Programme Area: Smart Systems and Heat

Project: Data Management and System Architecture

Title: Protocols and Legislative Initiatives Report

Abstract:

The principal objective achieved within the reports is the identification from other relevant projects of architectural techniques that can be applied to the SSH data architecture design and to identify and assess UK and EU directives, protocols, and legislative initiatives that may impact upon delivery of the SSH Programme.

Context:

This project specified the data system functionality and architecture that would fulfil the information and service requirements of a smart energy system. This included data security and privacy aspects. Hitachi Europe and energy & sustainability consultants DNV Kema worked independently on two £100,000 contracts to identify any data system constraints that need to be incorporated into smart energy systems. The projects were launched in February 2013. The envisaged ETI Smart Systems and Heat system will depend on Information and Communications Technology (ICT) for its efficient design, operation and management. The ICT system will need to provide functionality right along the energy delivery chain: from supply to the end consumer. It will also need to support commercial activities such as billing, and to support academic analysis and review of the system during trials and proving.

ETI Smart Systems and Heat Programme

Data Management and Overall System Architecture WA3 WP1

(Technology Landscape and Outline Functional Specification)

D.H3.2
(Report of UK/EU Directives, Protocols and Legislative Initiatives)

V1.0

Date: 8th February 2013

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Confidentiality Statement

Executive Summary

There are a number of EU and UK policy initiatives that will impact upon the design and delivery of SSH

The key objective of Work Area 3 (WA3) is to design a scalable, flexible, reliable and secure ICT system, providing all the data management functionality in support of the ETI's envisaged SSH system. Within WA3, Work Package 1 will enable the ETI to more clearly define the content and outputs for the following two Work Packages. The first strand of activity for this work package includes an international review of projects undertaken in the ICT/Systems Architecture arena, an overview of UK/EU directives, protocols and legislative initiatives that may have an impact on the delivery of the SSH Programme, and an outline of the ICT technology roadmap including likely developments out to 2050.

The principal objective of D.H3.2 is to identify and assess UK and EU directives, protocols, and legislative initiatives that may impact upon delivery of the SSH Programme. Related objectives include defining a relevant policy scope for the SSH programme and smart energy systems in general.

A policy analytical framework and impact categories have been developed to assess the state of play of policies now and into the future for SSH

To achieve the above objectives, the following methods were used:

- Review and analysis of academic, industry and government documentation focusing on UK and EU directives, protocols, and policies relevant to the SSH programme.

- Compiling a policy long list including policies that may not have a direct impact on SSH but should be flagged for future consideration.

- Iteration of policy long list to develop a policy short list with project team and CTOs and development of a Policy Analytical Framework and Policy Impact categories.

- Assessment of policies using framework applied to SSH and preparation of final report and presentation.

Most relevant policy impacts on SSH are future distribution of heat and electricity, technical standards for smart network infrastructure, and UK smart meter roll-out. There is still uncertainty on data and privacy issues

This review indicates that overarching EU and UK policy frameworks support deployment of smart energy systems that can improve system performance (efficiency, stability and carbon reduction). As a result, SSH stands to benefit from the current policy environment.

Key policies that will impact the SSH programme are related to EU and UK initiatives surrounding standardization of smart network architecture and smart meter deployment. These policies can reduce the near term costs of SSH deployment and increase long term viability. UK building energy performance and heating policies will also support SSH.

Key uncertainties include future distribution between gas and electricity and how this will be regulated. Another critical factor is consumer acceptance of the UK Smart Meter Programme which includes developing an accepted regulatory framework for data and security issues. The UK is currently consulting on these initiatives and a framework is expected to be in place for 2014. However, any potential delays in the Smart Meter Programme may negatively impact deployment of SSH in the short term (2013 – 2015).

1   Introduction

1.1   Context

The key objective of Work Area 3 (WA3) is to design a scalable, flexible, reliable and secure ICT system, providing all the data management functionality in support of the ETI's envisaged SSH system. Within WA3, Work Package 1 will enable the ETI to more clearly define the content and outputs for the following two Work Packages. To successfully complete Work Package 1, two strands of activity have been created:

1)   The first strand of activity covers an international review of projects undertaken in the ICT/Systems Architecture arena, an overview of UK/EU directives, protocols and legislative initiatives that may have an impact on the delivery of the SSH Programme, and an outline of the ICT technology roadmap including likely developments out to 2050.

2)   The second strand of activity covers the development of an ICT system outline performance specification. It describes performance criteria and indicates flows of information with reference to key stakeholders. The focus is on the needs of both the UK SSH Programme and the demonstration phase (Phase 2). This strand also develops a ROM budget and timeframe estimates for Phase 2; including billing and system control requirements.

The scope of this deliverable is UK and EU directives, protocols, and legislative initiatives relevant for the ICT SSH programme.

1.2   Objectives of Deliverable D.H3.2

1.2.1   Principal Objective

The principal objective of D.H3.2 is to identify and assess UK and EU directives, protocols, and legislative initiatives that may impact upon delivery of the SSH Programme.

1.2.2   Other Objectives

D.H3.2 has a number of other objectives including:

1)   Development of a Policy Analytical Framework (Section 3.1) for UK Smart Energy Systems and defining a relevant policy scope for the SSH programme (Section 3.2);

2)   Development of Policy Impact Categories (Section 3.4) to assess the implications of EU/UK regulation and policy on ICT requirements and design relevant for the SSH programme;

3)   Identification of relevant policy issues that should be considered in the timeframe of the SSH programme and any future implications to a UK wide system implementation.

2   Methods

2.1   Policy Analytical Framework

The following framework depicts key policy areas that intersect and form a broader smart energy system. This system is further disaggregated into functional areas within which we can assess policy impacts upon the delivery of the SSH programme.
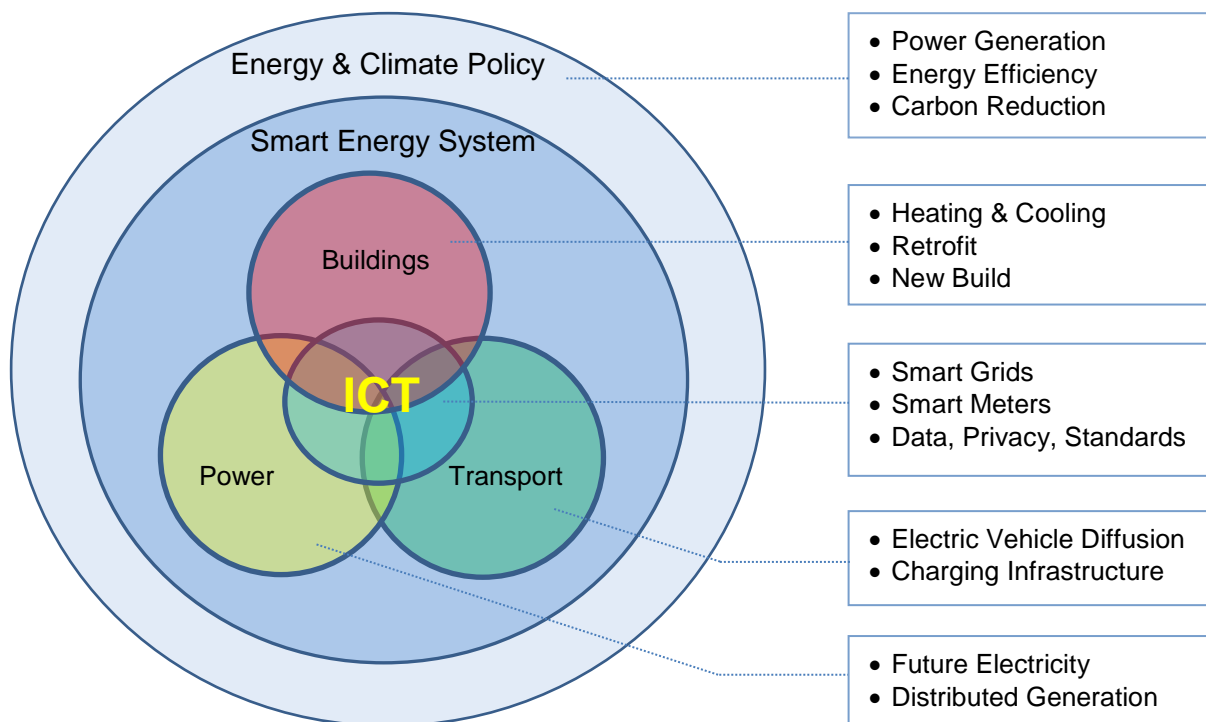
Figure 1. Smart Energy Systems Policy Framework. Source: Adapted from Tran, 2011

2.1.1   Energy & Climate Policy Drivers

The EU is an economic and political union of twenty-seven countries that operate through supranational institutions and intergovernmental agreements with its constitutional basis found primarily in the Maastricht Treaty (1993) and the Lisbon Treaty (2009). The Lisbon Treaty formally codified the EU members' common energy goals of ensuring security of supply, competitiveness and sustainability, reflecting a determination to set energy policy at the EU level. More specifically, overarching EU policies that could impact upon the design and delivery of SSH in the UK relate to 1) power generation, 2) end-use efficiency, and 3) carbon reduction. National UK energy policy often responds to these overarching EU directives. EU and UK national level policy is translated and implemented at the sectoral and service provision level within our smart energy systems framework which includes: 1) Information and communication technologies (ICT), 2) buildings, 3) power generation, 4) and transport.

2.1.2   Smart Energy Systems

In order to achieve the EU and UK energy policy objectives, a new approach in the generation, transmission, distribution, metering, supply, storage and consumption of energy is necessary. Massive renewable integration and energy storage technologies will have to be deployed, energy

efficiency will be a key driver, demand management will become increasingly important, and the electrification of heating and transport will be needed (EC, 2011). Much of this will be enabled through information and communication technologies (ICT) deployed through the grid and metering to actively match energy supply and demand (IEA, 2012a).

Building a 'smarter' grid is an incremental process of applying ICT to the electricity system, enabling increased dynamic real-time information flow on the network and allowing greater interaction between suppliers and consumers. For example, operators will get more detailed information about supply and demand, improving management of the system (e.g. shifting demand to off-peak times). Another key technology that will enable the smart grid is smart metering which will give consumers more information about electricity use, which may help reduce energy demand, cost and related carbon emissions (DECC, 2012c). Meters in homes and businesses will provide people with more accurate real-time information of electricity use, and allow energy supply companies to offer customers varying tariffs through the day that better reflect overall pressures on the system.

The smart energy system can be further disaggregated into key functional areas including ICT, Buildings, Power and Transport:

- *Information and Communication Technologies (ICT)* - In the future, demand will have to be matched to varying energy availability and infrastructure constraints. This requires fundamentally different, smarter energy system architecture involving widespread use ICT for real time data processing enabling demand management for homes and transport. Based on major EU and UK policy initiatives, ICT is disaggregated into the following major functional areas: 1) smart grids (i.e. smart network infrastructure and control), 2) smart meters, and new issues concerning 3) data, privacy and standards. Policies related to those functions are most relevant to an ICT enabled smart energy system and will intersect with other major areas of the energy system including buildings, power and transport.

