to improve the reliability of its estimates, identified reductions in demand of between 2 and 4 per cent in those trials that were statistically reliable. The results do not relate to a nationally representative sample of households and so provide limited further support for the Department's forecasts, but they have nevertheless generated useful findings, such as the effectiveness of different types of interventions, to inform the development of the programme.

6 The costs of the installation of smart meters in every home and the associated communications technology will be borne by energy suppliers and the Department expects the cost and the cost savings to be passed down to their customers. The Department's most recent estimate is that the smart metering system will cost **£11.3 billion to deliver**. The Department's estimate includes adjustments for optimism bias of between 10 and 15 per cent for individual components, reflecting its assessment of project specific costs and risks. As would be expected for a large programme, the Department has sought further cost information during the planning phase and revised its estimate of the total cost of the smart metering programme. The Department followed HM Treasury guidance to set optimism bias levels using project-specific information and based its provision on its assessment that it now has a good understanding of the likely cost of the system. HM Treasury guidance cites that cost escalation in projects involving the manufacture of equipment or development of information and communications technology has historically ranged from 10 per cent to 200 per cent.

7 The Department expects smart meters to help the average dual fuel customer to save £23 a year by 2020, if they change their energy use in line with the Department's estimates. This overall benefit depends on suppliers minimising costs and passing on all their efficiency savings through their prices.

The Department considers competition among suppliers gives them commercial incentives to deliver the lowest cost solution for consumers, and the Office of the Gas and Electricity Markets (Ofgem) is currently considering possible actions to strengthen competition in energy markets following the completion of its review of retail energy markets. The powers the Department is seeking in the Energy Bill 2011 to obtain information from suppliers will help it to monitor and evaluate the efficiency and effectiveness of the smart meter roll-out.

Findings on planning to date

8 Through Phase 1, the Department has developed its overall approach to installing smart meters, but now faces the considerably more challenging tasks of preparing detailed plans and delivering them. The Department has invested a considerable amount of time in consulting with industry and consumer groups, and developing the standard functions that smart meters will provide, the roll-out timetable and its approach to establishing the data and communications infrastructure. It has now provided certainty on its timetable and overall approach, which should help suppliers prepare for the roll-out. However, it has further to go to convert this into detailed delivery plans for achieving a major programme of complex and high-risk technical, regulatory and behaviour change projects to allow roll-out to start in 2014 and to deliver the benefits identified in its outline business case.

9 The Department's planning and budgeting for Phase 1 were initially insufficient to support clear monitoring and accountability. The Department outsourced the management of Phase 1 to Ofgem in July 2009. At this stage the commitment was to publish in July 2010 a 'Prospectus', setting out the overall framework for the smart metering implementation. The Department's initial agreement with Ofgem did not clearly define deliverables, priorities or how Ofgem's performance would be measured. It also did not set a budget for this Phase, but set annual budgets. As the scoping of the programme evolved and the Department gained a better understanding of the complexities, it agreed more detailed plans in April 2010 and entered an agreement with Ofgem in July 2010 that set out a budget and deliverables for an additional Phase (Phase 1a) with an expected completion date of January 2011. The Department published the Prospectus in July 2010 and completed this Phase in March 2011, by which time it had spent a total of £11.2 million on the programme, coming within its overall annual budget.

10 The Department has decided to manage the smart metering programme itself and is taking steps to strengthen its resources and approach.

The Department is building its new programme management team that will have an average of around 100 full-time equivalent staff from 2011-12 to 2014-15. The Department's latest estimate of the programme budget, covering programme management and consumer engagement, is £56 million for the period 2011-12 to 2014-15. It has further work to do to develop a detailed delivery plan for the next phase of the programme and it has not set a budget for the programme beyond the current spending review period.

Findings on the remaining delivery challenges

Delivering an appropriate, safe and secure technology solution that is adaptable to change

11 The Department is responsible for decisions on technical standards for the smart metering system and uses a series of industry and expert groups to develop proposals for design and technology solutions. The Department did not have a design authority to oversee the industry working groups during Phase 1, but has established one for the foundation stage to take overall responsibility for system design and security and to maintain the ongoing voluntary participation of industry.

12 There is very little time contingency to address the risk that design approvals, procurement and testing take longer than planned, adding to costs and delaying achievement of benefits. The Department intends to finalise its draft technical specification in January 2012. In response to stakeholders' views, the Department has allowed more time to establish the communications system by deciding to start mandated roll-out of smart meters in 2014 rather than 2012 as proposed in its 2010 public consultation. It has still to develop a specification for the national communications network to which each meter must connect.

13 The system will need sufficient flexibility to minimise the risk of future obsolescence, and it may need to change to meet smart electricity grids requirements. The Department has assumed that smart meters will have a 15-year life. However, future technology developments, including smart grids could potentially change the requirements for the meter specification and the data and communications systems within a shorter timeframe. The Department has built some flexibility into its design requirements to address obsolescence risk and recognises the need to align the programme with its evolving plans for smart grids.

14 Concerns about possible security risks, on which the wider public has not yet been seriously engaged, could potentially delay or stop the programme.

Collecting detailed energy consumption data from every household and transferring it to suppliers or other authorised parties through a central communications network creates risks of accidental release or theft of data, as well as cyber-attacks. The Department is developing plans for managing smart meter data access and privacy, has asked industry to establish a supporting Privacy Charter and has developed an initial security impact assessment, but more work is required on security before roll-out starts. A number of respondents to the Department's consultation also expressed concerns about perceived health impacts of installing wireless smart meter networks. The smart metering equipment will be subject to the standard requirements for wireless communications technologies and the Department plans to continue consulting the Department of Health on these perceived concerns.

Reducing uncertainty in the savings estimates

15 The Department has still to develop its benefits realisation plans and consumer engagement strategy.

Since October 2010, the smart meter programme has been working with the Central Office of Information to develop a framework for behaviour change to inform its consumer engagement and benefits realisation plans. It has assumed in its cost benefits modelling that marketing and consumer engagement will cost £100 million. To inform its plans, the Department intends to work with suppliers to trial approaches and learn lessons from the initial roll-out of smart meters before mass roll-out starts in 2014.

Understanding the costs and benefits for consumers

16 The Government decided at an early stage that smart electricity and gas meters should be rolled-out to all consumers. The costs and benefits to consumers will vary between households and further work is needed to assess the impact of the smart metering programme on vulnerable consumers.

The Department expects that the roll-out of smart meters will result in a wider range of tariffs. Some evidence from trials carried out in the United States indicates that time-of-use tariffs are potentially beneficial for consumers on low incomes. However, research commissioned by Ofgem suggests that vulnerable customers generally had little understanding of tariffs and are more likely to make inappropriate decisions regarding suppliers or tariffs. Lower levels of uptake among low-income or vulnerable groups would result in the costs and benefits being unevenly distributed, but the Department has yet to assess the potential impacts and whether specific action will be required to address distributional issues.

Conclusion on value for money

17 The roll-out of Smart Meters is a large complex programme. The Department expects that it will deliver reductions in energy use, efficiency savings and environmental benefits totalling £18.6 billion over the period to 2030, and that it will support the realisation of as yet unquantified benefits from smart grids in the future. The Department estimates the programme will cost £11.3 billion. In March 2011 the Department published its implementation strategy for the roll-out of smart meters.

18 On the basis of this early assessment of the Department's progress we conclude that the Department initially underestimated what would be required to deliver the first phase of the programme and that its early planning and budgeting during this phase were insufficient to support monitoring and accountability. The plans for the programme so far are not as well developed as originally intended in some areas, notably consumer engagement and benefits realisation. The Department did, however, invest a good deal of effort during this phase in developing the standard functions that smart meters will provide, its approach to establishing the data and communications infrastructure and it has now provided certainty on the overall timetable for the roll-out. The development phase of the programme, which cost £11.2 million, did not demonstrate full value for money. For a programme of this complexity it is vitally important to invest in strong planning. The Department is strengthening programme management.

