Department for
Business, Energy
& Industrial Strategy

Non-Domestic Smart Energy Management Innovation Competition

Overall impact evaluation report from NDSEMIC's Research and Evaluation Programme

Executive Summary

November 2020

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Executive summary

Smart meters are replacing traditional gas and electricity meters in homes, small businesses and schools across Great Britain as part of an important upgrade to the national energy infrastructure and underpinning the cost-effective delivery of Government's net zero commitment. They are a critical tool in the transition to a low carbon energy system, for example by enabling incentives for consumers to use energy when renewable generation is available and automatic charging of electric vehicles when prices are low. A key expected benefit of the transition to smart meters is that the energy data that they record will be used by consumers to engage with, and better manage, their energy consumption.

The Non-Domestic Smart Energy Management Innovation Competition (from here on 'the Competition') was an £8.8 million competition led by the Smart Metering Implementation Programme (SMIP) within the Department for Business, Energy & Industrial Strategy (BEIS). The Competition ran from 2018 to 2020 and aimed to maximise the potential for energy saving in three priority sectors (hospitality, retail and schools). To do this, it funded and supported the piloting of innovative energy management products and services ('tools') that use smart meter data to help smaller organisations manage their energy use.

This executive summary is part of a package of outputs published as products of the Competition, which also includes the (full) overall final evaluation report, seven pilot evaluations, insights for innovators, user impact case studies and an evaluation technical report. These are available on www.gov.uk.

Introduction

1. Market analysis by BEIS prior to the start of the Competition found that the existing market primarily served larger non-domestic organisations, but that there was technical and market potential for smart energy management products and services for smaller organisations.

2. The Competition aimed to pilot new solutions in the small retail, small hospitality and school sectors – these were sectors seen as a priority for targeted intervention.[1]

3. Specifically, the Competition objectives were to:

    - Develop innovative and easy-to-use data tools and services (such as online platforms, apps and behaviour change interventions) 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 (such as training materials and case studies) tailored to the requirements of the target sectors which would drive the 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 costs and carbon emissions.

[1] These sectors were chosen as they represent a significant proportion of the Great British organisations targeted in the rollout of smart meters to the non-domestic sector, both in terms of the total number of organisations and amount of energy consumed.

- 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 within the target sectors by enabling increased and more effective activity by partner organisations (e.g. Smart Energy GB, energy suppliers, devolved administrations and others).[2]

4. This document summarises the findings of the two-year Research and Evaluation Programme (REP) which ran in parallel to the Competition. 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 tools and support mechanisms piloted drove improved energy management in the target sectors), as well as generating learnings to inform longer-term market transformation.

5. Overall, the evaluation found that the smart energy management tools piloted had varying degrees of success in generating results, but most were successful in engaging and driving behaviour change among at least some of their users. In six out of seven cases (i.e. for AEMS, E-CAT, Energy in Schools, Energy Sparks, fluttr and GlowPro), the evaluation found evidence that the tool had already led to energy savings. In some schools (piloting Energy Sparks), the tool contributed to energy savings of between 10% and 20%, and for two businesses (piloting E-CAT), the in-depth quantitative energy consumption analysis also suggests savings of up to 11%.

Overview of the smart energy management tools piloted

6. Overall, nine tools were selected to receive initial development funding. Seven of these passed through to the next 'feasibility and initial testing' stage and they also went through to the final stage of the Competition, during which the innovations were piloted in a real-world setting.

Tools piloted within the small retail and small hospitality sectors

7. Four of the tools were piloted within the small retail and hospitality sectors:

- Alert Energy Management System (AEMS), developed by AND TR.
- Energy Comparison and Advice Tool (E-CAT), developed by Element Energy.
- Fluttr, developed by Considerate Group (piloted amongst restaurants and hotels only).
- GlowPro, developed by Hildebrand.

8. The tools targeted business managers and owners. Fluttr and GlowPro could also be used by staff members.

9. AEMS and GlowPro were accessible via online platform and mobile app. Fluttr was mobile app only and E-CAT was only available via online platform.