- *Buildings* - Residential energy use accounts for 13% of the UK's carbon emissions, and 75% of this energy is for heating water and living spaces. We currently heat buildings and water mainly from natural gas, but as UK electricity becomes progressively low carbon, switching to electric heating technologies (e.g. ground and air-source heat pumps) will become more viable. If the UK is to meet the 2050 target, emissions from homes need to be almost zero. As building energy use becomes increasingly supplied by intermittent renewable sources, ICT will become an important enabler for demand side management with direct implications for the SSH programme objectives.

- *Power* – The current power system is largely a one-way flow from large power stations to passive consumers. In the future, an ICT enabled smart system will allow many consumers to be producers where power will be generated more widely from homes, businesses and communities, from low carbon technologies including solar power and small-scale wind. Networks will need to allow operators to sense power generation from multiple sources, and manage two-way flows of electricity without damage to equipment or disruption to supply.

- *Transport* – In the future, there could be a shift to electrification of transport, with the take-up of electric cars and vans. Large-scale deployment of electric vehicles may cause significant increases in demand for electricity. By allowing more efficient use of the grid, smarter

technologies could minimise the amount of costly new physical infrastructure needed to accommodate larger flows of power (DECC, 2009).

2.2   Policy Scope for the SSH Programme

While we have defined a broader smart energy system described above it is necessary to specify domains most relevant to the SSH Programme. An ICT network enabled energy system connects domestic energy use to the grid, large scale and distributed generation and electric transport. The policy review will address the broader smart energy system and assess the most relevant impacts upon the SSH programme including ICT enabled energy use at the household level. Scoping the review allows us to categorize the different types of policy impacts on the SSH programme discussed below.

2.3   Policy Impact Categories

There are a number of policies in place at both the EU and UK level that will impact on deployment of the SSH programme. Based on the policy analytical framework that defines the functional domains of the Smart Energy System (SES) and the scoping of the SSH programme, we have developed the following policy impact categories:

- *Cross-cutting Impact* – These are policy initiatives that cut across different functional domains including ICT, housing, power and transport. These policies generally provide the overarching regulatory framework to incentivise low carbon technology deployment at the EU and UK level and will generally have a longer deployment time horizon (2013 – 2050).

- *Direct Impact* – These are policies that specifically target the deployment of ICT enabled smart energy systems and will be the most relevant for the SSH programme at both the EU and UK level. These policies will focus on infrastructure components including smart grids (i.e. network devices), smart meters and issues surrounding data security. These policies are generally either in place or committed by government to be implemented during the SSH pilot time horizon (2013 – 2015).

- *Complimentary Impact* – These are policies that while not directly targeting the ICT aspect of the SSH programme, may be complimentary to its' successful deployment or longer term viability. These policies will span all functional categories including: buildings, power, transport and data issues not directly related to SSH. These policies are either in place or will likely be deployed over a longer time with some overlap with the SSH programme (2013 – 2030).

- *Uncertain Impact* – These are policies that focus on aspects outside the direct scope of the SSH programme but may relate more generally to the smart energy system. These policies focus on different drivers of future energy system supply and demand that may be too high level or less certain of direct overlap with SSH deployment. While these policies are categorized as uncertain impacts they are highlighted for future consideration (Appendix 1). Their time horizon is less certain but generally beyond direct overlap with SSH (2020 – 2050). Figure 2 is a schematic showing the key steps to categorizing the policy impacts.
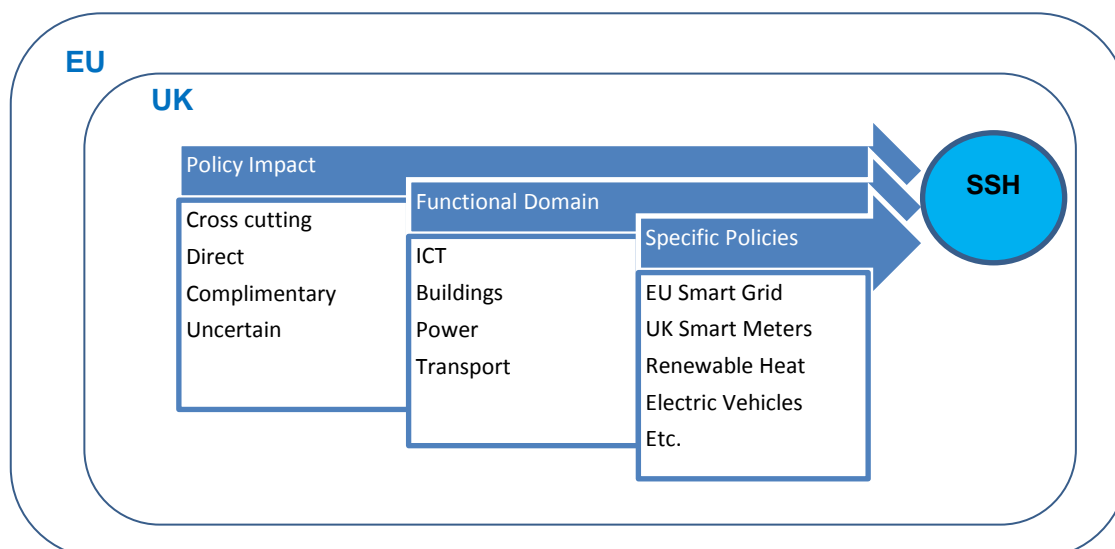
Figure 2. Schematic for categorization of policy impacts

3 Policy Impacts on UK Smart Systems & Heat Programme

3.1 Cross-cutting Impacts

3.1.1 EU Energy & Climate Policy

At the EU level there are a number of overarching policy frameworks in place that serve as a regulatory framework to drive low carbon technology deployment in the UK including:

- *The 2008 EU Climate and Energy Package (2007 – 2020)* – In 2007, the European Council adopted the 20:20:20 objective for a reduction in EU greenhouse gas emissions of 20% below 1990 levels, for 20% of EU energy consumption to come from renewable resources and for energy efficiency to drive a 20% reduction in energy use compared with reference case projected levels by 2020. Measures to achieve these targets will help drive the value of smart grids. Tightening of the overall greenhouse gas reduction target is likely to be considered in the next few years (GSG, 2011).

- *European Union Renewable Energy Target (EU Directive 2009/28/EC) (2009 – 2020)* – This requires each EU member state to increase the share of renewable energy in its gross final consumption. The directive targets an overall EU renewables share of 20% in 2020. It also targets a 10% renewable energy share in transport. The directive obliges member states including the UK to develop a National Renewable Energy Action Plan (NREAP).

- *The EU Emissions Trading Scheme (EU-ETS) (2003 – 2050)* – This was established in 2003 by EU Directive 2003/87/EC and launched in 2005. It is a mandatory cap-and-trade system covering CO_2 emissions in nine energy-intensive sector[1] including power and heat generation.

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[1] Combustion installations (power and heat generation), refinery processes, coke ovens, metal ores, steel, cement, glass, ceramics, and cellulose and paper.

From 2013, new rules for the EU-ETS will apply. For example, all allowances for the power sector will have to be auctioned, whereas the manufacturing industry will still receive part of its allowances for free, on the basis of stringent EU-wide benchmarks. Trade-exposed energy-intensive sectors will receive 100% of the benchmark value, while other industrial sectors will receive 80% of the benchmark, phasing out to 30% in 2020. DECC expects the EU-ETS to cover around 48% of national CO2 emissions in the 2013-2020 period (Phase III) and expects the EU-ETS to deliver around two-thirds of emissions reductions in the first three Carbon Budgets (Ofgem, 2011).

3.1.2   UK Energy & Climate Policy

The UK's cross cutting policy impacts stem from major initiatives related to 1) energy security and 2) carbon reduction, often in response to EU level directives.

- *The Energy Act 2008 (2008 - 2050)* – Under the UK 2008 Energy Act, new financial support for small-scale renewable generation up to 5 MW was introduced in April 2010. The goal was to make investment in small-scale renewables more attractive, and lead to more individuals, organisations and companies generating their own electricity. This type of development requires distribution network operators to manage the resulting less predictable power flows between many, smaller electricity entry and exit points. Monitoring and control of these flows will be essential where large volumes of distributed generation are concentrated (DECC, 2009). The act allows the Secretary of State to modify electricity and gas distribution and supply licences, so the licence holder has to install, or help install, smart meters to different customer segments, including private households (DECC, 2013c).

- *The UK Climate Change Act (2008 – 2050)* – Through this act, the UK has a unilateral legally binding target to reduce greenhouse gas emissions (GHG) by at least 80% of 1990 levels by 2050. The 2050 target is to be delivered through Carbon Budgets which limit UK emissions over successive five-year periods (DTI, 2007). Specifically, the UK under its EU carbon reduction commitments has to ensure that 32-40% of electricity will be generated from low-carbon sources by 2020. UKERC scenarios indicate that this will require almost complete decarbonisation of the electricity sector by 2030 and much greater electrification of heat and transport (UKERC, 2012).

- *National Renewable Energy Action Plan (NREAP) (2010 – 2020)* - The United Kingdom published its NREAP in July 2010. This plan translated the 15% energy target to 238 TWh, based on energy demand projections for 2020. The on-going Renewables Obligation[2] Banding Review, which is reassessing the rates of support to specific renewable energy technologies under the Renewables Obligation, indicates that 108 TWh of this should be generated by large-scale projects, with the remainder from small-scale ones, renewable heat and renewable transport fuels (UK, 2009a). Specifically, NREAP targets a renewable share in total heat consumption of 12% by 2020. It targets 3,914 kilotonnes of oil equivalent (ktoe) from biomass, 2,254 ktoe from heat pumps and 34 ktoe from solar. The DECC roadmap, which targets 73

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[2] Since 2002, the principal renewable energy policy measure in the electricity sector has been the Renewables Obligation (RO) (2002 – 2017), which is administered by the Gas and Electricity Markets Authority (GEMA) through Ofgem. The RO obliges suppliers to source an annually increasing proportion of their electricity from renewable energy sources. The obligation for the 2010/11 period was 11.1% (DECC, 2013c).

TWh by 2020 (from 13 TWh in 2010) suggests that a growth rate of over 19% per year will be needed.

3.2 Direct Impacts

3.2.1 EU Smart Grid & Smart Meters

- *Third Energy Package (EU Electricity Directive 2009/72/EC) (2009 – 2020)* – This package was released in 2009 and obliges members to further deregulate their electricity markets to facilitate greater supplier competition and consumer choice (GSG, 2011). The most important legislation from this package is the Electricity Directive which contains a provision for the roll out of smart meters to 80% of customers by 2020 in each Member State if a national cost-benefit test is passed. Because of differences in electricity sectors, EU members are addressing smart meter rollout and cost recovery individually. Related to these broader initiatives is Directive 2004/22/EC which sets general technical requirements for metering appliances including smart meters (Kema, 2012). The Directive also encourages long-term modernisation of the distribution grid, and encourages decentralised generation and energy efficiency through measures such as the introduction of smart grids (Ofgem, 2011; IEA, 2012).

