Smart Meter Energy Data:
Public Interest Advisory Group

A policy dialogue and work programme
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Centre for Sustainable Energy & Sustainability First

PIAG Phase 2 - Workshop Report 1

Government approaches to published data and statistics for energy consumption

Author : Judith Ward. Sustainability First
with support from Maxine Frerk & Kieran Dodds. Sustainability First
& Simon Roberts and Nicky Hodges. CSE

Status of this Report
This paper was prepared as an input to the work programme of the
Public Interest Advisory Group on access to smart meter energy data.

The paper pulls together contributions made at a workshop with PIAG members held on 14 January 2020.
Any oversight or other errors are the responsibility of Sustainability First and CSE.

Sustainability First & CSE
PIAG
(public interest advisory group on access to smart meter data for a public-interest purpose)

Workshop Report 1

Government approaches to published data and statistics for energy consumption

PIAG Workshop – 14 January 2020

Summary

The first phase of the PIAG project considered whether access to smart-meter energy data could better serve GB public policy-making and therefore the public good. We explored how smart meter energy consumption data – suitably anonymised and aggregated via a trusted processor arrangement - could provide a more accurate and granular customer-side data-source than today. We developed some basic use-cases and also looked at what consumer research tells us about customer-thinking on access to their meter data. We also explored potential routes to the data given customer privacy rules plus the absence of any hub in which GB smart-meter data comes together. All the first-phase PIAG papers can be found here - **https://www.smartenergydatapiag.org.uk/**

The second phase of the PIAG project is designed to explore the **additionality and public-interest value** which access to smart-meter data could potentially unlock. We are assembling **evidence** on how far increased access to smart meter data might offer **additional analytical insight**[1] in service of the public interest - **be this to government, regulators, national advisory bodies or public-interest bodies more widely.**

This workshop report is the first of four. It considers **current approaches by government (BEIS, MHCLG) to published official statistics and data-sets on energy consumption**. Future workshop reports will examine : the potential of smart-meter data for regulatory assessments and evaluation; the public-interest benefit which smart-meter data could bring to energy and net-zero planning of devolved, regional and local government; and, last, the public-interest benefit which smart-meter data could bring to improving analysis and insight on heat-decarbonisation.

[1] against currently available energy data sources – or other data likely to become available (i.e. due to developments from EDTF , SERL, other pilots/new data-sets)

In this first workshop we learned of **the essential role of the official energy consumption statistics produced by BEIS and MHCLG**, both as an input to government's own analysis and also for many other public-interest bodies who make wide use of official energy statistics and data as key inputs to their own work and analysis.

Across several key energy-consumption data-sets one key data-input is an annual kWh consumption figure for each electricity and gas meter in GB (I&C, household). These annual consumption figures have some historic limitations and these are well-understood[2]. For the time-being however this remains the best source of meter-point data available to government and to others, including as a main input to national-level energy-consumption data-sets.

In an energy system where customer-side flexibility plays a far greater role, analytical requirements for a public policy purpose are fast-becoming more complex. Much better insight is needed into evolving customer-usage patterns, be this by time-of-day and / or time-of -year. Moreover, in a significantly decentralised and decarbonising energy system both national-level and regional-level understanding of the demand-side - as well as the supply-side - is also fundamental. More accurate and more granular sources of customer-side data will therefore become ever-more important as an input to official energy statistics. For the future, smart-meter data, suitably anonymised and aggregated, therefore has the potential to become a key data-input to government statistics on the consumption-side. As noted, the official statistics widely inform both government's own analysis plus the energy models and forecasts of many others.

At the workshop we heard about **recent steps by BEIS and MHCLG to make improvements in both the quality and organisation of consumption-side data-inputs in official statistics and energy data-sets**. For example, with the advent of smart meters, the expectation is that over time the annual per-customer kWh consumption figure will become a largely accurate data-input. BEIS is also exploring scope for more accurate inputs of monthly and seasonal consumption data.

At the workshop we also heard from **UCL's SERL (Smart Energy Research Lab)** who are establishing a 10,000-strong longitudinal half-hourly smart meter data-set for both electricity and gas. Inter al, we asked how far this might be viewed as a sufficient proxy for a national half-hourly smart-meter data-set. We also heard from **three key public-interest users of national-level consumption-side data: National Grid ESO; the Committee on Climate Change; and, National Energy Action. We heard how presently they make use of official government consumption-side data-sources in their own work - and the extent to which they depend on these, absent access to more accurate or more granular national-level customer-side data-sources.** We also heard how these key organisations might perhaps wish to extend or improve upon their present analysis, should they have access to more accurate and

[2] Known as 'annualised estimates'. See p 8 for a more detailed explanation.

more granular customer-side energy consumption data, possibly via a nationally representative half-hourly smart meter data-set.

Our Phase 1 PIAG papers found that access to better customer-side data in the public interest was both desirable and feasible. As noted, we addressed some of the important questions around approaches to suitable anonymisation and aggregation of half-hourly smart-meter data, including access via a 'trusted processor' arrangement. This paper, supported by our workshop findings on 14 January 2020, has set out to explore in a systematic way the public- interest benefits of improvements to the official energy statistics by improving today's energy consumption data-inputs through access to more accurate and granular customer-side data. New longitudinal samples of half-hourly meter-data, such as UCL's SERL, will offer significantly improved insight, including via machine learning, albeit still not a fully representative national-level sample or a fully comprehensive basis for robust regional-level comparison. Taken together, the three use-cases set out in this paper show how there could be considerable public benefit from better consumption-side data as inputs to official statistics. The benefit of more accurate and granular customer-side data as an input to the official energy statistics would extend beyond government to many other public interest bodies. This would result in improved analysis, energy models and forecasts. As a result, we could expect significant improvements in market oversight by government and policy makers, better understanding of energy investment and infrastructure needs, better market interventions and evaluations, including to drive forward a net-zero energy system. Importantly, we would also be likely to see a better understanding by government and others of the distributional impacts arising from detailed changes and reforms in our evolving energy markets.

Drawing on workshop inputs and discussion, the paper concludes with a series of **points for BEIS and MHCLG to consider** on the **added public-interest value that greater access to granular smart meter data might bring to government's consumption-side statistics and data-sets.**

We are extremely grateful to all those who contributed to the workshop on 14 January 2020 and who afterwards kindly commented on this paper in draft. All errors or omissions sit with Sustainability First and CSE.

Sustainability First & CSE
29 April 2020

Introduction

This workshop report describes **current approaches by government (BEIS, MHCLG) to published statistics and data-sets on energy consumption**[3].

It also draws on **three case-studies** to explore the potential 'additionality' that increased access to smart-meter data could bring to the analytical work of **three public-interest users of national-level energy consumption data** : **the GB electricity system operator (National Grid ESO), the Committee on Climate Change (CCC), and National Energy Action (NEA).**

The paper draws on materials and discussion from the PIAG Workshop held on 14 January 2020. Contributors slides are embedded in the text. The paper is organised as follows :

Part I – Current Context

- **Section 1 : Current customer & demand-side data published by BEIS & MHCLG – high-level view** (pp 5-14)

Part II – Future Context

- **Section 2 : Expected new energy-consumption data-sets** (pp 15-16)
- **Section 3 : Data-users : three case-studies** (pp 17-22)
- **Section 4 : Added public-interest value that greater access to smart meter data might bring to government consumption-side statistics and data-sets. Other practical and public-interest benefits to consider** (pp 23-27)

Part I – Current Context

Section 1 : Current customer & demand-side data published by BEIS & MHCLG – high-level view

This section looks at what customer-side usage data is available now – and the main published data-sets and the data-sources which inform this data.

