Title:	Impact Assessment (IA)
Smart meter rollout for the small and medium non-domestic sector[1] (GB)	**IA No:** DECC0010
Lead department or agency: DECC	**Date:** 30/03/2011
Other departments or agencies: Ofgem	**Stage:** Final
	Source of intervention: Domestic
	Type of measure: Other
	Contact for enquiries: Ferry Lienert/Pau Castells (0300 068 6325/6541)

Summary: Intervention and Options

What is the problem under consideration? Why is government intervention necessary?

The policy for smart meters addresses market failures in the energy markets - information asymmetries, lack of coordination and negative externalities from energy consumption. Lack of sufficiently accurate and timely information on energy use may prevent customers from taking informed decisions to reduce consumption and thereby bills and CO2 emissions. This information failure also increases suppliers' accounts management and switching costs. In the absence of intervention by Government, suppliers would roll out only limited numbers of smart meters. Government intervention is needed to ensure commercial interoperability and full market coverage of smart meters. This will facilitate the capture of wider benefits to consumers, the environment, network operators and new businesses.

What are the policy objectives and the intended effects?

The objective of the Government intervention is to provide smart metering to non-domestic gas and electricity customers in a cost-effective way, which optimises the benefits to consumers, energy suppliers, network operators and other energy market participants and delivers environmental and other policy goals.

What policy options have been considered, including any alternatives to regulation? Please justify preferred option (further details in Evidence Base)

This policy focuses on the mandated replacement of non-residential gas and electricity meters in GB. The IA presents the two options for implementing a supplier-led rollout in the non-domestic sector with a centralised data and communications company. Both policy options envision a parallel procurement process with the Data and Communications Company (DCC) being operational in Q2 2014 with a minimum scope and further remits being added shortly after.

The options considered in this analysis are a mandated DCC with obligatory use of the central communications body and a voluntary DCC where suppliers can choose not to use the DCC. The latter presents the preferred policy option. The options are considered against a baseline in which 50% of non-domestic meters are replaced by smart or advanced meters by 2030 without a government intervention.

When will the policy be reviewed to establish the actual cost and benefits and the achievements of the policy objectives?	An early review of requirements for the rollout to ensure delivery of benefits is expected to be carried out before 2014. Further evaluation of the policy will also be conducted (provisionally by 2018). (See Annex1 – Post Implementation Review Plan)
Are there arrangements in place that will allow a systematic collection of monitoring information for future policy review?	The requirements for the collection of monitoring information that will contribute to the benefits realisation will be developed in the next phase of the programme.

Ministerial Sign-off: ***I have read the Impact Assessment and I am satisfied that (a) it represents a fair and reasonable view of the expected costs, benefits and impact of the policy, and (b) the benefits justify the costs.***

Signed by the responsible Minister. Date: 30/03/2011

[1] The present document focuses on smaller non-domestic sites – those in electricity profile classes 3 and 4, and those with gas consumption below 732 MWh per annum.

Summary: Analysis and Evidence

Policy Option 1

Description:

DCC mandate

Price Base Year 2009	PV Base Year 2011	Time Period Years 20	Net Benefit (Present Value (PV)) (£m)		
			Low: 1,454	**High:** 3,108	**Best Estimate: 2,266**

COSTS (£m)	**Total Transition** (Constant Price)	Years	**Average Annual** (excl. Transition) (Constant Price)	**Total Cost** (Present Value)
Low	n/a		n/a	**n/a**
High	n/a		n/a	**n/a**
Best Estimate	-5		39	**574**

Description and scale of key monetised costs by 'main affected groups'

Capital costs and installation costs amount to £361m; O&M costs amount to £39m. Communication costs amount to £151m and energy, disposal and pavement inefficiency reading costs are £23m.

Other key non-monetised costs by 'main affected groups'

n/a

BENEFITS (£m)	**Total Transition** (Constant Price)	Years	**Average Annual** (excl. Transition) (Constant Price)	**Total Benefit** (Present Value)
Low	n/a		138	**2,029**
High	n/a		250	**3,681**
Best Estimate	n/a		193	**2,840**

Description and scale of key monetised benefits by 'main affected groups'

Total consumer benefits amount to £1.63bn and consist mainly of savings due to a reduction in energy consumption.
Total supplier benefits amount to £453m and include avoided site visits (£248m), and reduced inquiries and customer overheads (£60m). Total network benefits amount to £175m and generation benefits to £47m.
UK wide benefits from reduced carbon are £535m.

Other key non-monetised benefits by 'main affected groups'

Advanced/smart meters are a strong enabling tool for many energy efficiency policies, facilitating improved competition, wider network benefits and demand side shifting.

Key assumptions/sensitivities/risks **Discount rate (%)** 3.5

All numbers adjusted for risk optimism bias and under central scenario unless stated otherwise. Sensitivity analysis has been applied to the benefits as energy savings depend on consumers' behavioural response to information and changes to them affect the benefits substantially.

The numbers presented are based on the assumption that a scope of the DCC including data aggregation will eventually be achieved.

Direct impact on business (Equivalent Annual) £m) [2]:			**In scope of OIOO?**	**Measure qualifies as**
Costs: 778	**Benefits:** 845	**Net:** 68	Yes	IN (£0 IN)

[2] Aggregates domestic and smaller non-domestic rollout. This approach has been agreed with the Better Regulation Executive.

Enforcement, Implementation and Wider Impacts

What is the geographic coverage of the policy/option?			Great Britain		
From what date will the policy be implemented?			The start date will be confirmed in accordance with the rollout plans for the preferred Option.		
Which organisation(s) will enforce the policy?			DECC/Ofgem		
What is the annual change in enforcement cost (£m)?			N/A		
Does enforcement comply with Hampton principles?			N/A		
Does implementation go beyond minimum EU requirements?			Yes		
What is the CO_2 equivalent change in greenhouse gas emissions? (Million tonnes CO_2 equivalent)			**Traded:** 4.1	**Non-traded:** 10.3	
Does the proposal have an impact on competition?			Yes		
What proportion (%) of Total PV costs/benefits is directly attributable to primary legislation, if applicable?			**Costs:** N/A	**Benefits:** N/A	
Distribution of annual cost (%) by organisation size (excl. Transition) (Constant Price)	**Micro** N/A	**< 20** N/A	**Small** N/A	**Medium** N/A	**Large** N/A
Are any of these organisations exempt?	N/A	N/A	N/A	N/A	N/A

Evidence Base for option 1

Annual profile of monetised costs and benefits - (£) constant prices

	2010	2011	2012	2013	2014	2015	2016
Transition costs[1]	0	0	217,447	378,487	1,661,291	3,507,471	4,571,175
Annual recurring cost[2]	0	0	-472,403	-1,659,018	6,457,311	24,028,856	43,413,327
Total annual costs	0	0	-254,956	-1,280,531	8,118,602	27,536,328	47,984,502
Transition benefits	0	0	0	0	0	0	0
Annual recurring benefits	0	0	0	0	5,845,243	11,433,167	40,644,649
Total annual benefits	0	0	0	0	5,845,243	11,433,167	40,644,649

	2017	2018	2019	2020	2021	2022	2023
Transition costs	4,767,695	2,402,722	-993,354	-2,479,066	-2,903,910	-3,113,036	-3,261,714
Annual recurring cost	62,780,766	75,296,521	77,808,952	75,421,461	70,357,890	64,952,400	59,543,363
Total annual costs	67,548,461	77,699,243	76,815,598	72,942,395	67,453,980	61,839,364	56,281,649
Transition benefits	0	0	0	0	0	0	0
Annual recurring benefits	93,717,219	148,738,034	204,232,891	251,701,132	270,982,031	276,876,185	279,433,435
Total annual benefits	93,717,219	148,738,034	204,232,891	251,701,132	270,982,031	276,876,185	279,433,435

	2024	2025	2026	2027	2028	2029	2030
Transition costs	-3,370,216	-3,435,500	-3,447,138	-3,209,206	-3,060,035	-1,861,702	-436,944
Annual recurring cost	54,166,694	49,314,573	44,297,962	38,944,307	33,556,152	28,092,767	22,592,107
Total annual costs	50,796,479	45,879,073	40,850,823	35,735,101	30,496,117	26,231,066	22,155,163
Transition benefits	0	0	0	0	0	0	0
Annual recurring benefits	279,618,154	281,139,667	283,031,998	301,973,980	309,796,469	309,883,494	310,177,463
Total annual benefits	279,618,154	281,139,667	283,031,998	301,973,980	309,796,469	309,883,494	310,177,463

Emission savings by carbon budget period (MtCO2e)

Sector		Emission Savings (MtCO2e) - By Budget Period		
		CB I; 2008-2012	CB II; 2013-2017	CB III; 2018-2022
Power sector	Traded	0	0	0
	Non-traded	0	0	0
Transport	Traded	0	0	0
	Non-traded	0	0	0
Workplaces & Industry	Traded	0.01	0.61	1.54
	Non-traded	0.02	1.44	3.64
Homes	Traded	0	0	0
	Non-traded	0	0	0
Waste	Traded	0	0	0
	Non-traded	0	0	0
Agriculture	Traded	0	0	0

[1] Note that from 2019, the one-off, transition costs become negative. This is driven by costs from pavement reading inefficiencies (increased costs of reading legacy meters) when compared to the counterfactual. Under both options considered in the analysis there would be no more pavement reading costs towards the end of the rollout , whereas in the counterfactual (with only 50% of meters being smart) some would remain. Hence subtracting the counterfactual costs produces a negative cost or cost saving.

[2] The negative annual recurring cost figures in years 2012 and 2013 arise from the fact that under the rollout scenario fewer smart meters are installed than would have been assumed in the counterfactual. As installation under the programme picks up this effect disappears.

	Non-traded	0	0	0
Public	Traded	0	0	0
	Non-traded	0	0	0
Total	Traded	0.01	0.61	1.54
	Non-traded	0.02	1.44	3.64
Cost effectiveness	% of lifetime emissions below traded cost comparator	100%		
	% of lifetime emissions below non-traded cost comparator	100%		

Summary: Analysis and Evidence — Policy Option 2

Description:

No DCC mandate

Price Base Year 2009	PV Base Year 2011	Time Period Years 20	Net Benefit (Present Value (PV)) (£m)		
			Low: 1,438	**High:** 3,089	**Best Estimate: 2,248**

COSTS (£m)	**Total Transition** (Constant Price)	Years	**Average Annual** (excl. Transition) (Constant Price)	**Total Cost** (Present Value)
Low	n/a		n/a	**n/a**
High	n/a		n/a	**n/a**
Best Estimate	-5		39	**574**

Description and scale of key monetised costs by 'main affected groups'

Capital costs and installation costs amount to £361m; O&M costs amount to £39m. Communications costs amount to £151m and energy, disposal and pavement inefficiency reading costs are £23m.

Other key non-monetised costs by 'main affected groups'

n/a

BENEFITS (£m)	**Total Transition** (Constant Price)	Years	**Average Annual** (excl. Transition) (Constant Price)	**Total Benefit** (Present Value)
Low	n/a		137	**2,013**
High	n/a		249	**3,662**
Best Estimate	n/a		192	**2,822**

Description and scale of key monetised benefits by 'main affected groups'

Total consumer benefits amount to £1.63bn and consist mainly of savings due to a reduction in energy consumption.
Total supplier benefits amount to £446m and include avoided site visits (£248m), and reduced inquiries and customer overheads (£60m). Total network benefits amount to £165m and generation benefits to £47m.
UK wide benefits from reduced carbon are £535m.

Other key non-monetised benefits by 'main affected groups'

Advanced/smart meters are a strong enabling tool for many energy efficiency policies, facilitating improved competition, wider network benefits and demand side shifting.

Key assumptions/sensitivities/risks — **Discount rate (%)** 3.5

All numbers adjusted for risk optimism bias and under central scenario unless stated otherwise. Sensitivity analysis has been applied to the benefits as energy savings depend on consumers' behavioural response to information and changes to them affect the benefits substantially.

The numbers presented are based on the assumption that a scope of the DCC including data aggregation will eventually be achieved.

Direct impact on business (Equivalent Annual) £m)[5]:			**In scope of OIOO?**	**Measure qualifies as**
Costs: 778	**Benefits:** 844	**Net:** 67	Yes	IN (£0 IN)

[5] Aggregates domestic and smaller non-domestic rollout. This approach has been agreed with the Better Regulation Executive.