- *European Electricity Grid Initiative (EEGI) (2012 – 2021)* – The EU has invested approximately 300 million in smart grid projects in the last decade (GSG, 2012). The most important European RD&D programme for smart grids is the EEGI. This was set up as part of the Commission's Strategic Energy Technology representing the European industry bodies European Network of Transmission System Operators (ENTSO-E) and the European DSO Association for Smart Grids (EDSO-SG). The aim is to coordinate research and demonstration of smart grid technologies across Europe, avoiding duplication of effort and promoting the exchange of best practice. EEGI is still at the planning stage. Consultation on a roadmap finished in 2011. This roadmap proposes a nine year RD&D programme for electricity networks, with an estimated cost of €2bn over nine years (2012 – 2021). It is proposed that in the first years of the programme, funding is covered by Member States and the Commission (with EU funds concentrating on investments with EU benefits). From 2013, new tariff schemes in Member States should begin to provide additional funding (Ofgem, 2011).

- *Smart Grid Standardization EU Mandate 490/441/468 (2012 – On-going)* - The Commission has produced common technology standards in 2012 to be applied across Europe. The aim is to produce standards detailed enough to ensure interoperability but maintain a degree of flexibility for Member States due to different technical requirements (Ofgem, 2011). The standards integrate a variety of digital computing and communication technologies, electrical architectures, and associated processes and services for interoperability and functionality. Building, industry, appliances and home automation are out of the scope of this mandate; however, how those functions interface with the smart grid are covered by this mandate (EC, 2011). A non exhaustive list of legal inputs and instruments considered for this mandate at the time of publication (2011) is given in Appendix 2.

3.2.2 EU Data, Information & Privacy

EU directive 95/46/EC on processing of personal data and EU directive 2002/58/EC (2002 – Ongoing) – these directives relate to processing of personal data and the protection of privacy in the electronic communications sector respectively. According to the commission recommendation of 9.3.2012 on preparation for the roll-out of smart metering systems, these two directives are "fully applicable to smart metering where there is processing of personal data, in particular in the use of

publicly available electronic communications services for contractual and commercial relations with customers". This recommendation provides further guidance on how the directives should apply to the smart metering systems. Other directives related to security and privacy includes:

- Directive 2009/136/EC amending Directive 2002/22/EC on universal service and users' rights relating to electronic communications networks and services;

- Directive 2006/24/EC on the retention of data generated or processed in connection with the provision of publicly available electronic communications services or of public communications networks;

- Directive 1999/93/EC on a Community framework for electronic signatures.

3.2.3   UK Smart Grid

While the current UK government has not yet adopted a formal overarching policy on the smart grid it does have various initiatives in place to support smart grid demonstration:

- *Low Carbon Network Fund (LCNF) (2010 – 2015)* – In 2009, Ofgem launched the LCNF a £500m funding mechanism to support large-scale trials of smart grids as part of the Ofgem (2010 – 2015) Distribution Price Control Review (DPCR5) undertaken to establish incentives, revenues and expenditure allowed by DNOs. Two tiers of funding are available: 1) Tier 1 allows DNOs to recover a proportion of expenditure incurred on small scale projects, 2) Tier 2 allocates up to £64m to help fund flagship projects through an annual competition (ENSG, 2009).

- *Network Innovation Competition (NIC) (2015 - 2020)* - The NIC provide upfront partial funding to network companies, or possibly third parties, for innovation projects for networks to deliver low carbon or environmental benefits across electricity and gas transmission and distribution networks. Decisions on the annual maximum amount of money to be raised from consumers to support the NIC will be made at each price control review. The NIC will be in place for gas distribution and electricity and gas transmission price reviews starting in 2013 and implemented in the 2015 electricity distribution price review. It is intended to be a transitional measure, and will be reviewed periodically to assess whether it is still required.

- *Innovation Allowance (IA) (2015 - 2020)* - The Innovation Allowance provides direct funding to companies for smaller scale innovation projects. The allowance is proposed at a minimum 0.5% of allowed revenues, with companies able to request up to 1% depending on the quality of their innovation strategies. The IA will be in place for the next gas distribution and electricity and gas transmission price reviews in 2013, and implemented in 2015 for the next electricity distribution price review. It is intended to be a transitional measure, and will be reviewed periodically to assess whether it is still required (ENSG, 2010).

3.2.4   UK Smart Meters

- *Smart Meter Rollout Programme from (2014 – 2019)* - DECC estimates that smart metering will deliver £ 7.1 billion net benefits primarily through energy use reduction and demand management for consumers, energy suppliers and networks for the period up to 2030. Domestic dual-fuel customers are expected to save on average £ 22 per year by 2020 and £42 by 2030. It is estimated that by 2020, the average small and medium nondomestic customer will save over £ 100 per year on their energy bill as a result of having a smart meter (DECC, 2012). Smart meters are being installed in two phases; the Foundation Stage which began in

April 2011 and mass roll-out from 2014 - 2019. The roll-out of smart meters will be undertaken by energy supply companies replacing around 53 million gas and electricity meters in more than 30 million homes and businesses. The roll-out will also support the development of a smart grid delivering improved network efficiency and responsiveness, and supporting the uptake of electric vehicles and microgeneration thus interacting with power, transport and building policy. Figure 3 shows the current Smart Meter Programme plan (DECC, 2012). As of December 2012 the state of play for the smart meter programme is:

- Procuring the data and communications services throughout 2012, with bidders is currently in the Invitation to Submit Detailed Solutions phase;

- Completion of the EU notification for the first version of the technical specifications for smart gas and electricity meters and in-home displays (IHDs);

- Consultation on the second version of the technical specifications for the rollout of smart gas and electricity metering;

- DCC Prohibition Order and Licence Application Regulations coming into effect;

- Launch of the DCC licence competition;

- Publication of Government consultation responses, providing further detail on the regulatory framework for roll-out and the approach to roll-out monitoring, consumer engagement and protection (DECC, 2012).

- *Smart Metering Equipment Technical Specifications (SMETS) (2012 – 2013) –* As part of the Smart Meter programme the UK has developed common technical standards for smart metering equipment, to ensure interoperability (i.e. one energy supplier can use equipment installed by another allowing different pieces of equipment to work together). SMETS cover the gas and electricity meters and IHDs ensuring equipment can communicate data in a consistent format over the Home Area Network. There will also be technical standards for the communications hub. The first version of SMETS setting minimum requirements for gas and electricity meters and the IHD completed the EU notification period in July 2012. The second version will be notified to the EU in early 2013 and will include standards for the Home Area Network, and requirements for the communications hub (DECC, 2012).

3.2.5 UK Data, Information & Privacy

- *Data and Communications Company (DCC) (2013 - Ongoing) -* The transfer of data to and from household smart meters will be managed by a new UK wide function covering both the electricity and gas sectors. This central Data and Communications Company (DCC) will be independent of suppliers and distributors (DECC, 2012). The DCC is a key part of UK strategy for rolling out smart meters. Its primary role will be to provide data and WAN communication services for all domestic and many non-domestic smart meters that will also likely use the DCC (Figure 4). The DCC will be a new licensed entity, regulated by Ofgem enabling energy suppliers, network operators and other authorised parties (e.g. energy service companies or switching sites) to transfer data over a communications network remotely and securely. The DCC will not itself store any data, but it will control access to smart metering data by others, as permitted by the regulatory framework and, for example:
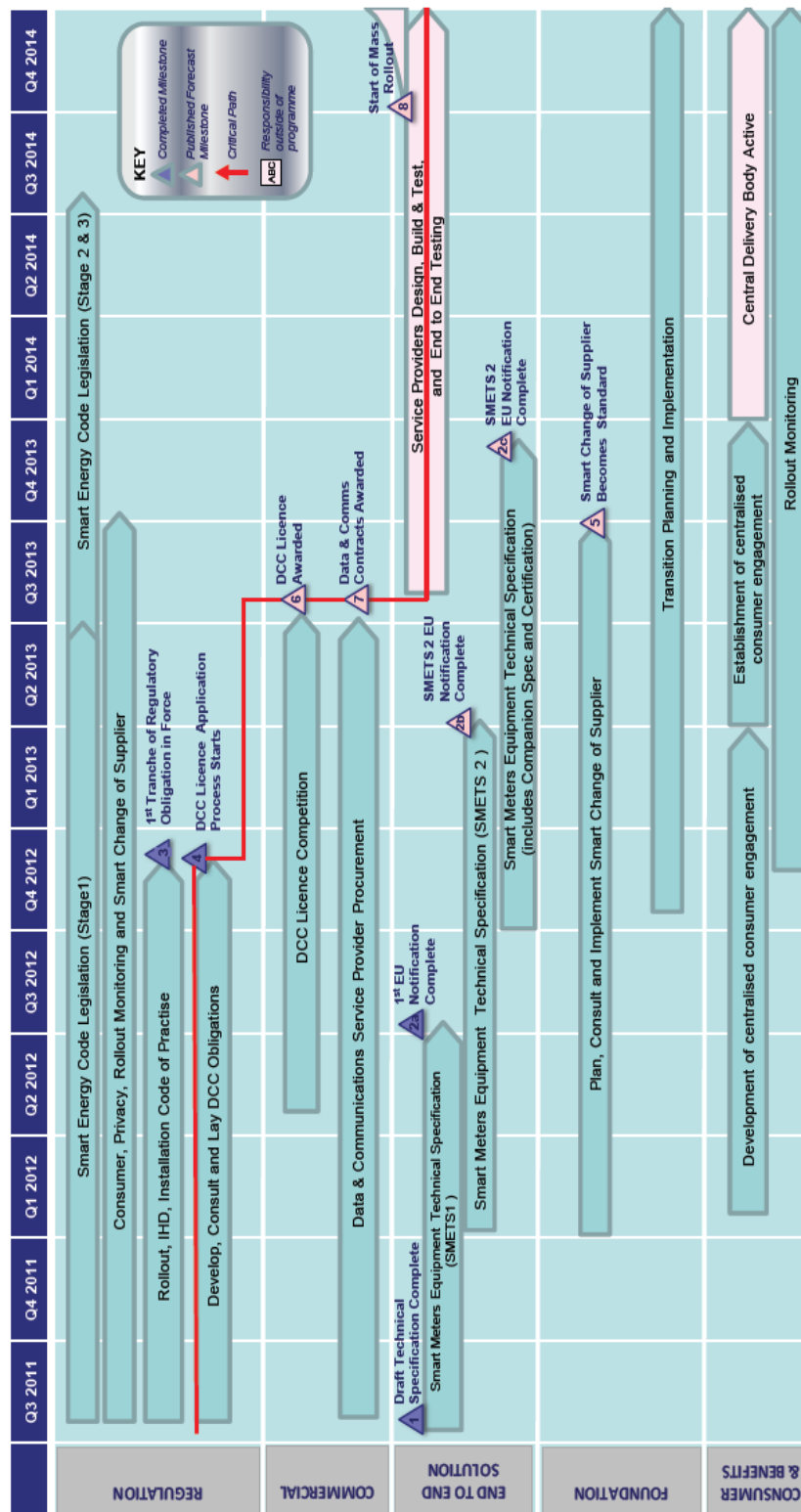
Figure 3. Smart Meter Rollout Programme Plan (DECC, 2012)[3].