[2] This was an implicit objective of work surrounding the Competition and its research programme, and therefore is not the focus of this report.

Table 1: Overview of features of the tools piloted in small retail and hospitality businesses

Tool feature	Key features
Provided tips on energy use and how to make cost savings.	AEMS, E-CAT, fluttr
Summarised energy use over time in graphs via the platform.	All
Summarised energy use in pdf reports.	AEMS, GlowPro
Issued alerts for unusual energy use and overspend.	AEMS, GlowPro[3]
Benchmarked energy use.	Against similar businesses (E-CAT) and comparable days (fluttr)
Contextualised data by presenting it in terms of money spent.	Fluttr
Provided information on energy consumption by equipment.[4]	AEMS, GlowPro
Enabled temperature monitoring.	GlowPro
Provided access to live data.	E-CAT, GlowPro

Tools piloted within the school sector

10. Four tools (E-CAT, Energy in Schools, Energy Sparks and Untapped) were piloted within schools. E-CAT was piloted in schools in the same way as in businesses – there were no additional 'school-specific' features. By comparison, the Energy in Schools and Energy Sparks tools comprised educational, pupil-targeted programmes, which were offered alongside online energy management platforms. Untapped also offered educational resources (though few users were aware of these).

11. The tools sought to engage users through:

- **Differentiated access to data dashboards** and **tailored information** for energy managers, teachers, pupils and others (e.g. the public for Energy Sparks, and IT technicians for Energy in Schools).
- **Learning resources that engaged teachers and pupils**. These were aligned to the national curriculum and covered a range of subjects (maths, science and information technology (IT)). All the school pilots, except E-CAT, offered educational resources alongside the tool. Pupils using Energy in Schools were also given access to energy and heat-monitoring equipment, and to computer programming equipment to learn how to monitor energy. Several schools participating in both the Energy in Schools and Energy Sparks pilots made use of the energy use graphs in classes such as maths. Through both pilots, children were encouraged to catalyse behaviour change (e.g. by running poster campaigns) and to participate in after-school clubs to learn how to act more sustainably (Energy Sparks) and how to code (Energy in Schools).

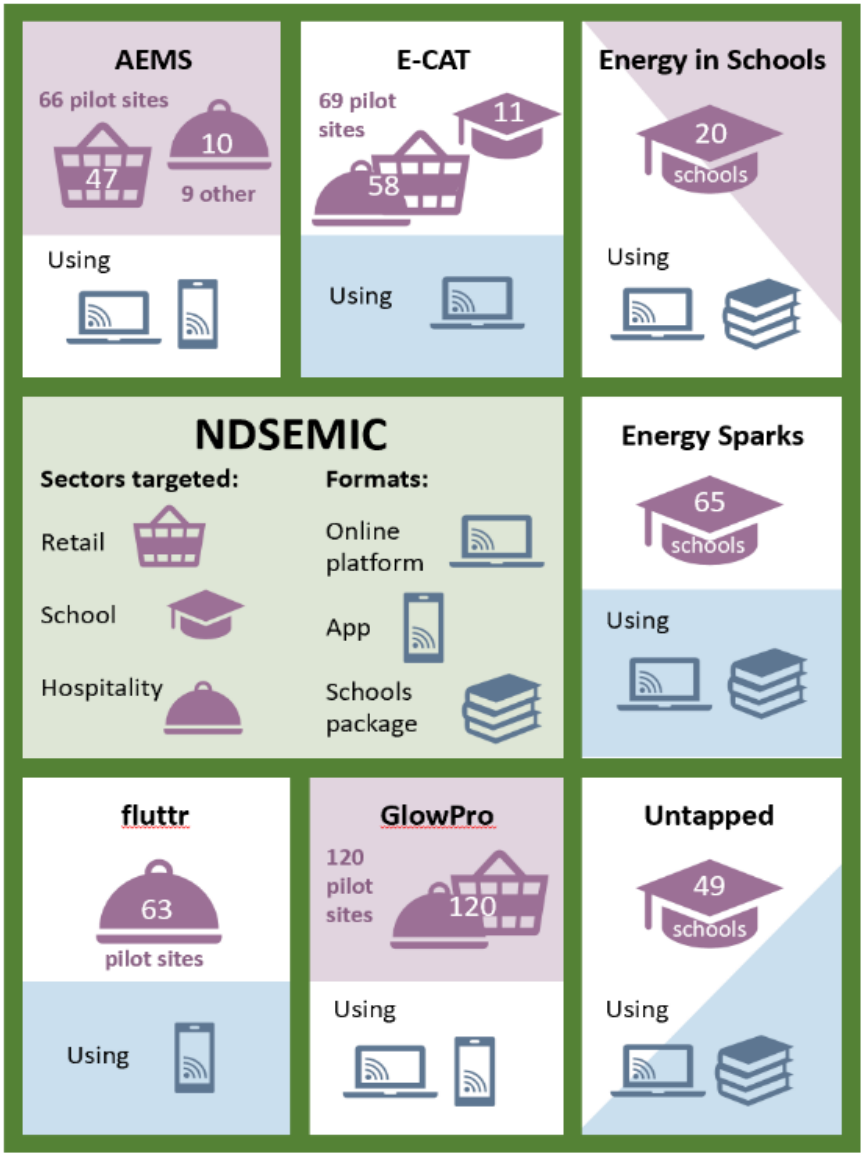
[3] The evaluation was not able to consult any GlowPro pilot sites which had piloted this feature.
[4] Where sensors were attached.