19 To achieve value for money in the future, the Department needs to develop further its plans to address the substantial risks in the programme. In particular, there is uncertainty over consumer benefits, which arises because international experiences and domestic trials together provide limited evidence to support particular assumptions about how much and for how long consumer behaviour will change. There is also the risk that costs increase more than the Department has provided for; major technical and logistical challenges to delivering a fit-for-purpose and secure system; and a risk that suppliers do not pass on all the net savings to their customers. The Department must commit to keeping its estimates of costs and benefits under review and provide clear decision points at which it will judge whether to progress with the programme as originally designed or to make changes to protect public value.

Recommendations

- a** Smart metering involves a complex mix of technology, regulatory and behaviour change projects and strong programme management is required to ensure that all the projects come together to realise the benefits. The Department should identify more precisely the critical paths and review points for updating costs, ensuring a secure system and reassessing options before taking decisions that may be irreversible.
- b** The rapid pace of technological change could potentially render some smart metering technology obsolescent during the life of the programme. The Department should build sufficient flexibility and clearly-defined review points into the programme, particularly in relation to the data and communications services contracts. Doing this will allow the use of newer technology where it is cost-effective to do so.
- c** The Department does not yet have a clear offering for consumers to encourage them to engage with smart metering technology and reduce their energy consumption. The Department should develop its draft benefits realisation strategy and consumer engagement plan as a priority. It should also develop a clear plan with suppliers for further trialling of smart meters during the foundation stage to ensure valuable experience is obtained and the lessons captured, in order to inform the strategy.
- d** The net benefits of the programme will be delivered by suppliers through their roll-out programmes and the Department is seeking powers to obtain information from suppliers for monitoring and evaluation of the efficiency and effectiveness of their roll-out. The Department should determine the criteria it will use to evaluate whether suppliers are delivering smart meters efficiently and effectively. It should regularly review suppliers' progress in installing smart meters and whether there is a need for additional changes to suppliers' licence conditions to secure cost-effective completion of the roll-out and value for consumers.
- e** Smart meters are intended in part to support new tariffs that encourage consumers to use energy when it is cheaper, but vulnerable groups may not take advantage of this potential benefit. During the foundation stage, the Department should research the extent to which different socio-economic groups are likely to secure the benefits of new smart meter tariffs. It should then consider whether targeted assistance is required to prevent certain groups bearing the costs, but not obtaining the benefits of smart meters.

Part One

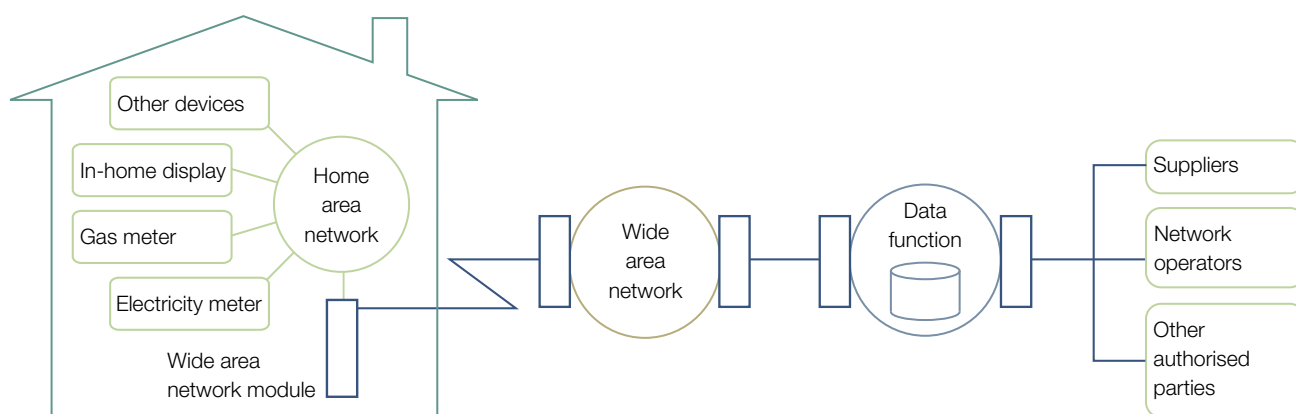
Introduction

The Government wants smart meters to be installed in every home and smaller non-domestic premises in Britain by 2019

1.1 The Government has decided that every household and smaller non-domestic premises in Great Britain should have ‘smart’ electricity and gas meters. Smart metering provides consumers with more detailed information than conventional meters, and allows suppliers to collect meter readings electronically (**Figure 1**). The Government expects that providing better information to domestic and non-domestic consumers will encourage them to reduce their energy demand and switch to better tariffs, reducing their bills and carbon emissions. It also expects smart meters will reduce costs for suppliers, generators and network operators.

Figure 1

The main components of the proposed smart metering system



Source: Department of Energy and Climate Change

1.2 The Government's longer-term aim is to enable the future development of a smart electricity grid. Smart grids are currently not well defined, but the broad aim is to achieve better connection for new electricity generation and to support demand from electric transport and heating. A smart grid also allows better matching of supply with demand, reduced reliance on providing energy generation capacity to meet peak demand, a reduced requirement for network reinforcement and less need for new generating capacity. The Government has identified the potential benefits of smart electricity grids in its assessment, but not quantified them as it is still reviewing the potential for smart grids and what they would require. There are currently no plans to develop smart gas grids.

1.3 Energy suppliers are already rolling-out significant numbers of smart meters. For example, in March 2010, British Gas announced its intention to install two million smart meters by 2012.¹ The Government considers that some suppliers may roll-out small volumes of smart meters in the absence of intervention, but that regulation is necessary to ensure that all consumers are supplied with interoperable smart metering equipment and that appropriate consumer protection is in place. The Government therefore intends to:

- Add conditions to energy suppliers' licences, obliging them to install smart meters that meet specific functional and technical standards in line with a mandated timetable.
- Licence a national data and communications company to collect electronic meter readings and provide the information to authorised suppliers and network operators. The use of the data and communications company will be optional for suppliers of non-domestic users.
- Develop a Smart Energy Code setting out the roles and responsibilities of all participants (suppliers, network operators and the data and communications company) in the delivery and operation of smart metering.
- Establish an installation code of practice that will regulate the sales activity of suppliers and their contracted installers at the point of contact with consumers.

1.4 The smart metering programme sits within a wider European policy context. All Member States are required under Directives 2009/72/EC and 2009/73/EC to roll-out 'intelligent metering systems' to domestic electricity consumers, following an assessment of the costs and benefits, and to consider the costs and timetable for installing intelligent metering for gas.² The Government's timetable for suppliers is to start the mass roll-out of 53 million smart electricity and gas meters to 30 million homes and smaller non-domestic premises in 2014 and to complete it by 2019. It is, to date, the only Member State to have set a timetable for the roll-out of smart gas meters to all households.

¹ Centrica Press Release, 29 March 2010: 'British Gas plans two million smart meters...' <http://www.centrica.com/index.asp?pageid=39&newsid=1970>

² Directives 2009/72/EC and 2009/73/EC <http://eur-lex.europa.eu/JOHtml.do?uri=OJ:L:2009:211:SOM:EN:HTML>

Organisational and financial responsibilities for the programme

1.5 The Department of Energy and Climate Change has overall responsibility for the smart metering programme (**Figure 2**). On 30 March 2011, it published its high-level strategy and plans. This was the culmination of work completed in Phase 1 of the programme, drawing on work undertaken by the Department, its predecessors and delivery partners previously on assessing the options, trialling smart meters and developing initial plans (**Figure 3** on page 16). The Department is now working to deliver a completed system design, regulatory framework and approach to benefits realisation.

Study scope and methods

1.6 The Committee of Public Accounts, in its 2009 report on *Programmes to reduce household energy consumption*, emphasised the importance of not underestimating the challenges of a national programme to introduce smart meters and, in particular, the need to set out clearly the expected benefits, and establish a comprehensive programme for delivering the benefits.³ In this report we provide an early assessment of the Department's preparations for suppliers' mass roll-out of smart meters from 2014, and the risks to securing value for money for taxpayers and consumers. We examine:

- the Department's management of the programme to date (Part Two);
- progress in designing the system (Part Three);
- the estimation and management of benefits (Part Four); and
- the cost to consumers (Part Five).