The governance arrangements for official statistics in the UK are set out in the Statistics and Registration Service Act 2007. This sets out the role of national statistics in providing an accurate, up-to-date, comprehensive and meaningful description of the UK economy and society for use by government, parliament and the wider community in decision-making and debate[4]. Producers of

[3] i.e. DUKES, ECUK, BEIS sub-national energy consumption statistics, NEED Framework data-set, English Housing Survey and Scottish & Welsh equivalents, Energy Performance Certificate data.

[4] Statistics and Registration Service Act 2007.http://www.legislation.gov.uk/ukpga/2007/18/contents

official statistics conform to a UK Statistics Authority code of practice regarding the production and release of official statistics to ensure that these serve the public, including in terms of trust, quality and value (TQV)[5]. Official statistics are published to pre-announced timetables to enable transparency.

BEIS - BEIS

BEIS official statistics cover energy supply, transformation and demand across the UK economy. BEIS statistics play an important role in support of a reliable, low cost, and clean energy system.

The BEIS slide-set - BEIS - provides context on BEIS published energy statistics which describe the UK energy system, including through main energy flows within the economy. Inputs include data on indigenous / imported energy; energy transformation; who consumes the energy; and, prices paid. From this data, energy balances are produced[6]. A list of all BEIS energy-related statistics publications can be found here : https://www.gov.uk/government/organisations/department-for-business-energy-and-industrial-strategy/about/statistics#publications**.** Users of BEIS energy statistics include government departments plus very many other external parties.

- **BEIS data collection** : supply-side and consumption statistics draw their data-inputs both from surveys of UK energy companies and from administrative data. This is enabled by legal frameworks (e.g. Statistics of Trade Act 1947, UK Energy Act 1976, Regulations). Monthly and quarterly data tends to have smaller sample sizes, but annual data may be near full-population. Data is collected by BEIS via:
  - **Compulsory / voluntary surveys / data requests**
  - **Administrative data** – e.g data anyway collected in relation to subsidy or other schemes administered by a government department, the UK oil and gas authority or by Ofgem.

This workshop paper is focused on official GB statistics for **energy consumption and customer-side data.** These are pulled together from two main sources :

- **Aggregate statistics produced from surveys of energy providers / retailers** (e.g. as inputs to DUKES, ECUK – including sales volumes, aggregate consumption, price information). Published monthly for electricity and quarterly for gas.
- **Annual meter-point data for domestic and non-domestic electricity and gas customers** collected from suppliers or their agents (e.g as inputs to the sub-national energy consumption statistics & NEED data-set; as an assurance check on national consumption against the survey data above).

[5] **https://www.statisticsauthority.gov.uk/code-of-practice/**

[6] Conforming to international norms

Major BEIS statistical releases on the energy consumption side include[7] :

- **DUKES (Digest of UK Energy Statistics)[8]** – a comprehensive set of aggregated annual data and statistics on production and consumption of overall energy and of individual fuels in the UK. Provides a wide-ranging picture of energy production and use over the previous five years, with key time-series from 1970. A comprehensive set of aggregated energy statistics, including tables, charts and commentary. Coverage includes energy consumption by sector plus non-gas, gas and electricity data.

- **Energy Consumption in the UK (ECUK)[9]** – aggregated statistics from modelled data and secondary analysis which cover energy consumption in the UK for domestic-use, transport (including road transport), industry-use and services. ECUK is organised under the following topics :
  - Energy consumption (for household consumption: includes consumption by fuel type, average energy consumption, electricity-use by appliance use etc)
  - Energy intensity
  - End use
  - Primary energy equivalents
  - Electrical products.

[7] See - https://www.gov.uk/government/organisations/department-for-business-energy-and-industrial-strategy/about/statistics
In addition, the summaries in this working paper were informed by a 2016 paper by Simon Elam of UCL. This pulled together a summary of these and other major GB consumption and demand-side data-sets.
https://d37809f7-dc9f-4c4f-835a-410a5acfa633.filesusr.com/ugd/ea9deb_eb986a05bbab4ad9933e5160d0f4945b.pdf

[8] https://www.gov.uk/government/collections/digest-of-uk-energy-statistics-dukes
[9] https://www.gov.uk/government/statistics/energy-consumption-in-the-uk

- **Sub-National Energy Consumption Statistics (Electricity and Gas)[10] –** comprise **an annual consumption figure (kWh)** for every GB domestic and non-domestic electricity and gas customer (meter-point) known as **annualised estimates**[11].
  - **Inputs for ~30 million electricity meters** (with meter load-profile) : obtained via energy retailers (or their data aggregators) plus Gemserv. ~80% are *annualised advance*[12]. ~20% are *estimated annual consumption* (i.e. where two meter-reads twelve months apart are not available)[13].
  - **Inputs for ~24 million gas meters** [14]: obtained via Xoserve and independent gas transporters.

- The sub-national energy consumption statistics are time-series data - dating back to 2004[15]. As noted, electricity meter-data is sourced via electricity retailers[16] and gas meter-data largely sourced from Xoserve[17]. Gas data is weather-corrected, but not the electricity data. Estimates for off-grid households are also derived. The sub-national energy consumption statistics are aggregated at the level of Region, Local Authority, Middle Layer Super Output Area (MSOA), Lower Level Super Output Area (LSOA). Since 2013, just under 1 million postcode-level electricity data-points are also available[18]. The same data-set is used as the main data-input for individual energy consumption to the NEED data-set below.

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[10] **https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/853104/sub-national-methodology-guidance.pdf**

https://www.gov.uk/government/collections/sub-national-electricity-consumption-data **and** https://www.gov.uk/government/collections/sub-national-gas-consumption-data

[11] **Annualised Estimates** : the document 'What is NEED ?' describes these as 'a good approximation of consumption, but do not cover exactly the calendar year'.
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/720055/Annex_D_-_What_is_NEED.pdf

[12] '**Annualised Advance' (AA)** = an estimate of annualised consumption based on consumption recorded between two meter readings.
[13] '**Estimated Annual Consumption' (EAC)** = where two meter readings are not available. Instead, an estimate of annualised consumption is produced from historic information coupled with profile information for that meter (e.g Load Profiles 1-4).
[14] '**Annual Quantity' (AQ)** = estimate of annualised consumption using consumption recorded between two meter-readings at least 6 months apart. Estimate is 'weather-corrected'.
[15] Northern Ireland data is also available

[16] In practice for England, Wales and Scotland from energy retailers' data aggregators. So, ten data submissions of 31 million records per annum (~80% Annualised Advance / ~20% Estimated Annual consumption). Economy 7 consumption-data is also included.

