Smart Meter Energy Data:

Delivering on a public-interest purpose

Public Interest Advisory Group (PIAG)

2017 – 2021

Snapshot

Sustainability first

About

Smart Meter Energy Data Public Interest Advisory Group

The smart meter energy data Public Interest Advisory Group (PIAG) was a collaborative public-interest project to consider access to GB smart meter energy data. It was convened between 2017 and 2021 by two environment charities, Sustainability First and the Centre for Sustainable Energy. This note is a snapshot about the project, its research, outputs and main recommendations.

Sustainability First

Sustainability First is a think-tank that promotes practical, sustainable solutions to improve environmental, economic, and social wellbeing. We are a registered charity that primarily works in the public utilities, and have a long, proven record of delivering impactful projects that help shape policy, regulation, and company behaviour in the energy and water sectors.

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for a world where sustainability is second nature, carbon emissions have been cut to safe levels, and fuel poverty has been replaced by energy justice.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.

Acknowledgements

Sincere thanks to PIAG members and project funders for their active support and engagement throughout (full list on page 7). As the lead-author on many of the PIAG papers, particular thanks go to Maxine Frerk, Sustainability First associate.

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Delivering on a public-interest purpose

1. The gap – energy demand-side data

Access to energy demand-side data is a key enabler of the energy transition. PIAG was established to consider a crucial missing piece of this demand-side data puzzle.

How much electricity and gas do we actually use? At a given time? At a given season ? In a given year? Or, at a certain place? These are basic questions. Like other countries around the world, the UK is engaged in wholesale decarbonisation of its energy system. Whether household or business, much of this transformation is customer-led, and answers to these questions matter more than ever. A clear and accurate picture of detailed patterns of energy-use is a necessary building block in shaping a future energy system. Innovators and policy-makers alike need access to detailed demand-side energy data so that effective pathways to an affordable and decarbonised future are well-informed.

The smart meter energy data Public Interest Advisory Group — or PIAG — was convened by two charities, Sustainability First and the Centre for Sustainable Energy (CSE) to tackle a significant energy demand-side data-gap. Smart meter data is a welcome potential energy demand-side data source. However, this data is presently unavailable to government, to regulators or others who may have sound public-interest reasons for its use.

There are now ~25 million electricity and gas smart meters in GB homes and small businesses[1] . By contrast with our old non-digital meters, smart meters record accurate energy consumption data at half-hourly intervals. In effect, they can offer a precise snapshot of when the energy was used as well as how much.

Smart meter data therefore represents an untapped resource for a range of stakeholders across the energy sector. Part of PIAG's objective was to map out the different public interest benefits this new data source could unlock, whether that was for policy makers and regulators working on energy efficiency and flexibility, innovative businesses designing new approaches to heating and transport, or local groups planning ahead for the energy system in their own area.

But there is a challenge to realising the public-interest potential of smart meter data because, quite rightly, access to this data is carefully protected. At present, energy retailers and other service providers can access detailed smart meter data subject to individual customer consent. But for other 'public interest' actors, the necessary frameworks to enable access to this data absent an individual consent are not in place. This is so for government bodies, regulators, local authorities, academics and more. PIAG found that data-access in the public interest would be feasible via suitable safeguards of data-aggregation and anonymisation while at the same time respecting important principles of personal privacy and security.

This is why the answers to our basic questions - about what detailed patterns of electricity and gas-use look like - remain a surprising unknown. Despite accurate half-hourly data increasingly recorded by smart meters, PIAG has highlighted how national energy statistics – which inform and underpin many major policy decisions, energy scenarios and plans - still rely to a surprising extent on estimated figures, small samples and historic models.

This is a rapidly developing area. In 2019, the UK became the first country to set a target to reach net-zero by 2050. Navigating a just energy transition is a pressing matter, with the levelling-up agenda and also the uneven impacts of the covid-19 pandemic. Meanwhile, new developments in machine learning and AI are constantly raising new questions for data ethics and privacy, as recognised in the National Data Strategy that the government launched in 2020.

In 2019, the government's Energy Data Taskforce published its *Strategy for a modern digitalised energy system*. Building on that, the government launched its Strategy and Action Plan in July 2021 on *Digitalising our energy system*

[1] BEIS, Installed since 2011. Smart meter statistics in Great Britain: quarterly report to end June 2021.

for Net Zero[2]. Inter al, the plan notes, 'the government and Ofgem welcome the collaborative work undertaken by the Advisory Group [PIAG] and will consider the recommendations outlined in the Group's final report'.