Enforcement, Implementation and Wider Impacts

What is the geographic coverage of the policy/option?			Great Britain		
From what date will the policy be implemented?			The start date will be confirmed in accordance with the rollout plans for the preferred Option.		
Which organisation(s) will enforce the policy?			DECC / Ofgem		
What is the annual change in enforcement cost (£m)?			N/A		
Does enforcement comply with Hampton principles?			N/A		
Does implementation go beyond minimum EU requirements?			Yes		
What is the CO_2 equivalent change in greenhouse gas emissions? (Million tonnes CO_2 equivalent)			**Traded:** 4.1	**Non-traded:** 10.3	
Does the proposal have an impact on competition?			Yes		
What proportion (%) of Total PV costs/benefits is directly attributable to primary legislation, if applicable?			**Costs:** N/A	**Benefits:** N/A	
Distribution of annual cost (%) by organisation size (excl. Transition) (Constant Price)	**Micro**	**< 20**	**Small**	**Medium**	**Large**
Are any of these organisations exempt?	N/A	N/A	N/A	N/A	N/A

Evidence Base for option 2

Annual profile of monetised costs and benefits* - (£) constant prices

	2010	2011	2012	2013	2014	2015	2016
Transition costs[6]	0	0	217,447	378,487	1,661,291	3,507,471	4,571,175
Annual recurring cost[7]	0	0	-472,412	-1,659,037	6,457,264	24,028,676	43,412,949
Total annual costs	0	0	-254,966	-1,280,550	8,118,555	27,536,147	47,984,125
Transition benefits	0	0	0	0	0	0	0
Annual recurring benefits	0	0	0	0	5,815,437	11,373,651	40,453,575
Total annual benefits	0	0	0	0	5,815,437	11,373,651	40,453,575

	2017	2018	2019	2020	2021	2022	2023
Transition costs	4,767,695	2,402,722	-993,354	-2,479,066	-2,903,910	-3,115,065	-3,261,714
Annual recurring cost	62,780,107	75,295,689	77,808,062	75,420,574	70,357,035	64,957,553	59,548,595
Total annual costs	67,547,803	77,698,411	76,814,708	72,941,508	67,453,125	61,842,488	56,286,881
Transition benefits	0	0	0	0	0	0	0
Annual recurring benefits	93,342,154	148,068,180	203,333,829	250,465,026	269,381,235	275,211,366	277,726,687
Total annual benefits	93,342,154	148,068,180	203,333,829	250,465,026	269,381,235	275,211,366	277,726,687

	2024	2025	2026	2027	2028	2029	2030
Transition costs	-3,370,216	-3,435,500	-3,447,138	-3,209,206	-3,060,035	-1,861,702	-436,944
Annual recurring cost	54,171,952	49,319,905	44,303,355	38,949,725	33,561,597	28,098,217	22,597,571
Total annual costs	50,801,737	45,884,405	40,856,217	35,740,519	30,501,562	26,236,516	22,160,627
Transition benefits	0	0	0	0	0	0	0
Annual recurring benefits	277,899,022	279,379,151	281,223,430	299,982,002	307,666,905	307,706,961	307,950,912
Total annual benefits	277,899,022	279,379,151	281,223,430	299,982,002	307,666,905	307,706,961	307,950,912

Emission savings by carbon budget period (MtCO2e)

Sector		Emission Savings (MtCO2e) - By Budget Period		
		CB I; 2008-2012	CB II; 2013-2017	CB III; 2018-2022
Power sector	Traded	0	0	0
	Non-traded	0	0	0
Transport	Traded	0	0	0
	Non-traded	0	0	0
Workplaces & Industry	Traded	0.01	0.61	1.54
	Non-traded	0.02	1.44	3.64
Homes	Traded	0	0	0
	Non-traded	0	0	0
Waste	Traded	0	0	0

[6] Note that from 2019, the one-off, transition costs become negative. This is driven by costs from pavement reading inefficiencies (increased costs of reading legacy meters) when compared to the counterfactual. Under both options considered in the analysis there would be no more pavement reading costs towards the end of the rollout , whereas in the counterfactual (with only 50% of meters being smart) some would remain. Hence subtracting the counterfactual costs produces a negative cost or cost saving.

[7] The negative annual recurring cost figures in years 2012 and 2013 arise from the fact that under the rollout scenario fewer smart meters are installed than would have been assumed in the counterfactual. As installation under the programme picks up this effect disappears.

	Non-traded	0	0	0
Agriculture	Traded	0	0	0
	Non-traded	0	0	0
Public	Traded	0	0	0
	Non-traded	0	0	0
Total	Traded	0.01	0.61	1.54
	Non-traded	0.02	1.44	3.64
Cost effectiveness	% of lifetime emissions below traded cost comparator	100%		
	% of lifetime emissions below non-traded cost comparator	100%		

Contents

A. Glossary of Terms

CAPEX – Capital Expenditure
DCC – Data Communications Company
DNO – Distribution Network Operators
ESCO – Energy Service Company
GHG – Greenhouse Gas
GPRS – General Packetised Radio Service
GSM – Global System for Mobile Communication
HAN – Home Area Network
IHD– In-Home Display
IT – Information Technology
LAN – Local Area Network
NPV – Net Present Value
O & M – Operation & Maintenance
OPEX – Operational Expenditure
PPM – Prepayment Meter
PV – Present Value
RTD – Real Time Display
SPC – Shadow Price of Carbon
ToU – Time of Use (tariff)
WAN – Wide Area Network

B. Introduction and Strategic Overview

The Government set out its commitment to the rollout of smart meters in its coalition programme[8] - the Programme for Government.

The Programme for Government sets out the strategic context for the rollout of smart metering alongside the establishment of a smart grid. The smart meter policy sits within the broader Government policy of an increase in the EU carbon emission reduction target by 2020, through encouraging investment in renewable energy both locally and for large scale offshore wind developments; feed-in tariffs; and increased home and business energy efficiency via the Green Deal.

Smart metering will play an important part in supporting these policies and objectives, by directly helping consumers to understand their energy consumption and make savings; reducing supplier costs; enabling new services; facilitating demand-side management to help reduce security of supply risks; and aiding broad sustainability and affordability objectives. As well as facilitating the deployment of renewables and electric vehicles, smart metering is a key enabler of the future Smart Grid.

The rollout of smart metering therefore needs to happen on a timescale appropriate to supporting these various objectives and policies.

This Impact Assessment (IA) builds upon the work DECC has undertaken in the last 3 years in establishing and defining the case for rolling out smart meters, and its impact. This has been supported by cost benefit modelling and analysis by Mott Macdonald[9], Baringa Partners, Redpoint Consulting and PA Consulting Group. DECC has worked with Ofgem E-Serve as delivery partner during Phase 1 of the smart metering programme, which concluded in March 2011.

In the non-domestic market, energy suppliers are already required to ensure that, by April 2014, energy supplied to larger electricity sites (defined as those within profile classes 5-8[10]) and larger gas sites (defined as those with consumption above 732MWh per annum) is measured by an advanced meter. Since April 2009, such metering has also had to be provided where a meter is newly installed or replaced. The present analysis focuses on remaining, smaller sites – those in electricity profile classes 3 and 4, and those with gas consumption below 732 MWh per annum. These sites are the subject of the Impact Assessment.

The smart meter programme has assessed the requirements, costs, benefits and options for the smart meter solution in the areas of:

- functionality of the smart meters solution, including meters, communications and real time displays;
- length of the rollout period;
- scope and establishment of the central communications provider (DCC);
- implementation strategy for the mass rollout, including the establishment of the DCC and the obligations and protections that should be in place before DCC data and communications services become available.

The IA assesses costs and benefits for options on the implementation strategy for the rollout for non-domestic premises and accompanies the Prospectus Response Document and its accompanying annexes, which set out the detail and discussion of the policy options considered by the Smart Meters Programme.

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[8] HMG, *'The Coalition: Our programme for government'*, 2010

[9] BERR, *Impact Assessment of Smart Metering Roll Out for Domestic Consumers and Small Businesses*, April 2008, http://www.berr.gov.uk/files/file45794.pdf

[10] Numbered profile classes are used to categorise electricity sites that are settled by load "profile", rather than by actual information derived from half-hourly metering. Classes 1 and 2 cover domestic sites; classes 3-8, non-domestic.

C. The issue

Within Great Britain's small and medium non-domestic energy market (which we define as electricity sites within profile classes 3 & 4 and gas sites with consumption below 732MWh/year)[11], there are information difficulties for both consumers and suppliers. Suppliers often only know exactly how much energy a non-residential customer consumes after a quarterly meter read. Similarly, consumers will generally only be aware of consumption on a quarterly, historic basis unless they take active steps to monitor the readings on their meters.

Consumers would benefit from having more dynamic and useful information to enable them easily to manage their energy consumption. In addition, smart or advanced metering would improve data and billing accuracy.

Smart meters with an in-home display (IHD) or other means of providing information, or advanced meters providing information that can be accessed via computer or other remote means, provide the means of addressing these issues. Work specific to SMEs by the Carbon Trust[12] (using field trials) suggested that potential energy savings per business could be between 5% and 12% depending on the advice they received. The Carbon Trust anticipated that, if its field trial were scaled up nationally, there would be savings of over 2% of all carbon emissions from businesses.

Smart meters provide remote communication between the meter and the supplier, facilitating, amongst other things, more efficient collection of billing information, the development of more sophisticated tariff structures and demand management approaches that could be used further to incentivise energy-efficient behaviour by consumers and suppliers alike.

The benefits from a rollout of smart meters together with a free standing display or other means of providing information fall to a number of actors – to consumers (in terms of accurate bills, accurate and real-time information to enable them to manage energy consumption and potentially receive new services), to suppliers (in terms of more frequent 100% accurate information, reduced costs to serve) and to society (in terms of reduced carbon emissions).

There are also benefits for network companies from the use, subject to appropriate data, privacy and access controls, of data collected through smart metering to enable them better to manage the electricity network and to inform long-term investment in the network and development of smart grids.

Companies are already installing integrated smart/advanced meters or retrofitting advanced elements to "dumb" meters in the non-domestic market. However, in the absence of Government intervention, feedback from market participants suggests that a rollout of smart/advanced meters could, over time, only involve around 50% of meters and would thus only realise a proportion of the possible benefits. Experience from other countries shows that suppliers and others interested in meter provision, such as meter-owners (at least in competitive markets), rarely fully embrace smart/advanced metering as the benefits fall to a variety of actors and the market does not effectively maximise and share these benefits without some form of Government intervention.

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[11] Where the term "SME" is used, it should be taken to include all sites within these groupings, including the smaller sites of larger private and public sector organisations, as well as those of small and medium enterprises and micro-businesses.

[12] "Advanced metering for SMEs: Carbon and cost savings", Full Report, Carbon Trust, May 2007

D. Objectives

The objectives of Government intervention in the rollout of smart metering through the Smart Metering Programme are:

1. To promote cost-effective energy savings, enabling all consumers to better manage their energy consumption and expenditure and deliver carbon savings;
2. To promote cost-effective smoother electricity demand, so as to facilitate anticipated changes in the electricity supply sector and reduce the costs of delivering (generating and distributing) energy;
3. To promote effective competition in all relevant markets (energy supply, metering provision and energy services and home automation);
4. To deliver improved customer service by energy suppliers, including easier switching and price transparency, accurate bills and new tariff and payment options;
5. To deliver customer support for the Programme, based on recognition of the consumer benefits and fairness, and confidence in the arrangements for data protection, access and use;
6. To ensure that timely information and suitable functionality is provided through smart meters and the associated communications architecture where cost effective, to support development of smart grids;
7. To enable simplification of industry processes and resulting cost savings and service improvements;
8. To ensure that the dependencies on smart metering of wider areas of potential public policy benefit are identified and included within the strategic business case for the Programme, where they are justified in cost-benefit terms and do not compromise or put at risk other Programme objectives;
9. To deliver the necessary design requirements, commercial and regulatory framework and supporting activities so as to achieve the timely development and cost-effective implementation of smart metering and meeting Programme milestones;
10. To ensure that the communications infrastructure, metering and data management arrangements meet national requirements for security and resilience and command the confidence of stakeholders; and
11. To manage the costs and benefits attributable to the Programme, in order to deliver the net economic benefits set out in the Strategic Business Case.

These objectives form the basis of the benefits management work that has been undertaken in this phase and will be developed in greater detail as part of the next phase of the Programme.

E. Option Identification

As set out in the introduction, this IA builds on the analysis set out in the July 2010 Prospectus consultation IA[13]. Core to that IA was the concept of a central data and communications provider. This provider will manage central communications and data and is referred to as Data Communications Company (DCC) throughout this IA.