[17] Xoserve, the gas settlement body, provides 24 million meter-point records p.a

[18] ~ half of post-code areas suppressed for confidentiality

- **NEED – National Energy Efficiency Data Framework**[19] - a national dataset of energy consumption for over 25 million homes and approximately two million non-domestic buildings created to improve understanding of energy efficiency measures on energy-use in GB. Two anonymized samples are available for public use - via the BEIS website – one of 50,000 homes that is openly available and one of 4 million homes accessible with an end-user licence[20]. NEED matches the consumption data for a sample of 4 million homes with demographic and property data via an address spine covering :

    - Gas- and electricity meter annual reads (since 2004). **Using the individual-level energy consumption inputs from the sub-national energy consumption statistics above**
    - Property characteristics – property-type, age, floor-area (Valuation Office Agency, Scottish Assessor, EPC-data for the public data-sets)
    - Household characteristics (deprivation index by region, Experian)
    - Boiler installs (Gas Safe Register)
    - Installation of energy efficiency measures – loft and cavity insulation, PV (data inputs from government scheme administration - the Energy Company Obligation, Green Deal, Feed-in Tariff)

Published energy data-sets are anonymised to prevent identification of individual households.

Tabular summaries of the 4 million household NEED database are also available showing energy consumption against the demographic and property attributes listed above[21].

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[19] https://www.gov.uk/government/statistics/national-energy-efficiency-data-framework-need-report-summary-of-analysis-2019.

For a helpful summary description of the NEED data-set, see also **PIAG Stimulus Paper 7_Annex 3 - 'Possible routes to smart meter data for a public interest purpose'**

https://d37809f7-dc9f-4c4f-835a-410a5acfa633.filesusr.com/ugd/ea9deb_ef79f729eecd4d988d36e17e33d5f00b.pdf

[20] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/332169/need_anonymised_dataset_accompanying_documentation.pdf

[21] Access to the meter-level annualised NEED consumption data is available via the ONS Secure Research Service https://www.ons.gov.uk/aboutus/whatwedo/statistics/requestingstatistics/approvedresearcherscheme#becoming-an-approved-researcher-through-the-ons-approved-researcher-scheme

There are inevitably delays in publishing the data. As at April 2020 the most recent data available was the June 2019 report, which made use of 2017 energy consumption data.

Separately **BEIS also publish statistics on** : greenhouse gas emissions, household energy efficiency (ECO, RHI)[22], fuel poverty[23] and smart meter installations[24].

BEIS publish an interactive energy map to enable ready comparison at country, regional, local authority and post-code level. This includes comparisons of the sub-national energy consumption statistics and also other data on household energy use/energy efficiency, including EPC data - http://domesticenergymap.uk/

Discussion points : additionality that increased access to smart meter data might bring to BEIS energy statistics

National statistics on GB energy consumption are informed today by two main data-sources: (1) the top-down survey-data on fuel-sales and prices provided by companies to BEIS (electricity monthly; gas quarterly) and (2) national-level aggregation of the annual individual-level consumption data.

As set out above, this sub-national-level consumption data is sourced from the annual kWh 'annualised estimates' for electricity and gas. Also as noted, these same annual individual consumption figures feed into the NEED data-set which informs policy approaches and evaluation of GB energy efficiency measures.

A major point to note is therefore how far government's own analysis - plus other major public-interest actors (see case-studies below) - **depend very substantially on the BEIS consumption-side data-sets described in this paper as their main consumption-side data-input.** This is so for models, scenarios and analysis. In turn, this work informs policy development, interventions and regulatory oversight in the energy, energy efficiency and low-carbon fields. The BEIS consumption-side data-sets are extremely widely used, and, absent alternatives, are significantly depended-upon by all those working in the energy and environment fields and therefore of fundamental importance. **A fundamental underlying question for this paper is therefore how far today's official consumption**

[22] https://www.gov.uk/government/collections/household-energy-efficiency-national-statistics

[23] https://www.gov.uk/government/collections/fuel-poverty-statistics

[24] https://www.gov.uk/government/statistics/statistical-release-and-data-smart-meters-great-britain-quarter-4-2019

data could potentially be improved, including, arguably, via access to more granular half-hourly and other smart-meter data.

In due course, BEIS foresee that **one improvement to their present annual energy consumption data-set** will be replacement of the individual 'annualised estimates' with *accurate* annual consumption data sourced from smart meters. These accurate meter-reads would continue to be provided to BEIS on an annual basis under the Statistics of Trade Act.

BEIS may also explore the potential benefits and costs of processing **monthly consumption data** – which under data-privacy rules suppliers will be able to access from every smart meter without an explicit customer consent.

BEIS noted its interest in **improving data and information on fuel poverty** – for example, perhaps via better data-linking with other available data-sources.

Points raised at the workshop for possible further consideration by BEIS were :

- **Accurate monthly consumption-data from smart meters would be a substantial improvement on today's annual kWh consumption figures derived from annualised estimates[25].** There was strong feedback to BEIS that as the smart meter roll-out proceeds they should actively work towards requesting accurate monthly consumption data under the Statistics of Trade Act for both electricity and gas. This would be beneficial in public-interest terms in supporting better seasonal analysis, including improvements in regional analysis and comparisons. Capturing monthly peak-load data would also be valuable, given its importance in system planning and operation.

- **A possible shift from survey-data to smart-meter data** : whether in the medium-term there might be merit – for reasons of data-accuracy / greater granularity (temporal, locational, peak-loads) for BEIS to move from their present approach of top-down surveys of energy companies for energy sales data[26]. And instead, to consider sourcing accurate meter-data direct from suppliers[27] (this may also have cost-saving potential and enable more timely availability of data).

- **Calculation of BEIS fuel-poverty statistics will become increasingly complex with faster switching and more time-of-use tariffs** : tariff and price data is currently sourced quarterly from BEIS

[25] Annualised Estimates – see footnotes 10-19 above

[26] as per current data-inputs to DUKES national-level energy consumption statistics

[27] as per today's input to the subnational energy consumption statistics

surveys. BEIS are informed via suppliers of aggregate customer-numbers for a particular tariff in a particular region. This permits a national estimate for customers on that tariff and in turn feeds into the price-input to the annual fuel poverty statistics. For the future, this calculation may become more complex absent access to accurate data on ToU tariffs, switching and peak-demand. In principle, this data could become available from smart meters. However, data would need to be linked to the survey-based source[28] of modelled consumption data.

MHCLG

MHCLG (Ministry of Housing Communities and Local Government) is responsible for a major series of official statistics on housing and planning[29] used by central government, local authorities and others. Two major **MHCLG data-sets provide important contextual data to BEIS and to ONS about the housing stock, energy use and energy efficiency** :

- **The English Housing Survey – EHS** is a flagship annual survey of peoples' housing circumstances, including the physical condition and energy efficiency of their homes. It is a representative sample of ~ 13,300 households in England, quality-assured by follow-up home inspections of a sub-sample of ~6,200. EHS is a continuous national survey since 2008. It has equivalent Scottish and Welsh surveys[30]. The EHS covers all housing tenures and provides valuable information and evidence to inform the development and monitoring of government housing policy, including for building regulations, energy efficiency and policy for future homes. The EHS captures information on gas and electricity smart meters installed. Notably, EHS does not obtain actual energy-cost data from respondents. Instead, household energy costs are estimated, **based on consumption-data derived from modelled standard occupancy and heating patterns.** Lowest level of granularity in published EHS data is currently 'high-level regional', although lower level may be feasible in the future. An annual headline EHS report is published in January with more detailed reports published each

[28] i.e English Housing Survey. See next section on MHCLG statistics.