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[3] Notes: As of end of December 2012 Adjustments to the roll out plan of about three months have been made to: 1) award of Data and Communications Company (DCC) Licence, 2) procurement activity for Data and Communications Service Providers, and 3) development of Smart Meter Equipment Technical Specifications. The contract and licence award dates have also moved from end of April 2013 to end of July

- Energy suppliers will use the DCC to collect meter readings remotely so that they can bill customers accurately;

- Network operators will use the meter data (on an aggregated basis) to manage demand and plan investment;

- When prepayment customers top-up, energy suppliers will update the meter via the DCC;

- Consumers can choose to give authorisation to third parties to access their meter data. For example, switching sites may offer to make tariff recommendations to consumers based on their energy consumption (DECC, 2012a).

The UK is running a competition to appoint the organisation that will hold the licence to be the DCC. The DCC will then appoint companies to provide smart metering data and communications services. To enable timely progress with smart meter roll-out, DECC is running procurement exercises to identify the DCC data and communications service providers, although it is the DCC that will sign and manage the contracts. The DCC licence holder is expected to be appointed mid-2013 and able to sign contracts with service providers shortly thereafter.
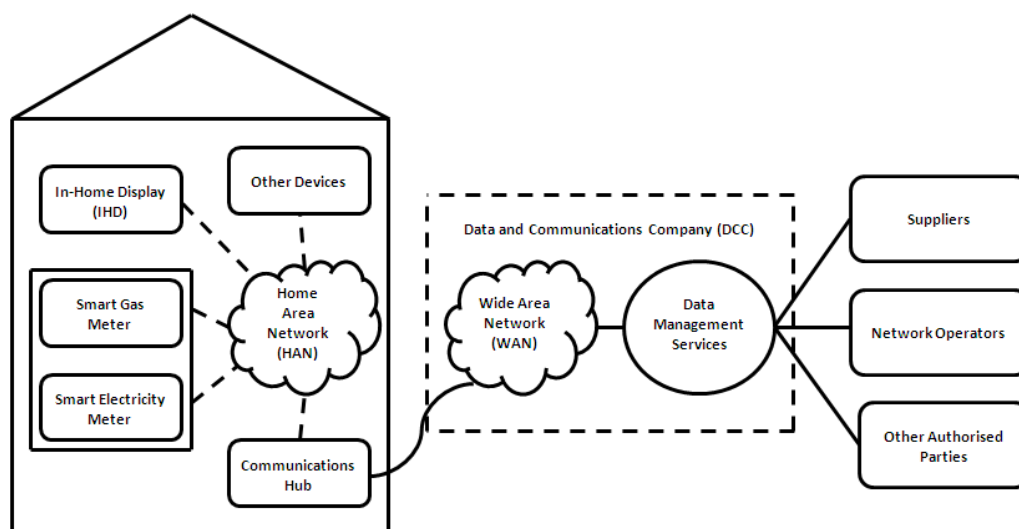
Figure 4. Smart Meter Design and Role of Data and Communications Company (DECC, 2012a)

- *Data Protection Act (1998 - Ongoing) -* The Data Protection Act 1998 establishes a framework of rights and duties which are designed to safeguard personal data. This act will apply in conjunction with the specific smart metering regime that the Government puts in place (see below).

- *Smart Metering Implementation Programme Data access and privacy consultation (2012) -* The government response to this consultation in December 2012 included a proposal to change the electricity and gas licensing conditions (for supply and distribution) as existing in Electricity Act 1989 and Gas Act 1986. The conclusion of this consultation will also be reflected in the upcoming Smart Energy code (see below). In addition, a Privacy Impact Assessment companion document was provided.

2013. The completion of the notification of the second technical specification to the EC was planned for December 2012 but has changed to around March 2013.

- *Smart Energy Code (2012 - Ongoing) -* On November 8, 2012, the government has issued a consultation on the draft legal text for stage 1 of the Smart Energy Code. The consultation has closed on January 7, 2013. The SEC will be a new multiparty agreement which will define the rights and obligations between the Data and Communications Company (DCC) and the users of its services and specify other provisions to govern the end-to-end management of smart metering (DECC, 2013).

3.3   Complimentary Impacts

3.3.1   EU Buildings

- *EU Directive on the Energy Performance of Buildings (EPBD, 2002/91/EC) (2002 – Ongoing)–* This Directive sets requirements for energy efficiency in building codes, including minimum energy performance requirements (MEPs) and energy certificates. A recast of the EPBD (2010/31/EU) was adopted in May 2010 to strengthen the energy performance requirements and to clarify and streamline provisions. Importantly, this directive encourages the introduction of intelligent metering systems whenever a building is constructed or undergoes major renovation. This directive will influence UK initiatives to increase the energy performance of buildings and will positively impact the viability of the SSH programme.

3.3.2   UK Heating and Cooling

- *Renewable Heat Incentive (RHI) (2011 - 2020) -* This scheme proposed in the NREAP administered by Ofgem began in 2011. The RHI targets uptake of heat technologies at all scales. First priority is large emitters in the industrial, public service, commercial and district heating sectors, which contribute 38% of CO_2 emissions. The government expects RHI to reduce carbon emissions by a 44 Mt by 2020. Only technologies with an existing commercial track record are eligible shown in Appendix 3. The RHI does not target innovations and does not directly impact on ICT enabled smart systems. However monitoring the effectiveness of most eligible technologies requires metering, which may influence the uptake of smart meters over time as economies of scale increase.

  In 2012, the UK announced support for a domestic RHI and is currently consulting on proposals for a domestic scheme under a second phase of the Renewable Heat Premium Payment scheme (RHPP[4]) with the intention of launching in summer 2013 (DECC, 2012b). It is not yet clear what technologies are eligible for the domestic RHI and may therefore be relevant for the SSH programme.

3.3.3   UK Buildings

- *The Green Deal and Energy Company Obligation (ECO) (2011 – 2018) –* These programmes focus on building insulation. The government is establishing the Green Deal framework to enable private firms to offer consumers energy efficiency improvements to their homes, community spaces and businesses at no up-front cost, and recoup payments through a charge

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[4] The Renewable Heat Premium Payment is a one-off grant designed to help towards meeting the costs of installing renewable technologies in your home, until the Renewable Heat Incentive (RHI) is introduced for domestic customers. The Renewable Heat Premium Payment scheme - Phase 2 will run from 1 May 2012 to 31 March 2013, subject to available funding (EST, 2013) URL: http://www.energysavingtrust.org.uk/Generating-energy/Getting-money-back/Renewable-Heat-Premium-Payment-Phase-2

in instalments on the energy bill. The Energy Act 2011 introduced powers alongside the Green Deal to require private landlords from 2016 to make energy efficiency improvements requested by tenants, and by 2018 to improve the least efficient properties ensuring a minimum energy efficiency rating of 'E' before they can be rented out or have carried out the maximum package of measures under the Green Deal and the Energy Company Obligation (ECO) if there are no net negative costs to landlords (IEA, 2012).

- *The Climate Change Levy (CCL) (2001 – Ongoing)* - Introduced in 2001, the CCL is a tax on energy for lighting, heating and power supplied to businesses and the public sector. Revenue from the levy is fed back to businesses through a 0.3% reduction in their national insurance contributions. From 1 April 2013 the CCL is 0.524 pence per kilowatt hour for electricity, 0.182 pence per kilowatt hour for natural gas[5] and 0.1429 pence per kilogram of coal[6] (HMRC, 2012). The CCL does not apply to taxable commodities supplied for use by domestic consumers or to charities for non-business use, and therefore may not directly impact the SSH programme as it targets domestic households. However the potential uptake of ICT technologies to promote energy efficiency in commercial buildings could potentially lower upfront costs for smart technologies more generally through economies of scale.

- *Climate Change Agreements (CCAs) (2012 - Ongoing)* - The CCAs are related to the CCL. They are voluntary agreements for energy-intensive industries offering up to 65% discount on the CCL, if companies meet targets on energy efficiency or carbon reductions. Renewable electricity suppliers are exempt from the CCL. CCAs have a two-tier structure: 1) sector-level agreements between DECC and the sector or trade association (known as umbrella agreements). These set out sector targets, the sector and DECC's obligations, and the procedures for administering the agreements and 2) individual agreements between DECC and the facility operator (known as underlying agreements). These set out the targets the facility needs to meet, the operator and DECC's obligations, and the procedures for administering the agreements. (DECC, 2012c). The CCA's potential impact on smart energy systems is linked to the CCL.

3.3.4 UK Power

These following mechanisms leverage financial incentives to reward long-term investment in grid networks. Grid operators that achieve set objectives in efficiency, reliability, environmental performance, and customer satisfaction will be rewarded with higher allowances. This is expected to spur investment capital for smart technologies (grid networks, smart metering, etc.) (KTN, 2011) and therefore have a complimentary impact on the SSH programme over the longer term:

- *RIIO (Revenue = Incentives + Innovation + Outputs) (2013 – 2021)* - Ofgem recently reformed its process for carrying out Price Control Reviews. Its new framework, RIIO aims to ensure that network companies, transmission and distribution play a greater role in shifting to a low carbon and secure energy system while providing long term value for money for existing and future consumers. The next transmission price control (RIIO-T1) period is 2013-2021 and business planning by the three TOs is well advanced. Ofgem recently launched the next distribution

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[5] Gas supplied by a gas utility or any gas supplied in a gaseous state that is of a kind supplied by a gas utility for burning in Great Britain (HMRC, 2012).
[6] Any other taxable commodities including coal and lignite; coke and semi-coke of coal or lignite, and petroleum coke (HMRC, 2012).

price control (RIIO-ED1) for 2015-2023 and draft business plans for all 14 distribution networks are expected in May 2013.

- *RIIO-T1* for transmission supports system balancing by requiring TOs to develop business cases for a longer time period looking out to 2050. Improved strategic investment planning can help TOs deliver a sustainable network where and when it is required (e.g. areas with increasing generation but limited existing network infrastructure). Through tools such as the uncertainty mechanisms within RIIO-T1, TOs are able to respond to changing demands on the network, for example bringing forward investment plans should generation wish to connect more quickly than anticipated.