This IA further examines the two options considered in the July 2010 IA; whether the use of DCC should be (i) mandatory or (ii) voluntary in the non-domestic sector. Analysis is undertaken in light of the additional information received since July 2010. This confirms that a voluntary use of DCC presents the preferred option, since it provides businesses with greater freedom of choice while having a negligible impact on the benefits case.

Most considerations with regards to meter functionality, rollout profile, communications infrastructure and DCC establishment in the domestic IA are applicable for the non-domestic IA. Where this is not the case, the difference is outlined in the cost or benefit section of this document. This IA outlines how the considerations impact the costs and benefits of the two options under consideration for the non-domestic element of the smart meters policy.

For some of the costs and benefits analysed it is not possible to determine the proportion that falls to the domestic or non-domestic sector. In some cases, we have, therefore, accredited the costs or benefits fully to the domestic analysis[14], in light of the much greater number of meters in that sector.

For modelling purposes IT, legal, marketing and organisational costs, as well as integration of early meters from the rollout, have been fully allocated to the domestic cost benefit analysis. Similarly we have credited all benefits from better informed investment decisions in electricity networks to the domestic analysis. The accredited costs outweigh the benefits, so the result is a potential understatement of net benefits of the domestic policy and a potential overstatement of net benefits of the non-domestic policy. It is important to note however, that the overall impact on the net present value of the smart meter domestic and non-domestic rollouts is neutral and that in aggregate neither costs nor benefits are underestimated or overestimated.

Options analysed

The IA considers two policy options to deliver the preferred Government solution for a smart meters rollout in non-domestic premises:

<u>Option 1 – Mandate use of DCC</u>
Option 1 would see all non-domestic energy suppliers being required to use the DCC service for their smart meters from the time DCC is operational.

<u>Option 2 - DCC use at discretion of suppliers</u>
Option 2 leaves the use of DCC to supplier discretion. Section F describes the assumptions regarding supplier incentives to use DCC.

These options are assessed against a baseline in which 50% of non-domestic meters are replaced by smart or advanced meters by 2030 without a government intervention.

[13] http://www.decc.gov.uk/en/content/cms/consultations/smart_metering/smart_metering.aspx
[14] Published in parallel to this document, see:
http://www.decc.gov.uk/en/content/cms/consultations/smart_mtr_imp/smart_mtr_imp.aspx

F. Evidence Base

In this section we describe the main assumptions underpinning the analysis and the reasons for them with references to the evidence where appropriate. Further work has been undertaken since the July 2010 IA, particularly in the areas of rollout, functionality and communications, and this has implications for the cost and benefit calculations. This further analysis has been undertaken by DECC and Ofgem and has been informed by the outputs of expert working groups and externally sourced work by Programme contractors. In addition we have received feedback from stakeholders on many aspects of the analysis during this period.

We have refined our assumptions and methodology on the basis of a critical examination of the evidence we have received, and any changes have also undergone a process of cross-Government peer review. Key estimates that have been refined since July 2010 and which have an impact on the costs and benefits of the non-domestic rollout, include the rollout profile, meter costs, benefits from better outage management, other network benefits, safety inspections and meter-read site visits, benefits from customer switching, and the methodological approach to assessing the impact of ToU tariffs.

Most of the assumptions used in this IA are shared with the assumptions used in the analysis for the domestic sector. Where this is not the case it is noted and explained within the text.

Differences between the assumptions used in this IA and the one published in July 2010 are noted and explained within the text.

The assumptions are generally shared between the options under consideration, but where there are differences these are noted.

It should be noted that, within the economic model, all up-front costs are annuitised over the lifetime of the meter or over the rollout period. The modelling assumes that a loan is required to pay for the asset, which is then repaid over the period. Following Government guidance, a cost of capital of 10% has been assumed. The benefits are not annuitised but annualised, that is, they are counted as they occur.

Underlying assumptions

For the modelling of the rollout, we have made a number of assumptions, which are outlined in the following section.

<u>Advanced meters vs. smart meters</u>
The present analysis builds on decisions previously taken with regard to some flexibility for installation of smart and advanced meters. Meters without full smart functionality can remain, or can continue to be installed:

- Where advanced metering is installed before April 2014 and the customer wishes to retain it; or
- Where advanced metering is installed after April 2014 under pre-existing contractual arrangements.

These decisions reflected the state of development within the non-domestic market, with advanced metering being relatively extensively deployed and attendant early energy and carbon savings being achieved. The Government did not, therefore, wish to limit this beneficial early activity by creating uncertainty around advanced metering investment.

A variety of advanced metering solutions are available, and used, within the non-domestic market, especially by larger or multi-site customers. Many of the existing advanced meters have been installed by advanced metering service providers rather than suppliers. Non-domestic customers, like domestic customers, may install their own meters or appoint an accredited party, other than their supplier, to install the meter and collect readings from it. These providers have grown in number over recent years and offer a service tailored to consumers requirements, providing feedback on consumption patterns via the internet or over a local network. This feedback allows consumers to monitor their consumption and to target energy and carbon savings. Service providers contract with communications companies to permit the meter to be accessed and data downloaded. These advanced metering solutions not only carry a different cost to smart meters as defined by the programme, but are also assumed to deliver different levels of benefits.

There will be no mandate requiring a compliant smart meter (meeting the finalised technical specification) or an advanced meter (providing as a minimum remote access to metered consumption, and capable of measuring half-hourly (electricity) or hourly (gas) consumption) to be installed before the start of a mass rollout, envisaged to be April 2014. Thereafter, smart would be installed on a new and replacement basis (except where advanced metering was permitted under the exceptions arrangements).

It is assumed that by 2020 the split between smart and advanced meters would be:

- Electricity: 77% smart and 23% advanced
- Gas: 60% smart and 40% retrofit advanced

The proportion of benefits realisable for advanced meters is shown in the table below.

Table 1: Proportion of smart meter benefits realisable for advanced meters

	Advanced meters	
	Electricity	Gas
Energy saving	90%	80%
Short run marginal cost savings from Time of Use (ToU)	0%	0%
Inbound enquiries	80%	80%
Customer service overheads	80%	80%
Debt handling	20%	20%
Remote disconnection	0%	0%
Avoided site visit	100%	100%
Reduced losses	0%	0%
Reduced theft	N/A	N/A
Microgeneration	0%	N/A
Supplier switching[15]	£0.8	£0.8
Network benefits	0%	N/A

Use of DCC

The Prospectus[16] proposed that, in the non-domestic sector, use of DCC should not be mandatory for smart meters, but that those providing them should be able to use DCC if they wished to do so. Similarly, advanced meters would be able to use DCC, subject to mutually acceptable terms and conditions.

The Programme's view is that a voluntary, rather than a mandatory approach to using DCC for smart and advanced meters would only change the number of

[15] We assume that advanced meters would realise a flat supplier switching benefit of £0.8 per meter, which is in line with the switching benefits realised by smart meters before the DCC is established and for smart meters that choose not to use the DCC under policy option 2.

[16] http://www.decc.gov.uk/en/content/cms/consultations/smart_mtr_imp/smart_mtr_imp.aspx

electricity meters that actually use it to a limited extent. No new evidence indicating otherwise has come to light in the course of the consultation. This reflects the fact that suppliers with large, domestic portfolios are likely to wish to install a common, smart meter where they can, and to wish to use a common communications platform, even where they are offered a choice. In the non-domestic electricity sector, supply is dominated by these suppliers with large, domestic portfolios.

We continue to assume that the incentive to opt out of using the DCC might be more pronounced for non-domestic suppliers of gas. Because there are a number of gas suppliers with a significant share of the non-domestic market, but no domestic business, there is a reduced incentive for those suppliers to use the DCC to ensure compatibility with their domestic operations.

For modelling purposes we have assumed that under Option 1 (mandated approach) the percentage of meters using DCC would be broadly in line with our expectations of smart penetration in the small and medium non-domestic market of 77% for electricity and 60% for gas.

In contrast, under the voluntary approach (Option 2), only 97.5% of those smart electricity meters (so 76% of all non-domestic electricity meters) and 75% of those smart gas meters (so 45% of all non-domestic gas meters) would choose to use DCC. These percentages are in line with the market share of suppliers with large domestic portfolios which are likely to wish to install a common, smart meter where they can, and to wish to use a common communications platform, even where they are offered a choice.

Benefits from using the DCC

Smart metering requires a suitable communications platform over which data can be securely transmitted. In preparing the Prospectus Response Document, the Programme has analysed options for both the establishment of the DCC and for its initial scope, which are discussed in detail in the domestic Impact Assessment.

Three broad scope options have been considered as part of Phase 1 of the Programme:

- a “Minimum DCC” option which would include secure communications and access control[17], translation[18] and scheduled data retrieval functions[19].

- Additionally to the “Minimum scope”, registration could be added to the remit of DCC, which would mean that DCC should assume responsibility for managing the supplier registration database that records the registered supplier for every meter point. Such function would facilitate the development of a streamlined dual-fuel change of supplier process.

- Also adding data processing and aggregation functions (for electricity) to the remit of the DCC. These services are currently performed by industry agents and involve the preparation of a meter point data for settlement. Central data storage could also be included in this option.

The modelled solution assumes an establishment of an operational DCC from the end of Q1 2014 with a “minimum scope” (see Prospectus Response Document), with registration being added to the scope some time after. Information available also indicates that a positive business case may exist for the inclusion of data processing and aggregation. However, decisions on the latter would need to be

[17] Secure two way communications with smart meters, enabling remote meter reading, meter diagnostics and other data communications.

[18] The conversion of different technical protocols to support inter-operability.

[19] Scheduling of the collection of meter readings and managing that process on behalf of suppliers and network operators.

subject to further technical, economic and competition impacts analysis. For modelling purposes, it is assumed that registration will be added to the remit of DCC in 2016, with data processing and aggregation added in 2019.

Some of the benefits identified as arising from the rollout of smart meters are to an extent dependent on the existence of the DCC and its scope. As one of the policy options proposes a voluntary approach to using the DCC, those benefits that are enabled by DCC are adjusted for the proportion of meters that we assume would opt out of the DCC:

- We assume that without DCC, smart meters would realise those switching benefits that the analysis has identified to be realisable in the pre-DCC situation - £0.8 per smart meter per year
- No benefits from reduced losses are realised for SME smart meters not using the DCC
- Amongst the benefits to networks, we assume that only the savings from reduced investigations of voltage complaints could be realised for non-DCC meters. We assume that network operators would be able to access the voltage information monitored by the smart meter even if no connection to the DCC was established.

Consistent with the domestic analysis, for those meters that would use DCC under both options, the benefits are adjusted before 2014, at which point the DCC is implemented in its initial 'minimum' scope.

Meter numbers and SME energy consumption

Despite efforts to gain a better understanding of the number of non-domestic gas meters and the attempt to derive more robust information from various statistical sources, it has not been possible to refine the estimates since the July 2010 IA. Planned work on the non-domestic National Energy Efficiency Data Framework (NEED) will allow us to verify with a substantially higher degree of confidence the validity of the assumption on the number of gas meters for future analysis.

Table 2: Meter numbers and energy consumption

	Electricity	**Gas**
Meters (2009)	2,140,000	1,500,000
Consumption (kWh)	17,400	79,800
New meters	1.5% - 51,000 per annum	

Non-domestic counterfactual

The counterfactual establishes the business as usual world against which the smart meter rollout is assessed. By determining the rollout that would have occurred had there been no policy intervention the analysis can ensure that only incremental costs and benefits are considered.

Advanced meters vs. smart meters

The counterfactual case assumes as in previous versions of the IA that without Government intervention market participants will only install smart/advanced meters where a positive business case exists. We assume that this would be 50% of the market by 2030.

We assume that meter competition and choice will exist – in the model we assume that the meter take-up will be:

- advanced meters: 40% (or 20% of total SME meters) by 2030
- smart meters: 40% (or 20% of total SME meters) by 2030
- retrofit advanced : 20% (or 10% of total SME meters) by 2030

Benefits from using the DCC

As outlined in the assumptions section above some benefits are dependent on the existence and scope of the DCC. Since we assume that in the counterfactual there is no DCC, we adjust the benefits accordingly:

- Smart meters will only realise £0.8 switching benefits per meter p.a.
- Smart meters will not realise benefits from reduced losses
- For network benefits we assume that only savings from avoided investigations of voltage complaints are realised in the counterfactual scenario, as the critical mass of smart meters required for the realisation of the remaining network benefits would not be realised in the absence of a mandated rollout.