[29] Including on leasehold dwellings, private landlords, the British Social Attitudes analysis and reporting, and ad hoc housing research projects (eg on estates re-generation).

[30] The **English Housing Survey** brings together two previous survey series into a single fieldwork operation: the English House Condition Survey (EHCS) and the Survey of English Housing (SEH). There are separate and broadly equivalent surveys in Scotland – The **Scottish House Condition Survey** - https://www.gov.scot/collections/scottish-house-condition-survey/ and in Wales - the **Welsh Housing Conditions Survey** - https://gov.wales/welsh-housing-conditions-survey

summer, including an energy report. The energy report covers different topics each year[31]. Tables and archived data-sets are available on-line.

- **EPC data**: Energy Performance Certificates are required whenever a UK domestic property is rented or sold, based on a survey by a qualified domestic energy assessor. MHCLG publish a quarterly statistical release of EPC data in England and Wales, at local authority level[32]. The Energy Performance of Buildings Register also has EPC data for 2 million non-domestic buildings, for public buildings (Display Energy Certificates) plus Air Conditioning Inspection Reports. There are now over 9 million domestic EPC records, accessible via MHCLG's Open Data Portal[33]. There are some recognised quality issues around the consistency of data-capture in EPCs, but nevertheless EPC-data offers valuable insight not otherwise available. EPC data includes a **banded property-level energy efficiency rating (A-G)**, as well as other data such as **estimates** for current annual energy consumption (kWh/m2) and for current annual energy costs for heat and light[34]. EPC data feeds into the published data-sets for the NEED framework. For the future, and subject to GDPR, MHCLG aim to link EHS data and household-level EPC data.

Discussion points : additionality which increased access to smart-meter data might bring to MHCLG statistics

Points made at the workshop on 14 January 2020 included :

- **Quality assurance for MHCLG statistics** : greater access to granular smart-meter data could usefully offer potential quality assurance to MHCLG. For example, *actual* household usage vs *modelled* usage. Or, by offering better evidence on under-heating by particular demographics; or, by enabling better estimates of thermal performance of buildings to monitor effectiveness of

[31] https://www.gov.uk/government/statistics/english-housing-survey-2017-to-2018-energy**.** Examples include : awareness and influence of Energy Performance Certificates (EPCs), the cost of energy, main gas, and heating systems (2017-18), energy efficiency (2016).

[32] In Scotland, the EPC Register is 'owned' by the Scottish Government and operated by the Energy Saving Trust (Scotland).

[33] https://epc.opendatacommunities.org/
Individual property-level EPC information can also be accessed

[34] EPC data for existing dwellings represent a 'reduced-data SAP' and include : recommendations to improve energy efficiency and prospective EPC-rating; environmental impact rating; building characteristics e.g. dwelling age, type, size, wall construction etc; presence of energy efficiency measures e.g. loft insulation, cavity wall / solid wall insulation; main heating system, main heating fuel, boiler type, secondary heating, heating controls, PV array etc

building regulations. Each of these examples would enable better MHCLG data-inputs to BEIS, and therefore support improved analysis and policymaking.

- **Smart meter data and the EHS:** EHS combines detailed information on both buildings and their occupants. Granular consumption data of the kind held by smart meters will be important in discovering the underlying consumption patterns of different households / groups, including those with low-carbon technologies, and which in turn may have significant public interest applications. For example, linking smart-meter data with EHS data would offer the potential to : improve evaluations of changes to tariffs; generate improvements in fuel-poverty statistics derived from EHS data (presently reliant on estimated energy expenditure derived from housing-type / demographic); and, improve official models of energy consumption in buildings presently based on EHS input data with estimated building thermal performance (e.g. National Housing Model).

- **Geographic coverage :** MHCLG EPC data is for England and Wales. The 2018/19 EHS will produce more granular regional analysis for the first time and is at England-level only. Users of EPC data would be interested in bringing together UK-wide data. ONS has now taken this on board following a previous request by MHCLG. UK-level tables were previously a responsibility of MHCLG but subject to resource it was felt that this would better sit with an ONS- lead.

- **Proxy indicators** : a national smart meter data-set could potentially offer new proxy-indicators on the housing stock, in ways similar to the EPC data-base now. For example, changes in volume or location of new housing stock.

Part II

Section 2 : Expected new energy-consumption data-sets

As section 1 sets out, **the most granular level of customer consumption-data incorporated into today's official energy statistics is one annual consumption figure for each of electricity and gas (kWh/meter), with attendant limitations**.

A small number of well-designed half-hourly data-sets are available from several large smart-meter trials which although somewhat historic, can be accessed for further analysis [35]. These can offer insight but are not nationally representative samples, may have limited contextual information and are not longitudinal. Re-analysis of historic trial data perhaps also risks compounding statistical limitations or 'old' insights.

Importantly, a major **new longitudinal half-hourly customer data-set is being created via the UCL Smart Energy Research Lab (SERL).**

Smart Energy Research Lab: What added insight this (or other forthcoming data) may add to current official energy consumption statistics

SERL is led by UCL on behalf of a consortium of seven universities. UCL is the 'data-owner' and, via its data-platform, the UK Data Archive (Univ of Essex) is the 'data-processor'. Considerable effort has been devoted to getting the legal and technical frameworks right for data-access, including obtaining individual consents. The SERL portal will provide access to half-hourly smart-meter electricity and gas consumption data – plus linked contextual-data - to UK academic researchers. This will be a representative sample obtained with customer consent of 10,000 GB households with second-generation SMETS2 meters (plus a proportion of DCC-enrolled SMETS 1 meters). In line with established UK Data Archive data protection measures, access to the dwelling-level data will be limited to accredited academic researchers. All identifying data is securely stored separately from data used for research; research-data is pseudonymised to protect privacy of the participants; and, statistical disclosure control is applied to all outputs to ensure no individual can be identified in any results that are published.

[35] For example : DECC's Energy Demand Research Project (SSE data – electricity & gas); Northern Powergrid's Customer Led Network Revolution (British Gas data – 6,000 sample); UKPN's Low Carbon London – sample size – 1,100; and the Ireland's Commission for Energy Regulation electricity smart meter trials – sample-size 5,000 (also a gas data-set – sample size 2,000). See paper by Simon Elam, UCL - https://d37809f7-dc9f-4c4f-835a-410a5acfa633.filesusr.com/ugd/ea9deb_eb986a05bbab4ad9933e5160d0f4945b.pdf

The SERL slide-set sets out at a high-level how the SERL data compares with NEED, EHS and EPC data-sets. The SERL data-set covers : both electricity and gas; is updated daily; includes tariff data; export-data for behind the meter micro-generation such as solar PV (though generation data is not available via the DCC); contextual data from the SERL survey plus a match with weather-data and EPC data (if available). And, subject to ethics approval will aim for further data-linking. The one-off contextual survey (postal) had a high completion-rate and includes respondent details on energy and heating, accommodation plus household characteristics including some personal data. Survey questions are harmonised where possible with 'ground-truth' surveys such as the Census, English Housing Survey or Understanding Society to enable the representativeness of the SERL data-set to be evaluated.

