Energy for a Net Zero Society Conference 2021
British Institute of Energy Economics
Oxford, 13th – 14th September 2021

SUPPORTING SMART METERING INNOVATION TO DRIVE ENERGY SAVINGS FOR HOMES AND SMALL BUSINESSES

Kelly Finnerty, Stephanie Gale, Suzanne Cooper and Andrew Charlesworth

UK Department of Business, Energy and Industrial Strategy, Smart Metering Implementation Programme, 1 Victoria Street, London SW1H 0ET.
https://www.gov.uk/government/organisations/department-for-business-energy-and-industrial-strategy

KEYWORDS: Energy and Environment, Energy Consumer – Domestic, Smart Energy, Innovation

ABSTRACT

Smart meters are being rolled out across Great Britain and will play a critical role in modernising the way we all use energy and helping to achieve the UK's long-term commitment to net zero greenhouse gas emissions by 2050. As part of this, BEIS has provided grant funding for two innovation Competitions, for innovators to develop smart energy management tools to maximise the benefits of smart meters and potential for energy savings. The Non-Domestic Smart Energy Management Innovation Competition (NDSEMIC) provided £8.8 million funding and piloted several tools in non-domestic settings, namely small hospitality and retail businesses and schools and the Smart Energy Savings Competition (SENS) provided £6.25 million funding and focused on developing a variety of tools for domestic consumers. The main findings for this report come from NDSEMIC, as findings for this Competition have now been published, whereas the SENS Competition and evaluation is ongoing. The NDSEMIC evaluation found that smart energy management tools can help small businesses and schools become more energy efficient in their behaviours and save energy and for six out of the seven tools piloted, there is evidence that energy savings were achieved. However, to achieve energy savings, the findings showed that the tools needed to first gain the customers' initial interest (typically through promising potential cost savings, environmental benefits or improved energy management) and sustain that interest over a period of time (through the tools' providing timely and granular data, novel and actionable energy saving tips and presenting data clearly, or additional educational components in the case of schools). They also needed to be able to catalyse action and change energy use behaviour, which most tools were successful at doing through encouraging low cost and easy and quick behaviour change actions such as turning lights or equipment off when not in use. Overall, the NDSEMIC evaluation showed that under existing market conditions, there are non-domestic consumers who will take up and use these types of tools and they can generate energy savings and other benefits. Further research through the SENS Competition will show whether energy feedback tools in homes can provide energy savings and other benefits to domestic consumers as well.

1. INTRODUCTION

Smart meters are replacing traditional gas and electricity meters as part of an essential infrastructure upgrade for Great Britain. As of 30 June 2021, there were 25.2 million smart and advanced meters in homes and small businesses in Great Britain [1].

Smart meters play a critical role in modernising the way we all use energy and are aiding the transformation of the energy system, so that it works better for energy consumers [2]. For example, the half-hourly consumption and price data recorded by smart meters unlocks new approaches to managing demand. Innovative products such as smart 'time of use' tariffs reward consumers for using energy away from peak times and enable technologies such as electric vehicles and smart appliances to be cost-effectively integrated with renewable energy sources, as well as allowing energy suppliers to accurately bill their customers [2].

This transformation into a smarter and more flexible energy system will play a vital role in decarbonising the energy sector, enabling the Government to cost-effectively deliver on its long-term commitment to net zero greenhouse gas emissions by 2050 [2].

The Smart Metering Implementation Programme (SMIP) cost-benefit analysis (CBA) outlined that the Programme would continue to develop significant benefits for households and small businesses in Great Britain, with a total Net Present Value (NPV) of £6 billion over the appraisal period [3]. A significant proportion of these savings are realised by consumers engaging with the data from their smart meters, changing their behaviour and reducing their energy use.

For example, domestic households receive an In-Home Display (IHD) alongside their smart meter which provides near real-time feedback on their energy consumption. Smaller non-domestic sites are also entitled to timely access to the consumption data from their smart meter (and BEIS has recently published a consultation on the non-domestic smart meter data offer to maximise benefits for consumers[1]).