1.7 To assess value for money, we compared programme management against best practice and examined outputs and spending to date against plans and progress on the programme. To assess the management of risks, we examined the Department's approach to delivering the benefits, controlling costs and system design. We collected evidence by reviewing programme documents and wider literature, interviewing staff in the Department and Ofgem, and consulting key industry and consumer stakeholders. Further information on our methods is in Appendix One.

³ Committee of Public Accounts, *Programmes to reduce household energy consumption*, Fifth Report of Session 2008–09, HC 228 p.6, <http://www.parliament.the-stationery-office.co.uk/pa/cm200809/cmselect/cmpublic/228/9780215526618.pdf>

Figure 2
Organisational and financial responsibilities within the programme

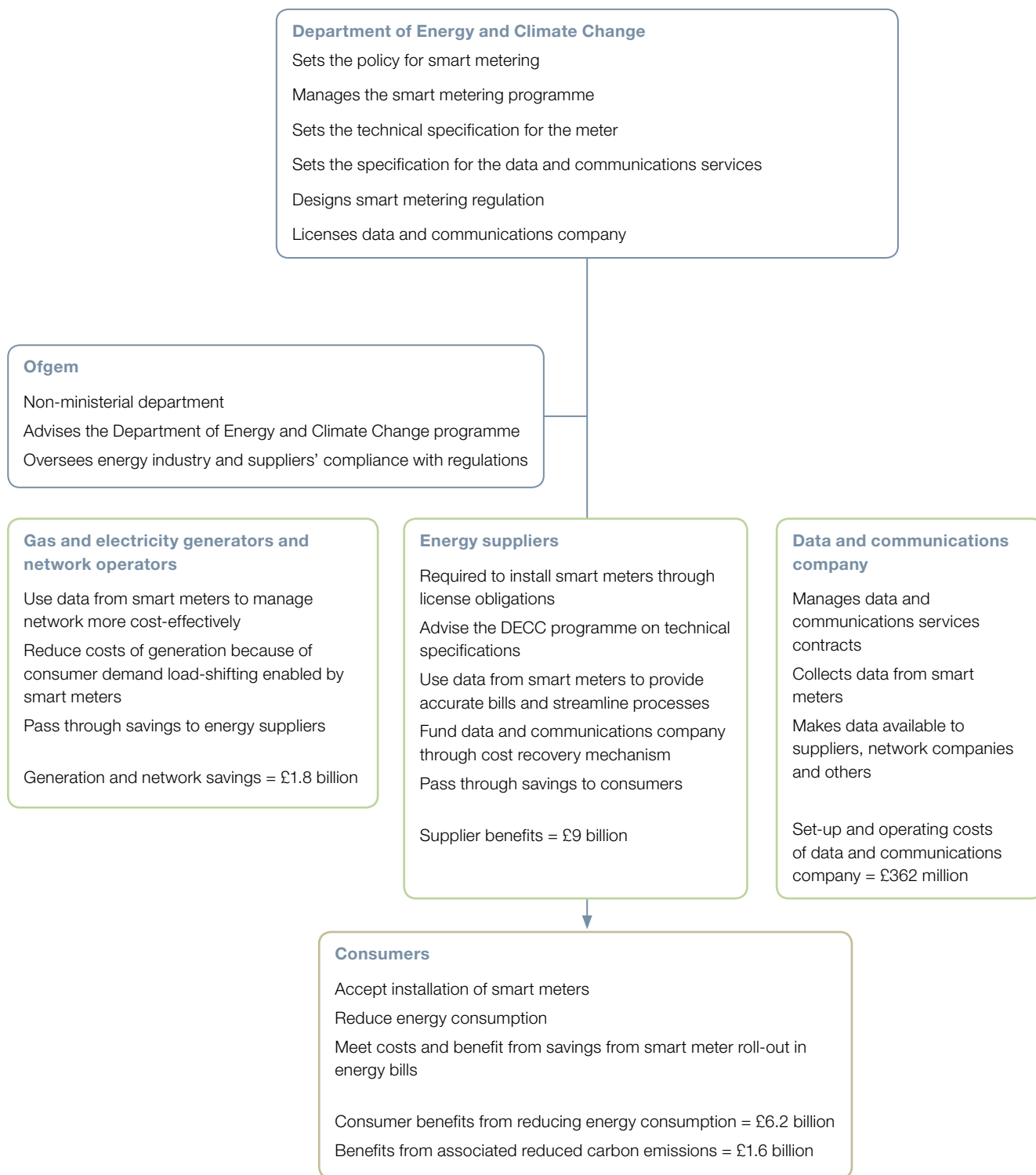
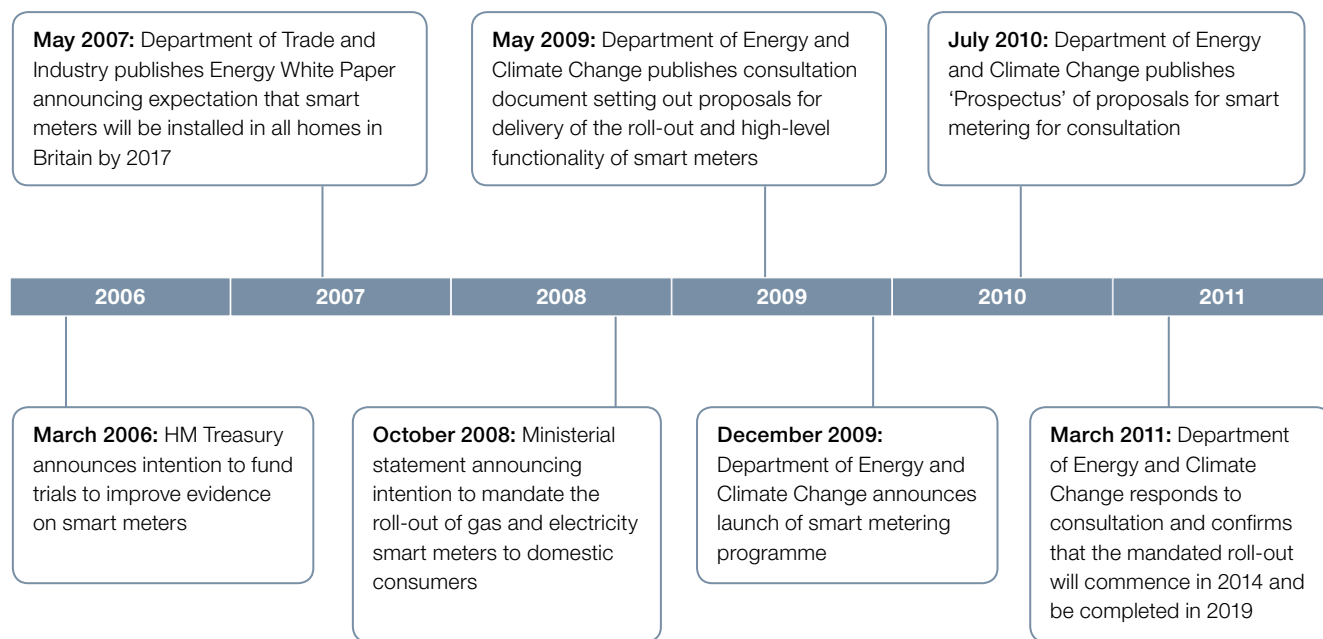


Figure 3

Timeline of the development of the Government’s plans to roll-out smart meters



Source: National Audit Office

Part Two

Progress against plans

2.1 Effective programme planning and management are needed at all phases in the lifecycle of a programme to support the delivery of outputs in the most economic and efficient way. In this part of the report we examine:

- the Department's plans for Phase 1 and how the scope, timescale and cost evolved after it was launched;
- achievements at the end of Phase 1; and
- the Department's decision to manage the programme itself following the completion of Phase 1.