The pilot phase of the five-year SERL project is now complete and the Research Portal is being developed with access to half-hourly smart-meter data for an initial sample of 1,700 participants (expected Q2-Q3 2020). Main-phase recruitment to reach 10,000 households is expected to take place over a number of waves in 2020 (including the potential for a further wave to cover those not adequately represented in the current rollout e.g. in the north /Scotland, high-rise property).

An academic research programme is being developed to make use of the data-set. **SERL will be pleased to hear from public-interest organisations interested in collaborating with academic partners**.

Workshop discussion stressed that the SERL data-set will offer a valuable and important new energy data-source for future academic research, for government and others - including, for example, for those who might wish to undertake sophisticated modelling and wider application of the data via machine-learning.

The SERL data-set is a significant advance in terms of making available half-hourly electricity and gas consumption data for research and analytical insight. However, even with a 10,000 strong longitudinal sample over 5-years, this is composed of households with SMETS 2 meters only, and as the roll-out of SMETS 2 meters is only partial (~10% as of April 2020) it does not provide a full nationally representative sample. Nor can it provide a sufficiently representative sample for robust regional or local-level comparison. In this sense, the SERL data-set cannot be regarded as a proxy or substitute for the national energy statistics produced by BEIS under the Statistics of Trade Act.

Section 3 : Data-users - three case-studies

Three key users of national-level consumption data and statistics outlined for the workshop their current experience and use of government consumption-data in their day-to-day work. They were also asked to offer their thoughts on what increased analytical insight, if any, might be brought to their work by access to granular smart meter data, including via the official energy statistics.

National Grid Electricity System Operator (ESO) – User Case 1

National Grid ESO

- The ESO's core role is to manage system balancing and operability of the GB electricity transmission system in real-time, ensuring safe and secure operations at the most efficient cost for consumers. Conduct of these duties necessitates access to appropriate data and information across the full range of short- and long-term responsibilities. As well as supporting PIAG, the ESO is also working in conjunction with Ofgem, BEIS and the Energy Networks Association to improve data-sharing through the ENA Open Networks 'Data Workstream'.
- Significant energy-sector expenditure hinges upon the availability and quality of data available to the ESO (and to the gas system operator) – be this for market analysis, forecasting, modelling or scenario-development. Examples of some 'big-ticket' items informed by data available to the ESO and gas system operator include 'within-day' energy balancing costs - £1.5bn p.a. (Electricity £1bn; Gas £0.5bn); expenditure on energy network investment (Transmission - England, Wales & Scotland - £1-2bn p.a; energy distribution - ~£200m per network p.a.); GB generation requirements - £1bn p.a (contracts for difference; capacity contracts). Insufficient and poor quality data can therefore have material implications for operational spend or decisions on network investment.
- Notwithstanding increasing decentralisation of the electricity system, the ESO does not currently have comprehensive access to granular data below the transmission network level. Aside from wind and solar, the ESO lacks real-time visibility of other small distributed energy sources (location, connection-capacity, output) or real-time granular data about customer loads – be these I&C customers or households (location, capacity, customer usage patterns). The ESO has sophisticated regression tools for forecasting and modelling, and so can learn by analysis of within-day conditions after the event. But, at the same time, the ESO actively seeks better quality and actual data where this is available. From an ESO standpoint, access to actual demand-side data (i.e. rather than data from innovation projects or trials) - including more granular smart-meter consumption data - could inform development of more efficient approaches and tools to inform system operation and GB network investment overall.
- The ESO gave three practical examples of where access to more granular consumption data could improve areas of ESO operation :

- **<u>Tools for Better Decision-Support</u> –** in an electricity system dominated by intermittent renewables and ever-more low-carbon technologies, the ESO has been looking for many years beyond the supply-side of the equation in enabling cost-efficient system balancing and peak management. Increasingly, the ESO wishes to deepen existing understanding of demand-side characteristics at a significantly more granular level. In particular, to support better decision-making via its analysis, models and forecasts, the ESO would like more comprehensive understanding of the variability of different customer consumption patterns – be that I&C customers or households.
- Currently the ESO understands 'average' profiles for households[36], but has little direct insight into household consumption patterns associated with different low-carbon technologies or different customer segments – i.e for PV, EVs, heat-pumps and batteries. At present, for customer consumption data, the ESO makes use of annual average load profile data from Elexon - produced from half-hourly data from 2000 homes; draws from the DECC Household Electricity Use Survey on appliance-level usage - <250 owner-occupier households – mostly monitored for less than a full calendar year in 2010-11[37]; and for gas consumption data, uses Xoserve annual aggregate meter data. For likely usage patterns associated with low-carbon technologies such as PV or heat-pumps the ESO draws upon data from innovation trials, supplemented by Met Office data. Trial data has some limitations : it is time-limited and offers limited insight into geographic variability (eg whether heat-pump operation is in Scotland or in the south). For EV's, despite increasing uptake, much trial data mainly reflects the experience and consumption patterns of early adopters. As yet, this data also gives no insight into the operational potential of vehicle-to-grid.
- Looking to the future, the ESO wishes to improve on its customer-side insights - and therefore the quality of inputs into its analysis, models and forecasts - through :
  - Access to continuous and more granular customer consumption data (ideally half-hourly but even seasonal data of help).
  - Access to better contextual 'big-data' for day-to-day use of low-carbon technologies (different locations, usage patterns - demographic differences etc).
  - Obtaining visibility, if possible, of response to price signals or contracts for demand-side flexibility (perhaps via customer consumption data).

[36] Diversified peak load - 1kW; car-charger - e.g 7kW; heat-pump e.g ~3.5kW; household PV array ~ 3-4 kW; battery - 1.5 – 2kW.

[37] Household Electricity Survey (HES). 2010-11 & 2014 research papers - **https://www.gov.uk/government/collections/household-electricity-survey**. Also now somewhat dated – e.g pre-dates widespread uptake of LED lighting

- **ESO Future Energy Scenarios (FES)** – this is the major industry-wide annual exercise in scenario development. **The FES process informs and underpins £ tens of billions** in investment planning for both the transmission and distribution network companies (electricity, gas) and also for energy sector investment more widely including the capacity market. The FES also informs regulatory and wider industry decisions.
- Current government data-sources used by the ESO as inputs to the FES include : Energy Consumption in the UK, DUKES, Energy Trends, plus Elexon annual profiles and Xoserve annual aggregate data (as above). HES and EPC data is also used - albeit the ESO looks more in practice to SAP data. The Sub-National Energy Consumption Statistics are also used to inform scenario-thinking at a GB wide-level (example : trying to obtain insight into the impact on network investment plans of a whole-scale uprating of the housing stock to EPC 'C' by 2035). And also in looking at plans to reinforce a network at a particular location.
- **For the future, potential improvements to FES customer-side data would include access to : better seasonal and within-day consumption data; better regional consumption data; better consumption data for low carbon technologies (EVs, heat-pumps, storage, PV). FES scenarios will become more robust where customer-side data-inputs become less 'average'.**

- **Better Regional-Level Investment Planning** – FES scenarios are broken-down into regional projections to inform investment plans relating to energy off-take and to transmission and new gas pipeline development. The ESO has very limited visibility of data below the transmission level but seeks accurate regional and operational benchmarks. The ESO currently uses high-level data obtained at the gas off-take or grid-supply point. As noted, FES uses annual consumption data from published sources and applies the 'average' annual consumption figures for each region (e.g. taken from the BEIS sub-national energy consumption statistics). Monthly consumption data would better inform seasonal differences at a regional level. For some low carbon technologies, there is patchy registration data (e.g. heat-pumps) and for others there is presently little or none (e.g. residential batteries). In particular, for EVs there is little public data on where cars are actually charged - analysis is currently informed by proxy-data[38].