Energy consumption

For the non-domestic counterfactual the analysis continues to assume stable levels of energy consumption per SME going forward. This is based on the currently available information and is a sensible and conservative representation of business as usual energy levels projections for SMEs.

Even though energy projections for the non-domestic sector are available[20] it is not possible to derive from these a sensible representation of the diverse business groupings represented in the SME sector as defined in this IA, the drivers of its energy consumption, and its projected levels of energy consumption going forward.

Preliminary analysis suggests that both gas and energy consumption business as usual trends per SME are, if anything, likely to be upwards. Therefore the assumed flat baseline is if anything likely to underestimate the energy and carbon savings of the policy.

[20] http://www.decc.gov.uk/en/content/cms/statistics/projections/projections.aspx

G. Costs

Advanced meter

For previous IAs we based our assumption of advanced meter costs on the work done by the Carbon Trust and the work done by DECC for the IA for larger non-domestic sites[21]. The costs used were the mid-point between the high and low costs for advanced meters used in the Carbon Trust trials. This also applied to installation and maintenance costs. It is assumed that the up-front communications costs are part of the asset price but running costs are separate.

A variety of advanced metering solutions is available, and used, within the non-domestic market. These carry a variety of costs. If the costs of advanced metering are lower than those we have modelled, the effect would be to increase the overall net present value of the policy, and, within the options, marginally to increase the net benefit of the voluntary option vis-a-vis the mandatory option because of the slightly higher incidence of advanced installation assumed for the former[22].

Smart meter

The smart meter costs have been revised slightly in comparison to the July 2010 IA and show a cost increase of £1 per electricity meter to reflect the addition of the 'last gasp' functionality (including the capability in the meter to alert suppliers and networks when electricity supply is lost). The installation costs are based on domestic installation cost estimates and the maintenance cost is assumed to be 2.5% of the asset costs. Upfront and running communications costs are seen as separate from the meter.

Retrofit advanced

This option means that the dumb meter is not replaced, but is read remotely by a retrofit device attached to the meter, resulting in lower installation costs and avoiding stranding any assets. It is assumed that the upfront communications costs are part of the asset cost and that maintenance is 2.5% of the asset cost.

Display

We continue to assume that delivery of real time information is achieved through a standalone display which is connected to the metering system via a Home Area Network (HAN). In this sector, information would be provided in a variety of ways, not necessarily through a display device, especially via the internet. However, we anticipate that a significant number of customers, particularly smaller customers, would use a display device. Our cost assumptions regarding the in home displays (IHD) remain unchanged.

[21] IA of Smart Metering rollout for Domestic Consumers and for Small Businesses: www.berr.gov.uk/files/file45794.pdf

[22] It is also worth noting that as smart meters decrease in price through economies of scale realised through the domestic rollout, they will become an attractive alternative to costly advanced meters, potentially resulting in a shift towards a greater proportion of smart meters as assumed in this analysis. This would not only have the impact of lowering asset costs, but would also lead to the realisation of greater benefits as some of the discounting of benefits would fall away.

Table 3: Summary of costs per meter

	Asset cost	Installation costs	Maintenance costs (annual - 2011)
Advanced meter Electric	£247	£136	£6.1
Advanced meter Gas	£247	£136	£6.1
Retrofit option Gas	£120	£68	£3
Smart meter Electric	£44	£29	£1.1
Smart meter gas	£56	£49	£1.4
IHD	£15	-	-

Communications costs

Our assumptions with regards to asset and ongoing costs for the communications infrastructure remain unchanged and are summarised in the table below:

Table 4: Communications costs

	Capex (£ per meter)	Opex (£ per meter per year)
WAN	15	5.3
HAN electricity	1	0
HAN gas	3	0

It is assumed that, due to technological advances, the costs of the meters and communications will fall over time. This has been seen with current meters and – internationally - for smart meters. We assume that costs fall by 1% per annum, resulting in 10% by the end of 2020. This reduction is split and is applied at three time points: 2010, 2017 and 2024.

In line with the previous IA, we retain our cost estimates for the operation and maintenance costs of the communication technology. We assume – in line with the available evidence – these to be £5.3 per meter per year (annuitised) for the WAN devices which includes an allowance for network security that enables secure communications.

Cost of capital

The costs of assets and installation are assumed to be subject to a private cost of capital, i.e. resources committed to assets and installation have an opportunity cost. That cost is fixed at 10% p.a. in the IA. A number of stakeholders have suggested that their own rates of return are lower than this level. This relatively high rate has been chosen to ensure that the full opportunity cost of the investment is reflected in the IA.

Energy costs

The smart metering assets will consume energy, and after discussions with meter specialists we continue assuming that a smart meter system (meter, IHD and communications equipment) would consume 2.6W more energy than current metering systems. These assumptions are therefore unchanged.

Disposal costs

The July 2010 Impact Assessment considered costs from having to dispose of dumb meters as part of the roll out, estimated at around £1 per meter. Included among these are the costs of disposing of mercury from gas meters.

These costs would have been encountered under business as usual meter replacement programmes, but would be accelerated by a mandated rollout. While the underlying cost assumption of £1 per meter has not changed, the cost-benefit model now reflects that meters would have had to be disposed off regardless of the implementation of the smart meters programme and now only takes into account the acceleration and bringing forward of the disposal over and above the counterfactual. The calculation now also applies the £1 disposal cost to smart meters, with resulting costs for the first generation meters to be replaced from 2027.

Pavement reading inefficiencies

The April 2008 IA first set out the rationale for an equation to capture the decreasing efficiency of reading non smart meters as the roll out of smart meters proceeds – described as pavement reading inefficiencies. The May 2009 IA included some modifications to this equation to better represent the increasing cost of reading non-smart meters as the total number of non-smart meters decreases. The assumption of the maximum additional cost of these readings was increased and they increase exponentially to a limit of four times the existing meter reading cost. These reads are treated as an additional cost per meter and the costs are spread across the roll out. The assumptions underlying these costs have not been changed between the July 2010 and this IA.

Apportioning of costs to domestic IA

As outlined in section C, some of the costs have been credited exclusively to the domestic analysis, because a split by incidence in domestic and non-domestic sector is not possible.

IT, legal, marketing and organisational costs as well as integration of early meters from the rollout have been fully allocated to the domestic cost benefit analysis and are not included in the cost benefit modelling presented in this IA.

H. Benefits

We classify benefits in three broad categories: consumers, businesses (energy suppliers, networks and generation businesses) and UK-wide. For the non-domestic IA it is important to note that the consumer category in this case also captures businesses as customers of the energy industry.

Benefits are allocated to the first order recipient of the benefit. To the extent that businesses operate in a competitive market –in the case of energy suppliers– or under a regulated environment –in the case of networks– a second order effect is expected as benefits or cost savings are passed down to end energy users i.e. consumers. For example, avoided meter reads are a direct, first order, cost saving to energy suppliers. As energy suppliers operate in a competitive environment, we expect these to be passed down to consumers. Second order benefits are however not modelled in order to avoid double counting.

Consumer benefits

In the context of the non-domestic analysis we refer to consumers as non-domestic entities that purchase energy from energy suppliers.

Energy demand reduction

We assume that smart/advanced meters, together with provision of data, will reduce energy consumption by between 2.8% (electricity) and 4.5% (gas) per meter in the central case. This is in line with the changes seen in trials carried out by the Carbon Trust.

Microgeneration

We have attempted to estimate the savings from using smart meters to deliver export information from microgeneration devices. We have done that by estimating the number of microgeneration devices that will be in use by 2020 in the non-domestic sector. Our estimate of the number of units (under 300,000 by 2020) results in savings per SME electricity meter per annum (£0.43) that reflect that a separate meter and its installation cost are not needed.

Business benefits

Most benefits (or cost savings) in this section are attributed to energy suppliers. When benefits are related to generation, network or transmission businesses this is noted as appropriate.

Avoided site visits

Currently energy suppliers have to visit their customers' premises for a number of reasons, namely for taking meter reads and for carrying out safety inspections. The rollout of smart meters will have implications for the requirement to carry out such visits in a number of ways.

Additional evidence has emerged and has resulted in a revision of our approach to avoided site visits in comparison to the July 2010 IA. Because all aspects discussed in the following are closely interlinked and reflect changes to the operations of visiting customers' premises as a result of the rollout of smart meters, they are grouped here in a section on 'avoided site visits'.

- Regular visits

  - Regular meter read visits

Smart meters will allow meter reading savings for all the suppliers once the rollout is complete. We continue to assume that avoided regular meter reading will bring in benefits (cost savings) of £6 per (credit) meter per year in our central scenario

taking into consideration both actual and attempted reads. This is reflective of the avoided costs of the regular meter reading cycle, for which meter reading operatives cold call premises in an area to read a meter and repeat to do so if access is not gained at the first instance.

- Regular safety inspection visits

This updated IA now also takes account of additional costs for regular safety inspections of smart meters. These had previously not been considered, but consultation responses have led the programme to review previous assumptions.

The impact of these additional visits is a cost of £0.6 p.a. for 90% of meters and of £8.75 p.a. for 10% of meters.

Currently safety inspections are carried out as part of the regular meter reading visits and therefore carry little if any additional cost. While the programme is of the view that this is not reflective of the effort that should be undertaken to ensure safeness of a meter, the model contains no incremental costs for safety inspections in the current situation.

The programme expects that the rollout of smart meters will help facilitate a change in the underlying regime and that the current required frequency of one inspection every two years will not persist across the population of meters once smart meters have been installed. This will need to be subject of a policy decision by The Health and Safety Executive (HSE), but initial discussions with HSE have already indicated that it is willing to consider reform, subject to any changes being risk and evidence based and not resulting in any reduction in existing levels of safety. This adheres to the principles of better regulation and would directly reduce the regulatory burden placed on businesses.

For modelling purposes we have made assumptions on the costs to suppliers of carrying out safety inspections after the rollout of smart meters. We assume a new risk-based regime with different requirements for different risk categories:

- Low risk group:
- 90% of meters
- Require a safety inspection every 5 years
- Area based approach with £3 cost per successful visit

- High risk group:
- 10% of meters
- Require a safety inspection every 2 years (or 5% of meters every year)
- Approach of scheduled appointments with £17.5 cost per successful visit[23]

There is of course uncertainty around what proportion of meters might be considered high risk under a new safety inspection regime, but for modelling purposes it seems reasonable to assume that the same proportion of the population currently requiring special safety inspection visits will continue to require dedicated visits at a greater frequency than the majority of meters (see special visits section).

- Special visits

We have also refined our assumptions with regards to “avoided special visits”. Previously we assumed that without smart meters one additional visit per meter at a cost of £3 is required every four years, for purposes of either reading a meter or carrying out a safety inspection, resulting in a benefit of £0.75 per meter p.a. After a

[23] This results from using the current commercial rate of £10 for an appointed special visit and reflecting that first time access rates will be below 100%. Only 50% of premises are expected to provide access at the first attempt, with 25% of premises each requiring a second and third visit. The same assumption is used for modelling the benefits from avoided special safety inspection visits in the current situation, further outlined below.

revision of the underlying assumptions we now reflect benefits of £0.5 per credit meter p.a. from avoided special meter reads and benefits of £0.875 per meter p.a. from avoided special safety inspections.

- Special meter read visits:

We assume a benefit of £0.5 per credit meter reflecting the following activities in the current situation that will be redundant once smart meters are rolled out:

- 5% of credit meter customers p.a. request a dedicated visit for a special read (e.g. because of bill disputes)
- Such a visit costs £10, as access at first attempt is assumed

- Special safety inspection visits:

We assume a benefit of £0.875 per meter reflecting the following activities in the current situation that will be redundant once smart meters are rolled out:

- 5% of the meter population p.a. requires a dedicated visit for a safety inspection
- Such a visit costs £17.5, reflecting the requirement for repeat visits

Customer service overheads

Call centre cost savings are a result of a reduction in billing enquiries and complaints. Smart meters will mean the end of estimated bills and this is expected to result in lower demand on call centres for billing enquiries. This assumption is unchanged since July 2010 and we assume this cost saving to be £2.20 per meter per year in the central scenario (£1.88 for reduced inbound enquiries and £0.32 for reduced customer service overheads). No new information was gathered and our assumption is based on previous supplier estimates that inbound call volumes could fall by around 30% producing a 20% saving in call centre overheads. Other consultation responses used similar cost assumptions for call centre cost savings.

