

<b>Title of the measure:</b>	UK23_Smart metering and Billing (domestic)
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### **General description**

The UK Government's vision is for every home in Great Britain to have a smart electricity and gas meter with In-Home Displays (IHD). Ensuring householders have direct access to information about their energy use within their homes will enable consumers to manage that use and reduce their carbon emissions. The smart energy meters and IHD will provide consumers with near real-time information on energy consumption. Bills will be accurate and switching between suppliers will be smoother and faster. It is expected that new products and services will be supported in a more competitive, efficient energy supply and energy management services market.

The Department for Business, Energy and Industrial Strategy (BEIS) (formerly DECC) is leading the roll-out with support from the industry regulator, Ofgem. Ofgem E-Serve led the policy design phase of the central programme on behalf of DECC, however, since April 2011, BEIS has been directly responsible for managing the implementation of the programme.

Estimates suggest that over the next 20 years the installation of smart meters will provide £6.2 billion net benefits to the UK; the programme will cost £10.5bn and provide £14.8 in benefits up to 2030. The Government estimates that the average household electricity and gas bill is expected to reduce by £26 in 2020 (2014 Impact Assessment).

The rollout will involve visiting 30 million homes and replacing 53 million domestic gas and electricity meters. BEIS has established the Smart Meter Implementation Programme to set the policy framework, revise the regulatory framework, including updating consumer protections, and ensure the necessary cross-industry arrangements are in place.

Installation will take place over two implementation phases:

**The Foundation Stage** – this began in 2011 and Government is working with the industry and consumer groups and other stakeholders to ensure that all the necessary groundwork is completed for mass rollout. The foundation stage will let industry:

- build and test systems;
- learn what works best for consumers; and
- learn how to help people get the best from their meters.

**The Mass Rollout** – Smart meters will be rolled out as standard across the country from 2016 to the end of 2020, but there is no legal obligation on individuals to have one.

The transfer of data to and from domestic smart meters will be managed centrally by a new Great Britain-wide function covering both electricity and gas sectors. This central Data and Communications Company (DCC) will be independent of suppliers and distributors. It will provide two-way communications to smart meters, to which smart meter service users (suppliers, network companies and other authorized third parties) will be given access to data for specified purposes. The DCC began live services in November 2016, enabling the main installation stage of the Smart Metering Programme to begin.

Quarterly Smart Meter statistics are published. As at 31 December 2017 there were 4.1 million gas meters operated in smart mode by large energy suppliers in domestic properties across Great Britain, and 5.5 million smart and smart type electric meters. Smaller energy suppliers had installed a further 0.46 million smart meters. Overall, these smart or smart type meters represent 18.9 per cent of all domestic meters operated by large energy suppliers.

<https://www.gov.uk/government/collections/smart-meters-statistics>



BEIS will continue to monitor smart meter installations and the number of meters in operation in Great Britain on a quarterly basis until the end of the Programme. More detailed information on the methodology used to produce estimates of the number of meters installed and operating during the roll-out period is included in the accompanying methodology note, available at:

<https://www.gov.uk/government/collections/smart-meters-statistics>

### ***Impact evaluation (methods and results)***

The costs and benefits of smart metering (both domestic and non-domestic) were evaluated in ex-ante Impact Assessments in 2011, 2013 and 2014 by the (former) Department of Energy and Climate Change. This was subsequently updated in August 2016 by BEIS, to reflect developments in the delivery of the roll-out since 2014 and new evidence that had come to light, including data from early smart meter deployment.

### ***Means and outputs***

The costs which were assessed for this measure were:

- capital cost of meter and in-home display, and communications equipment in the home, estimated as £145 per dwelling for installation of gas and electric smart meter
- installation costs; estimated as £107 per dwelling for a dual fuel installation
- operating and maintenance costs
- supplier and industry IT costs
- Data and Communications Company's and its service partners' capital and operational expenditure; energy costs from smart metering equipment in the home
- meter reading costs
- disposal costs
- legal and organisational costs
- cost associated with consumer engagement activity.