Other non-government customer-side data currently available to the ESO, include a monthly supply of aggregated and anonymised local (grid supply point) customer data via a paid-for arrangement with Electralink. Other than this, below the transmission-level, the ESO uses within-day profile data from innovation trials. Many of these are supported under network innovation schemes and offer a helpful source of data on usage patterns of low-carbon technologies and on customer interaction with renewable energy sources. Further scrutiny of this data will continue to offer lessons. However, most

[38] FIT registration data for PV (to date); For EVs - car registration or car charger data from DfT : so, imperfect information on where a car is actually charged.

innovation trials are one-off time-limited studies, not regularly 'updated' or repeated. They do not offer a 'continuous' data-source to feed-into ESO forecasts and models. Universities also conduct many valuable innovation trials or studies which similarly inform the ESO. Manufacturers also produce helpful data, but this tends to reflect test-conditions rather than actual customer data. Many of these current data sources available to the ESO are helpful – but also have some limitations. Given rapid change in the market, such data-sources also risk being historic. Trial-data is not nationally representative or a basis for regional comparison. Trial data is not a continuous data source – albeit the UCL SERL data-set could prove helpful here.

As seen, forecasting and planning activity by the ESO, including their flagship Future Energy Scenarios, shapes £ billions each year in operational approaches and investment planning across the entire gas and electricity sectors. Unlike the electricity distribution networks, the ESO is not currently entitled to directly access smart-meter data via the DCC to inform its analysis and modelling. To improve annual forecasting, the ESO would benefit from access to aggregated and anonymised customer-side data at a national, regional and sub-regional level. To improve maximum demand planning and operational and seasonal decision-making, access for the ESO to granular consumption data on a 'continuous-basis' – monthly, daily or hourly would be of particular help. Access to monthly data would represent a significant advance on the current position.

The ESO is committed in its Digitalisation Strategy[39] to providing wider public access to its own data to inform efficient business decision-making across the industry and drive innovation. The ESO aims to enable other organisations to undertake their own comparative analysis and forecasts, to trial new techniques, and to scrutinise and benchmark energy industry scenario-inputs and assumptions. The ESO aims for this to help remove barriers to market participation and transform the customer experience through digital enablement.

[39] ESO Digitalisation Strategy. December 2019 - **https://www.nationalgrideso.com/document/157931/download**

The Committee on Climate Change (CCC) - User Case 2

The statutory body giving independent advice to government on building a low-carbon economy and preparing for climate change, makes use of energy data from both the supply- and consumption-sides. Official data-sets feed into the CCC's work to produce national carbon budgets, to base-line data for CCC scenarios and models, and to track annual progress for CCC reports to parliament. Inter al, the CCC makes use of DUKES, Energy Consumption in the UK (ECUK), NEED data, the English Housing Survey and the Scottish and Welsh equivalents[40]. From a CCC stand-point :

- **The current annual energy consumption figures for households** (kWh for gas and electricity) **have recognised limitations** - and actual data from smart meters would give more accuracy. Also, access to more granular within-year data would very helpfully reflect usage-variation by time-of-year and / or by time-of-day.
- **NEED data** – limitations of current annual consumption data as above. NEED data also contains only a limited-to-moderate set of contextual variables, preventing fuller data linking**.** For the Sixth Carbon Budget, CCC is making use of NEED data to model estimated savings on energy efficiency. More granular consumption-data would offer better insight on how different property and household characteristics can affect usage. This in turn could help with monitoring impact of energy efficiency measures, and support better targeting of energy efficiency schemes and measures. CCC want to understand how to drive up overall opportunities for energy efficiency, and so improve their advice to government.
- **English Housing Survey & Scotland and Wales Housing Condition Surveys** : CCC used for Fifth Carbon Budget.
- **EPC data** : EPC data was an initial advance. However, the SAP-based property-level data comes with some acknowledged quality issues. An assurance 'cross-check' from *actual* gas and electricity consumption data to EPC ratings would therefore be helpful. This would also give better evidence on under-heating. Similarly, obtaining access to more granular consumption data on seasonality at the property-level.
- **The National Household Model data** is a valuable dataset for which more granular consumption data would represent a real advance.
- **Low carbon technologies** : CCC models would benefit from a better picture of flexible use of low-carbon heating technologies. Half-hourly electricity and gas consumption data - plus maximum-load data - could offer welcome insight into *actual* usage-patterns and bill impacts of low-carbon technologies (including heat). This could greatly benefit insight into electricity system peak-loads, as well as leading to a greater overall understanding of potential heat-pump efficiency – which in turn would benefit UK public policy.

[40] Examples include : Fifth Carbon Budget 2026-32 **https://www.theccc.org.uk/publication/fifth-carbon-budget-dataset/** ; the Net-Zero Report (May 2029) https://www.theccc.org.uk/publication/net-zero-technical-report/#supporting-charts-and-data; and CCC annual Progress Reports to parliament - **https://www.theccc.org.uk/publication/reducing-uk-emissions-2019-progress-report-to-parliament/#supporting-charts-and-data**

- **Consistency in published statistics** – so far as possible continuity across different years is important both for base-lining and for tracking progress[41].

National Energy Action – User Case 3

National Energy Action (NEA)

National Energy Action is a national charity working across England, Wales and Northern Ireland to end fuel-poverty. From an NEA stand-point, more granular energy consumption data at the national level would be of considerable benefit in support of :

- **NEA's practical work** – in delivering well-targeted energy advice and efficiency measures to households.
- **NEA's advocacy work** - its research, analysis and national-level policy advice on fuel poverty issues, including on the distributional impacts of energy policy.

NEA data-use today : NEA makes regular use of BEIS and MHCLG published data - including EHS data and EPC bands for different income levels. Today's published data is useful for NEA's analysis on fuel-poverty and energy efficiency but some of the widely-recognised shortcomings of the data inevitably also limit available insights. NEA's very practical first-hand experience leads it to conclude that real data is significantly better than modelled data, both with regards to accuracy and to cost. Trial-data can be of value but is not nationally representative and comes with important limitations. For example, for regional comparison; for distributional analysis at a national-level.

NEA gave **two examples of how more granular national-level consumption data could support better analysis** for both its practical and policy work **:**

- **Practical work : NEA joint-project with Scottish and Southern Energy Networks on Social Constraint Management Zones.** This project uses the NEED dataset, overlain with deemed consumption profiles and degree days to consider how at particular sub-stations to try to reduce household load and / or the potential to 'flex' load **for a 'social benefit' purpose**. The consumption data captured in NEED is currently annual (and partly estimated) and so very high-level. More granular national-level consumption data (monthly, half-hourly) would give NEA better insight into the impact that technology in homes could have in helping to reduce network stress – not only at particular locations – but also in assessing the potential value of national-level deployment by the distribution networks of social constraint management zones. Similarly, the

[41] For example, in 2017 the time-frame for recording and inputting annual gas consumption data changed, creating dis-continuities for analysis.

ability to better target the kind of households most likely to be able to offer flexibility services to the networks – be this from a local or a national stand-point.