The Department appointed Ofgem to manage the programme on its behalf but did not initially establish a clear delivery agreement

2.2 From March to November 2009, the Department carried out preparatory work on scoping, defining and planning its smart metering programme, and identifying the skills and resource mix required to deliver it. It reached agreement in July 2009 that Ofgem would manage Phase 1 of the programme on its behalf. Ofgem is responsible for the economic regulation of the electricity and gas industries in Great Britain. The Department considered Ofgem could appropriately manage the smart metering programme as an extension of the programme delivery function it has for a number of the Department's other environmental programmes.

2.3 The Department and Ofgem launched Phase 1 of the programme in December 2009, with the aim of publishing a smart metering 'Prospectus' in summer 2010. The Department did not, however, initially establish an agreement with Ofgem that clearly identified the activities that would be required to deliver the Prospectus and the resulting decisions on the programme, the scope and timing of consultation on the Prospectus, key priorities or how Ofgem's performance would be measured. This lack of precision reflected a lack of programme and project management approach and skills.

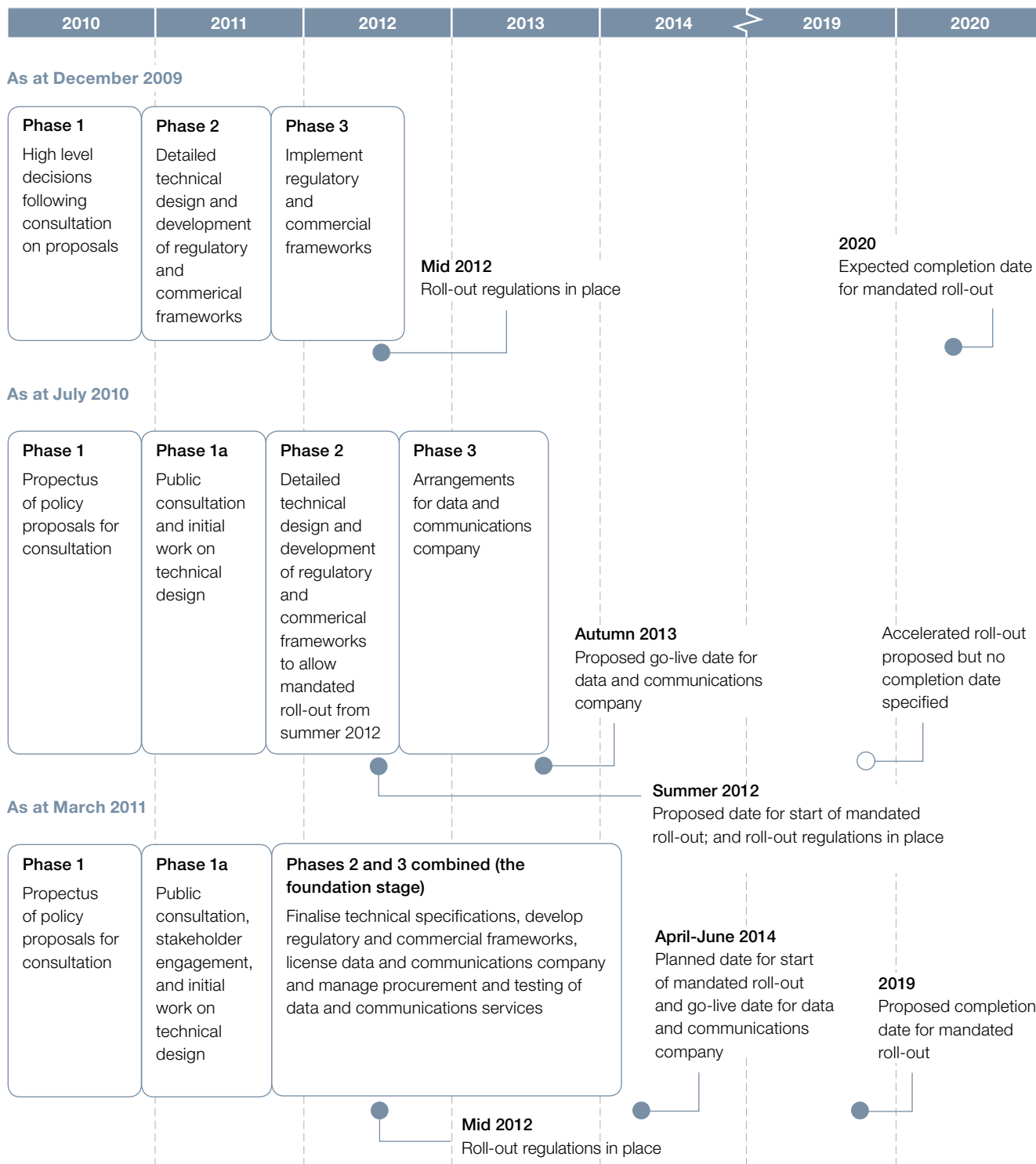
2.4 The Department revised its approach as its understanding of the complexities of the smart metering programme developed and to meet the requirements of the new administration following the general election. In April 2010, it agreed more detailed plans and in July 2010 it entered agreement with Ofgem for a new Phase 1a, which was introduced to allow time for detailed consultation on the Prospectus, to a revised deadline for post-consultation decisions by Ministers of January 2011. The Prospectus was published in July 2010, as planned, and the Department completed Phase 1a in March 2011, two months later than planned. The March 2011 plans included provision for mandated roll-out to start in 2014 rather than in 2012, as proposed in its consultation, and finish in 2019, a year earlier than previously planned (**Figure 4**).

The Department's planning and budgeting for Phase 1 were initially insufficient to support monitoring and accountability, but it remained within its annual programme budget

2.5 Robust cost estimates underpin good decision-making, planning and management. The Department set financial year budgets for the smart metering programme of £3 million for 2009-10 and £15 million for 2010-11, covering expenditure on Phase 1 and subsequent spending on Phase 2. We would have expected the Department to set a budget for Phase 1 against which to manage its own and Ofgem's expenditure, but it did not do so initially. Ofgem prepared monthly forecasts of its spending on the programme, but before the start of Phase 1a these were not linked to completing specific tasks. In July 2010, the Department set a budget of £7.5 million for Ofgem's Phase 1a spending and a further £1.35 million for contingency.

2.6 The final cost of completing Phase 1, including Phase 1a, was just under £11.2 million. This covered the cost of the Department's policy team (£1.19 million) and Ofgem's costs (£10 million). Based on its monthly spending forecasts, Ofgem spent £3.87 million on Phase 1 and £6.12 million on Phase 1a (18 per cent less than forecast) (**Figure 5** on page 20). Total spending remained within the overall annual programme budget set by the Department of £3 million for 2009-10 and £15 million for 2010-11.

Figure 4
Changes in the overall programme timetable since 2009



Source: National Audit Office

The Department has developed its overall approach, but much has still to be done to add detail to its plans.

2.7 Given the lack of detailed plans at the outset of Phase 1 and subsequent evolution of the Department's approach, it is difficult to determine precisely whether the plans for each element of Phase 1 of the programme have progressed as much as intended. Completion of Phase 1 in March 2011 has, however, achieved an important milestone in planning for the roll-out. The Department's decisions have provided suppliers with certainty on the roll-out timetable, and by setting the start of roll-out as 2014, following consultation on its proposal to start roll-out in 2012, has provided more time for industry and consumers to be prepared for mass roll-out. That timetable is based on the Department finalising the technical specification of the smart meters in January 2012, following notification to the European Commission in October 2011. The Department is working to have the regulatory framework for roll-out in place by mid 2012. In the foundation stage the Department needs to undertake considerable further work to add detail to its plans and complete its work to specify, procure and licence the communications infrastructure. It also needs to further develop its benefits realisation plan, which has progressed more slowly than intended. We examine these further in Parts Three and Four.