The present value of all costs for the domestic sector was estimated as shown in the Table below.

### **Total present value of costs 2013 to 2030 in 2011 prices with a present value base year of 2016**

<b>Category</b>	<b>Cost item</b>	<b>£million</b>
In premise costs	Meters & IHDs	2,551
	Installation of meters	1,942
	Operation and maintenance of meters	626
	Communications equipment in premises	1,016
DCC related costs	DCC licence	230
	Data services	377
	Communications services	1,334
	Other service providers	95
Suppliers and other participants system costs	Supplier capex	536
	Supplier opex	306
	Industry capex	69
	Industry opex	90
Other costs	Energy	652
	Disposal	11
	Pavement reading inefficiency	271
	Organisational	258
	Marketing	192
	<b>Total costs (2013 to 2030)</b>	<b>10,555</b>

### ***Data about energy savings***



Within the impact assessment, energy savings are estimated based on a series of large-scale international review studies and two major UK studies. These were the 2011 Energy Demand Research Project (EDRP), which provided information on consumers responses to a range of forms of feedbacks including smart meters and the 2015 Early Learning Project (ELP) an extensive programme of research into how best to deliver consumer benefits through effective engagement, which included exploring how consumers who received smart meters between 2011 and early 2013, engaged with smart metering.

On this basis the savings in demand were estimated as

- Electricity: - 2.8% for all consumers with a range (for sensitivity analysis of 1.5% to 4%)
- Gas: 2% for credit consumers (range of 1% to 3%) and 0.5% for consumers on pre-payment meters (range of 0.3% to 1%)

Estimates of the annual energy savings are 0.6 TWh in 2016 and 5.2 TWh in 2020 (see Results section below).

#### *Sources of uncertainties about energy savings*

The savings are based on estimates per consumer and the anticipated roll out programme. As discussed above there is some uncertainty in the average savings that will be achieved based on large scale roll out as the results are based on experience from trials.

#### *Evaluation of the energy savings*

**Typology of calculation method:** mixed deemed and ex-post estimate

**Typology of baseline:** “actual before” energy consumption

**Typology of adjustments, correction and other factors:** As the estimation of smart meter energy is based on empirical trial results, i.e. observed impacts, these are net of any potential comfort taking and direct rebound effects. Therefore, no further adjustment is necessary to apply to the smart meter energy savings estimates.

#### *Other indicators monitored and/or evaluated*

As well as energy savings, the impact assessment also evaluated several other benefits. These included those to suppliers of a range of activities including avoided site visits; reduced inquiries and customer service costs; improvements in debt handling; and reduced costs for switching customers between prepayment and credit meters, and reduced costs for facilitating customers switching between suppliers. Total benefits are estimated as £14.35 billion, and compared to costs give a net present value for smart metering of £3.79 billion. A discount rate of 3.5 % was used to calculate present value.

#### **Present value of benefits (2013 to 2030) (2013 £)**

		£m
<b>Consumer benefits</b>	<b>Energy saving and microgeneration</b>	<b>3856</b>
<b>Supplier benefits</b>		<b>7954</b>
<b>Network related benefits</b>		<b>748</b>
<b>Generation benefits</b>		<b>899</b>
<b>Carbon and air quality benefits</b>	<b>Global CO2 reduction</b>	<b>599</b>
	<b>EU ETS from energy reduction</b>	<b>179</b>
	<b>EU ETS from ToU</b>	<b>45</b>
	<b>Air quality</b>	<b>69</b>

#### Methods

Every two years an assessment is made on progress over the previous target period. The energy savings from in home displays/Smart meters are calculated according to supplementary Green Book policy appraisal guidelines available at

<https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-government>



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## Results

The Government's 'Updated energy and emissions projections 2016' (published in March 2017) provide estimates of the impact of smart metering in the domestic sector:

<b>Ex-post evaluation</b>	<b>2010</b>	<b>2016</b>	<b>2020</b>
CO <sub>2</sub> (kt)			
Energy (TWh)			
<b>Ex-ante evaluation</b>	<b>2010</b>	<b>2016</b>	<b>2020</b>
CO <sub>2</sub> (kt CO <sub>2</sub> e/year)	0	164	1388
Energy (PJ)*	0	2.2	18.7

\* Energy figures converted from carbon by using same energy/carbon ratio as in UK NEEAP 2010 (published in July 2011) for home displays/ Smart meters in the household sector.