- **Gamification and competition** to motivate pupils to complete activities and compete against other schools in reducing their energy consumption. Energy in Schools, Energy Sparks and Untapped used league tables to compare participating schools, both in terms of energy outcomes and contributing activities (which earned points). Energy in Schools users were also given access to large TV screens which displayed energy use and leader board information, raising the profile of energy use across the whole school.
- **The use of Energy Champions** to improve awareness of energy use and to encourage behaviour change across schools. Energy Champions assigned through Energy in Schools were pupils and those assigned via Energy Sparks were adults (teachers, governors, parents, etc.). As part of both pilots, the Champions were trained to raise energy awareness in the school and to identify and promote opportunities to reduce energy waste.

Visual of tool pilot sites

12. Figure 1 visualises the seven projects by number and sector of pilot sites (retail, hospitality and school) and tool format.

Figure 1: Visual of tool pilot sites and sectors



Evaluation approach

13. Both the overall evaluation and the seven pilot-level evaluations took a theory-based approach. Under this approach, data collection and analysis are designed to provide evidence (qualitative and quantitative) that support, refute or refine the 'theory' of how a programme's inputs are intended to lead to its desired outcomes.

14. 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, surveys, energy consumption analysis and project delivery documentation).

15. The evaluation also drew on insights gained through 'action research' delivered as part of the Competition. This comprised best practice sharing, shared problem solving, creating communities of learning and activity-based learning towards cross-programme themes.

Key findings of the evaluation

Energy saving outcomes

16. This evaluation provides evidence 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 has proven valid**.

17. For six out of the seven tools piloted, there is evidence that energy savings were achieved.[5] The evaluation's level of confidence in the strength of this evidence ranged from very high (Energy Sparks) through high (E-CAT, Glow-Pro, Energy in Schools) to medium (AEMS, fluttr).

18. In some cases, savings were substantial: Energy Sparks contributed to energy savings of between 10% and 20% in some schools whilst two small businesses piloting E-CAT reached savings of up to 11%.

19. Where savings did not occur, it was 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).

20. Findings therefore show that energy savings are dependent upon tools gaining initial customer interest, sustaining that interest and being able to catalyse action and change energy use behaviour.

[5] As a rating of confidence that tool contributed to savings in at least some sites.

Gaining customer interest

21. The following factors proved important in encouraging pilot participation. 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:[6]

- 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** (in the form of reduced carbon emissions, but also in terms of increased green credentials), and **improved business management**. These motivations were found across both sectors and regardless of pre-existing green motivations.
- A **full package of features** proved helpful in engaging schools alongside the basic energy use portal, with educational resources particularly important in motivating schools to take up the tools initially. **Models that involved pupils** as a user of energy monitoring data helped to increase take-up of 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. Pilots found it easier to target primary rather than secondary schools with educational resources.
- Local authority **climate emergency declarations** acted as a key driver for schools' interest in some cases. The support of local authorities also helped to drive interest in some of the piloted tools.