Figure 5

Ofgem's forecast and actual spending (£000s)

| | Phase 1 | | Phase 1a | | | |
|--------------------------------------|--------------|-----|--|-----|--------------|-----|
| | Out-turn | | Ofgem business plan budget as at July 2010 | | Out-turn | |
| | (£) | (%) | (£) | (%) | (£) | (%) |
| Staff | 677 | 17 | 1,392 | 19 | 1,155 | 19 |
| Consultancy and other external input | 2,460 | 64 | 3,785 | 50 | 3,386 | 55 |
| Overheads | 731 | 19 | 2,312 | 31 | 1,582 | 26 |
| | 3,868 | | 7,489 | | 6,123 | |

Source: National Audit Office analysis of Ofgem data

The Department is taking steps to strengthen its programme management arrangements

2.8 The Department announced in December 2010, that in view of the scale of the programme and the importance of government accountability for its delivery, it would, starting from the foundation stage, manage the programme itself. The Department's decision was informed by a review of programme governance arrangements and strategic options for subsequent phases. The Department concluded that the cost of managing the programme itself would be broadly similar to the cost of continuing to outsource programme management to Ofgem. However, managing it in-house would increase the likelihood of success by strengthening programme leadership and capability. In our review, we found that there had been significant weaknesses in the programme management of Phase 1. The changes to the management responsibilities for Phase 2 has also achieved a clearer separation of duties between programme delivery and regulation of the energy industry's management of the roll-out.

2.9 The programme management and governance arrangements for the foundation stage are considerably more developed than was the case for Phase 1. As at May 2011, the Department was in the process of establishing a new programme management team, which it expects will have an average of around 100 full-time equivalent staff from 2011-12 to 2014-15, and developing its delivery plans further. Key tasks during the foundation stage include the licensing of the data and communications company and tendering for data and communications services, which will need to be managed as major projects in their own right.

2.10 The Department's latest estimate is that it will require a budget of £56 million for the period 2011-12 to 2014-15 to cover programme management and consumer engagement. It has not developed an estimate of the whole life cost of programme management beyond the current spending review period.

2.11 The Department has a new internal review process which requires all projects with a public investment or economic cost exceeding £10 million to be submitted to an approvals committee at key stages in their development. The committee approved the outline business case for the smart metering programme in March 2011, subject to important caveats that the programme needed to develop more detailed delivery plans and a stronger understanding of what is necessary to deliver smart grids. The committee expects to carry out further reviews in due course and the Programme will continue to be reviewed by the Treasury and Cabinet Office's Major Projects Authority.

Part Three

System design

3.1 The smart metering programme involves a number of major interdependent and individually complex information and communications technology projects. In this part of the report we examine:

- the Department's overall approach to system design;
- the risks to delivering a functioning system within the planned timetable;
- the potential impact on the system of the future development of smart grids; and
- security and privacy risks, and how the Department intends to manage them.

The Department is relying on expert working groups to inform the system design, overseen by its new design authority

3.2 To develop the functional requirements and technical standards for individual system components, the Department and its delivery partner Ofgem, have relied on a series of advisory working groups, comprising industry and consumer experts. There are currently 19 working groups, each with a specific remit, such as to develop and propose standards for the home area network. Industry and others have participated in these groups on a voluntary basis, covering their own costs. This approach has helped minimise the cost to the Department of system design, but has also introduced risks as these groups are not formally accountable to the Department, and some have been slow to provide advice. They are also focused on discrete parts of the system, so are not in a position to identify risks across the system as a whole. This approach therefore relies on the Department's ability to determine whether to accept or reject the technical advice, and to fill any gaps in the advice provided.

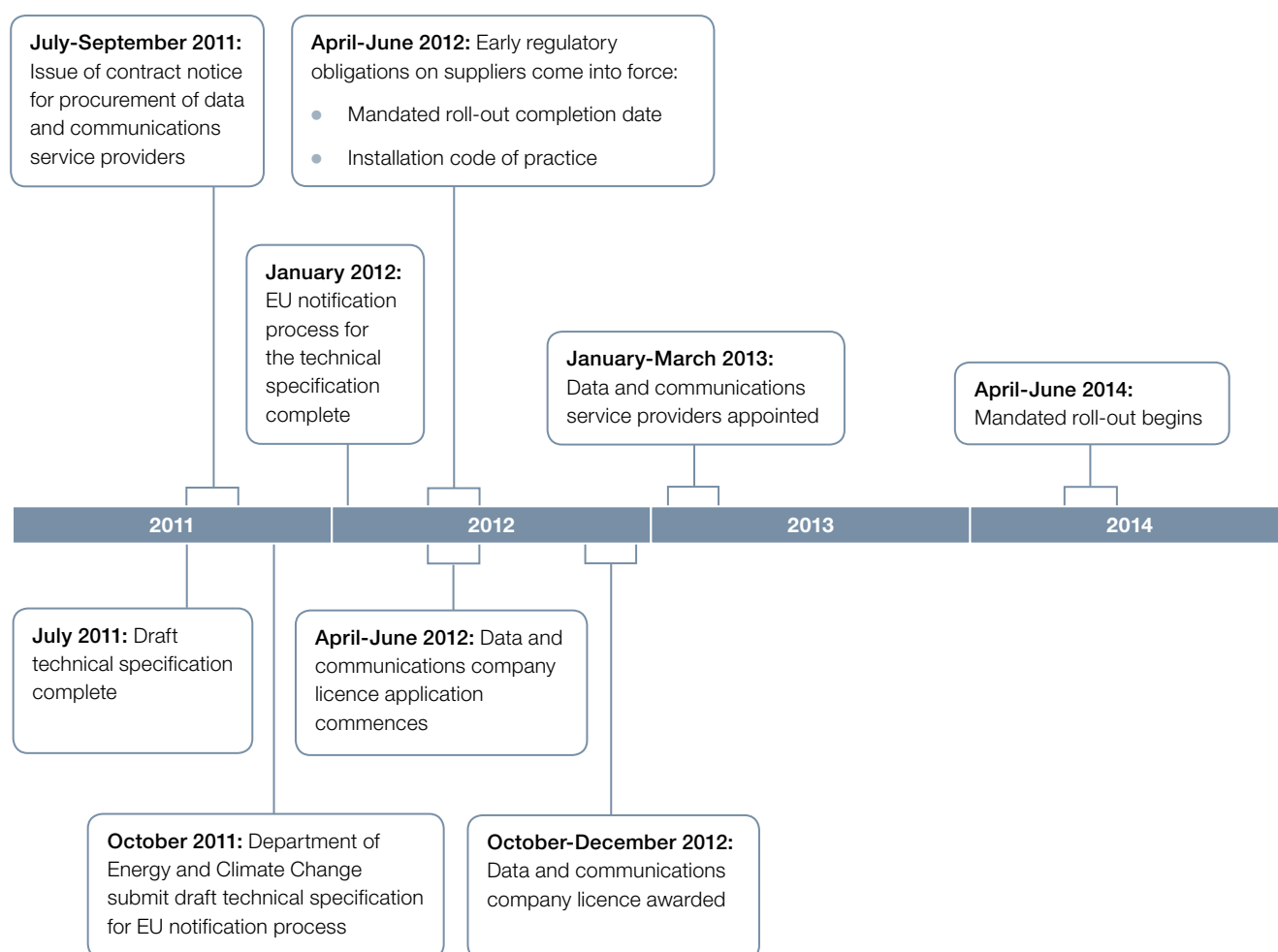
3.3 To address design risks across systems, it is good practice to establish a central design authority with overall responsibility for the system architecture and approval or rejection of technical proposals. The Department did not establish a design authority during Phase 1, but has done so for the foundation stage. The Department will continue to rely on the working groups to propose the specification for the detailed system design but the new authority will be responsible for checking the integrity of proposed technical standards for meters, communications and data management services at key milestones.

There is very little time contingency in the delivery schedules

3.4 The Department has adopted a sequential approach to system design, starting with the requirements for meters, in-home displays and home area networks (**Figure 6**). In its 2010 public consultation, the Department proposed mandating the roll-out of smart meters in 2012, but in March 2011, following stakeholder consultation, it decided to set the start date as 2014 in order to give suppliers more time to prepare.

Figure 6

Key milestones in the system development



NOTE

1 The forecast date for completing the EU notification process is dependent on the completion of consultation with industry on the draft specification and the European commission or other Member States raising no objections to the specification submitted by the Department.