Previous evidence has also shown that more sophisticated and data-driven tools using smart meter data have the potential to further help consumers to save money and reduce costs. However, there was an evidence gap in relation to which types of tools, services and features would work best to facilitate this. BEIS therefore commissioned two innovation competitions to fund the development of such tools, to develop the evidence base in this area and to learn more about what policy levers might affect developments in the market for energy management tools across sectors in the future.

2. APPROACH AND METHODOLOGY

Specifically, BEIS launched two Competitions for innovators to develop several products and services based on smart meter data to maximise the benefits and potential for energy savings: one focusing on non-domestic consumers including schools and small businesses and another targeting domestic consumers. The Competitions each offered grant funding to several successful applicants known as 'Competition Partners'.

[1] https://www.gov.uk/government/consultations/maximising-non-domestic-smart-meter-consumer-benefits-improving-the-data-offer-and-enabling-innovation

The NDSEMIC Competition

The Non-Domestic Smart Energy Management Innovation Competition (NDSEMIC) was an £8.8 million competition led by the Smart Metering Implementation Programme (SMIP) within BEIS. The main competition ran from 2018 to 2020 and funded innovators to develop tools based on smart meter data for non-domestic consumers, to maximise the potential for energy savings in three priority sectors (small businesses in the hospitality and retail sectors and schools) [4]. To do this, it developed and piloted several innovative energy management tools that use smart data to help smaller organisations to manage their energy consumption better.

Specifically, the Competition objectives were to:

- **Develop innovative and easy-to-use data tools and services** which were tailored to the requirements of the target sectors, added value to smart meter data and facilitated user engagement.

- **Develop packages of complementary interventions and support mechanisms** tailored to the requirements of the target sectors which would drive uptake and effective use of data products and services.

- **Secure earlier and greater levels of energy management activity** within the key sectors, leading to reduced energy use and costs and subsequently reduced carbon emissions.

- **Develop and strengthen the market** for energy management products and services for smaller non-domestic consumers by reducing the barriers to/stimulating the market for organisations developing solutions.

- **Support the implementation of energy management** with the target sectors by enabling increased and more effective activity by partner organisations.

Overall, nine tools were selected to receive initial development funding (Phase 1 - 2018). Seven of those passed through to the next 'feasibility and initial testing' stage (Phase 2 – Oct 2018 – Jan 2019) and all of these also went through to the final stage of the Competition (Phase 3 – Feb 2019 – 2020), during which the innovations were piloted in a real-world setting [4].

Across all seven projects, 452 sites were engaged in piloting the tools, including 307 chain and independent businesses within the retail and hospitality sectors, and 145 primary and secondary schools [4].

Four of the tools were piloted within the small retail and hospitality sectors: Alert Energy Management System (AEMS), Energy Comparison and Advice Tool (E-CAT), Fluttr and GlowPro. The tools targeted business managers and owners, and Fluttr and GlowPro could also be used by staff members. AEMS and GlowPro were accessible via online platform and mobile apps, whereas Fluttr was mobile app only and E-CAT was only available via an online platform [4].

Each of the tools included various features to drive behaviour change:

- The AEMS tool tracked and visualised energy usage for users and provided 'push'

alerts via mobile. It also provided users with energy saving insights and allowed users to set energy budgets and performance targets.

- The Fluttr tool correlated users' energy use data with key business metrics and provided energy saving tips tailored to business type on how to achieve energy, emissions and cost savings.

- The E-CAT tool monitored energy data and provided it to users at half hourly intervals. It showed a comparison of users' energy use with organisations of a similar type and size, and provided energy saving tips and recommendations tailored to the user's business.

- The GlowPro tool provided different types of users with live energy consumption data and alerted them to changes and included additional functions for business planning and billing management.

These tools and their various features and functionalities were expected to lead to changes in behaviour through making users more aware of their energy use and proactively giving them advice/tips on how to save energy by modifying their behaviour, which would then lead to reductions in energy use and cost savings.