- **<u>Policy work</u> : improved insight into the distributional impacts of the recovery of energy policy costs via electricity bills, especially in a world of more cost-reflective tariffs** – at present, many energy 'policy-costs' (social, environmental) are charged to electricity bills[42]. These costs are currently recovered via the standing charge and / or via a p/kWh levy charged to every unit of electricity consumed. There are ~2 million electrically-heated homes in GB, many of which are poorly insulated. These households have significantly higher electricity consumption than equivalent-sized gas-heated homes, and tend to be lower-income. Electrically-heated households arguably meet a disproportionate share of total policy-costs. For homes with storage heaters and hot-water tanks - which charge-up over-night at a lower unit-rate (e.g Economy 7) - policy costs represent an even higher share of the off-peak p/kWh unit rate.
- In the future, electricity settlement reform will drive greater cost-reflection in industry charges, which retailers will reflect in at least some retail tariffs[43]. In turn, this will raise new questions around what a fair distribution of policy-costs might look like in a more cost-reflective world. What will be the distributional impact of continuing to spread these costs evenly across every half-hour? Or, alternatively perhaps across particular half hours (eg at peak-times ?).
- Access to a national half-hourly consumption data-set by NEA and others with a national-level interest in policy, would support better understanding of how different customer segments or household types use their electricity and therefore improve insight into the distributional impact of approaches to the allocation of costs (including policy costs) both today - and in a future with more cost-reflection in tariffs.
- Insight into the impacts on electricity bills of (1) greater cost-reflection coupled with (2) approaches to allocation of policy-costs is important, especially in understanding those at risk of most disadvantage. In particular, on whether there might be a disproportionate impact for homes which are electrically-heated. This matters not just in today's world, but also for a future where electric heat is expected to play a more significant role. Access to more granular consumption data would therefore improve NEA's analysis work and support its advocacy role by (1) enabling it to bring to the notice of government and the regulator the distributional impacts of approaches to recovery of industry-costs, including policy-costs, in a more cost-reflective world, especially for the fuel-poor or those not able to be flexible at times when electricity prices are high and (2) put forward fair approaches to mitigate major distortions or impacts.

[42] i.e. rather than to gas-bills or recovered via taxation

[43] by enabling a more accurate match of industry costs and charges with individual customer half-hourly consumption

Section 4 : **Added public-interest value that greater access to smart meter data might bring to government consumption-side statistics and data-sets. Other practical and public-interest benefits to consider.**

This workshop paper at a 'high-level' has set out the main data-sets that make up our official energy statistics for energy consumption for industry and for households and for energy efficiency measures in homes, and the main data-sources which inform these.

Notably, the most granular level of customer consumption-data today that feeds into our official energy statistics is a single annual consumption figure for each electricity and gas meter (kWh/meter)[44].

Our three user-cases show how a national-level customer-side analysis for public-policy advice and decision-making continue to be very largely informed by these national-level official consumption statistics, notwithstanding their generally acknowledged limitations. Until now, this has been for the well-understood reason that more accurate and more granular metered energy consumption-data did not exist for government or for others to access at scale.

The three user-cases offer practical examples of how access to more granular smart meter data would bring additional analytical insight to those organisations and therefore bring additional public benefit - be this via accurate monthly smart-meter data initially, or half-hourly within-day data in due course.

The points below bring together and summarise the 'value-added' and 'additionality' from a public benefit stand-point – identified via the use-cases and the workshop discussion – that access to more accurate and more granular consumption data (plus other smart-meter data e.g maximum load data, export-data) **could bring if incorporated into the official energy statistics**.

'Additionality' of more granular data than today for existing applications

- **Cost savings and cost-efficiency** – half-hourly consumption data would give greater accuracy in model inputs, more accurate operational forecasts, better-informed scenario development, more accurate assessments of infrastructure needs and more certainty in investment plans (National Grid ESO; CCC 6th Carbon Budget)
- **Seasonal analysis –** early incorporation of accurate monthly meter-data into official energy statistics would be a most useful initial 'no-regrets' step. Particularly important for heat-related investment and interventions (National Grid ESO, CCC, NEA) as well as for roof-top PV.

[44] see page 7 on **sub-national energy consumption statistics** for full explanation of annualised estimates etc

- **Improved distributional impact and analysis** – a far better understanding of variation in consumption among different demographic groups (through secure data-linking), and of variation in customer-usage patterns. Improvements in current insight on distributional impacts of measures between I&C customers and household customers, between different customer groups, including the vulnerable and those on low-income, plus inter-generational analysis.
- **Ability to produce more robust national-level assessments of measures or interventions derived from analysis of local-level or regional projects** (NEA)
- **Geographic variation** – a far more accurate understanding of geographic / local variation in patterns of actual energy use – especially heat-related (e.g for heat-pumps, for hydrogen policy) or for EV-charging. Beneficial for : well-targeted regional interventions, including for fuel-poverty support or subsidies ; more certainty in network investment plans, including for distribution system operators.

Major public-interest 'data gaps' that half-hourly smart meter data could fill

- **Low-carbon technologies - and the need to improve the accuracy of forecasting models** - granular usage patterns and profiles of different low-carbon technologies are currently very largely not known. This is a substantial data-gap. Operational performance profiles for these technologies is a main input into today's forecasts, models and scenario development - and a key area for public policy (e.g. for heat pumps, other low-carbon heat, EV-charging, PV households, batteries). For example, the BEIS ECUK data-set would greatly benefit from a more accurate understanding of the half-hourly electricity consumption patterns of EV charging (NG ESO, CCC, NEA).
- **Scope for additional data from smart meters :** electricity smart-meters will record **maximum-load data** at the customer-level. This is presently neither recorded nor reported via official consumption statistics or elsewhere[45]. In public policy terms this could be of particular value – e.g. insight into EV charging, flexibility-potential of electric heat, distributional impacts of time-of-use tariffs, identification of network hot-spots etc). Smart-meters will also record with accuracy whether a meter is in **pre-pay mode** which is currently not reflected in official statistics and could offer useful insight for the fuel-poverty statistics, especially where appropriately linked with other data.
- **Quality assurance of other major data-sets** e.g accurate consumption data would provide important assurance for the flag-ship EHS survey, and importantly, for the Energy Performance Certificate registry data-sets (MHCLG).

[45] National Grid record this at an aggregate level at the Grid Supply Point Group. This also feeds into load forecasts and FES scenarios modelling.