Source: Department of Energy and Climate Change

3.5 The Department's milestones allow little contingency for delays in completing, integrating and testing the system, with data and communications services presenting a particular risk. Delays could add to costs and put back achievement of benefits, reducing the net benefits of the programme. To meet its timetable, the Department must:

- complete the EU notification process for the technical specification. The Department's timetable assumes that there will be no objections to its specification and that it will complete the process within three months of submitting it. The Department has estimated that energy suppliers will be able to supply smart meters in bulk by 2013. Objections from the European Commission or other Member States could delay bulk procurements of smart meters;
- establish a data and communications company with the technology to receive communications from smart meters and provide resulting data to suppliers. The timetable is based on the Department running parallel competitions to award a licence to a data and communications company (which will require a supporting regulatory framework including a new Smart Energy Code) and, separately, appoint a preferred bidder or bidders for data management and communications services that must then enter into a contract with the licence holder to allow the system to start operating in April to June 2014. The licence award and procurement of data and communications services are on the critical path; and
- test the operation and security of individual components and the end-to-end system. End-to-end testing of the full system as a whole is scheduled to begin by December 2013 and must reach a successful conclusion if the mandated roll-out is to start in April to June 2014.

The Department's aim is that the design will support smart grids, although future changes may be necessary

3.6 The smart meter system is intended to support the future development of smart grids, which could allow network operators to better manage the energy system and reduce carbon emissions, for example, by better matching generation of electricity from renewable sources to demand. The development and need for smart grids is dependent on other factors, such as the electrification of transport and heating, and the take-up of microgeneration, so it is uncertain whether or how the smart meter design and the data and communications company licence and service specification that are currently being developed and finalised might need to adapt to support a smart grid. The Department recognises the challenge of future-proofing. It has sought to include some flexibility, for example, by enabling the Wide Area Network module to be replaced without replacing the meter itself and including increased data storage capacity in the technical specification for meters in anticipation of this being required for smart grids.

3.7 There is, however, a risk that the smart meters and the data and communications structure will have to be modified or replaced before the end of their working life once the requirement for smart grids has been defined. This creates a challenge to minimise costs while incorporating sufficient flexibility, review points and appropriate allocation of risk into specifications and the data and communications company licence and service contracts.

Concerns about data security risks could undermine the programme if they are not appropriately managed

3.8 Smart meters will store detailed data on individual households' energy use that will be transferred to suppliers and other authorised parties through a central communications network. The Government has confirmed the principle that consumers should choose how their consumption data is used and by whom, with the exception of data required to fulfil regulated duties, such as providing accurate bills. It has still to determine what data may be required for regulated duties and whether consumers will have to opt-in or opt-out of data-sharing arrangements with industry. Although the management of data will be subject to the Data Protection Act, the Department is developing specific arrangements for smart meter data access and privacy, and has asked suppliers to draw up a Privacy Charter setting out how smart metering data will be protected.

3.9 The Department is seeking to mitigate the risks that the system is vulnerable to security breaches, criminal cyber-attacks and the accidental release, theft and misuse of personal data. If the initial roll-out of smart meters results in a bad customer experience and poor public relations, this could threaten the success of the programme. For example, in the Netherlands, the Dutch Government, unlike Great Britain, decided to place a legal obligation on consumers to accept the installation of new smart meters and concerns about data privacy and security contributed to a public backlash that halted the national programme. The Department has established an expert Privacy Advisory Group to inform its policy. The Department established a Security and Technical Experts Group to examine security issues and in March 2011 completed a detailed security risk assessment. The scope of the risk assessment does not currently cover the data communications company data centre and operational premises that have still to be designed. The Department has also still to develop a detailed mitigation plan.

3.10 A number of respondents to the Department's consultation expressed concerns about electromagnetic sensitivity relating to smart meter communications technologies, particularly wireless technologies. The communications technology solutions have not yet been selected for the smart metering system, but where wireless technologies are used they will have to comply with relevant regulations, best practice and international standards as set out by the International Commission on Non-Ionizing Radiation Protection. Compliance with these standards will be a functional requirement of the smart metering equipment and licence obligations. The Department plans to continue consulting the Department of Health on these perceived concerns.

Part Four

Forecast benefits

4.1 The Department estimates that installing smart meters will deliver a net benefit of £7.3 billion between 2011 and 2030 (discounted at 3.5 per cent). In this part of the report we examine:

- the sensitivity of the Department's estimates of benefits to changes in key assumptions;
- limitations in the evidence on consumer benefits and how the Department is seeking to address them; and
- the Department's strategy for achieving the benefits.

The economic benefits of smart metering are potentially large, although there are uncertainties

4.2 The Department estimates that installing smart electricity and gas meters will deliver a gross benefit of £18.6 billion between 2011 and 2030 (**Figure 7**). The largest sources of benefits are reduced demand as a result of providing consumers and businesses with better information on energy use and prices (£6.2 billion), avoided visits to read meters (£3.4 billion) and reductions in the cost to suppliers of managing the process of customers switching supplier (£1.7 billion). The Department decided at an early stage that there would be synergies from installing both smart electricity and gas meters, and our analysis using the Department's model suggests that excluding gas could potentially reduce the net benefits of the roll-out between 2011 and 2030 by up to £6 billion.

4.3 The Department's estimate of gross benefits is subject to a wide range of uncertainty, ranging from its lowest estimate of £13.5 billion (£2.2 billion net) to its highest estimate of £24.3 billion (£12.9 billion net). Most of the variation reflects adjustments to the assumed level of energy reduction from a lower estimate of a 1 per cent reduction to an upper estimate of a 4 per cent reduction. The sensitivity of the estimates to variations in energy reduction highlights the importance of improving the evidence base on the impact of smart meters and in-home displays, updating benefit estimates and monitoring benefits realisation. The estimates are based on rolling-out smart meters to 97 per cent of households, which is how the Department has defined the completion of its roll-out for modelling purposes. The Department has not examined the impact on its estimates of varying the level of roll-out of smart meters.

Figure 7

The Department's detailed benefits analysis 2011-2030 (£m)

| | Domestic premises | Non-domestic premises | Total |
|---|--------------------------|------------------------------|---------------|
| Energy saving | 4,598 | 1,622 | 6,220 |
| Microgeneration | 36 | 7 | 43 |
| User benefits | 4,635 | 1,629 | 6,264 |
| Avoided site visits | 3,178 | 248 | 3,426 |
| Reduced customer enquiries | 1,053 | 51 | 1,104 |
| Reduced customer service overheads | 183 | 9 | 192 |
| Reduced cost of debt handling | 1,075 | 51 | 1,126 |
| Avoided cost of serving prepayment meters | 991 | 0 | 991 |
| Remote (dis)connection | 244 | 7 | 251 |
| Reduced theft | 237 | 0 | 237 |
| Customer switching | 1,606 | 80 | 1,686 |
| Supplier benefits | 8,567 | 446 | 9,013 |
| Reduced losses | 438 | 90 | 528 |
| Avoided investment in the transmission and distribution network as a result of lower peak demand through take up of time-of-use tariffs | 29 | 1 | 30 |
| Savings from quicker restoration of supply following an outage | 46 | 19 | 65 |
| Operational savings from fault fixing | 86 | 35 | 121 |
| Better informed enforcement investment decisions | 115 | 0 | 115 |
| Avoided investigation of voltage complaints | 43 | 12 | 55 |
| Reduced outage notification calls | 21 | 9 | 30 |
| Network benefits | 780 | 165 | 945 |
| Savings from the lower cost of generating more energy at off peak times through take up of time of use tariffs | 121 | 27 | 148 |
| Avoided investment in generation capacity as a result of lower peak demand through take up of time-of-use tariffs | 653 | 20 | 673 |
| Generation benefits | 774 | 47 | 821 |
| Global CO ₂ reduction | 654 | 434 | 1,088 |
| EU Emissions Trading System savings from energy reduction | 371 | 84 | 455 |
| EU Emissions Trading System savings from reduced carbon emissions from generating more electricity at off-peak times through take up of time-of-use tariffs | 47 | 17 | 64 |
| UK-wide benefits | 1,072 | 535 | 1,607 |
| Total | 15,827 | 2,822 | 18,649 |

NOTE

1 Numbers do not sum due to rounding effect.

Source: Department of Energy and Climate Change Impact assessments March 2011

The evidence base for consumer benefits is inconclusive

4.4 The largest single benefit identified in the Department's impact assessment is a reduction in energy consumption totalling £6.2 billion over the next 20 years, with an associated £1.5 billion in benefits from reduced carbon emissions.⁴ This is additional to reductions in consumption that it expects to achieve through energy efficiency measures such as the Green Deal. The Department has assumed a sustained 2.8 per cent reduction in annual electricity consumption and 2 per cent reduction in gas consumption per household once fitted with a smart meter. This is based on a literature review completed in May 2008 by the consultants Mott MacDonald, which identified savings from trials and experiences overseas ranging from 1 per cent to 15 per cent, and has been informed by more recent reviews that also show greater reductions are possible.⁵ The estimate of economic benefits from reducing energy consumption and moving demand to off-peak times is sensitive to the length of time that these changes in energy use are sustained. So, for example, using the Department's model the average consumer must sustain their reduction in energy consumption for more than a year if the benefits of smart metering are to outweigh the costs.