Remote switching and disconnection

The meter functionality will enable the remote enablement or disablement of the electricity and/or gas supply. The direct benefits associated with these capabilities are the avoided site visits and equipment upgrade costs. These are captured in the debt management and in the prepayment cost to serve savings. We also continue to include a further benefit of £0.5 per credit meter per year for the benefits of being able to remotely disconnect those consumers. Ofgem is consulting on a Spring Package of regulatory measures to strengthen protections for consumers, which covers disconnection arrangements under the smart metering currently being installed by “early movers”.

Prepayment cost to serve

These benefits are not of relevance for the SME analysis, as we assume that no prepayment meters are used in the sector. There may some quasi-pay-as-you-go tariffs in this sector in the future, but these would be likely to lie outside the prepayment infrastructure.

Debt management:

More accurate energy use information should help consumers better manage their energy expenditure, preventing large debts arising. This reduces supplier costs in managing and recovering debt. The benefit assumed in our modelling is £2.20 per meter per year, which reflects reduced enquiries related to debt recovery and management. Suppliers estimate that a 30% fall in inbound calls volume could result in 20% savings in call centres overheads. There may also be attendant benefits to customers from increasing supplier readiness to offer terms because of diminished exposure to risk of debt.

Switching Savings

The introduction of smart metering will allow a rationalisation of the arrangements for handling the change of supplier process. Trouble shooting teams employed to

resolve exceptions or investigate data issues will no longer be needed. Suppliers will be able to take accurate readings on the day of a change of supplier, resolving the need to follow up any readings that do not match and instances of misbilling will reduce.

In addition to responses to the Prospectus, the Programme has collected further evidence through an Information Request[24] on the costs and benefits associated with the establishment and operation of DCC in the gas and electricity industries. This Information Request was completed by members of the Data Communication Group's Community of Technical Experts, which included industry parties (energy suppliers, network operators and market operators) whose existing systems will be impacted by the introduction of smart metering and the establishment of DCC. Participants were asked to provide feedback under a prescribed set of options for the scope of DCC's activities. These included a minimum scope, inclusion of DCC registration and inclusion of data processing, aggregation and verification.

The main category of benefits examined through this Information Request relates to customer switching. The Information Request asked for views of the potential scale of this benefit and the extent to which the benefits are contingent on DCC providing a centralised supplier registration system covering both electricity and gas.

Suppliers were asked to estimate the value of benefits that could be realised under each option and to comment on the factors which could constrain the realisation of benefits. The benefit estimates provided considered the potential benefits of reducing the complexity / cost associated with interfacing with a variety of registration agents. Where an option resulted in the transfer of functions from suppliers' agents to DCC (e.g. data processing and aggregation), suppliers were asked to estimate the costs that would be avoided. Network Operators and Metering Agents were asked to provide evidence on the extent to which each option will facilitate the realisation of customer switching and related benefits (e.g. the avoided costs of handling registration-related queries from energy suppliers).

In previous impact assessments we had assumed savings of £100m per year, or £2 per meter per year[25]. Following analysis of responses to the request for information, we now consider customer switching benefits of £3.11 per smart meter per year where the scope of the DCC includes data collection, registration, data processing, data aggregation and data verification functions. Where the scope of the DCC includes data collection and registration, benefits of £2.22 per smart meter per year are considered and where the scope of the DCC includes only data collection, benefits of £1.58 per smart meter per year are considered. Before the establishment of DCC customer benefits are assumed to be of £0.8 per meter per annum. This switching benefit amount is also assumed for advanced meters and for those meters choosing not to use DCC under option 2 in this non-domestic analysis. The preferred establishment option leads to the establishment of an operational DCC from the end of Q1 2014 with a "thin scope" (see Prospectus Response Document), with registration being added to the scope some time after. A decision on the inclusion of data processing and aggregation will be considered in the future. For modelling purposes, it is assumed that registration will be added to the remit of DCC in 2016, with data processing and aggregation added in 2019.

Theft

The approach to benefits from reduced theft differs between the domestic and the SME IA. No benefits from a reduction in theft are accredited to the rollout in the SME smart meter IA, as we assume that no theft occurs in the non-domestic sector. This is a conservative view and any theft that in reality occurs and that could be reduced through the rollout of smart meters would increase the non-domestic benefit case.

[24] issued on 14th October 2010

[25] Based on estimates from Owen and Ward (2006)

Losses
We continue to assume that smart meters facilitate some reduction in losses and that the benefits per meter per year will be £0.5 for electricity and £0.1 to £0.2 for gas. This represents an initial assessment of the range of possible benefits to network operations made originally by Mott MacDonald[26].

Network benefits
DECC and Ofgem have carried out a reassessment of benefits to electricity networks from smart metering following a review of international evidence and analysis provided by the Energy Networks Association (ENA).

- Outage management

The availability of detailed information from smart meters will improve electricity outage management and enable more efficient resolution of network failures once a critical mass of meters and the resulting geographical coverage is reached. Benefits identified are a reduction in unserved energy (customer minutes lost), a reduction in operational costs to fix faults and a reduction in calls to fault and emergency lines. The analysis has also informed the decision to include last gasp functionality as part of the minimum functionality requirements. The benefits identified are:

1. Reduction in customer minutes lost (CML)

This captures the customer benefit from reduced outages, because better information from smart meters will enable networks to better identify the nature, location and scope of an incident and to take the most appropriate reactive action, leading to quicker restoration times.

2. Reduction in operational costs to fix faults

This captures operational savings to networks from being able to manage outages better, because with shorter restoration times and better knowledge of a likely cause technical crews can be deployed more efficiently and in a more targeted manner.

3. Reduction in calls to faults and emergencies lines:

In the long run customers will be confident that networks are aware of outages due to smart meter information. In the short run we also envisage a reduction in the number of calls that need to be answered by the introduction of automated messages that inform callers of the geographic scope and expected restoration time, facilitated by more accurate information from smart meters.

- Other electricity network benefits

In addition to the benefits outlined in the previous paragraph, networks will also benefit from the implementation of smart meters and enhanced availability of data through savings from avoided costs of investigation of customer complaints about voltage quality of supply:

1. Avoided cost of investigation of customer complaints about voltage quality of supply[27]

With smart meters electricity network operators will be able to monitor voltage remotely, removing the need to visit premises to investigate voltage complaints. Information collected by Ofgem indicates the total number of notifications that require a visit to the premises. For the base scenario we have used a cost per visit

[26] Mott MacDonald, *Appraisal of costs and benefits of smart meter roll out options*, April 2008

[27] While the benefit of better informed investment decisions is subject to the same assumption of critical mass that is outlined in Annex 1, the argument can be made that the avoided costs for investigating voltage complaints is not dependent on a critical mass and will be realised for the proportion of premises where a smart meter has been installed. For modelling purposes we have therefore translated the identified benefits from voltage investigation into per meter benefits and linked them to the rollout profile.

of £1000, reflecting a significantly reduced figure of the cost per fault (see Annex 1). The estimate is based on the costs of resolving a fault to network operators, which is on average around £2400 but will involve locating the issue, which is not the case for voltage investigations. A voltage investigation will generally also not require multiple staff to be dispatched, providing additional reason to discount the fault cost. We assume that such visits would be redundant in the future as voltage can be monitored remotely.

Better informed investment decisions for electricity network enforcement

One area of difference between the domestic and the non-domestic analysis are benefits from better informed investment decisions. As these are realised across the whole electricity network infrastructure, the decision has been taken to accredit them to the domestic side of the analysis only, to reflect that the full picture of investment requirement can only be established under consideration of both domestic and non-domestic demand and to avoid double-counting.

Energy demand shift

A time of use tariff (ToU) uses different prices depending on the time of day in order to incentivise consumers to shift their energy consumption from peak to off-peak times, in doing so flattening the load demand curve. Smart meters make this type of tariff possible by recording the time when electricity is used, and potentially informing consumers of changes in prices.

Our underlying assumptions on Time of Use (ToU) pricing have been revised from the July 2010 IA. We have reassessed the potential for load-shifting, based on a bottom-up calculation, and have considered how this will evolve going forward under different scenarios. For SMEs, EA Technology[28] estimate bottom up SME discretionary load to be around 21%, based on heating and cooling demands. Due to a lack of available studies and data, the take up of TOU tariffs and proportion of discretionary load shifted is initially assumed to be the same as in the domestic sector.

We assume that 20% of SME customers will take-up ToU tariffs. Similarly all non-domestic assumptions with regards to a change in the amount of shifted load through time are in line with the domestic smart meter analysis.

UK-wide benefits

DECC has also valued the avoided costs of carbon delivered from the savings of energy through smart meters[29], in line with current government guidance[30].

[28] EA Technology, p38 [need to insert link]

[29] DECC has not netted off the carbon emissions embodied in production and transportation metering equipment. The analysis does not take account of life cycle carbon emissions.

[30] http://www.decc.gov.uk/en/content/cms/statistics/analysts_group/analysts_group.aspx

I. Rollout profile

The rollout profile for smart meters in the non-domestic sector is assumed to be the same as for domestic customers. Anecdotal evidence indicates that in practice energy suppliers may decide to prioritise non-domestic installations. This would result in an increase in the net present value of the non-domestic rollout. Additionally, by the nature of the exceptions regime for advanced metering, a high percentage of advanced metering assumed in this IA is likely to be installed by April 2014.

In order to allow modelling of costs and benefits, we have stylised the rollout period in four distinct stages. In each stage, assumptions have been made in regards to the rollout strategy of individual energy suppliers. This has been informed by extensive information and data gathering, and individual interviews with energy suppliers over the course of the consultation period and beyond (see Rollout supporting document).

1) Early movers (present to Q3 2012)

In this period some suppliers will be rolling out volumes and most will be carrying out trials. The consumer may be offered a smart meter, but if the consumer subsequently switches supplier, there is a high risk that smart functionality is lost as the incoming supplier may be unable to support the technical configuration.

A modelling assumption is made that 50% of meters installed in this period will not be compliant.

2) Commercial and technical interoperability (Q4 2012 – Q2 2014)

Suppliers will have access to compliant meters as bulk supply of compliant smart equipment is available. This may happen as early as Q2 2012 for some energy suppliers. We also assume that from this point in time there are no constraints on availability of trained field staff and safe harbour on communications is offered. Rollout volumes in this period and smart-readiness of internal systems are driven by energy suppliers commercial strategies. Full and automatic technical interoperability will not be available until the establishment of the DCC. However, from Q4 2012, as in the domestic sector, suppliers are likely increasingly to be able to use meters in smart mode on change of supplier, and to be incentivised to do so.

3) DCC establishment (from Q2 2014)

Maximum deployment rates are achieved 6 months after the establishment of the DCC and there are no constraints on the volumes of communications services that the DCC can offer. Such peak volumes are extended until 10% of the customer base is reached.

4) Ramp down

This is reached when individual suppliers reach the final 10% of installations as a proportion of customer base is assumed to be hard-to-reach due to a range of customer and technical elements: long term vacant premises, repeated customer no access, lack of standard communication coverage and site specific safety issues.

A great deal of uncertainty remains as to the nature and extent of the rollout tail. Information provided by energy suppliers indicates that it could take three years to complete smart meters installations to their hard-to-reach customer base. For modelling purposes, we assume that the yearly distribution of installations in the tail within these last three years is of 6%, 3% and 1% respectively. This reflects increasing complexity in resolving the most difficult customer and technical elements of the rollout.

J. Results

The results below are produced by running a cost benefit estimation model using the assumptions outlined above. Within the model, the upfront costs are annuitised over either the lifetime of the asset or over the period 2011-2030. The cost numbers are risk-adjusted, i.e. they have been adjusted for optimism bias (see section H on risk). We have applied sensitivity analysis to benefits and we present benefits in terms of low, central and high scenarios. Tables 9 and 10 show the impact of smart meters on energy bills of non-domestic customers. This builds on existing DECC modelling on energy prices to estimate the impact on domestic energy bills in cash terms of the deployment of smart meters.

The period of the analysis has been adjusted to reflect the fact that we are in 2011. The price values are nevertheless still based on a 2009 basis (for example, energy prices are based on 2009 to reflect the latest available price data from the Interdepartmental Analysts Group guidance[31]).

For the decision about the preferred policy option the results of the model run are compared for both options under consideration.