2. How to fix it

PIAG concluded its work with six major recommendations. These were published in a final report in May 2021.[3]

1. BEIS Energy Statistics : official energy statistics should be expanded using newly available smart meter data to respond to users' needs.

- BEIS plan for smart-meter data to improve the accuracy of the annual consumption inputs to their official energy statistics. But there is also a need for additional information on when that energy is used. A first step should be to report on consumption data by month. PIAG also encouraged BEIS to consider the costs and benefits of collecting data by day or by half-hour.
- BEIS should also make use of smart meter data to report on maximum daily demand, a valuable proxy pending full half-hourly data. This might help improve understanding of heat-usage or electric vehicle charging patterns. Similarly, to make use of data on exports of electricity to the grid to help better understand household use of PV or storage.
- As well as BEIS's summary statistics, the same new data attributes should be added to the National Energy Efficiency Data-Framework (NEED), the BEIS database that links demand to high level demographics and which is the basis for a publicly available sample of 4 million anonymised records linked to demographic data.
- BEIS in fact already has the legal powers it needs to collect such data from suppliers. But other complementary routes might also be available, such as requesting data through the DNOs.
- Given rapid evolution of this policy area, a close dialogue between BEIS and users of their energy statistics is vital.

2. UCL's Smart Energy Research Lab (SERL): The SERL project should be extended beyond 2022 and access to it should be widened.

- SERL's sample of smart meter data from 13,000 consenting households is a valuable resource for the whole sector. PIAG was agrees that funding should be extended past the current end date of 2022.
- At the same time, the SERL dataset should be expanded. Certain demographics are currently not represented (due to phasing of the smart meter rollout), and at its current size, the SERL sample is too small to allow for robust analysis at a sub-regional level.
- Access to SERL should be broadened beyond academic users, at least to include other accredited researchers. PIAG also recommended that SERL enhance the opportunity for third parties, subject to privacy safeguards, to gain access via partnership with a university.

3. Electricity distribution networks (DNOs): depersonalised smart meter data held by DNOs to be treated as system data and therefore 'presumed open'.

- The DNOs are one of the key potential conduits to smart meter data. Their access to personal consumption data is subject to both the government's Data Access and Privacy Framework (DAPF) and also GDPR. DNOs have each recently agreed their privacy plans with Ofgem so that they can access half-hourly consumption data for their own operational and planning purposes, provided it is suitably aggregated or anonymised. But DNOs are also subject to Ofgem's recent Data Best Practice guidance, which includes the principle that wherever possible system-data should be 'presumed open' and the interplay between these various rules is not clear.

[2] Energy Data Taskforce, A strategy for a modern digitalised energy system (2019); BEIS, Innovate UK and Ofgem, Digitalising our energy system for Net Zero: strategy and action plan 2021.

[3] PIAG, Final report — phase 2 (2021).

- PIAG's analysis came to the view that some smart meter data not expressly covered by the DAPF, such as data on voltage, export and maximum demand, for the future should be 'presumed open' as system data. Similarly, consumption data - provided it is adequately de-personalised by aggregation. Ofgem should consider providing updated guidance.
- In making depersonalised smart-meter data more generally available, DNOs should consider consistency of approach.

4. Models / Machine Learning: smart meter data should be used to train existing models to improve the accuracy of current representations of energy demand

- Even if wide access to smart meter data was available – and all the more so until then – consumption models remain essential for understanding both actual usage and potential impacts of policy changes. With smart meter data, models such as the Energy Systems Catapult's EnergyPath Networks, the Centre for Sustainable Energy's THERMOS and the Building Research Establishment's BREDEM could be made both more accurate and detailed. PIAG looked to BEIS and UCL, the home of SERL, to work with modellers to develop proposals to progress this work.
- Opportunities to strengthen energy modelling are being missed. SERL offers a 'laboratory' model for data gathering in partnership. Whether through this or another route, all new customer- or publicly-funded innovation projects should be required to collect smart meter data where it is available.

5. Gas smart meter data: it is time for a major push by Ofgem, BEIS, and others on gas demand data.

- The demand-side data-gap is even greater when it comes to gas which is a particular concern given the challenge of heat decarbonisation. For instance, DNOs are mandated to participate in the system for smart meter data access, but GDNs are not (gas distribution networks). GDNs feel the costs would outweigh the benefits. PIAG recommended that BEIS and Ofgem set expectations for GDNs to take part in future.
- With the expected transition from gas to electric heating, understanding gas usage will be increasingly important to DNOs as well as GDNs. BEIS, Ofgem and the DNOs themselves should consider how to use gas smart meter data, and any obstacles to accessing it.
- When DNOs gather anonymised datasets from their customer-funded innovation projects, Ofgem requires that they publish these. The same does not apply to GDNs. PIAG concluded it should. Likewise, commercial players like gas suppliers and boiler manufacturers should be encouraged to share their insights, and Xoserve, the central data provider for the gas market, should follow counterparts in electricity by opening up access to its gas demand profiles.
- Far more research is needed into gas usage. SERL can help here with a focus on gas demand. But more broadly, PIAG recommended that BEIS commission a meta-study on the available evidence on heat-usage in GB.