Similarly, four tools (E-CAT, Energy in Schools, Energy Sparks and Untapped) were piloted within schools. E-CAT was piloted with both schools and businesses and there were no additional 'school-specific' features. By comparison, the Energy in Schools and Energy Sparks tools comprised educational, pupil-targeted programmes (e.g. lesson plans which used smart meter data), which were offered to pilot schools alongside the tools themselves. Both tools/packages also included nominating 'Energy Champions' (pupils or adults for Energy in Schools and Energy Sparks respectively) and league tables which displayed energy saving activities/performance against other participating schools. Energy in Schools' tool also included a coding platform to help pupils learn to code. Untapped also offered educational resources [4].

The Research and Evaluation Programme (REP) was a parallel two-year programme running alongside the Competition to extract meaningful learnings and support broader market transformation. The REP was led by Ipsos MORI along with the Carbon Trust and representatives from Technopolis and Loughborough University [4]. The REP had two primary strands of activity: evaluation and action research. The former consisted of an impact evaluation of the Competition overall and the seven pilot projects (that progressed to Phase 2); the latter involved activity-based learning with Competition Partners and industry actors to support market development such as facilitating workshops on different themes.

The evaluation of the Competition sought to assess the extent to which the Competition achieved its short-term objectives (i.e. the extent to which the tools and support mechanisms piloted drove improved energy management in the target sectors), as well as generating learnings to inform longer-term market transformation.

Both the overall evaluation of the Competition and the seven pilot-level evaluations took a theory-based approach. The evaluation assessed and compared different 'cases' (i.e., the seven pilots) to explore in what circumstances key impacts (such as energy savings) were observed and why. This involved triangulating a range of primary and secondary evidence sources

(including qualitative interviews, observation/site visits, surveys, energy consumption analysis and project delivery documentation). The evaluation also drew on insights gained through 'action research' delivered as part of the Competition.

The findings from the main NDSEMIC Competition were published by BEIS on the GOV.UK website in November 2020 and includes the following research outputs: executive summary, overall impact evaluation: full report, technical report, insights for innovators: developing smart energy management services for SMEs, an evaluation case study for each of the seven pilot projects, case studies for each of the three sectors and a video case study for one pilot site.

The SENS Competition

In addition to funding the NDSEMIC Competition, BEIS committed £6.25 million to fund the Smart Energy Savings Innovation Competition (SENS), to support the development and trialling of innovative feedback products and services that use smart meter data to help domestic customers reduce their energy consumption in their homes [5]. Of the £6.25 million total SENS budget, project teams could apply for a share of up to £4.4 million in grant funding to develop and trial innovative products and services, with the remainder funding a concurrent programme of monitoring and evaluation.

In addition to delivering energy savings in excess of those realised through the standard smart meter offer, the Competition also aims to achieve: market development for energy feedback products and services, improved knowledge (for consumers) of how to reduce energy use through behaviour change; better engagement between energy suppliers and their customers; improved household budgeting; increased thermal comfort; lower greenhouse gas emissions; savings on energy bills and greater use of renewable and low carbon technologies.
The SENS Competition comprised the following Phases:

- **Phase 1 (June 2019 to December 2019):** Competition Partners developed new innovative technologies that used smart meter data to help households change the way they use energy. Following a competed application process, eight projects were selected and allocated (matched) grant funding for Phase 1 to develop their products and/or services ahead of potential household trials in Phase 2 [5].

- **Phase 2 (January 2020 - ongoing):** Pilot and evaluate tools through large-scale household trials to understand energy consumption impacts. Following a stage-gate review process, five projects that had reached a suitable development stage were taken through to Phase 2 [5].

The five Phase 2 products have been developed by Eliq Limited, Energy Local CIC, Green Energy Options (GEO) Limited, GenGame Limited and Lightbulb ES Limited [5].