- *RIIO-ED1* for distribution will also support system balancing. As with transmission, it will be important that the right network is delivered in the right places, including the potential need to support non-generation balancing tools. This might be through the use of smarter network technology to provide real-time information or connecting those tools to the network. A new, important consideration during the RIIO-ED1 process will be the active role that DNOs can play in helping to balance the system. Traditionally, distribution networks have had a very passive role in balancing the electricity system. This is expected to change in the future with increased levels of distributed generation and two-way electricity flows (IEA, 2012).

3.3.5 UK Transport

While transport does not directly feature in the SSH programme, the electrification of transport through electric vehicle charging at home and additional infrastructure build will impact on home energy demand and the grid. ICT enabled energy systems can help manage this additional demand. These key UK policies are therefore seen as complimentary to the future viability of the SSH programme:

- *Plug-in Car Grant (2011 – Ongoing) -* The plug-In car grant commenced in January 2011 to help both private consumers and businesses purchase an electric, plug-in hybrid or hydrogen fuelled car. Buyers are able to receive a grant of 25% off the cost of a car up to value of £5000 and 20% off the cost of a van up to a maximum of £8,000 (DfT, 2013)

- *Plugged in Places (2011 – 2013) -* In support of the Plug-in Car Grant, this UK framework provides around £25 million through the Plugged-In Places programme to install charging infrastructure in eight cities around the country by March 2013. From 2011, DfT offers match-funding to support installation of electric vehicle recharging infrastructure in pilot areas across the UK. This policy aims to develop infrastructure and collect data on how drivers use and recharge to inform development of a national recharging infrastructure system7 (Ofgem, 2011).

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[7] Three Plugged-In Places in London, Milton Keynes and the North East are already installing recharging points in their areas. In December 2010, funding for five additional Plugged-In Places projects in Northern Ireland, Scotland, Greater Manchester, the Midlands and the East of England was announced (DfT, 2013).

4   Conclusions

4.1   Summary of Key Impacts on SSH

4.1.1   Electricity and Gas Distribution

Overarching EU and UK policy frameworks support deployment of smart energy systems that can improve system performance (efficiency, stability and carbon reduction). SSH stands to benefit from the current policy environment. However, energy security and climate change policy are not always aligned and consideration should be given to how they are deployed at the household level. The most relevant for SSH is how gas and electricity distribution is regulated.

In 2009, the EU Third Package for liberalization of energy markets was legislated in Directives for electricity (2009/72/EC) and for gas (2009/73/EC). However, there is a greater policy emphasis on smart metering for electricity than for gas. Currently, if economic benefits can be shown, member states are required to deploy smart meters over a 10-year time horizon and ensure 80% of consumers are equipped by 2020. However, if smart metering for gas is also shown to be economically beneficial only a timetable for deployment is required, with no binding targets for market penetration.

UK Climate Change Policy encourages electrification of heat. But modifications in electricity and gas distribution licenses are legislated under the Energy Act (2008), which can direct license holders to install smart meters for private households. This is currently being consulted on as part of the UK Smart Meter Programme and would improve the cost/benefit for SSH deployment. SSH should monitor the consultation process on the regulatory obligations of license holders as part of the roll out programme and seek to align the SSH programme with these initiatives.

The design and delivery of SSH will also have to consider how end use changes over time. Currently, UK domestic heating is provided mainly through gas. But if heating becomes increasingly electrified to meet UK Climate targets, SSH will have to account for different future scenarios of gas and electric home heating, how policies currently focus on smart metering electricity over gas, and how that may, or may not change in the future.

4.1.2   Technical Standards

In 2012, The EU (Mandate 490/441/468) produced common technology standards for a smart network infrastructure to be applied across Europe. The aim was to produce standards detailed enough to ensure interoperability but maintain a degree of flexibility for Member States due to different technical requirements. These standards do not directly cover building and industry appliances but do cover how they interface with smart network architecture. It will be important for SSH to consider how technical standards are updated to future changes in appliances and interfaces, since this will impact building performance and therefore the design and delivery of SSH.

EU smart network standards have been aligned with Directive 2004/22/EC on measuring instruments which establishes technical requirements for smart metering appliances[8]. But Directive 2004/22/EC only includes regulations covering the process until the metering device is offered on market or brought into operation. National legislation is then responsible for end use. This includes further requirements during the lifetime of the meter, including calibration, tolerance, etc.

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[8] It contains technical provisions for metering devices for electricity, gas, water, other liquids, heat meters, scales, etc.

Standardization of network architecture, meters and interfaces is beneficial for SSH since there are agreed upon technical standards to refer to during design, and a framework in place to ensure interoperability which will streamline deployment and reduce costs. However, SSH will have to ensure that technical standards for future devices and interfaces are aligned between the EU and UK. Additionally, SSH will have to carefully monitor the development of UK legislation that governs smart meter end use and how that will influence design of use cases and future deployment.

Work is now being done on technical standards, changes to the gas and electricity codes, and various consumer issues, for example, what companies can do during installation visits. There are already obligations to allow energy companies to replace meters on a regular basis on safety grounds and to ensure they continue to measure accurately. DECC is working with suppliers to establish criteria that will determine when they will be obliged to install or replace any meters with one that meets the technical specifications of smart meters. This is expected to be completed at the time mass roll-out begins in 2014.

4.1.3   Data and Privacy

The UK has acknowledged positive consumer engagement as crucial for success of the smart meter roll out, and has implemented programs to promote consumer knowledge and awareness. In the Netherlands, privacy concerns led to a serious delay in the 2009 smart meter roll-out scheme where mandatory smart metering deployment was rejected by the Dutch Senate. The renewed government proposal was forced to lessen the requirement for mandatory smart metering installation and to allow consumers to decide against smart metering. The revised legal framework from 2010 stipulated only a voluntary roll-out with various options for consumers to protect their data.

Personal data is protected by EU privacy law set by Directives 95/46/EC and 2002/58/EC. However, special attention will have to be given to smart metering as the amount of personal data collected is much greater than ever before. The UK is now developing a regulatory framework to ensure privacy standards and access rights are in place before the 2014 smart meter roll-out. The UK is currently running a competition to appoint the license holder for the Data and Communications Company (DCC). This will be a new licensed entity, regulated by Ofgem enabling energy suppliers, network operators and other authorised parties (e.g. energy service companies or switching sites) to transfer data over a communications network remotely and securely. The DCC will not itself store any data, but it will control access to smart metering data by others, as permitted by the regulatory framework. SSH will have to carefully monitor this development since any major delays in the smart meter programme due to privacy concerns will likely impact the viability of SSH in the short to medium term (2014 – 2018).

4.1.4   Building and Heating

Various EU and UK building and heating policies can positively impact the viability of SSH. The EU Directive on the Energy Performance of Buildings (2010/31/EU) specifically promotes smart metering for new buildings and major renovations. The current UK Renewable Heat Incentive (RHI) only targets uptake of heat technologies for non-domestic heating. But the UK intends to launch a domestic RHI is in the summer of 2013 which will be more relevant for SSH. While these policies do not directly target new innovations, they do require advanced metering to monitor the effectiveness of eligible proven technologies (Appendix 3). This may influence the uptake of smart meters and smart network architecture over time as economies of scale increase and positively impact the longer term viability of SSH (2020 – 2050).

Other UK building policies that may impact SSH include the Green Deal and Energy Company Obligation (ECO) which helps private firms offer consumers energy efficiency improvements to homes at no up-front costs. And from 2016 private landlords are required to improve building insulation as requested by tenants. Additional insulation will impact the design specifications of the SSH programme in terms of energy requirements for space heating and should be accounted for in use case scenarios.

4.1.5 Power Systems

The UK has implemented policy to reward long-term investment and performance of grid networks. Ofgem has reformed its' Price Control Reviews with a new framework called RIIO (Revenue = Incentives + Innovation + Outputs). RIIO aims to ensure that network companies, transmission and distribution play a greater role in shifting to a low carbon and secure energy system while providing long term value for money for existing and future consumers. Grid operators that improve efficiency, reliability, environmental performance, and customer satisfaction will be rewarded with higher allowances. This is expected to spur investment capital for smart technologies (grid networks, smart metering, etc.) and positively impact the medium to long term viability of SSH (2015 – 2030).

4.1.6 Policy Time Scale Implications

Figure 5 shows the time horizon over which each policy evaluated is in effect. The policies are grouped by their impact categories including: 1) cross cutting, 2) direct, 3) complimentary and 4) uncertain. If we assume that full deployment of the SSH programme is between 2015 – 2020 all of the identified direct and complimentary policies will be in effect except for the UK Low Carbon Network Fund that ends in 2015 and the UK Plugged in Infrastructure funding which ends this year. However, if the SSH programme is delayed until after 2020 a number of policy initiatives will no longer be in effect and not support longer term viability of the SSH programme. This policy framework provides a reference point revaluate future policies against SSH programme objectives.
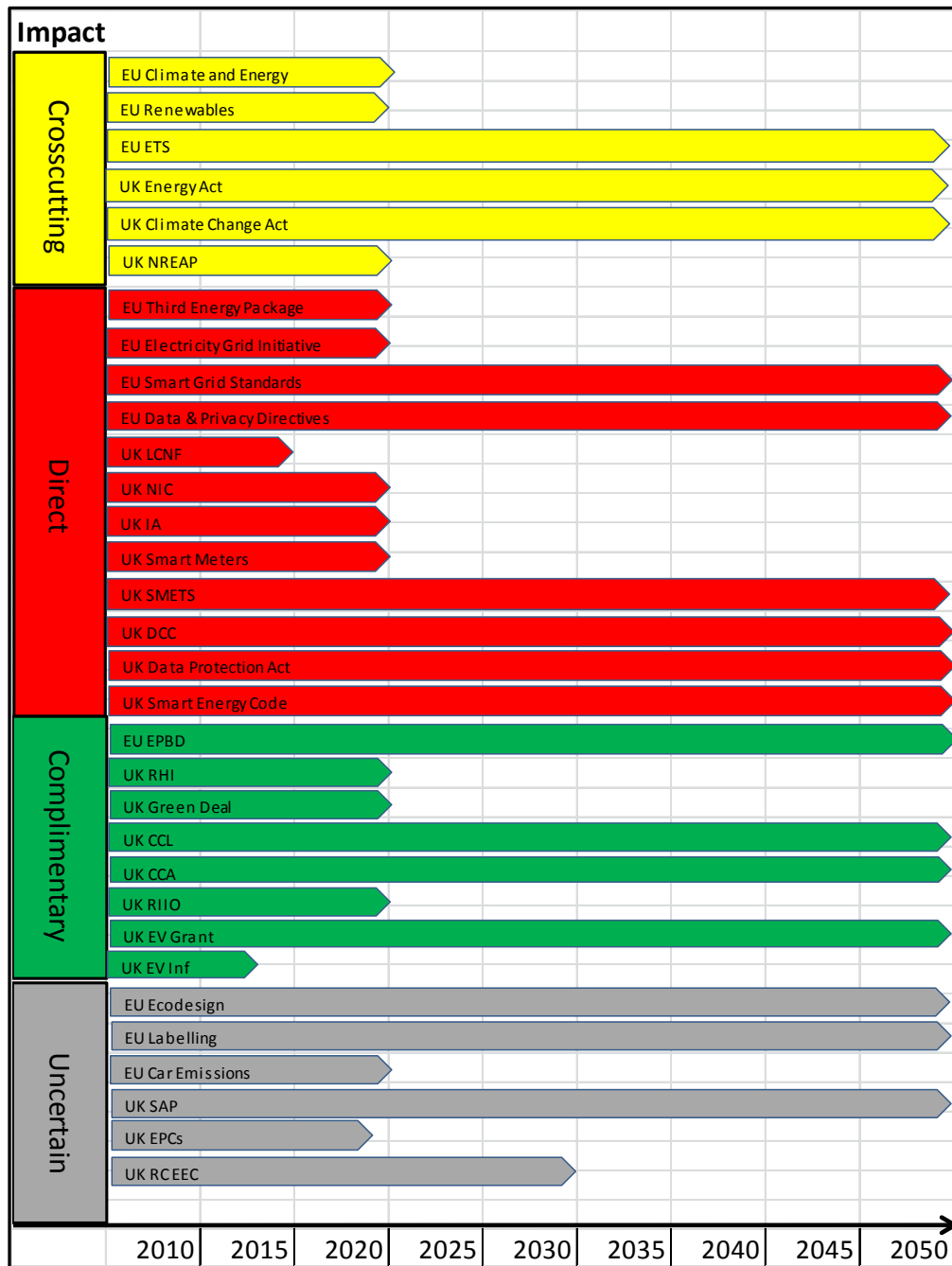
Figure 5. Policy time horizon by impact categories