- **Assurance on quality and standards for refurbishment and new-build homes** – more accurate assessment and improved monitoring of the 'performance gap' on building standards. Granular consumption-data linked at property-level to the EPC data could support policy development on building performance, 'performance gaps', building regulations (CIBSE).
- **Export / storage / appliance level**: In some instances, half-hourly data itself is perhaps inadequate to understand 'public benefit' in these areas, although artificial intelligence (AI) and machine learning (ML) may allow robust inferences. Access to higher-frequency data (e.g. up to 10-second via consumer access devices) may be helpful in the future.
- **Data on household PV, EV chargers and solid wall insulation** - is presently sourced through a number of different routes, including via the information collected in connection with the administration of subsidised schemes. At best this forms a patchy picture, which may become more so as government support schemes change or are phased out. Again, AI/ML may serve a purpose.

Other practical and public interest benefits to consider from access to half-hourly smart meter data

- **Current arrangements for collecting electricity consumption data for the national energy statistics** – will anyway have to change as a result of planned reforms to electricity settlement[46]. This provides a **good opportunity to review the way that electricity data is currently collected by BEIS from suppliers** under the Statistics of Trade Act and to take advantage of more accurate and more granular data shortly becoming more readily available via the settlement system.
- **An annual national half-hourly data-set from smart-meter data could replace some inputs to the current monthly and quarterly top-down surveys of the energy companies which presently feed into DUKES and ECUK –** potentially offering both greater data-accuracy and some possible cost-savings.
- **A nationally representative half-hourly data-set is needed for test-bed purposes to ensure public benefit from flexibility innovation** – this would address cost-hurdles for smaller flexibility innovators and other public-interest providers to test proposed interventions for flexiblity, including approaches to price-signals. A nationally representative half-hourly test-bed would enable impacts to be modelled pre-implementation - including distributional

[46] **Annual meter-reads submitted to BEIS :** these are currently submitted by data aggregators (on behalf of suppliers) to BEIS under the Statistics of Trade Act as inputs to the sub-national energy consumption statistics or for the NEED database. Under the likely Target Operating Model for future settlement, the present activity of 'data aggregation' may discontinue and so the current mechanics of submitting meter-reads to BEIS will require consideration[46]

impacts, impacts on usage patterns for different low-carbon technologies (heat, EV-charging etc). Lowering barriers for innovators and public policy actors to access smart-meter data is important to unlock potential energy system benefits. A Data Trust Model[47] is perhaps one possibility – which could also inform public policy and public interest data applications.

- **Access to granular, half-hourly smart-meter consumption-data should become a funding condition of future trials of low-carbon technologies**. As the SMETS2 rollout advances, such a pre-condition will become a real possibility.

Conclusion

Our energy system is undergoing fundamental change. The need to shape efficient pathways to net-zero, to enable flexible customer response to 'offset' intermittent renewables, to ensure effective oversight of new demand-side markets as these evolve, and, extremely important, to obtain a good understanding of the distributional impacts of these changes on different customer and consumer groups - will require access to customer-side data and information which is significantly more accurate and more granular than that available today. This includes better understanding of geographic variation in patterns of energy consumption and how low-carbon technologies are used in practice.

Furthermore, since the workshop on 14 January, we can also now see that the kind of economic shock triggered by the pandemic - and the unknowns around the shape and speed of any recovery – offer a clear illustration of how future access to a national yet granular set of energy consumption data could better inform government actions. Be that on disadvantage arising from the pandemic, measures to ensure a smart and sustainable economic recovery, or effective evaluation of interventions.

With access to more accurate, more granular customer-side data – including the data that smart meters could provide - government, regulators and policy-makers will obtain additional insight and understanding of developments in the GB energy markets and become significantly better-placed to deliver public benefit and to serve the public interest.

Sustainability First & CSE
27 April 2020

[47] A legal structure to provide independent stewardship of data

Smart Meter Energy Data Public Interest Advisory Group

https://www.smartenergydatapiag.org.uk/

PIAG Membership

As at April 2020 members of the PIAG group include :
([+] denotes funding member in Phase 1. * denotes funding member in Phase 2)

BEIS
Citizens Advice
Committee on Climate Change
Ministry of Housing, Communities and Local Government (MHCLG)
Energy Networks Association
Energy-UK
Energy Saving Trust
Energy Systems Catapult*[+]
Connected Places Catapult
Elexon*[+]
Electralink*
Greater London Authority*
National Grid ESO[+]
National Infrastructure Commission
Northern Powergrid[+]
Ofgem[+]
Office for National Statistics
Ombudsman Services
Scottish Government
Smart DCC (Smart Data Communications Company)*[+]
Smart Energy GB
South-East Energy Hub
TechUK
Welsh Government
Which?
UK Statistics Authority
Cambridge Architecture Research Ltd
University of Edinburgh / Teddinet
UCL Smart Energy Research Lab[+]
University of Exeter
University of Reading
UKERC
Xoserve
CIBSE
Centre for Sustainable Energy
Sustainability First

Smart meter energy data Public Interest Advisory Group papers - Phase 1

Public Interest Advisory Group papers all available at https://www.smartenergydatapiag.org.uk/	
Kick-off stimulus paper	**Initial Meeting – 30 November 2017** Maxine Frerk, Sustainability First Judith Ward, Sustainability First Simon Roberts, CSE
Working Note	**Clarifying what smart meter data could add to the public interest: public interest questions to frame PIAG's work** Judith Ward
Stimulus paper 1	**Background to ICO Guidance on anonymisation and annex on data access privacy legal framework** Maxine Frerk
Stimulus paper 2	**International experience – smart meter data access** Maxine Frerk
Stimulus paper 3	**Data ethics – a review of the landscape** Maxine Frerk
Stimulus paper 4	**Stakeholder perspectives on smart meter energy data and potential public interest use-cases** Nicky Hodges, CSE
Stimulus paper 5	**Public interest use-cases: data attributes, data requirements, and associated privacy and access implications** Simon Roberts
Stimulus paper 6	**Consumer research on access to smart meter energy data** Maxine Frerk
Ipsos MORI research report	**Customer thinking on privacy in relation to smart meter data for 'public interest' use** Ipsos MORI
Stimulus paper 7	**Possible routes to smart meter data for public interest uses** Maxine Frerk
Stimulus paper 8	**Capability requirements of public interest data user organisations** Nicky Hodges
PIAG final report	**Final Report – Phase 1.** **7 June 2019** Maxine Frerk
Annex to PIAG final report	**Summary of PIAG project papers in Phase 1** Kieran Dodds, Sustainability First

Sustainability First

Sustainability First is an environment think-tank and charity, rooted in experience, with a clear commitment to promoting long-term sustainability through practical thought-leadership. Sustainability First works in the fields of sustainability policy and practice for energy, water supply, and water management. In particular, Sustainability First promotes a 'public interest' agenda in the energy and water sectors, economic regulation and sustainability duties, innovation and how this can better serve sustainability, and the social justice aspects of sustainability including fair treatment for consumers and citizens in vulnerable situations

www.sustainabilityfirst.org.uk

Centre for Sustainable Energy

The Centre for Sustainable Energy (CSE) is an independent national charity that works for a world where sustainability is second nature, carbon emissions have been cut to safe levels, and fuel poverty has been replaced by energy justice. Based in Bristol, CSE undertakes practical work to support individuals, communities, and organisations to take action on energy. CSE shares knowledge and experience to empower people to change the way they think and act about energy by giving advice, managing innovative energy projects, training and supporting others to act, and undertaking research and policy analysis.

www.cse.org.uk