Several projects provide ongoing energy feedback and advice via mobile and/or web applications using half hourly smart meter data. In order to drive behaviour change leading to energy savings, these products and services use a range of techniques, including behavioural insights, gamification, tailored analytics, machine learning and advice designed to build households' ability to act on energy advice. Other features of the tools supported by the competition include integrated smart thermostats that can access smart meter data to provide feedback on the costs of different heating patterns and local energy clubs (Energy Local) that offer a share of local energy generation alongside a smart tariffs [5]. Infographics explaining

the SENS Programme in more detail have now been published on the GOV.UK website online [6].

A 'Trial Design and Evaluation Lead' (TDEL) was commissioned by BEIS to undertake a robust evaluation of the SENS Competition, including separate trial evaluations for each of the individual projects. This is led by Ipsos MORI, in partnership with the Energy Saving Trust (EST), the University of Manchester, the University of Edinburgh and the Smart Energy Research Lab (SERL).

Where feasible the Trial Design and Evaluation Lead was asked to design Randomised Control Trial or Quasi-Experimental evaluations of the impact of the products on total household energy use over and above savings realised from the standard smart meter offer. Primary quantitative and qualitative data collection with trial participants will also be carried out, and used to support both the primary research question (impacts on aggregate energy use) and a range of secondary questions. Within this, there will also be data collection and analyses activities to assess COVID-19 context plus wider market impacts research.

In terms of the specific research and evaluation approach, the primary data collection consists of the following main data sources, which will be conducted by Ipsos MORI with consented trial participants [6]:

- **Telephone survey:** A baseline and end line telephone survey (in summer 2021 and Spring 2022 respectively) conducted by Ipsos MORI with a sample of Treatment and Control trialists, from each trial. This will cover topics such as energy behaviours and attitudes, uptake of energy efficiency measures, views of smart metering and demographics.

- **Qualitative research:** Qualitative interviews conducted with a sample of Treatment trialists from each trial (in between the baseline and end line survey in Autumn/Winter 2021) and diary exercises or site visits/ observations may be conducted too. These will discuss user experience and feedback of the product/service and associated benefits. Stakeholder interviews with relevant parties including Competition Partners will also be conducted.

- **Energy Consumption Analysis:** Energy Consumption savings will be measured through statistical analysis of participants' energy consumption data provided via the UCL Smart Energy Research Laboratory (SERL), where secured opt-in consent provided by trialists.

In terms of the evaluation designs, of the five projects that progressed to Phase 2, two evaluations are Randomised Control Trials (GEO Limited and Lightbulb ES Limited), two are matched control design (GenGame Limited and Eliq Limited) and the remaining one is a theory-based evaluation (Energy Local CIC).

Through the delivery of both the SENS and NDSEMIC competitions, BEIS aims to understand the impact of energy management tools in addition to smart meters on energy consumption, support tool uptake and ensure that future tools are attractive and valued by consumers in order to stimulate broader market transformation for smart services.

3. RESULTS

Most of the results for this paper will be based on the findings from the main NDSEMIC Competition as this evaluation has now been finished and the results have been published, however, results are not yet available for SENS as this evaluation is still ongoing.

The NDSEMIC Competition

Most of the findings below come from the overall impact evaluation report [4] and executive summary [7].

Energy saving outcomes

Overall, the NDSEMIC evaluation found that smart energy management tools and services can help small businesses and schools to become more energy efficient in their behaviours and save energy. Therefore, the Competition's hypothesis that smart energy management tools can add value to smart meter data for smaller non-domestic sites was proven valid.

For six out of the seven tools piloted, there is evidence that energy savings were achieved. In some cases, these savings were substantial: with schools saving between 10% and 20% in some cases whilst two businesses reached savings of up to 11% [4].

Where savings did not occur, it was usually because of disinterest in the tool, a lack of motivation (i.e. prioritisation of other concerns) or a feeling that changes in energy use were not possible (e.g. where the tool did not clearly demonstrate the costs and benefits of particular changes in usage). Findings therefore show that in order to achieve energy savings, tools must first gain initial customer interest, sustain that interest over time and be able to catalyse action and drive behaviour change.