Table 5: Total costs and benefits

	Total Costs £bn	**Total Benefits £bn**	**Net Present Value £bn**
Option 1	0.574	2.840	2.266
Option 2	0.574	2.822	2.248

Table 6: consumer and supplier benefits

	Consumer Benefits £bn	**Business Benefits £bn**	**UK-wide Benefits £bn**	**Total Benefits £bn**
Option 1	1.629	0.676	0.535	2.840
Option 2	1.629	0.658	0.535	2.822

Table 7: low, central, and high estimates

	Total Costs £bn	**Total Benefits £bn**			**Net Present Value £bn**		
		Low	**Central**	High	Low	**Central**	High
Option 1	0.574	2.029	2.840	3.681	1.454	2.266	3.108
Option 2	0.574	2.013	2.822	3.662	1.438	2.248	3.089

Table 8: benefits

	Consumer Benefits £bn			**Business Benefits £bn**			**UK-wide Benefits £bn**		
	L	**C**	H	L	**C**	H	L	**C**	H
Option 1	1.062	1.629	2.169	0.585	0.676	0.820	0.382	0.535	0.692
Option 2	1.062	1.629	2.169	0.568	0.658	0.800	0.382	0.535	0.692

[31] http://www.decc.gov.uk/en/content/cms/statistics/analysts_group/analysts_group.aspx

The modelling results show that both options are almost equal in terms of net present value. The non-mandated DCC option works with the grain of an existing market, provides businesses with greater freedom to base their decisions on commercial considerations and is therefore in tune with the better regulation principles. The voluntary DCC option is the preferred approach. In addition, as there is already an active market for these services, mandating the use of DCC would reduce the choice available to suppliers and risk limiting innovation in new services.

A comparison to the July 2010 IA shows that for both options under consideration, cost and benefits have moved generally in line with each other. A slight increase in costs is the result of the changed present value base year. The increase in benefits stems from the same source in combination with newly identified network benefits.

The programme has also carried out an exercise to determine the net effect of smart meters on businesses across both the domestic and the non-domestic parts of the policy, establishing that the overall impact on businesses is positive, i.e. benefits outweigh the costs. The overall rollout of smart meters results in a net benefit to businesses of £1bn over a 20 year period. This approach has been agreed with the Better Regulation Executive.

Distributional impacts

Impacts of smart/advanced meters on SME energy bills

The costs to energy suppliers will be recovered through higher energy prices, although we assume that any benefits to suppliers will also be passed on to SME consumers[32]. This increase in price will result in higher energy bills. However, the reduction in energy consumption from smart meters will counteract this impact, leading, on average, to a net decrease in energy bills. The results below show the average impact on SME energy bills. It is possible there will be some variation between SMEs depending on the level of energy they save and on how suppliers decide to pass through costs to SMEs. For the purposes of our analysis we have assumed that on average energy suppliers will pass down to SMEs the average additional cost of installing smart/advanced meters.

In previous non-domestic IAs the bill impacts have been calculated with a view to presenting the overall impact that smart and advanced meters in use in the non-domestic sector would have. For the current analysis we have refined this approach. We continue to present the bill impacts consistent with the methodology used in previous IAs but in addition present the bill impact of those smart and advanced meters installed as a result of the Government intervention and therefore reflecting that smart and advanced meters would have been installed in the counterfactual. Table 10 accordingly shows the incremental bill impact generated from smart meters that would not have been installed without a mandate.

The bill impact for SMEs is shown in Tables 9 and 10, with substantial reductions in energy bills from the first year of the rollout for the average SME for both methodological approaches. It is important to note that prices are expressed in nominal terms, hence not being discounted by the opportunity cost of time.

[32] For this analysis we have assumed that suppliers, networks and generation businesses pass 100% of the additional costs and benefits on to consumers.

Table 9: Impact on SMEs energy bills for a dual fuel customer (preferred policy option 2) – all smart and advanced meters

Year	Impact on gas bill	Impact on electricity bill
2012	-4	-2
2013	-8	-4
2014	-16	-6
2015	-30	-10
2016	-48	-17
2017	-67	-24
2018	-87	-32
2019	-99	-39
2020	-106	-42
2021	-111	-44
2022	-114	-46
2023	-117	-48
2024	-120	-51
2025	-124	-61
2026	-127	-68
2027	-130	-70
2028	-134	-72
2029	-137	-74
2030	-139	-76

Table 10: Impact on SMEs energy bills for a dual fuel customer (preferred policy option 2) – smart and advanced meters installed under the rollout programme

Year	Impact on gas bill	Impact on electricity bill
2012	-3	-1
2013	-6	-3
2014	-11	-4
2015	-21	-7
2016	-36	-12
2017	-51	-17
2018	-66	-24
2019	-74	-29
2020	-78	-31
2021	-79	-32
2022	-80	-32
2023	-79	-33
2024	-80	-34
2025	-80	-40
2026	-80	-43
2027	-80	-44
2028	-80	-44
2029	-80	-44
2030	-79	-44

The price impacts of smart meters in the SMEs sector are detailed in Table 14 below. It is important to note that even though the price impact per unit of energy is expected to be positive for a number of years, the reduction in energy consumption arising from the policy will mean that overall the average net impact on bills will be negative from year one.

Furthermore, price impacts are projected to become negative from 2021 since the savings to suppliers - for example from avoided meter reading and site visits, lower customer overheads and debt handling costs - will lead to suppliers lowering prices,

despite having to pay for smart meters. Note that the vast majority of meters will be installed by 2020 and the installation cost will fall substantially from then whilst the benefits continue.

It is further worth noting that the change in methodology outlined above for the bill impacts has no effect on the price impact. The overall cost that is fed through from industry to consumers takes into consideration costs that would have been incurred in the counterfactual and is equal for either approach.

Table 11: Price impacts on SMEs– all smart and advanced meters

£/MWh	Gas price impacts	Electricity price impacts
2012	-0.03	-0.01
2013	-0.06	-0.02
2014	0.10	0.03
2015	0.32	0.10
2016	0.40	0.13
2017	0.49	0.16
2018	0.36	0.12
2019	0.18	0.06
2020	0.08	0.03
2021	-0.02	-0.01
2022	-0.08	-0.02
2023	-0.15	-0.05
2024	-0.20	-0.07
2025	-0.27	-0.09
2026	-0.33	-0.11
2027	-0.39	-0.13
2028	-0.44	-0.15
2029	-0.49	-0.16
2030	-0.53	-0.18

As outlined in the assumptions section, we assume a flat energy baseline for non-domestic organisations.

Stranding

Stranding costs are incurred when a meter is taken out before the end of its expected economic life. Stranding costs are the costs incurred when a meter is taken out before the end of its expected economic life. This does not include the costs of removing old meters and installing new meters, but includes the costs from an accelerated depreciation of the asset (i.e. reduced length of the meter's life). This cost depends on the speed of a rollout; we assume it would be avoided in a new and replacement scenario, but that costs would occur in a 10-year or shorter rollout option (the basic meter life span is 20 years). To assess the impact of the different options, we have made some simple assumptions with respect to stranding. These are as follows:

- meter asset value is based on the replacement cost of a basic meter;
- for assets provided by commercial meter operators, the stranding costs include a profit margin and annuitised installation costs since these are included in the annual meter charge;
- no installation costs are included for meters provided by DNOs since installation is paid upfront by suppliers;
- stranding costs for National Grid provided meters include 50% of annuitised installation costs to reflect the fact that prior to 2000 installation costs were annuitised in the meter charges, whereas after 2000 installation was paid up-front;
- meter recertification continues during the deployment period.

Under both options we estimate stranding costs of £90m present value.

The total stranding costs over the period of a specific smart meter rollout profile should be the same regardless of the order of meter replacement. Whilst specific contractual relationships between suppliers and meter operators may influence behaviours to an extent, we assume for the economic evaluation that there is no attempt to minimise stranding costs in the early years of the rollout by replacing older meters first. Hence we assume that the age of the meters replaced (outside of the recertification Programme) is the average age of legacy meters remaining in each year.

K. Risks

Costs: Risk Mitigation and Optimism Bias[33]

The rollout of smart meters will be a major procurement and delivery exercise. The project will span several years and will present a major challenge in both technical and logistical terms.

There is a consensus that stakeholders do not explicitly make allowances for optimism bias in the estimates they provide for procurement exercises. By calling for pre-tender quotes for various pieces of equipment, suppliers are revealing the likely costs of the elements of smart metering and hence no further adjustment is necessary. However, historically, major infrastructure and IT contracts have often been affected by over–optimism and gone substantially over-budget, so we have adjusted the estimates for optimism bias, in line with guidance from HMT's Green Book.

The optimism changes adopted in the present non-domestic IA are shared with the domestic IA and detail of such changes can be found in that IA.

Table 12: Optimism bias factors

	Optimism bias factor
IHD	15%
Smart meter	15%
WAN CAPEX	10%
WAN OPEX	10%
HAN	15%
Installation	10%
Commercial risk	10%

More detail on optimism bias and how it is applied can be found on the Treasury website in the Green Book guidance[34].

[33] Baringa Partners, *Smart Meter Roll Out: Risk and Optimism Bias Project*, 2009
[34] http://www.hm-treasury.gov.uk/economic_data_and_tools/greenbook/data_greenbook_supguidance.cfm#optimism

Benefits: sensitivity analysis

No sensitivity analysis was made for costs as it was felt that the risks for costs were covered by the optimism bias. We ran the following sensitivities on the benefits:

Table 13: Sensitivity analysis for benefits

	Low benefits	Central benefits	High benefits
Consumer benefits			
Energy savings electricity	2%	3%	4%
Energy savings gas	4%	4.5%	5.5%
Business benefits			
Supplier benefits			
Avoided site visit	underlying visit cost + 8%	underlying visit cost	underlying visit cost - 8%
Call centre savings	£1.9	£2.2	£2.5
Network benefits			
Avoided investment from ToU	10%	20%	40%
Reduction in customer minutes lost	2%	5%	10%
Operational savings from fault fixing	3%	5%	10%
Avoided investigation of voltage complaints	£500	£1,000	£1,493
Reduced outage notification calls	5%	10%	20%
Generation benefits			
Short run marginal cost savings from ToU	10%	20%	40%
Avoided investment from ToU (generation)	10%	20%	40%

Please note that as the avoided site visit category captures various elements with varying underlying costs, the sensitivity is presented as a percentage change from the central scenario.

The below table presents the impacts of the above sensitivity analysis in present value terms:

Table 14: present value impact of benefit sensitivity analysis

£m	Low benefits	Central benefits	High benefits
Consumer benefits			
Energy savings electricity	£330	£674	£992
Energy savings gas	£725	£948	£1,171
Business benefits			
Supplier benefits			
Avoided site visit	£227	£248	£269
Call centre savings	£53	£60	£68
Network benefits			
Avoided investment from ToU	£0	£1	£2
Reduction in customer minutes lost	£8	£19	£38
Operational savings from fault fixing	£18	£35	£70
Avoided investigation of voltage complaints	£6	£12	£17
Reduced outage notification calls	£4	£9	£17
Generation benefits			
Short run marginal cost savings from ToU	£14	£27	£54
Avoided investment from ToU (generation)	£10	£20	£39

Despite having previously received responses indicating a lower price for advanced electricity meters (around £120 rather than the assumed £247), we have retained our original cost assumption.

L. Enforcement

All of the options outlined in this IA would be implemented direct via licence obligations or through industry codes underpinned by licence obligations. New licence requirements would be enforced in the same manner as existing licence obligations – by Ofgem as the gas and electricity markets regulator. Ofgem has power to investigate any company which is found to be breaching the terms of their licence (including any consumer protection provisions) or is found to be acting anti-competitively. The Office of Fair Trading also has a range of other enforcement powers in respect of consumer protection (see the Consumer Protection annex to the Prospectus).

M. Recommendation – Next Steps

Next steps are described in the Government Response document which this IA accompanies.

N. Implementation

The Implementation approach is described in the Government Response document which this IA accompanies.

O. Monitoring and Evaluation

The plan for managing and measuring benefits realisation will be developed alongside the detailed design for the smart meter solution. The objectives set out in section B will form the basis for the benefits realisation work.

It is envisaged that as the rollout progresses, particular attention will be paid to monitoring early behavioural responses to smart meters with the objective of feeding back any findings from this experience into the rollout process. This way, adjustments to the rollout Programme can be realised in order to maximise the benefits from the smart metering rollout.

Results from piloting schemes are also expected to feed into a better monitoring and evaluation of the rollout. This includes both previous pilots such as the EDRP, and piloting carried out during the Foundation stage.