6. Future proofing : doors should be kept open to a longer-term comprehensive solution to smart meter data access.

- Looking ahead, PIAG found a need to keep the door open to broader solutions, including a single trusted processor that would provide a route for all stakeholders' smart meter data needs, as explored in an earlier report from PIAG.[4]
- BEIS, Ofgem and others are encouraged to bear in mind smart-meter data-access as the system evolves. For instance, via any future review of the DAPF, the move to half-hourly settlement or renewal of the DCC licence. With plans for a Future System Operator – charged with operational planning of the electricity system and long-run planning for both the electricity and gas networks, it will be important to address that new body's needs for demand-side data including smart-meter data – plus potential for it to play a coordination and access role for others.
- BEIS, Ofgem and Citizens Advice to continue to weigh consumer protection issues against a potential loss of public value from a demand-side data-gap.
- Industry bodies - Smart DCC, Electralink, Elexon and Xoserve - challenged to be ambitious in how they make system data and metadata available in the public interest.

[4] See PIAG, Final report – phase 1 (2019).

- Lastly, PIAG recommended that BEIS and the ONS work together to clarify where responsibility for smart-meter data-access should sit between them.

3. PIAG: a research resource for the future

There are two major PIAG reports supported by nineteen background papers, articles, commentaries and more. These form a major resource to inform future policy development. All of these document can be found of the PIAG microsite.[5]

PIAG's work was in two phases, the first from 2017 to 2019, the second from 2020 to 2021.

Phase 1 findings

In phase 1, PIAG laid the foundations of the project by assessing the need for better demand-side data, the challenges of balancing public interest and privacy concerns, and the options for moving forward.

The need for better demand-side data

The deficit in accessible GB demand-side data – especially energy consumption data - was clear from an early stage, as were the potential challenges. Without access to smart meter data, it was found that policy makers risked 'flying blind' into the energy transition. For example:

- As the electricity system moves towards half-hourly settlement, Ofgem will need access to half-hourly consumption data to understand and measure the impact of its own reforms on different groups.
- Local energy planning is expected to become increasingly important as communities and local authorities become involved in low-carbon infrastructure like EV charging points, district heat or hydrogen networks. At present, the consumption statistics that inform this are lacking in local granularity.
- Government departments and public bodies will need access to suitably granular data to enable them to discharge their duties, and in particular should not be left with *less* access to this data than energy retailers or other market actors enjoy.
- NGOs, charities, think tanks and universities all need access to smart meter data within the policy debate.

These findings formed the basis of the deep-dive workshops on specific public interest use cases for smart meter data that were held in phase 2.

Balancing public interest and privacy concerns

In parallel with PIAG, the question of how to balance privacy and access to energy data – or other sensitive personal data - has been debated across the globe. International examples and examples from other sectors were explored in an early PIAG paper. Drawing on these, PIAG identified that the UK's Digital Economy Act 2017 had already established a set of principles on data privacy, which could be extended to guide thinking on access to smart meter data. In addition, the 2012 Data Access and Privacy Framework had addressed individual-level privacy concerns regarding smart-meter data-privacy.

Building on these principles, PIAG commissioned a major consumer research agency to review public opinion research on smart meter data privacy. The core finding was that participants said that they would find it hard to judge the risks and benefits involved and hence would generally expect government or the regulator to determine how best to protect their interests.[6]

With this in mind, PIAG concluded in July 2019 that a focus was needed on the wider societal benefit of smart meter data as well as on how best to protect the individual customer.

A proposed way forward

To stimulate discussion, phase 1 concluded by proposing a strawman data access system. In this system, a single 'trusted processor' (possibly the ONS, for example) could take on a responsibility for collecting the input smart-meter data from whichever party held it, linking it with other property and demographic data as necessary, and producing the required outputs. This proposal was then held under review in the course of phase 2.

[5] https://www.smartenergydatapiag.org.uk

[6] Ipsos Mori, Customer thinking on privacy in relation to smart meter data for 'public interest' use (2018).

Phase 2 findings

In phase 2, PIAG looked in more detail at the precise additional value that smart meter data could unlock and likely main use-cases. Four workshops were convened to assess to possible use of smart-meter data in the following areas, each with a workshop report.