Gaining customer interest

The following factors proved important in encouraging participation with the pilot tools. These may be relevant when considering the types of sites likely to initially take up or accept the offer of smart energy management tools in a market scenario:

- Small retail and hospitality sites were typically motivated to participate in the pilots because they believed the tool would generate potential cost savings, environmental benefits (i.e. energy savings and reduced carbon emissions), and improved business management.

- A full package of features including lesson plans and other educational resources provided alongside the smart energy management tools proved helpful in engaging schools and especially in motivating schools to take up the tools initially. Pilots generally found it easier to target primary rather than secondary schools with educational resources. Tools that involved pupils as a user of energy monitoring data helped to increase take-up and engagement with the tools and improve results.

- Where schools had an existing sustainability 'infrastructure' this also motivated them to take up the tools, though this was not a prerequisite for tool take-up. Similarly, local authority climate emergency declarations acted as a key driver for schools' interest in some cases.

Sustaining customer interest

The following are factors which proved important in sustaining customer engagement with smart energy management tools over time. These may be relevant for those wishing to understand which tools may be successful commercially at engaging users.

- Timely and granular data proved significant for engagement, with users most appreciating having access to live data at half hourly (or less) intervals, and users with temperature and equipment-level monitoring feeling most able to make changes in how and when they use energy. In most cases, this level of detail was new (i.e. additional to information available through energy bills).

- Utility and novelty of energy efficiency insights was crucial to engagement. Tailored energy efficiency tips and reports which were refreshed over time (and which adapt according to context e.g. season) proved helpful to keep energy management 'top of mind' for users. Users who felt that the tips were not actionable were deterred from using the tools and therefore did not benefit from them.

- Presenting data in easy-to-understand, relevant formats proved important for organisational buy-in, which in turn was important for sustained engagement. For example, presenting energy consumption in terms of money spent or in terms of equivalent energy (e.g. number of kettles boiled) enabled the consequences of energy waste to be more easily communicated to business staff and school pupils on site.

- Users who received ongoing support from Competition Partners were more likely to continue engaging with the tool and make energy use changes as a result. Support was particularly impactful when offered either face-to-face or over the phone. Schools in particular needed support at both the induction stage and beyond to secure whole school engagement with both teaching and support staff and pupils.

- In small retail and hospitality businesses, tools were able to have the most impact where their use or recommendations became part of routine business practice. For example, automated controls such as smart plugs were highly effective ways of ensuring equipment was turned on/off appropriately. Desktop portals appear to have been marginally easier to integrate into business operations, through mobile phone accessed portals were helpful for those that required more flexible access e.g. in hotels. Longer-term, business users were planning to use tools to help them make procurement and operational decisions and to monitor their ongoing energy use and associated costs.

- In schools, tool elements that encouraged 'friendly' competition appeared to be highly effective in maintaining engagement amongst pupils. Where tools were embedded within broader sustainability movements in schools, this motivated them to engaged with the tools, change behaviours and carry out energy efficient actions. In addition, tailored tool experiences and data presentations for different subsets of school users (e.g. a separate portal for pupils) proved more impactful than a single portal for all users, as did ensuring that such users were aware of the features relevant to them.

Catalysing action and changing energy use behaviour

Most of the tools were successful in engaging customers and driving behaviour change among at least some of their users. The following factors proved important in catalysing more energy efficient behaviour amongst tool users and therefore understanding which tools may be effective at supporting net zero ambitions and carbon reduction objectives.

- Low cost and easy and quick changes (e.g. switching off equipment or lights when not in use) were the most frequently made behaviour changes. Where such action was widespread and sustained, or where it concerned particularly energy-intensive equipment, the energy saving effect could be significant. One example included using ovens only when needed and/or limiting energy use to specific times of day, which resulted in businesses and schools seeing quite significant reductions in their energy consumption.

- Some users did not feel able to change their behaviour or take action to reduce their energy consumption, either because they felt this was unnecessary as their energy use was already minimal, they were unable to pinpoint specific actions which might lead to energy savings, or they were insufficiently motivated to change their behaviour.