<b>Measure Impact Level</b>		
<input type="checkbox"/> <b>low</b>	<input type="checkbox"/> <b>medium</b>	<input checked="" type="checkbox"/> <b>high</b>

- In general: definition of the impact in terms of final energy. All electricity savings should be linked only to electricity consumption, all other savings (except for those involving fuel substitution and CHP) to the overall final energy consumption.
- Fuel substitution and CHP savings: the savings should be linked to the primary energy, calculated with a fixed factor of 2.5.
- The categories (low, medium, high) should be linked to the aggregate electricity or energy consumption of the sector to which the measure is assigned (households, transport, industry or tertiary), and not to a particular targeted end-use, because statistical data are often missing at the level of end-uses.
- The following limits (in each case in % of the overall electricity or final energy consumption of the respective sector; in case of fuel substitution and CHP: of primary energy consumption) are defined for the three impact levels:
  - **low impact:** <0.1%
  - **medium impact:** 0.1-<0.5%
  - **high impact:** ≥0.5%

## *Interaction of measures*

Please also see the related 'UK14\_Smart metering and billing for SMEs' in the Tertiary sector.

## *Historical data*

It was announced in the 2007 Energy White Paper that the UK Government intends to roll forward a package of measures which will change the way in which energy use is metered and billed. The UK government proposed that from May 2008 and, where technically feasible, every household having an electricity meter replaced and every newly built domestic property would be given a real-time electricity display, free of charge. The display must show real-time information about electricity consumption and cost and meet a minimum performance requirement of 95% accuracy in the normal range of energy use by a household.

An energy demand research project, co-funded by Government and industry, involved several thousand households receiving smart meters or feedback devices, displaying real-time energy use. The project, managed on the Government's behalf by Ofgem (energy regulator), involved trials of different ways of improving billing and metering. The trials provided information on reductions in energy use that consumers make in response to different forms of feedback about their energy use and test consumer response to time of use tariffs that encourage energy use to be switched away from peak periods. The project ran for two years, with regular interim reports on emerging findings and informed the further development of policy on smart meters and associated feedback devices.

## Methods (historic)



Every two years an assessment is made on progress over the previous target period. The energy savings from in home displays/Smart meters are calculated according to supplementary Green Book policy appraisal guidelines available at

<https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-government>

### Results (historic)

The DECC Updated energy and emissions projections 2015 (published in Nov 2015) provide estimates of the impact of Real time displays/Smart meters in the domestic sector:

<b>Ex-post evaluation</b>	1995	<b>2010</b>	<b>2016</b>	<b>2020</b>
CO <sub>2</sub> (kt)				
Energy (TWh)				
<b>Ex-ante evaluation</b>	1995	<b>2010</b>	<b>2016</b>	<b>2020</b>
CO <sub>2</sub> (kt CO <sub>2</sub> e/year)		0	493	1881
Energy (PJ)*		0	6.69	25.4

\* Energy figures converted from carbon by using same energy/carbon ratio as in progress report on UK NEEAP 2007 (published in July 2011) for home displays/ Smart meters in the household sector.

The 2006 Annual Report and NEEAP 2014 only contains estimates for the non-domestic smart metering – see ‘UK14\_Smart metering and billing for SMEs’ in the Tertiary sector.