Annex 1: Post Implementation Review (PIR) Plan

Basis of the review: The Department of Energy and Climate Change will ensure that the smart meters Programme is subject to a comprehensive and integrated review and evaluation process, both during the initial Foundation stage and towards the end of the main rollout – provisionally by 2018. The Secretary of State has powers that are likely to be extended until the end of 2018 for introducing regulatory requirements on suppliers regarding the rollout of smart meters

This process will meet a number of obligations, including Programme Management requirements (as set out in OGC guidance e.g. Managing Successful Programmes), policy commitments set out in the Government Response document, and to ensure evidence is available to help DECC maximise the benefits of the Programme and report on outcomes including Carbon reductions required under the Government's Carbon Plan.

There are planned to be two separate review processes:

1. A review of the roll out strategy to establish whether additional requirements should be placed on suppliers with regard to local coordination (the review of early rollout)

2. A Post Implementation Review (provisionally by 2018)

Review objective: The review of early rollout objective will be to identify whether suppliers' approaches to roll out are meeting the Government's overall objective to roll out smart meters in a cost-effective way, which optimises the benefits to consumers, suppliers and other parties and delivers environmental and other policy goals. At this point it has not been determined whether this review process will apply to non-domestic customers.

The PIR which will be carried out by DECC will take a broad perspective on the results of Government intervention and the results of the approaches taken to policy and benefits realisation, in order to feed back into the policy making process.

Review approach and rationale: The review of early rollout will consider the impacts of installations of smart meters on consumers, in particular in respect of the quality of the customer experience and changes to energy consumption, and the effectiveness of different approaches to roll out (for example the quality of communications and approaches to local coordination and community involvement). Consideration will be given to the impacts on different types of consumer, including the vulnerable. However it has not yet been decided whether impacts on non-domestic customers will be the subject of specific scrutiny.

The PIR will include evaluation of the impacts of smart metering on residential and non-domestic customer service benefits (e.g. ease of switching, availability and uptake of smart-enabled products and services), on industry costs and process simplification, on competition in relevant markets, including energy management products and services, and of the way that smart metering is enabling and supporting other policies e.g. Smart Grids and the Green Deal, as well as the evaluation of the impacts on energy consumption behaviour and customer experience of the rollout. The PIR has yet to be designed but is likely to draw on evidence from the Benefits Management Strategy (BMS) work, further research commissioned by DECC, stakeholder interviews and international comparisons.

Baseline: The comparison to be made is with the position prior to roll out. Baseline data will be collected as part of the evaluation plan and BMS work.

Success criteria: Quantitative targets will be set for all relevant benefits, including those described in this IA, as part of the BMS work as a basis for deciding whether the Programme objectives had been achieved. However the extent to which this will be done separately for non-domestic customers has not yet been determined.

Monitoring information arrangements:

Work to develop the requirements for the first stage of evaluation planning is currently in progress and will identify detailed requirements and options for the early rollout review. See domestic IA for the planned approach to collecting data as part of the first phase of implementation planning. It has not yet been decided how far these arrangements will apply to non-domestic customers. Measurement of other benefits and costs (e.g. network cost savings and support for smart grids, reduced supplier costs), will be carried out under the Programme Benefits Management Strategy (BMS) which is under development and will track benefits delivery. Benefits metrics for these will be developed as part of the BMS. Given the broad objectives of the Programme, a wide range of information will be required.

Where practicable, information would be collected from suppliers on a voluntary basis. Legislative powers are being taken under the Energy Bill currently before Parliament so that the Department will be able if necessary to require energy suppliers to provide information on matters relating to the rollout of smart meters for this purpose.

Consideration will be given to the potential interfaces between the Smart Meters monitoring and evaluation process and DECC's National Energy Efficiency Data framework.

Annex 2: Detailed results

Below are the detailed results from the model (in £million) for the central case scenario of option 1 – DCC mandate:

Total costs		**574**
	Capital	265
	Installation	96
	O&M	39
	Comms upfront	58
	Comms O&M	93
	Energy	28
	Disposal	3
	Pavement reading inefficiency	- 8
	Supplier IT	-
	Central IT	-
	Industry IT	-
	Industry Set Up	-
	Marketing	-
	Integrate early meters into DCC	-
NPV		***2,266***
	(Stranding costs	090)

Total Benefits		**2,840**
Consumer benefits		1,629
	Energy saving	1,622
	Microgeneration	7
Business benefits	Supplier benefits	453
	Avoided site visits	248
	Inbound enquiries	51
	Customer service overheads	9
	Debt handling	51
	Avoided PPM COS premium	-
	Remote (dis)connection	7
	Reduced theft	-
	Customer switching	87
	Network benefits	175
	Reduced losses	99
	Avoided investment from ToU (distribution/transmission)	1
	Reduction in customer minutes lost	19
	Operational savings from fault fixing	36
	Better informed enforcement investment decisions	-
	Avoided investigation of voltage complaints	12
	Reduced outage notification calls	9
	Generation benefits	47
	Short run marginal cost savings from ToU	27
	Avoided investment from ToU (generation)	20
UK-wide benefits		535
	Global CO2 reduction	434
	EU ETS from energy reduction	84
	EU ETS from ToU	17

Below are the detailed results from the model (in £million) for the central case scenario of option 2 – no DCC mandate:

Total costs		**574**
	Capital	265
	Installation	96
	O&M	39
	Comms upfront	58
	Comms O&M	93
	Energy	28
	Disposal	3
	Pavement reading inefficiency	- 8
	Supplier IT	-
	Central IT	-
	Industry IT	-
	Industry Set Up	-
	Marketing	-
	Integrate early meters into DCC	-
NPV		***2,248***
	(Stranding costs	090)

Total Benefits		**2,822**
Consumer benefits		1,629
	Energy saving	1,622
	Microgeneration	7
Business benefits	Supplier benefits	446
	Avoided site visits	248
	Inbound enquiries	51
	Customer service overheads	9
	Debt handling	51
	Avoided PPM COS premium	-
	Remote (dis)connection	7
	Reduced theft	-
	Customer sw itching	80
	Netw ork benefits	165
	Reduced losses	90
	Avoided investment from ToU (distribution/transmission)	1
	Reduction in customer minutes lost	19
	Operational savings from fault fixing	35
	Better informed enforcement investment decisions	-
	Avoided investigation of voltage complaints	12
	Reduced outage notification calls	9
	Generation benefits	47
	Short run marginal cost savings from ToU	27
	Avoided investment from ToU (generation)	20
UK-wide benefits		535
	Global CO2 reduction	434
	EU ETS from energy reduction	84
	EU ETS from ToU	17

Specific Impact Tests

Type of testing undertaken	*Results in Evidence Base? (Y/N)*	*Results annexed? (Y/N)*
1. Competition Assessment	No	Yes
2. Small Firms Impact Test	No	Yes
3. Legal Aid	No	Yes
4. Sustainable Development	No	Yes
5. Carbon Assessment	Yes	No
6. Other Environment	No	Yes
7. Health	No	Yes
8. Equality IA (race, disability and gender assessments)	No	Yes
9. Human Rights	No	Yes (see Consumer Protection Annex to Prospectus document)
10. Privacy and data	No	Yes (see Privacy and Security Annex to Prospectus document)
11. Rural Proofing	No	Yes

Specific Impact Tests

1. Competition assessment

Consumers

From a consumer point of view the introduction of smart meters will have an effect on the competitive pressure within energy supply markets – in particular because accurate and reliable data flows facilitate faster switching, encouraging consumers to seek out better deals, thereby driving prices down.

In addition, the improved availability of more accurate and timely information should create further opportunities for energy services companies to enter the smaller non-domestic market; and for other services to be developed, for example new tariff packages and energy services, including by third party providers. Overall, smart metering should enhance the operation of the competitive market by improving performance and the consumer experience, encouraging suppliers' and others' innovation and consumer participation.

Whilst these effects are difficult to quantify in terms of the overall IA it is important for the pro-competitive aspects to be considered going forward.

Industry

Great Britain is the geographical market affected by the rollout of smart meters. The products and services affected will be:

- gas and electricity supply;
- gas and electricity meters;

- provision of energy services (including information, controls, energy services contracting, demand side management) and smart homes
- meter ownership, provision and maintenance;
- other meter support services;
- gas and electricity network services;
- communications services.

In competition terms the rollout would therefore affect:

- gas and electricity suppliers;
- gas and electricity networks;
- meter manufacturers;
- meter owners, providers, operators and providers of ancillary services;
- energy services businesses and providers of smart home services;
- communications businesses.

The competition impact of the Data Communications Company (DCC).

There is an impact on competition through the establishment of the DCC.

DCC will be responsible for managing the procurement and contract management of data and communications services that will underpin the smart metering system. All domestic suppliers will be obliged to use the DCC. In the non-domestic sector, use of the DCC will be elective.

DCC will be a new licensed entity, which is granted an exclusive licence, through a competitive tender process for a fixed term. In effect the DCC would secure the communications services for a fixed period, locking-out competitors for that period. However, Ofgem will then be able to exert direct regulatory control over it to ensure that it applies its charging methodology in line with its licence obligations as well as regulating the quality and service levels delivered by the DCC.

Competition will be maximised within the model by re-tendering for services on a frequent basis, but a balance would need to be struck to take account of the length of contract needed to achieve efficiencies.

As non-domestic suppliers would not be obliged to use the DCC services, there would be continuing opportunity for suppliers and other metering and energy service providers to differentiate through delivery of communications systems as well as other aspects of their offerings. As metering service providers are particularly active in the current advanced metering market, the exceptions allowing continued installation of advanced metering until April 2014 (and, in some cases, thereafter) would help them continue to offer services and to innovate.

Where the DCC is used, centralised communications could lead to improved supplier competition as a result of making switching between suppliers easier. This is because many of the complexities involved in switching involving numerous stages could be stripped away, making the process simpler, shorter and more robust, resulting in a faster and more reliable consumer experience and thereby encouraging more consumers to switch.

The voluntary approach to the DCC could theoretically adversely affect competition because a customer could lose some smart functionality when switching supplier. However, as set out in the IA, we expect the overwhelming majority of smart meters to utilise DCC services. Where they do not, the Programme's approach to promoting technical and commercial interoperability will strongly incentivise gaining suppliers to offer smart services where meters meet the technical specification.

Speed of Rollout

One possibility is that smaller energy suppliers might be disadvantaged in a rollout by being unable to obtain equipment and services at the same cost and rate as larger suppliers, and that this would be exacerbated by a faster rollout. Similarly, if resources are scarce for all under a rollout (i.e. equipment and installers), small suppliers might feel a greater cost impact than larger suppliers due to the relative size of the increased costs in proportion to the size of the business. However, some of this may be mitigated by the more flexible approach for roll out to be applied to small suppliers.

2. Small Firms

There may be small firms affected by the domestic rollout in the areas of:

- gas and electricity purchase (customers)
- gas and electricity supply;
- meter manufacturing;
- meter operating and services;
- energy services and smart homes.

As part of the consultation on the Smart Metering Prospectus, the Smart Meter Programme sought and received the views of small business customers and their representatives, and of those who deal with this sector.

Small businesses and their representatives see particular benefits in timely and entirely accurate billing. Their concerns have included:

- costs that would be passed through to business during a rollout
- delivery of interoperability in the absence of mandatory use of the DCC
- cost transparency
- undue burdening of micro-businesses
- avoiding or minimising business disruption
- possible use of remote disconnection
- the need for thoroughgoing advice and support on use of the meters and on energy efficiency as a whole.

The Government has decided that suppliers should be required to accede to an approved installation Code of Practice governing the domestic sector. It has further decided that micro-businesses will be also be protected by a Code. We expect that both sectors would use the same core Code, with appropriate adjustments for micro-business customers. The customer engagement strategy, which will be developed during phase 2 of the Programme, will consider approaches to micro-businesses. In developing rules on disconnection in the light of early installation of smart meters by some suppliers, Ofgem considered whether these should also apply to the non-domestic market, but concluded that the proposed rules would not materially address small business concerns or add to existing protections. It will closely monitor disconnections in the non-domestic sector, and its consultation on the "Spring Package" enables non-domestic customers and their representatives to comment further on its proposals in this area, including coverage.

The IA indicates that there would be a net benefit from smart or advanced metering, but, to maximise the benefits, business will have to respond to the additional information provided by the new metering, for example, by changing energy-use patterns or taking energy efficiency measures. Help and clear guidance will help mitigate small businesses' costs and increase benefits. In respect of information about use, the Government has decided that micro-businesses with smart meters will have access to data from smart meters on the same basis as domestic customers.