- In small retail and hospitality businesses, while the tools did generally prove effective in prompting energy efficient action across pilot sites, personalised support and equipment-level monitoring may be necessary to support sites to make larger or more complex investments, for example substantial equipment upgrades. For those with an existing sustainability drive or who were already actively monitoring their energy use, tools only prompted action where they provided new information to the user e.g. in the form of more granular data. Energy efficiency tips, benchmarks, budgets, alerts and advice were most effective at enabling change when tailored to the user's context or organisation. However, not everyone needs to use the tools directly to benefit from then; management could use such tools to identify practices and actions which are then passed down to other staff within the business to implement as well.

- In schools, once engaged with the tools**,** pupils acted as effective agents of change, driving behaviour change among other pupils, school staff and encouraging the implementation of more efficient energy management processes. Elements that encouraged competition were highly effective in engaging pupils such as leader boards showing school's energy use compared with other participating schools and/or the number of energy saving actions they have completed compared with other schools. A display screen in a central location presenting data from the tool in ways that were relevant and engaging for both pupils and adults also helped to engender a culture of energy efficiency across pilot schools and kept energy efficiency front-of-mind.

Lessons for future market development

At present, the market for innovative smart energy management tools that the NDSEMIC Competition sought to develop is still a relatively early stage and the evaluation does not reach any definite conclusions about longer-term commercialisation of the tools it piloted. However, at the time of publication there were some positive indications that at least some of the tools piloted had reached a degree of commercial readiness with partnerships being formed.

The evaluation suggests a range of possible factors which may affect future market development in this area and the potential emergence of a self-sustaining market for non-domestic smart energy management solutions. These include:

- How the market responds to the requirements of early adopters, who may be driven by a range of financial, operational or environmental concerns. Similarly, the evaluation has shown the value of tools tailored to the school sector in particular.

- The role of partnerships between market actors as a way of reducing the costs of reaching customers and providing services.

- The scope for integration of energy data and energy management tools into technological solutions supporting other activities (such as educational tools in the school sector, or retail and hospitality IT systems), which can deliver greater functionality to users.

- The strategies adopted by energy suppliers, and possibly other market actors, in developing new, bundled services as part of energy tariffs which offer additional benefits to customers at scale and potentially for no additional charge.

- The potential for meters that meet the Smart Metering Equipment Technical Specifications (SMETS meters) to offer a more streamlined, lower cost route to accessing energy data than Advanced Meter Reading (AMR) meters and pulse metering, and the scope for product functionalities that make use of live, granular data.

- The balance between SMETS and AMR in the future non-domestic metering landscape in light of the above.

- Regulatory drivers, including obligations on suppliers to make consumption data readily available to their non-domestic customers or third parties acting with customer consent.

- Wider developments such as the possible development of new data systems for accessing half hourly data as part of future arrangements for market-wide half hourly settlement.

The SENS Competition

Phase 2 trials began in January 2020, however, the COVID-19 pandemic and subsequent restrictions during 2020 had a significant impact on the progress of the SENS programme. As

a result, all five trials have now been extended to end in March 2022, with final findings and reporting due to follow later in 2022.

4. CONCLUSIONS

Overall, findings from the NDSEMIC Competition have shown that under existing market conditions there are consumers in all three non-domestic target sectors that will take up these types of tools, either actively (including being willing to seek out and pay for them) or more reactively/passively. In some cases, the tools piloted lead to significant energy savings and wider benefits for consumers [7].

There is therefore clear evidence that with sufficient engagement from the consumer, smart energy management tools and services can help small businesses and schools to become more energy efficient in their behaviours and save energy. This was particularly the case where tools appealed sufficiently to users' motivations, provided information in tailored, novel and timely ways and provided easily actionable advice.

However, the evaluation has also identified dependencies to this occurring. Behaviour change was not universal across sites; where this did not occur, it was either because of disinterest in the tool, a lack of motivation (i.e. prioritisation of other business concerns) or a feeling that changes in energy use were not possible (e.g. where the tool did not clearly demonstrate the costs and benefits of particular changes in usage). Therefore, for tools to be successful at market, or when scaled up, they would need to overcome such challenges [4].