4.5 The Department recognises that evidence on sustained behaviour change by domestic consumers is limited and that the behaviour observed in other countries, where climate and cultures of energy usage are different, may not be relevant to consumers in Britain. The Department and its predecessors have spent £10 million on a project involving a trial of several types of smart meter, in-home displays and other energy saving measures in a total of 50,000 households, in part to obtain better information on the impact of smart meters on domestic energy demand. The project started in 2006 and concluded in May 2011, a year behind schedule. The validity of some results has been constrained by design flaws, such as self-selection by participants and inconsistencies in the use of control groups, data collection and the documentation of results. The Department commissioned AECOM and other subject experts to examine sources of bias and provide assistance in interpreting the results. AECOM concluded that the trials that generated statistically reliable results suggested that supplying smart meters with in-home displays generally reduced electricity consumption by between 2 per cent and 4 per cent. In the case of gas, consumption reduced by between 2 per cent and 4 per cent. These results do not relate to a nationally representative sample of households and so provide limited further support for the Department's forecasts, but they have nevertheless generated useful findings for the smart metering programme such as the effectiveness of different types of interventions. The Department intends to work with suppliers to undertake further trials before the start of the mandated roll-out in 2014.

4 £1.5 billion in benefits associated with reduced energy consumption consist of reduced traded (EU ETS) emissions valued at £455 million and non-traded 'global CO₂ reductions' i.e. from reduced gas consumption valued at £1,088 million.

5 Mott MacDonald/BERR, *Appraisal of costs & benefits of smart meter roll-out options*, May 2008 - <http://www.decc.gov.uk/assets/decc/what%20we%20do/supporting%20consumers/smart%20energy%20meters/file45997.pdf>

4.6 The Department has also estimated that installing smart meters will encourage consumers to move their energy consumption to off-peak times resulting in cheaper generation and more effective management of the electricity network. In total, the Department estimates that £916 million⁶ can be saved, on the assumption that 20 per cent of energy consumers will take up time-of-use tariffs, which prompt them to move up to 10 per cent of their peak electricity usage to off-peak times. International evidence suggests that, depending on the type of tariff, consumers can shift between 6 per cent and 25 per cent of peak demand to off peak.⁷ The realisation of benefits from time-of-use tariffs depends however, on the proportion of consumers who choose to provide their suppliers with their detailed usage data and take-up new tariffs; as well as how much they switch to using energy at off-peak times. Ofgem's March 2011 Retail Market Review identified that increased tariff complexity inhibits customers from choosing the most appropriate tariff for their energy usage. Given the uncertainty about the nature of the tariff offer which suppliers will make and the proportion of consumers who will respond, there is a risk that these benefits will not be realised on the scale estimated by the Department.

Benefits realisation plans have still to be developed

4.7 The Department intends to set an end date for individual suppliers to complete the roll-out, but will leave suppliers to determine their individual roll-out strategies and therefore set the pace with which savings and consumer benefits are realised, within the overall timetable of completing the roll-out by 2019. The Department is expecting industry to realise the supply, network and generation benefits and competition among suppliers to provide a commercial incentive to achieve savings. The programme will require some suppliers and network companies to deliver major information technology change programmes and reform their internal processes, which bear their own risks. The Department expects the realisation of consumer and suppliers benefits to start at an early stage of the roll-out, but estimates that the realisation of most network benefits, totalling £945 million, will not start until 80 per cent of the roll-out is completed, which it forecasts will be achieved in 2018.

⁶ £916 million in benefits result from the shifting of demand to off-peak. These consist of £30 million in avoided investment in the network, reduced costs of electricity generation in the short term of £148 million with a further £673 million from avoided investment in generation capacity, and reduced traded emissions valued at £64 million.

⁷ *Smart Tariffs and Household Demand Response for Great Britain*, Gill Owen and Judith Ward, Sustainability First March 2010 p.19.

4.8 The Department has identified that funding for a major government-led consumer engagement programme will be needed to help consumers make best use of the technology and achieve the carbon reduction benefits. Since October 2010, the smart meter programme has been working with the Central Office of Information to develop a framework for behaviour change for its consumer engagement work. The Department has not yet established a consumer engagement strategy or clarified the responsibilities of Government and energy suppliers. It has, however, estimated in its cost benefit analysis that marketing and consumer engagement by Government and industry will cost £100 million up to 2019, based on a budget set in 2007 for marketing digital switchover, a programme with different requirements.

4.9 The Department has still to develop a benefits management strategy. It has not therefore developed any specific plans to manage or track whether benefits are passed through to the consumer in full. It is relying on competition among suppliers to deliver the supply-side benefits. The enforcement of common commercial and technical interoperability requirements for smart meters is intended to strengthen the competitive pressures in the supply market. The Department has concluded that competition among meter manufacturers and energy suppliers, with compliance backed by regulation, will provide the most appropriate protection for consumers.

Part Five

Costs to consumers

5.1 From the outset of any programme or project, it is vital to clearly identify the costs involved and how they will be met. In this part of the report we examine:

- how the Department has addressed risk in its cost estimates; and
- how the Department is minimising the risk that consumers, particularly vulnerable groups, pay too high a price for the roll-out of smart metering.

The Department's cost estimates include adjustments to cover its assessment of the risk of cost escalation

5.2 The Department's cost estimates for smart metering total £11.3 billion over the next 20 years (**Figure 8** overleaf). This covers the capital cost of the meters and the data and communication technologies, the cost of installing, operating and maintaining them and the cost of replacing or upgrading smart meters and network modules installed before 2014 that do not comply with the Department's technical specifications. The estimate, which includes financing costs and allowance for optimism bias, is based on information provided by energy suppliers, meter manufacturers and network companies, supported by evidence on the cost of rolling-out smart meters in other countries. **Figure 9** overleaf shows the estimated unit cost of key system components. Additionally, some 50 million non-smart electricity and gas meters, with a value of £829 million, will have to be removed before the end of their normal working life.

Figure 8
Cost of smart meters (2011-2030)

| Cost element | Domestic | Non-domestic | Total (£m) |
|--|---------------|--------------|---------------|
| Capital cost of meters | 4,005 | 265 | 4,270 |
| Meter installation | 1,596 | 96 | 1,692 |
| Communication operation and maintenance | 1,314 | 93 | 1,407 |
| Information technology | 1,026 | 0 | 1,026 |
| Communication set-up | 792 | 58 | 850 |
| Energy | 731 | 28 | 759 |
| Meter operation and maintenance | 692 | 39 | 731 |
| Inefficiencies in reading non-smart meters | 238 | -8 | 230 |
| Industry set-up costs | 198 | 0 | 198 |
| Marketing | 85 | 0 | 85 |
| Cost of upgrading non-compliant meters | 65 | 0 | 65 |
| Disposals of old meters | 15 | 3 | 18 |
| Total | 10,757 | 574 | 11,331 |

NOTE

1 Net present value at constant prices (2009) based on discount rate of 3.5 per cent.

Source: Department of Energy and Climate Change, Impact Assessment March 2011

Figure 9
Estimated unit cost of key components of the smart metering system

| Component | Electricity (£) | Gas (£) |
|---------------------------|-----------------|------------|
| Meter | 44 | 56 |
| In-home display | 15 | 15 |
| Wide area network module | 15 | 15 |
| Home area network | 1 | 1 |
| Installation ¹ | 29 | 49 |
| Total | 104 | 136 |

NOTE

1 Estimated cost of dual fuel installation is £68. These costs are capital costs and do not include operation and maintenance.