In terms of regulatory burden, responsibility for installing new metering rests with suppliers. There is, therefore, no new administrative burden on small business customers. The overwhelming majority of small firms are likely to receive domestic-style smart meters and, like domestic customers, will benefit from the economies of scale from a large-scale rollout of these meters. Advanced meters will tend to be installed at the sites of large users or multi-site organisations.

Previous consultations have assumed that climate change objectives, to which smart and advanced metering contribute, should not be compromised by exemptions for particular sectors of the market, including small firms. In fact, small firms using the meters can benefit from improving energy efficiency, thus reducing energy costs and defraying the costs of the meters themselves.

The competition test (above) notes that smaller energy suppliers might be disadvantaged in a rollout by being unable to obtain equipment and services at the same cost and rate as larger suppliers, and that this would be exacerbated by a faster rollout. Similarly, if resources are scarce for all under a rollout (i.e. equipment and installers), small suppliers might feel a greater cost impact than larger suppliers due to

the relative size of the increased costs in proportion to the size of the business. However, some of this may be mitigated by the more flexible approach for roll out to be applied to small suppliers.

Most small suppliers provide either gas or electricity, but not both. One view is that as the volume of smart metering increases there will be an increase in the dual-fuel supply share of the market although this is already a trend that is being seen in the market. It is difficult to assess whether this will be the case – the view is based on the projections of the types of dual-fuel-related offerings that suppliers will make in a smart metering world and the popularity of these. It is possible that small suppliers could therefore be impacted negatively unless they are, or become, dual fuel suppliers.

More generally, smart metering is expected to provide new business models for energy services which may have relatively low entry costs and regulatory restrictions if they do not involve the licensed supply of energy. Experience in other areas e.g. Internet businesses show that small firms may be highly competitive in such areas. Decisions on the role of DCC and data protection and access arrangements will need to promote a level playing field for small firms.

3. Legal Aid

The proposals would not introduce new criminal sanctions or civil penalties for those eligible for legal aid, and would not therefore increase the workload of the courts or demands for legal aid.

4. Sustainable Development

An objective of the rollout is to reduce energy usage and consequently achieve carbon emissions.

Smart metering will provide consumers with the tools with which to manage their energy consumption, enabling them to access innovative solutions and incentives to support energy efficiency and take greater personal responsibility for the environmental impacts of their own behaviour.

The rollout can also contribute to the enhanced management and exploitation of renewable energy resources, for example by helping to facilitate the introduction of smart demand-side management approaches such as time-of-use (TOU) and dynamic tariffs which enable the more effective exploitation of renewable energy. The proposals would particularly contribute to the need to live within environmental limits, but would also help ensure a strong, healthy and just society (see health IA) and would put sound science in metering and communications technology to practical and responsible use. The proposals would promote sustainable economic development, both in terms of enhancing the strength, and improving the products, of meter and display device manufacturers, and by increasing employment and raising skills levels in the installation and maintenance of meters and communications technologies.

5. Carbon assessment

Following DECC guidance[35], we have carried out cost effectiveness analysis of the options in addressing climate change. The existence of traded (electricity) and non-traded (gas) sources of emissions means that the impact of a tonne of CO_2 abated in the traded sector has a different impact to a tonne of CO_2 abated in the non-traded sector. Reductions in emissions in the traded sector deliver a benefit but do not reduce GHG, whereas reductions in the non-traded sector do actually reduce GHG emissions.

Cost effectiveness analysis provides an estimate of the net social cost/benefit per tonne of GHG reduction in the ETS sectors and/or an estimate of the net social cost per tonne of GHG reduction in the non-ETS sectors.

We calculate the cost-effectiveness of traded and non-traded CO_2 separately:

Cost-effectiveness (traded sector) = (PV costs – PV non- CO_2 benefits – PV traded carbon savings)/tonnes of CO_2 saved in the traded sector

Cost-effectiveness (non-traded sector) = (PV costs – PV non- CO_2 benefits – PV non-traded carbon savings)/tonnes of CO_2 saved in the non-traded sector

[35] http://www.decc.gov.uk/en/content/cms/statistics/analysts_group/analysts_group.aspx

The table below presents the present value of costs and non- CO_2 benefits as well as the tonnes of CO_2 saved in the traded and non-traded sectors, the corresponding cost effectiveness figures and the traded and non-traded cost comparators (TPC and NTPC). The Cost Comparators are the weighted average of the discounted traded and non-traded cost of carbon values in the relevant time period. If the cost per tonne of CO_2 saving of the policy (cost-effectiveness) is higher than the TPC/NTPC the policy is non-cost effective.

Table 16: Cost effectiveness

Option	PV costs	PV Non-CO_2benefits (£million)	EU ETS permits savings (Millions of tonnes of CO2 saved equivalent)	Millions of tonnes of CO_2 saved – non-traded sector	Traded sector cost comparator	Cost-effectiveness – traded sector	Non-traded sector cost comparator	Cost-effectiveness – non-traded sector
1	574	2,311	4.14	10.31	20.21	-444	40.6	-211
2	574	2,298	4.14	10.31	20.21	-441	40.6	-209

Table 16 shows how the rollout will save over 4 million of tonnes of CO_2 equivalent in the traded sector and over 10 million tonnes of CO_2 in the non-traded sector over a 20-year period. Both options are cost-effective: in both the traded and non-traded sector, the cost per tonne of CO_2 of abating emissions (cost-effectiveness) is lower than the cost comparator for both the traded and non-traded sector.

6. Other Environment

A smart metering Programme would have some negative environmental impacts. The first is the costs of legacy meters. Most significant among these would be the cost of disposal of mercury from gas meters, estimated at around £1 per meter. These costs would have to be met under usual meter replacement Programmes, but would be accelerated by a mandated rollout. The smart metering assets will consume energy and after discussions with meter specialists we continue with the assumption that the smart metering equipment installed within a consumer's premises will not consume more than 2.6W above the consumption of conventional metering equipment. These assumptions are unchanged. Gas meters would require batteries for transmitting data and some display devices may also use batteries. The batteries would be subject to the Directive on Batteries and Accumulators.

The Government's view is that the positive environmental impacts of smart meters clearly outweigh any negative impacts.

7. Health

There are a number of positive health impacts from the rollout of smart meters. In particular, smart meters enable suppliers to target energy efficiency measures better and encourage customers to take such measures. These confer health benefits to individuals – particularly vulnerable individuals – deriving from greater thermal comfort.

Many of the benefits of smart metering are underpinned by the ability to access the meter remotely and to provide customers with real time data on their gas and electricity consumption. In the home or premises the system will comprise various elements including a wide area communication module to provide communications to the DCC and a home area system linking devices within the home or premises to the smart metering system (including the in-home display).

A small number of responses to the consultation expressed concerns about electromagnetic sensitivity relating to smart meter communications technologies, particularly to wireless technologies. At this stage communications technology solutions have not been selected for the smart metering system. Both wired and wireless technologies exist that could be used and, for practical and technical reasons, both will need to be utilised by installers during the roll-out. However 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 using smart metering equipment that meets the functional requirements will be a licence obligation.

The programme will continue to engage with the Department of Health and our full range of stakeholders on all relevant practical issues as work progresses on communications for smart metering.

8. Human Rights

The smart meter rollout may engage the following Convention rights: Article 1 of the First Protocol (protection of property); Article 8 (right to privacy); and Article 6 (right to a fair trial).

Article 1, Protocol 1 may be engaged because a Government mandate will entail changes to the existing market structure, which might constitute an interference with supplier licenses, and current meter owners' and providers' possessions. DECC's view is that any interference would be in the general interest and proportionate to the benefits that this policy would accrue.

Article 8 may be engaged because smart technology is capable of recording greater information about a non-domestic customer's energy use in its property than existing dumb meters. As the preparatory work under the smart meter Implementation Programme progresses the Government will need to continue to be satisfied that any interference with privacy is justified, proportionate and necessary in accordance with Article 8 ECHR.

In addition, to roll out smart meters, installers will have to enter consumers' property. As the preparatory work under the smart meter Implementation Programme progresses the Government will need to continue to be satisfied that any interference with privacy is justified, proportionate and necessary, in accordance with human rights and European law.

Ofgem is responsible for enforcing the conditions of gas and electricity supply licences. DECC's view is that the existing enforcement regime under the Electricity Act 1989 and the Gas Act 1986 (which, for example, give licensees the opportunity to apply to the court to challenge any order made, or penalty imposed, by Ofgem), which would continue to apply during a rollout of smart meters, is compliant with Article 6. In addition, as a public authority, Ofgem is bound by section 6 of the Human Rights Act 1998 to act compatibly with the European Convention on Human Rights. Article 6 may also be engaged in relation to the grant of any new licences under a centralised model. DECC's view is that a new licensing regime in the Energy Act 2008 would be compliant with Article 6.

9. Equality IA (EIA)

The Government is subject to general duties in respect of disability, race and gender equality. The current duties are:

- Disability Equality Duty: designed to eliminate unlawful discrimination and victimisation; eliminate harassment of disabled persons that is related to their disabilities; ensure that public sector organisations promote equality of opportunity between disabled persons and other persons; promote positive attitudes towards disabled persons; encourage participation by disabled persons in public life; and take steps to take account of disabled persons' disabilities, even where that involves treating disabled persons more favourably than other persons;
- Race Equality Duty: designed to eliminate unlawful discrimination and victimisation and to promote equality of opportunity and good relations between persons of different racial groups;
- Gender Equality Duty: designed to eliminate unlawful discrimination, harassment and victimisation and to promote equality of opportunity between women and men.

The non-domestic rollout will affect businesses and public bodies, rather than individuals. The Government does not, therefore, envisage an impact in respect of the duties, but it will continue to keep this issue under review as work continues during Phase 2 of the Smart Metering Programme.

10. Data and Privacy

Customer access to data

Smart metering will result in a step change in the amount of data available from electricity and gas meters. This will, in principle, enable energy consumption to be analysed in more detail (e.g. half-hourly) and to be 'read' more frequently (e.g. daily, weekly or monthly) by suppliers. This will allow consumers to view their consumption history and compare usage over different periods (e.g. through the IHD or internet applications).

The Prospectus Response proposes that the data arrangements for micro-businesses with smart meters in respect of access to, and granularity of, data will be the same as those for the domestic sector. Those for larger non-domestic customers with smart meters or for any non-domestic customer using an advanced meter will remain a matter for contract.

Data privacy

The frequency with which meters are read and the level of detail of data to be extracted will vary according to the mode of operation (eg some form of pay-as-you-go or credit) and the type of tariff the customer has chosen. As now, suppliers will need regular meter readings to provide accurate bills. Where they offer innovative tariffs, such as those based on time of use, they will need more detailed consumption information. The availability of data to suppliers, particularly half-hourly data, raises some potential privacy issues. Energy consumption data may be considered personal data where a living individual can be identified from the data itself or from the data and other information in the possession of the person, e.g. address details. On that basis, energy consumption data will be personal data for the purposes of the Data Protection Act 1998 regardless of whether the data is from a conventional, prepayment or smart meter.

In Phase 2, the Programme will consider further the appropriate rules for the non-domestic sector, taking account of the fact that, under the Data Privacy Act 1988, only sole traders could be considered "living individuals", including whether data privacy arrangements going beyond the requirements in the DPA are desirable.

Data security

To protect the privacy of data, it is imperative that the smart metering system be secure. Building on best practice we have looked at the privacy and security issues across the end-to-end smart metering system, undertaking an initial risk assessment which will be further developed as the Programme progresses. A set of security requirements for how these risks should be addressed will be produced which will inform development of the technical specifications that the industry will be required to adopt.

To support our work in this area, we have held discussions with stakeholders and have established a Privacy Advisory Group (PAG), which includes the Information Commissioner's Office (ICO) and more recently has been expanded to include representatives of consumer groups and suppliers, to provide expert advice to the Programme. We will continue to expand and deepen our engagement with stakeholders on these issues.

The Programme will undertake more work in the next phase to inform the development of a privacy policy framework. The Programme will continue to work with the expanded PAG and other stakeholders to help us reach a final decision on these issues.

Data privacy and security issues are discussed more fully in the 'Data Privacy and Security' Annex to the main Prospectus Response Document.

11. Rural proofing

Smart meters will address the problems attached to "difficult to read" meters, which may at present lead to those in rural areas receiving fewer actual meter readings and estimated bills. The scope for introducing different payment methods for smart prepayment meters would assist those in rural areas who find key-charging or token purchase difficult. The opportunity, through smart meters, to provide more targeted and tailored energy efficiency advice would also assist those in rural areas, including those in "hard to reach" dwellings.