4.1.7 Meeting Acceptance Criteria

The following acceptance criteria were set out by the ETI for this deliverable:

- Review and analysis of industry and government literature focusing on UK and EU directives, protocols, and policy influencing delivery of SSH;

- Analysis of the implications of EU/UK regulation including assessing potential change to ICT requirements and design, including identifying potential barriers to implementation of SSH

- Identifies issues that should be considered in the timeframe of the overall Programme and any future cost/timescale implications to a UK wide system implementation

Figure 6 provides a visual summary of key impacts on SSH depicting how the acceptance criteria have been met including highlighting key policies and the relative interactions and size of policy impacts on the SSH programme.

Figure 6. Relative Policy interactions and impacts on SSH programme. Larger size of sphere indicates greater impacts, closer to SSH centre indicates greater certainty of impact, intersection of spheres indicates important policy interactions but does not preclude other interactions.
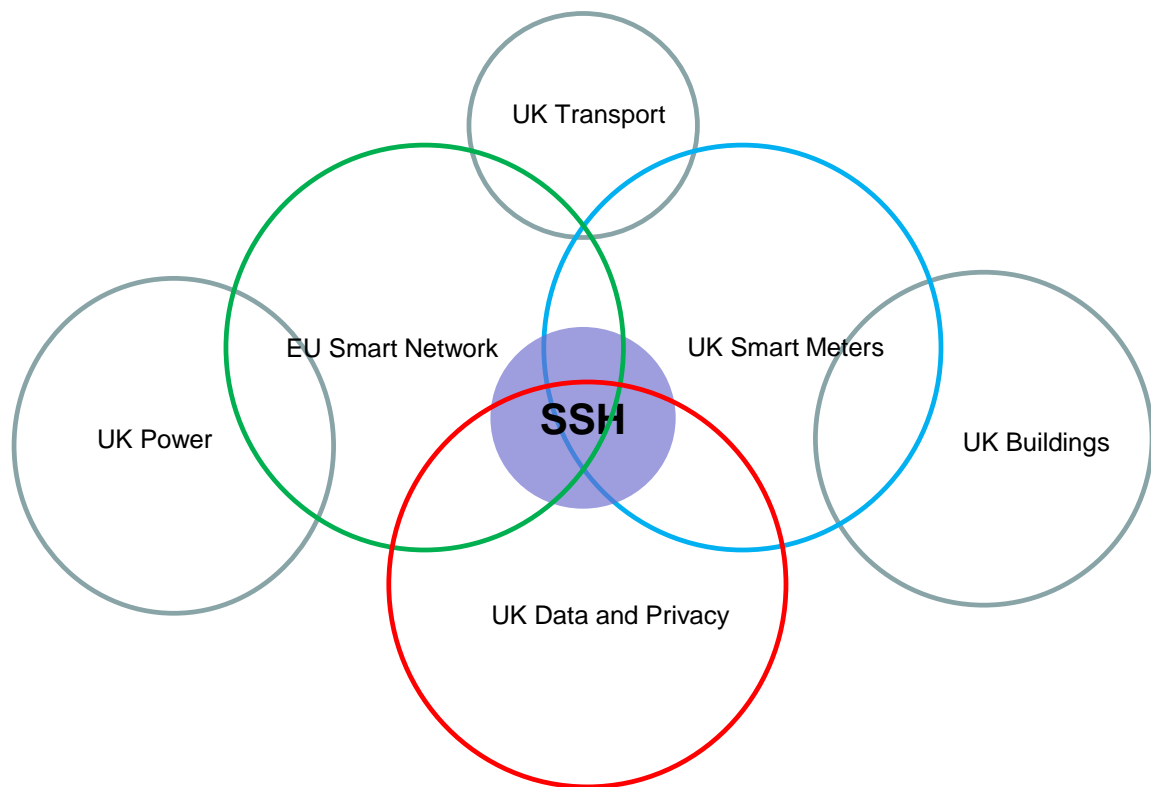
Figure 6 can be summarized as follows:

- A major impact on SSH is the potential success or failure of the UK smart meters programme where mass rollout from 2014 – 2019 directly overlaps with SSH implementation. The success of this program is contingent on both EU network standards, and UK data and privacy concerns shown by the other major overlapping spheres.

- The other major impact on SSH is EU technical standards for smart networks, which also sets mandates for how smart meters interface with the network and will impact the UK smart meter programme. SSH will have to monitor UK development of smart meter standards and how this may be influenced by EU mandates over the short and medium term (2013 – 2020).

- Another major impact on SSH is data and privacy concerns over mandatory smart meter roll out which is being vetted through 1) public consultation, 2) procurement of the DCC, and 3) legislation of the Smart Code. ETI will have to carefully monitor the outcome of these processes and make a strategic decision whether or not to align itself with the UK smart meter programme based on its potential success for mass roll out in 2014.

- SSH will also have to consider how energy end use changes over a longer time horizon, specifically the future split between electricity and gas and how this will be influenced by changes in the policy landscape. This is shown by the interconnecting spheres of UK transport, buildings and power on the periphery but still important to monitor over the longer term (2020 – 2050). There are also specific policies in place in each of these domains that may support SSH in the near term (2013 – 2020) that should be monitored including the domestic RHI, Ofgem's new price control review (RIIO) and capital incentives for electric vehicles.

- In terms of policy timing issues, if SSH is deployed between 2015 – 2020 all of the identified direct and complimentary policies will be in effect except for the UK Low Carbon Network Fund that ends in 2015 and the UK Plugged in Infrastructure funding which ends this year. However, if the SSH programme is delayed until after 2020 a number of policy initiatives will no longer be in effect and not support longer term viability of the SSH programme (Figure 5).

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Appendix A

A.1 Uncertain Impacts

A.1.1 EU Energy Products

The impacts of EU product policy on the SSH programme is uncertain since the review has not identified UK policy that has directly responded to these related to domestic energy use. However they have been flagged since in principle there may be implications for the SSH if product policy overlaps with ICT components or interfaces deployed at the household level.

- *Directive for Setting Ecodesign Requirements for Energy-related Products (Ecodesign, 2009/125/EC) (2009 – Ongoing) -* The recast Directive Establishing a Framework for Setting Ecodesign Requirements for Energy-related Products (Ecodesign, 2009/125/EC) aims to improve energy efficiency throughout a product's life cycle. It applies to products that use energy and to products that have an impact on energy use, such as building components. Product-specific standards will be set by EU regulations based on the directive.

- *Energy Labelling Directive (2010/30/EU) (2010 – Ongoing) –* These Requirements for energy labelling of household appliances are based on several directives adopted over the past two decades. The recast of the Energy Labelling Directive (2010/30/EU) expands the mandatory labelling requirement to cover commercial and industrial appliances and also energy-related appliances; product specific labelling standards are set up under this directive.

A.1.1 EU Transport

EU Regulation 443/2009 (2015 – 2020) - Recent EU transport policies aim to reduce CO_2 emissions from new passenger cars. In May 2009, the EU adopted Regulation 443/2009 to reduce CO_2 emissions from new passenger cars to reach a fleet average of 130 grams CO_2 per kilometre (g CO_2 per km) by 2015. From 2020, this limit will be 95 g CO_2 per km. The regulation will be complemented by measures[9] to further cut emissions by 10 g CO_2 per km. A similar type of regulation for new vans was adopted in May 2011 (Regulation 510/2011) (Ofgem, 2011)). These policies target overall fleet efficiency. While in principle it may spur deployment of electric vehicles over the long term it is highly uncertain how car manufacturers will respond since these standards could be met to some degree by increasing efficiency from conventional vehicles. The longer term impact on the SSH is highly uncertain.

A.1.2 UK Data, Information, Privacy

Standard Assessment Procedure (SAP) (2001 – Ongoing) – SAP is DECC's methodology for assessing and comparing the energy and environmental performance of dwellings. Its purpose is to provide accurate and reliable assessments of dwelling energy performances that are needed to underpin energy and environmental policy initiatives including:

- The Buildings Regulations for England and Wales and the Devolved Administrations relating to the conservation of heat and power, where SAP is the method specified for assessing compliance;

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[9] Complementary measures include efficiency improvements for car components with the highest impact on fuel consumption, and a gradual reduction in the carbon content of road transport fuels.

- HM Treasury's Stamp Duty exemption for zero carbon homes, for this purpose the SAP model was extended to include appliance energy use;

- National Calculation Methodology, as specified by the Energy Performance of Buildings Directive, SAP was used to produce Energy Performance Certificates;

- Local Authority stock reporting, etc.

SAP quantifies a dwelling's performance in terms of: energy use per unit floor area, a fuel cost based energy efficiency rating (the SAP rating) and CO_2 emissions. These indicators of performance are based on estimates of annual energy consumption for the provision of space heating, domestic hot water, lighting and ventilation. Other SAP outputs include estimate of appliance energy use, the potential for overheating in summer and the resultant cooling load. While SAP is a compliance tool it may compliment the implementation of ICT systems more generally since the underpinning information, product performance and relevant data that SAP relies upon must be produced to a high level of accuracy and reliability. However, its direct impact on deployment of SSH is uncertain but should be monitored over time (DECC, 2013c).