Wider uptake of tools and market expansion will be partly dependent on broader cultural shifts within schools and businesses towards carbon emissions reductions (and increased energy efficiency), other technological developments, the growth of complementary markets and ongoing policy development aimed at increasing energy efficiency and clean growth [4].

In particular, ongoing tool support proved an important driver of both engagement and impacts across all three target sectors. In addition, some pilot participants took part as they had 'nothing to lose' but this may not translate to willingness to pay to use such tools in a broader context. Here, wider government policy and programming (as well as initiatives led by the energy supply market and others) may facilitate the testing and trialling of ways to commercials and scale up solutions in these circumstances [4].

Government action may also impact the scale and nature of market development moving forwards. For example, policies affecting the metering landscape as well as the arrangements for accessing energy consumption data for non-domestic consumers and innovators acting on their behalf could impact innovators' motivations and target markets. Partnerships between innovators and other market actors (such as energy suppliers and Data Communications Company Other Users), may also be important to facilitate access to potential customers and energy consumption data [4]. Since the publication of the evaluation, BEIS has published a consultation on the non-domestic smart meter consumer data offer which explicitly builds upon NDSEMIC findings[2]. This proposes that in future, energy suppliers would be required to provide all non-domestic smart meter customers with free, user-accessible information about their energy consumption (based on the half-hourly data from their smart meter). It also

[2] https://www.gov.uk/government/consultations/maximising-non-domestic-smart-meter-consumer-benefits-improving-the-data-offer-and-enabling-innovation

proposes changes that would make it easier for third parties to access non-domestic SMETS and AMR consumption data from energy suppliers to support innovation. Government will respond to that consultation in due course.

More broadly, the learnings from both NDSEMIC and SENS have the potential to be applied more widely and to support progress towards achieving net zero, particularly in the energy sector. The NDSEMIC pilots have generated examples of how organisations such as schools can engage with and use such data tools, the level of support they need and the wider benefits they get from using them, beyond energy and cost savings. How to support and disseminate such approaches more widely could be the subject of further work [4].

The findings from the NDSEMIC Phase 3 extensions project and the SENS evaluation, which will both be available in 2022, will likely also generate further insights and learnings into the potential of smart energy management tools to provide benefits for both non-domestic and domestic energy consumers. In particular, future findings may support broader future learning about smart infrastructure and how it can support innovation across different sectors and also inform learnings on how smart energy feedback tools can be improved, commercialised and scaled up. More broadly, there may also be overlaps between consumers' uptake and use of smart energy feedback tools and broader consumer attitudes towards other net zero initiatives such as electric vehicles, smart energy tariffs and tariff comparison websites.

5. REFERENCES

1 Smart meters in Great Britain, quarterly update August 2021, available at: https://www.gov.uk/government/collections/smart-meters-statistics

2 Smart Meter Policy Framework Post 2020, available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/990525/smart-meter-policy-framework-post-2020-govt-response-minimum-annual-targets.pdf

3 Smart meter roll-out: cost-benefit analysis 2019, available at: https://www.gov.uk/government/publications/smart-meter-roll-out-cost-benefit-analysis-2019

4 NDSEMIC overall impact evaluation: full report, Nov 2020, available at: https://www.gov.uk/government/publications/non-domestic-smart-energy-management-innovation-competition-ndsemic-evaluation-findings

5 https://www.gov.uk/government/publications/smart-energy-savings-sens-competition

6 The Smart ENergy Savings (SENS) Innovation Competition: overview (infographics), January 2021, available at: https://www.gov.uk/government/publications/smart-energy-savings-sens-competition

7 NDSEMIC overall impact evaluation: executive summary, Nov 2020, available at: https://www.gov.uk/government/publications/non-domestic-smart-energy-management-innovation-competition-ndsemic-evaluation-findings