The DECC Updated energy and emissions projections 2013 (published in Sep 2013) provide estimates of the impact of Real time displays/Smart meters:

<b>Ex-post evaluation</b>	1995	<b>2010</b>	<b>2016</b>	<b>2020</b>
CO <sub>2</sub> (kt)				
Energy (TWh)				
<b>Ex-ante evaluation</b>	1995	<b>2010</b>	<b>2016</b>	<b>2020</b>
CO <sub>2</sub> (kt CO <sub>2</sub> e/year)		0	855	1822
Energy (PJ)*		0	11.6	24.6

\* Energy figures converted from carbon by using same energy/carbon ratio as in progress report on UK NEEAP 2007 (published in July 2011) for home displays/ Smart meters in the household sector.

The NEEAP 2014 only contains estimates for the non-domestic smart meter roll-out which are 6.1 PJ for 2016 and 15.8 PJ for 2020.

### Methods (historic)

This is available in Annex A of the 2007 UK Energy Efficiency Action Plan.

### Results (historic)

In the progress report of the 2007 UK Energy Efficiency Action Plan, the estimated carbon savings from billing and metering were 2.0 MtCO<sub>2</sub> by 2020 and the energy savings were estimated to amount to 27 PJ.

<b>Ex-post evaluation</b>	2000	2010	2016	2020
direct CO <sub>2</sub> (kt)				
Energy (PJ) (Fuels/Electricity)				
<b>Ex-ante evaluation</b>	2000	2010	2016	2020



direct CO <sub>2</sub> (kt)*			1400	2000
Energy (PJ) (Fuels/Electricity)**			19.0	27.0

\*carbon reported as MtCO<sub>2</sub>e in publication

\*\*Energy reported as 2010 – 0 TWh; 2016 – 5.3 TWh; 2020 – 7.5 TWh  
(Multiplied by 3.6 to convert to PJ)

**Source:** progress report on the UK NEEAP 2007 (published July 2011)

## References

BEIS, 2016

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DECC – Smart Meters

<https://www.gov.uk/smart-meters-how-they-work>

Ofgem – Transition to smart meters

<https://www.ofgem.gov.uk/electricity/retail-market/metering/transition-smart-meters>

Smart Metering Implementation Programme: prospectus

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/42718/220-smart-metering-prospectus-condoc.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/42718/220-smart-metering-prospectus-condoc.pdf)

2014 Impact Assessment - Smart meter roll-out for the domestic and small and medium non-domestic sectors (GB)

[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/276656/smart\\_meter\\_roll\\_out\\_for\\_the\\_domestic\\_and\\_small\\_and\\_medium\\_and\\_non\\_domestic\\_sectors.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/276656/smart_meter_roll_out_for_the_domestic_and_small_and_medium_and_non_domestic_sectors.pdf)

2014 UK National Energy Efficiency Action Plan

[https://ec.europa.eu/energy/sites/ener/files/documents/2014\\_neep\\_united-kingdom.pdf](https://ec.europa.eu/energy/sites/ener/files/documents/2014_neep_united-kingdom.pdf)

Green Book policy appraisal guidelines

<https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-government>

*Annual energy savings estimate from:*

Updated energy and emissions projections 2016

<https://www.gov.uk/government/publications/updated-energy-and-emissions-projections-2016>

*Historic annual energy savings estimate from:*

Updated energy and emissions projections 2015

<https://www.gov.uk/government/publications/updated-energy-and-emissions-projections-2015>

Updated energy and emissions projections 2013

<https://www.gov.uk/government/publications/updated-energy-and-emissions-projections-2013>

UK Report on Articles 4 and 14 of the EU End-use Efficiency and Energy Services Directive (ESD)

Update on progress against the 2007 UK National Energy Efficiency Action Plan (July 2011)



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[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/48144/2289-uk-report-eu-enduse-esd.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48144/2289-uk-report-eu-enduse-esd.pdf)

2007 UK Energy Efficiency Action Plan

<https://ec.europa.eu/energy/en/topics/energy-efficiency/energy-efficiency-directive/national-energy-efficiency-action-plans>

2007 BERR Energy White Paper (historic reference)

<http://webarchive.nationalarchives.gov.uk/+/http://www.berr.gov.uk/energy/whitepaper/page39534.html>



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