A.1.3 UK Buildings

- *Energy Performance Certificates (EPCs) (2008 - 2018)* - EPC's are required of a sale, rent or construction of a building. The EPC scheme, an obligation under EU Directive 2006/32/EC is fully implemented and includes an A to G rating of the buildings performance together with recommendations for cost-effective action to improve building efficiency and links to sources of advice (IEA, 2012). These are more of a communication based device to improve the quality of information for consumers and may indirectly influence understanding surrounding smart energy systems. The likely impact upon SSH however is uncertain.

- *Reduction Commitment Energy Efficiency Scheme (RC EEC) (2010 – 2030) - Established* in 2010 under the 2008 Climate Change Act, the scheme covers emissions by firms and public bodies not already subject to the EU system or substantially covered by other agreements. It comprises reporting requirements and a carbon levy. There are also several policies to promote energy efficiency in residential buildings (IEA, 2012). In 2012, DECC undertook a consultation on proposals to simplify the Scheme. Under the new proposals, participants will benefit from: 1) reduced complexity, greater business certainty, and less overlap with other schemes; 2) a 55% reduction in administrative costs, which equates to £272m up to 2030; 3) clearer rules to incentivise the adoption of cost-cutting energy efficiency measures. The Government will now lay an Order before Parliament and the Devolved legislatures, with the Order intended to come into force on 1st June 2013. The majority of the proposals set out in the Government Response will then be introduced at the start of the second phase, in 2014/15. The scheme features a range of reputational, behavioural and financial drivers which aim to encourage organisations to develop energy management strategies that promote a better understanding of energy usage (DECC, 2013c). The scheme may indirectly encourage the uptake of energy saving technologies, but it is not clear how it would specifically impact upon the SSH programme at this time.

Appendix B

B.1   Current legal inputs that intersect with Smart Grid Standardization EU Mandate 490/441/468

Directive 2004/22/EC on measuring instruments (MID);
Standardisation Mandate M/374 of 20th October 2005 as base for developing standards for utility meters;
Directive 2006/32/EC on energy end-use efficiency and energy services
Directive 2004/8/EC for the promotion of cogeneration in the internal energy market
Renewables Directive (2009/28/EC, Art16)
Directives 2009/72/EC and 2009/73/EC ('Third Energy Package')
Standardization Mandate M/441 of 12th March 2009 on development of an open architecture for utility meters
Standardization Mandate M/468 of 29th June 2010 concerning the charging of Electric vehicle
European Convention for the Protection of Human Rights and Fundamental Freedoms (ECHR)
The Treaty on European Union (TEU, art. 6) Data Protection Directive (Directive 95/46/EC)
Directive 2002/58/EC of the European Parliament and of the Council of 12 July 2002 concerning the processing of personal data and the protection of privacy in the electronic communications sector (Directive on privacy and electronic communications) as amended by Directive 2009/136/EC (November 25, 2009)
Data Retention Directive, (Directive 2006/24/EC) – (telecommunications data)
Directive on a Community framework for electronic signatures (1999/93/EC December 13, 1999)
Regulation (EC) No 2006/2004 on cooperation between national authorities responsible for the enforcement of consumer protection law
Directive 2004/108/EC on Electromagnetic Compatibility
Directive 1999/5/EC on Radio and Telecommunications Terminal Equipment
Communication COM (2010)245 on a Digital Agenda for Europe (EC, 2011)

Source: European Commission, 2011

Appendix C

C.1 Technologies and tariffs under the Renewable Heat Incentive

Levels of support					
Tariff name	Eligible technology	Eligible sizes	Tariff rate (pence/ kWh)	Tariff duration (Years)	Support calculation
Small commercial biomass	Solid biomass including solid biomass contained in Municipal Solid Waste and CHP	Less than 200 kWth	Tier 1: 7.9 Tier 2: 2.0	20	Metering. Tier 1 applies annually up to the Tier Break, Tier 2 above the Tier Break. The Tier Break is: installed capacity x 1,314 peak load hours, i.e.: kWth x 1,314
Medium commercial biomass		200 kWth and above; less than 1000 kWth	Tier 1: 4.9 Tier 2: 2.0		
Large commercial biomass		1000 kWth and above	1.0		Metering
Small commercial heat pumps	Ground-source heat pumps; Water-source heat pumps; deep geothermal	Less than 100 kWth	4.5	20	Metering
Large commercial heat pumps		100 kWth and above	3.2		
Solar collectors	Solar collectors	Less than 200 kWth	8.5	20	Metering
Biomethane and biogas combustion	Biomethane injection and biogas combustion	Biomethane all scales, biogas combustion less than 200 kWth	6.8	20	Metering

Source: DECC, 2012b

Appendix D

D.1 Long List of UK / EU directives, protocols and legislative initiatives

In accordance with the acceptance criteria, a long list of all UK / EU directives, protocols, and legislative initiatives that may impact or act as a constraint on the implementation of SSH was compiled. The final decision of which policies to highlight in the final report is based on further analysis of the policy long list (i.e. policies are no longer active or deemed highly relevant) and internal review with CTs and the Project Manager.

D.1.1 United Kingdom

Energy Act 2004 - The government policy is to ensure that the United Kingdom's energy supplies are of the right quality, reliable, secure and can provide for future demand. Ensuring that energy supply is secure means working both in the short term, so as to minimise the risks of any unplanned interruptions, and in the long term, by having the right policies in place. This includes policies that encourage: 1) open, transparent energy markets, both domestically and internationally; 2) diverse energy sources; 3) international energy dialogue; and 4) timely and accurate information to the market.

Energy Bill 2012 - Aims to closing a number of coal and nuclear power stations over the next two decades, to reduce dependence on fossil fuels and has financial incentives to reduce energy demand. Government climate change targets are to produce 30% of electricity from renewable sources by 2020, to cut greenhouse gas emissions by 50% on 1990 levels by 2025 and by 80% on 1990 levels by 2050

UK Climate Change Act 2008 - The United Kingdom has a unilateral legally binding target to reduce greenhouse gas emissions by at least 80% of 1990 levels by 2050. The target was set as part of the 2008 Climate Change Act. The 2050 target is to be delivered through Carbon Budgets which limit UK emissions over successive five-year periods. The Act also set up an expert body, the Committee on Climate Change, to advise the government.

The Climate Change Levy (CCL) - Introduced in 2001, the CCL is a tax on energy for lighting, heating and power supplied to businesses and the public sector. Revenue from the levy is fed back to businesses through a 0.3% reduction in their national insurance contributions. From 1 April 2011 the CCL is GBP 4.85 per MWh for electricity, GBP 1.69 per MWh for natural gas and GBP 13.21 per tonne for coal.

Climate Change Agreements (CCAs) - The CCAs (2001) are voluntary agreements for energy-intensive companies and offer up to an 80% discount on the CCL, if the companies meet targets on energy efficiency or emissions reduction. Renewable electricity suppliers are exempt from the CCL.

Carbon Emissions Reduction Target (CERT) - Established in 2008, CERT follows on from the Energy Efficiency Commitment (EEC). It obliges large energy suppliers to help households reduce their carbon emissions. The companies meet this obligation mainly through the promotion (typically free and subsidised offers) of insulation, lighting and other energy efficiency measures.

Community Energy Saving Programme (CESP) - Established in 2009 to complement CERT, the scheme achieves aims of both carbon reduction and addressing fuel poverty by requiring energy

suppliers to achieve 19.25 Mt CO2 lifetime savings in the most deprived areas of England, Scotland and Wales, promoting area-based and whole-house approaches to energy efficiency improvements.

Reduction Commitment Energy Efficiency Scheme (CRC EES) - Established in 2010 under the 2008 Climate Change Act, the scheme covers emissions by firms and public bodies not already subject to the EU system or substantially covered by other agreements. It comprises reporting requirements and a carbon levy. There are also several policies to promote energy efficiency in residential buildings.

National Renewable Energy Action Plan (NREAP) - EU directive obliges member states to develop a National Renewable Energy Action Plan (NREAP). The recent Renewable Energy Review, conducted by the Committee on Climate Change for the government and published in May 2011, concluded that renewable energy could cover 30% to 45% of all UK energy requirements by 2030. This focuses on removing non-economic barriers to renewable energy, centring on a number of key actions: 1) Providing grid access to the backlog of 5.5 GW of consented projects waiting for a grid connection, 2) Reducing investor risk through the maintenance of stable long-term support for renewables in the face of reform of the Renewables Obligation, 3) the establishment of a replacement/parallel support model based on feed-in tariffs (for large-scale projects) and other scheduled reforms of the electricity market.

The Green Deal and Energy Company Obligation (ECO) - The government programmes for tackling the insulation challenge. The government is establishing the Green Deal framework to enable private firms to offer consumers energy efficiency improvements to their homes, community spaces and businesses at no up-front cost, and recoup payments through a charge in instalments on the energy bill.

Energy Performance Certificates (EPCs) - EPC's are required of a sale, rent or construction of a building. The EPC scheme, an obligation under EU Directive 2006/32/EC, is fully rolled out and includes an A to G rating of the buildings performance together with recommendations for cost-effective action to improve building efficiency and links to sources of advice.

The Warm Front Scheme - The Warm Front scheme launched in 2000 in England provides eligible low-income households occupying low-efficiency homes with efficient heating systems, insulation, and draught proofing. Since its launch in June 2000, the scheme has assisted over 2.2 million households in England, with an average potential saving of over GBP 650 per year per household during the lifetime of the scheme.

Carbon Emissions Reduction Target and the Community Energy Savings Programme - These two measures are planned to be replaced by the ECO Affordable Warmth target. The target is intended to improve solid wall properties, which have not benefited much from previous schemes. As well as saving carbon, it is intended to improve the ability of the vulnerable and those on lower incomes to heat their homes affordably.

Low Carbon Buildings Programme – This ran from 2006 to 2010, consisted of grants for micro-heat systems amounting to about GBP 131 million for around 20 000 projects.

The National Renewable Energy Action Plan (NREAP) - NREAP targets 31% of electricity from renewables by 2020, of which 2% is to come from small-scale projects. The NREAP mentions plans to review the RO and Renewable Transport Fuels Obligation, and raises the possibility of a

move to a feed-in tariff (FiT) scheme for new large-scale electricity projects. Discussions on the design of this FiT are on-going, with a proposal for a long-term "contracts for difference" (CfD) model. The final model is expected to be launched in 2014.

Renewables Obligation (RO) - Since 2002, the principal renewable energy policy measure in the electricity sector has been the Renewables Obligation (RO), which is administered by the Gas and Electricity Markets Authority (GEMA) through Ofgem. The RO obliges suppliers to source an annually increasing proportion of their electricity from renewable energy sources. The obligation for the 2010/11 period was 11.1%.

Electricity Market Reform (legislation enacted in 2013) - The EMR proposes a transitional, targeted intervention to rapidly restructure the technology mix while simultaneously maintaining security of supply. In many respects it represents a fundamental departure from the market-based principles that have underpinned UK energy policy over the last two decades, reflecting concerns that market-based incentives may not be sufficient on their own to meet the government's electricity security and decarbonisation goals.