BEIS statistics

This workshop focused on BEIS's sub-national energy statistics and the NEED database, presently based on annualised consumption estimates. It was clear that understanding *when* energy is used is increasingly important. Seasonal profiles at least are needed to understand the growth in renewables and LCTs - but the more granularity the better.

Regulation

Given the growth of time-of-use tariffs and other forms of customer-side flexibility, it was found that Ofgem's ability to make informed policy choices increasingly will depend on having access to better data. Demand-side data has become a major strand of work within Ofgem, but there was nonetheless a major gap in terms of suitable data-sets able to link individual time-of-use consumption patterns with socio-demographic data - a gap that even an expanded SERL data-set was unlikely to fill.

Local Area Energy Plans

There is growing recognition of the importance of planning for the transition at a local level. But at present such plans largely rely on one-size-fits-all models of local consumption. It was concluded that a smart-meter data-sample could be used to train such models more accurately, while half-hourly demand data at feeder or postcode level would also provide an important resource.

Heat

From this workshop it was clear that the data-gap on gas-usage patterns was considerable and little understood. Given the challenge of decarbonising heat, detailed gas-usage data can offer a valuable indicator for different patterns of heat usage at the household and local level. There is also a need for a better understanding of how modelled data on heat-use in homes compares with actual consumption, and of how consumption varies across households. A main conclusion was that gas smart meter data could help to provide far better analytical insight but risks being comprehensively over-looked.

4. Next steps

The PIAG project concluded with a close-down event in June 2021. The next step is for its recommendations to be taken forward by a range of stakeholders, and in line with the government's *Digitalising our energy system* strategy. Sustainability First and the Centre for Sustainable Energy remain happy to engage.

5. Sponsors and participants

Sustainability First and the Centre for Sustainable Energy would like to express considerable thanks to project sponsors in phases 1 & 2 : Data Communications Company, Energy Systems Catapult, Elexon, Electralink, Greater London Authority, National Grid ESO, Northern Power Grid, Ofgem and UCL SERL (Smart Energy Research Lab).

PIAG members also included representatives of BEIS, Citizens Advice, the Climate Change Committee, the Energy Networks Association, the Energy Saving Trust, Energy-UK, MHCLG (Ministry for Housing, Communities & Local Government), the National Infrastructure Commission, the Office for National Statistics, the Scottish Government, Smart Energy GB, techUK, UKERC, the Universities of Exeter, Reading and Edinburgh, Cambridge Architecture Research Ltd, the Welsh Government and Which? A number of further organisations took part in the workshops in phase 2.

Full list of PIAG publications

All PIAG papers and reports can be found on the PIAG Microsite.

Phase 2 papers

Paper	Description
Final Report – Phase 2	Final Phase 2 paper
Annex 1 to final report	Working paper on DNO privacy plans
Annex 2 to final paper	Summary of findings of workshops 1 to 4
Workshop Paper 4	Analysis of domestic heat – possible added insight from smart-meter data
Workshop Paper 3	The potential 'public-interest' value of access to smart-meter data for devolved governments and local authorities
Workshop Paper 2	Regulatory assessments and system efficiency: potential benefits of smart-meter energy consumption data
Workshop Paper 1	Government approaches to published data and statistics for energy consumption

Phase 1 papers

Paper	Description
Phase 1 final report	Final Phase 1 paper (Workshop – April 2019. Publication – June 2019.)
Annex to PIAG final report	Summary of PIAG project papers
Stimulus paper 8	Capability requirements of public interest data user organisations
Stimulus paper 7	Possible routes to smart meter data for public interest uses
Ipsos MORI research report	Customer thinking on privacy in relation to smart meter data for 'public interest' use
Stimulus paper 6	Consumer research on access to smart meter energy data
Stimulus paper 5	Public interest use-cases: data attributes, data requirements, and associated privacy and access implications
Stimulus paper 4	Stakeholder perspectives on smart meter energy data and potential public interest use-cases
Stimulus paper 3	Data ethics – a review of the landscape
Stimulus paper 2	International experience – smart meter data access
Stimulus paper 1	Background to ICO Guidance on anonymisation and annex on data access privacy legal framework
Working Note	Clarifying what smart meter data could add to the public interest: public interest questions to frame PIAG's work
Kick-off stimulus paper	Initial Meeting – 30 November 2017

Sustainability First is a think tank and charity that promotes practical, sustainable solutions to improve environmental, economic and social well-being. We are a trusted convenor on public utility issues and have a strong track record of bringing stakeholders together in multiparty projects in the public interest.

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