Source: Department of Energy and Climate Change, Impact Assessment March 2011

5.3 As would be expected for a large programme during the planning phase, the Department's estimate of the total cost of the smart metering programme has been revised as plans have developed and further cost information has become available (**Figure 10**). These estimates are not directly comparable because they use different baseline years and different assumptions about the timing of roll-out, affecting their net present value. Part of the increase in costs since 2009 is due to these changes as well as new information provided by suppliers, mainly on information technology costs. However, between April 2008 and May 2009, reductions in the assumed level of risk and optimism bias accounted for the majority of the reduction in the estimated costs. The Department's latest estimates are also informed by international experiences, for example, from the roll-out of nine million smart meters in the United States, and the cost of smart metering components that are already in use in Great Britain.⁸ The estimates prepared in March 2011 are those used in the Department's outline business case, which was approved by its internal approvals committee.

Figure 10

Changes in the estimated total cost and net present value of rolling-out smart meters since 2008

| Date of impact assessment | Domestic | | Non-domestic | | Total Net present value (£bn) |
|---------------------------|-------------|----------------|------------------|----------------|-------------------------------|
| | Costs (£bn) | Benefits (£bn) | Costs (£bn) | Benefits (£bn) | |
| April 2008 | 13.4 | 12.0 | 1.0 | 2.6 | 0.2 |
| May 2009 | 8.1 | 11.7 | 0.8 | 2.5 | 5.3 |
| December 2009 | 8.6 | 14.6 | 0.6 | 2.8 | 8.2 |
| July 2010 | 10.1 | 15.0 | 0.6 | 2.8 | 7.1 |
| March 2011 | 10.8 | 15.8 | 0.5 ¹ | 2.8 | 7.3 |

NOTES

- 1 Adjusted to reflect rounding effect.
- 2 These estimates are not directly comparable as they were calculated using different baseline years and different assumptions about the timing of roll-out, which affect their net present value. Changes in estimated benefits are partly due to revisions to energy price forecasts.

Source: Department of Business Enterprise and Regulatory Reform/Department of Energy and Climate Change Impact Assessments

8 IEE white paper prepared by the Brattle Group, *The Impact of Dynamic Pricing on Low Income Customers*, September 2010. http://www.hks.harvard.edu/hepg/Papers/2010/IEE_LowIncomeDynamicPricing_0910.pdf

5.4 The Department followed HM Treasury guidance and made allowance for optimism bias in its March 2011 estimates based on project-specific information on risks. The Department has allowed for optimism bias in the cost of individual elements such as the communications infrastructure and information technology to a maximum of 15 per cent, informed by an analysis commissioned from the consultants Baringa Partners in 2009. The HM Treasury guidance cites that historically there has been cost escalation above original estimates for projects involving the manufacture of equipment or the development of information and communications technology from 10 to 200 per cent.⁹ The Department intends to use the foundation stage of the programme to further test its assumptions about costs, but considers that it already has a good understanding of the likely cost of the system and that its adjustment for optimism bias provides sufficient allowance for the risk of cost escalation.

5.5 The Department did not analyse the sensitivity of net benefits to changing its assumptions about the cost of smart meter system components, as it had considered this had been addressed in its assessment of optimism bias. Our analysis using the Department's model shows that if the anticipated benefits were realised in full, costs could escalate by a further 60 per cent over the Departments cost estimates, including optimism bias, before they would exceed the benefits. Until the finalisation of the specification of the smart meters and bids for the contracts to supply data and communications services and other key elements of the system are in place, some costs will remain uncertain.

The Department expects that competition among suppliers will minimise the cost for consumers

5.6 The Department has assumed in its estimate of the impact of smart meters on energy bills that suppliers will spread the cost of roll-out across their entire customer base. The Department expects that competition among suppliers will incentivise them to minimise costs and in its modelling of the costs to consumers has assumed that suppliers will charge their customers no more than the cost price of installing and operating the smart metering system, and pass through all the efficiency savings they achieve through the prices they charge.

5.7 Ofgem's March 2011 review of retail energy markets in Britain found evidence that energy companies were pursuing similar pricing strategies. The review covered energy markets as a whole, and did not address smart metering specifically, but the findings are relevant to the smart meter roll-out. For example, by increasing their prices when the mandated roll-out of smart meters starts without transparency for any increase in their costs, suppliers could seek to make profits on installing smart meters.

⁹ HM Treasury Green Book, *Supplementary Guidance on Optimism Bias* p.5, http://www.hm-treasury.gov.uk/data_greenbook_supguidance.htm

5.8 Suppliers will be required not to levy a one-off or upfront charge on their domestic customers for the smart metering equipment, including in-home displays, which they are required to provide. Beyond this, no additional constraints will be imposed on suppliers as to how they recover their costs. The Energy Bill 2011 contains provisions specific to smart meters that would give the Department powers to request information from suppliers, which will enable the Department to monitor and evaluate the efficiency and effectiveness of suppliers' roll-out plans.

The costs and benefits to consumers will vary between households

5.9 The Department estimates that the smart metering programme will result in an increase in annual domestic energy and gas bills for the average dual fuel customer of £6 by 2015 but by 2020 it will deliver a net annual saving of £23. This is an indicative figure which could be significantly lower, or higher, and it depends on how much the system actually costs to deliver and operate, whether savings are passed through to consumers in full and whether individual households are able to reduce their use of electricity and gas, and switch to cheaper tariffs, as a direct result of having smart meters.

5.10 There is a risk that the costs and benefits of smart meters will differ between households and exacerbate fuel poverty. Some evidence from trials carried out in the United States indicates that time-of-use tariffs are potentially beneficial for consumers on low incomes. However, research carried out by FDS for Ofgem suggests that vulnerable customers generally had little understanding of tariffs and are more likely to make inappropriate decisions regarding suppliers or tariffs¹⁰, and our 2008 report on protecting consumers highlighted concerns that vulnerable consumers may be paying more for their energy.¹¹ These findings are not specific to smart meters, but highlight how the impact of suppliers' roll-out plans or decisions to target new tariffs at particular groups could result in the uneven distribution of costs and benefits between consumers.

5.11 The interests of all consumers, including the vulnerable, will be protected by an Installation Code of Practice, including rules on sales and marketing activities around the installation visit. The code is currently being developed by suppliers in consultation with interested parties, including consumer groups.

¹⁰ Ofgem, *2011 Vulnerable customer research*, Report by FDS International, March 2011, http://www.ofgem.gov.uk/Markets/RetMkts/rmr/Documents1/Ofgem_vulnerable_customers_research_Final.pdf

¹¹ National Audit Office, *Protecting consumers? Removing retail price controls*, HC 342 Session 2007-08, 28 March 2008, http://www.nao.org.uk/publications/0708/protecting_consumers_removing.aspx

Appendix One

Methodology

The main elements of our fieldwork, which were undertaken between January and April 2011, were:

Selected method

1 Review the Department's cost benefit analysis of the smart metering programme, as set out in successive impact assessments, and conduct scenario modelling using the underlying financial model prepared by the Department.

2 Review of programme plans and progress reports prepared by the Department, Ofgem and consultants to the smart metering programme.

3 Interviews with officials in the Department and Ofgem.

4 Analysis of responses to the Department's consultation on its proposals and stakeholder interviews.

5 Review commissioned from Mott MacDonald of technical risks.

Purpose

To understand the Department's options appraisal and decision-making process; and identify the impact of changing key assumptions in the Department's model on its estimates of costs and benefits.

To understand how the programme was managed, and performance against plans.

To understand how programme planning and management practices operated.

To identify key risks to delivery as perceived by third-party stakeholders and how these had been reflected in the Department's decision-making.

To assess the Department's approach to developing the technology and key risks.



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