RIIO (Revenue=Incentives+Innovation+Outputs) - Ofgem recently reformed its process for carrying out Price Control Reviews. Its new framework, RIIO (Revenue = Incentives + Innovation + Outputs) aims to ensure that network companies, transmission and distribution, play a full role in the move towards a sustainable low carbon and secure energy system while providing long term value for money for existing and future consumers. The next transmission price control (RIIO-T1) period is 2013-2021 and business planning by the three TOs is well advanced. Ofgem recently launched the next distribution price control (RIIO-ED1) for 2015-2023 and draft business plans for all 14 distribution networks are expected in May 2013.

A renewable heat premium payment (RHPP) - Administered by the Energy Saving Trust, has been in place since 1 August 2011 and will run until 31 March 2012. It consists of grants for domestic heat consumers to help in the installation costs of solar water heaters, heat pumps (air/water/ground-sourced) and biomass boilers. Grants range from GBP 300 to GBP 1 250. Total funding amounts to GBP 15 million.

Renewable Heat Incentive (RHI) - The RHPP is the precursor to the Renewable Heat Incentive (RHI) scheme, which was proposed in the NREAP and opened for applications in late November 2011. The RHI is a far broader instrument, targeting the full range of heat technologies and applications at all scales. The first priority is large emitters in the industrial, public service, commercial and district heating sectors, which together contribute some 38% of CO2 emissions.

Smart Meters (2014) - Smart meters are being installed in two phases; the Foundation Stage and mass roll-out. During the Foundation Stage, which began in April 2011, the government is working with industry, consumer groups and other stakeholders to ensure that all the necessary groundwork is completed for mass roll-out. The government expects the mass roll-out to start in 2014 and to be completed in 2019. The roll-out of smart meters will be undertaken by energy supply companies, and will involve replacing around 53 million gas and electricity meters in more than 30 million homes and businesses.

Data Protection Act (1998 - Ongoing) - The Data Protection Act 1998 establishes a framework of rights and duties which are designed to safeguard personal data. This act will apply in conjunction with the specific smart metering regime that the Government puts in place (see below).

Smart Metering Implementation Programme Data access and privacy consultation (2012) - The government response to this consultation in December 2012 included a proposal to change the electricity and gas licensing conditions (for supply and distribution) as existing in Electricity Act 1989 and Gas Act 1986. The conclusion of this consultation will also be reflected in the upcoming Smart Energy code (see below). In addition, a Privacy Impact Assessment companion document was provided.

Smart Energy Code (2012 - Ongoing) - On November 8, 2012, the government has issued a consultation on the draft legal text for stage 1 of the Smart Energy Code. The consultation has closed on January 7, 2013. The SEC will be a new multiparty agreement which will define the rights and obligations between the Data and Communications Company (DCC) and the users of its services and specify other provisions to govern the end-to-end management of smart metering (DECC, 2013).

Vehicle Emissions - Several measures have been adopted to improve more efficient energy use in transport. The efficiency of new vehicles will be improved through EU regulations. From 2015, new passenger cars sold in the EU may not emit more than 130 grams of CO_2 per kilometre. There is a further provisional longer-term target of 95 g CO_2 per km by 2020, representing a 40% reduction on 2007 levels. For new vans, these mandatory limits are 175 g CO_2 per km from 2017. A limit of 147 g CO_2 per km by 2020 has also been specified, representing a 28% reduction on 2007 levels.

The vehicle excise duty (VED) and company car tax - The vehicle excise duty (VED) and company car tax, although primarily fiscal policy instruments encourage the development and purchase of fuel-efficient vehicles in the United Kingdom, as their structure is based on CO_2 emissions.

The Plug-In Car Grant - The plug-In car grant commenced in January 2011 to help both private consumers and businesses purchase an electric, plug-in hybrid or hydrogen fuelled car. Buyers are able to receive a grant of 25% of the vehicle price, up to a value of GBP 5 000. In June 2011, the government published its Infrastructure Strategy for the development of recharging infrastructure in the United Kingdom. In support of this, around GBP 25 million will be provided through the Plugged-In Places programme to install charging infrastructure in eight cities around the country by March 2013.

Voluntary Labelling Scheme - The United Kingdom also has a voluntary labelling scheme for new car fuel economy which helps consumers to compare carbon emissions, fuel costs and vehicle tax for different cars. Over 90% of new car dealerships use the label. Following the success of this scheme, the United Kingdom's used car fuel economy label was launched in 2009 with support from dealerships, manufacturers, the Low Carbon Vehicle Partnership and the government. To date over quarter of a million labels have been circulated into the used car market and nearly 2 000 used car dealers have signed up to this voluntary scheme.

Eco-driving - This was introduced as part of driving licence tests in 2008. EU regulations to lower rolling resistance and maintain appropriate tyre inflation pressure through mandatory fitting of tyre-pressure monitoring systems will apply to all new cars from 2014.

Green Bus Fund - Low-carbon public transport is also being encouraged through the Green Bus Fund, where funding of almost GBP 47 million is expected to introduce around 550 new low carbon buses across England. Low-carbon buses use at least 30% less fuel and emit nearly a third less carbon than a conventional bus.

Bio-Energy Capital Grants Scheme (BECGS) - The BECGS began in 2002, and the sixth round closed in April 2010. It provided capital grants to all sizes of biomass-fuelled heat and CHP plants in England. The level of the grant was 40% of the additional capital costs compared to a fossil fuel alternative.

Bioenergy Infrastructure Scheme - From 2004, the Bioenergy Infrastructure Scheme supported the biomass supply chain for electricity, heat and CHP producers. The most recent round, its third, closed in February 2010. It targeted small and medium-sized producers in England that supply end-users in Great Britain.

D.1.2   European Union

Directive on Energy End-Use Efficiency and Energy Services (2006/32/EC) - The United Kingdom's energy efficiency policies are guided by several EU regulations and directives. The Directive on Energy End-Use Efficiency and Energy Services (2006/32/EC) seeks to encourage energy efficiency through the development of a market for energy services and the delivery of energy efficiency programmes and measures to end-users. The directive requires member states to create national energy efficiency action plans and to meet an indicative target to reduce final energy use in the sectors outside the EU-ETS by 9% from the early 2000s to 2016.

EU Emissions Trading Scheme (EU-ETS) - The EU-ETS established in 2003 by Directive 2003/87/EC is a mandatory cap-and-trade system covering CO_2 emissions from installations in nine energy-intensive sectors: combustion installations (power and heat generation), refinery processes, coke ovens, metal ores, steel, cement, glass, ceramics, and cellulose and paper. The EU-ETS was launched in 2005 and its first commitment period ran until the end of 2007. The second phase covers 2008-2012.

EU 20:20:20 Objective - In 2007, the European Council adopted the 20:20:20 objective of reducing GHG emissions by 20%, increasing the share of renewable energy to 20%, and making 20% improvements in energy efficiency by year 2020. The GHG emissions and the RES targets are binding (GSG, 2012).

European Union (EU) Directive 2009/28/EC - This requires each EU member state to increase the share of renewable energy in its gross final consumption. The directive targets an overall EU renewables share of 20% in 2020. It also targets a 10% renewable energy share in transport. Under the directive, the United Kingdom is to achieve at least a 15% renewable energy share by 2020. While the 15% renewables target is binding, the manner in which an individual member state achieves it is at its discretion. The directive obliges member states to develop a National Renewable Energy Action Plan (NREAP).

Directive on the Energy Performance of Buildings (EPBD, 2002/91/EC) - The Directive on the Energy Performance of Buildings (EPBD, 2002/91/EC) sets requirements for energy efficiency in building codes, including minimum energy performance requirements (MEPs) and energy certificates. A recast of the EPBD (2010/31/EU) was adopted in May 2010 to strengthen the energy performance requirements and to clarify and streamline some provisions.

North Seas Countries' Offshore Grid Initiative (NSCOGI) - The development of the offshore transmission regime in Great Britain also contributes to the North Seas Countries' Offshore Grid Initiative (NSCOGI) which aims to facilitate current and possible future grid development in the region. Offshore wind generation is expected to increase significantly in the North Sea and the

Baltic Sea, from a few TWh per year today to around 125 TWh by 2020, assuming that EU member states follow their own 2010 National Renewable Energy Action Plans.

Ecodesign (2009/125/EC) - The recast Directive Establishing a Framework for Setting Ecodesign Requirements for Energy-related Products (Ecodesign, 2009/125/EC) aims to improve energy efficiency throughout a product's life cycle. It applies to products that use energy and to products that have an impact on energy use, such as building components. Product-specific standards will be set by EU regulations based on the directive.

Energy Labelling Directive (2010/30/EU) - Requirements for energy labelling of household appliances are based on several directives adopted over the past two decades. The recast of the Energy Labelling Directive (2010/30/EU) expands the mandatory labelling requirement to cover commercial and industrial appliances and also energy-related appliances; product specific labelling standards are set up under this directive.

EU Electricity Directive 2009/752/EC - The EU has enacted legislation regarding the smart grid and smart metering, most notably Electricity Directive 2009/752/EC, which requires EU member states to implement smart metering systems by 2020 where economic assessments of smart meters are positive.

Third Legislative Package 2009 - The EU is actively developing smart grid deployment plans. In January 2009, the European Commission launched a Task Force on Smart Grids which is to advise on policy and regulatory direction and to coordinate the first steps towards smart grid implementation under the provisions of the 2009 Third Legislative Package. Other notable pieces of legislation specific to smart metering include the 2009 Third Legislative Package, Directive 2005/89/EC (Security of Supply), Directive 2006/32/EC (Energy End-use Efficiency and Energy Services), and Directive 2004/22/EC (Measuring Instruments).

Smart Grid Standardization EU Mandate 490 / 441 / 468 - Mandate to European Standardisation Organisations (ESOs) to support European Smart Grid deployment. The objective of this mandate is to develop or update a set of consistent standards within a common European framework that integrating a variety of digital computing and communication technologies and electrical architectures, and associated processes and services, that will achieve interoperability and will enable or facilitate the implementation in Europe of the different high level Smart Grid services and functionalities as defined by the Smart Grid Task Force that will be flexible enough to accommodate future developments. Building, Industry, Appliances and Home automation are out of the scope of this mandate; however, their interfaces with the Smart Grid and related services have to be treated under this mandate.

EU Regulation 443/2009 - Recent EU transport policies aim to reduce CO_2 emissions from new passenger cars. In May 2009, the EU adopted Regulation 443/2009 to reduce CO_2 emissions from new passenger cars to reach a fleet average of 130 grams (g) CO_2 per kilometre by 2015. From 2020 on, this limit will be 95 g CO_2 per km. The regulation will be complemented by measures to further cut emissions by 10 g CO_2 per km. Complementary measures include efficiency improvements for car components with the highest impact on fuel consumption, and a gradual reduction in the carbon content of road transport fuels. A similar type of regulation for new vans was adopted in May 2011 (Regulation 510/2011).