Sustaining customer interest

22. The following are factors which proved important in sustaining consumer 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.

Across sectors

- **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 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 (as a metric of overall daily business activity) or in terms of equivalent energy (e.g. number of kettles

[6] Whilst it is not possible to generalise entirely from a pilot scenario to a real-world market context, it is possible to make inferences or hypotheses based upon this research.

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** were more likely to continue engaging with the tool and make energy use changes as a result. Support was particularly impactful when offered by the tool developers either face-to-face or over the phone. Schools in particular needed support at both induction stage and beyond to secure whole school engagement.

In small retail and small hospitality businesses

- Smart energy management tools were able to have an impact where their use or recommendations became **part of routine business practice**. As such, automated controls such as smart plugs were highly effective ways of ensuring equipment was turned on / off appropriately; and reports and tips provided within tools were sometimes integrated into standard monitoring or meetings.
- **Desktop portals** appear to have been marginally easier to integrate into business operations, though mobile phone-accessed portals offered users who need to be physically on the move (e.g. in hotels) more flexible access.
- Longer-term, users were planning to **use tools to help them make procurement and operational decisions** (e.g. about what equipment to buy or building upgrades to make) and to monitor their ongoing energy use and costs (e.g. reviewing the accuracy of their energy bills).

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 engage with the tools and carry out energy efficient actions.
- **Tailored tool experiences and data presentations for different school users** proved more impactful than a single portal, as did ensuring that such users were aware of the features relevant to them.

Catalysing action & changing energy use behaviour

23. **Most of the tools were successful in engaging customers and driving behaviour change among at least some of their users**.

24. The following are factors which proved important in catalysing more energy efficient behaviours amongst users. These may be relevant for those wishing to understand which tools may be effective at supporting net zero and carbon reduction objectives.

Across sectors

- **The changes that sites most frequently felt able to make were switching off equipment or lights when not in use**. Such action was low cost and easy and quick to implement. Where such action was widespread and sustained, or where it concerned particularly energy-intensive equipment, the energy saving effect could be significant. For example, by using ovens only when needed and/or by limiting energy use to specific

times of the day, businesses and schools were able to see quite significant differences in their energy consumption.

- **Some users did not feel able to change their behaviour or take action to reduce their energy consumption**. Some felt that change was unnecessary as their energy use was minimal, for example small retail outlets with no or few heating or cooling needs. For some sites with multiple pieces of energy intensive equipment, the tools were not able to convincingly pinpoint specific actions which might lead to energy savings and/or had not clearly set out the costs and benefits of actions. In other cases, pilot participants were insufficiently motivated to change behaviour.

In small retail and small hospitality

- While the tools did generally prove effective in prompting energy efficient action across pilots, **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 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 on use (by time or type of operation) or by equipment.
- Energy efficiency tips, benchmarks, budgets, alerts and advice were most effective at enabling change when **tailored to the user's context or organisation**, though this did not always cut neatly across sectoral boundaries. Often sub-sectors (i.e. hotels), type of equipment, time-of-day usage and energy intensity proved more important ways of 'segmenting' customers than 'whole' sectors.
- This evaluation showed that **not everyone needs to use smart energy management tools directly to benefit from them**. An organisation's management could use such tools to identify practices which are then passed down to other staff within the business.

In schools

- Once engaged, **pupils acted as effective agents of change** within their schools, driving behaviour change among other pupils, school staff, and more efficient energy management processes.
- Elements that encouraged competition were highly effective in engaging pupils. **Leader boards** showing schools' energy use compared with other participating schools, and/or the number/type of energy savings actions they have completed compared with other schools, were extremely effective in enthusing pupils.
- A **display screen** presenting data from the tool in ways that were relevant and engaging for both pupils and adults helped to engender a culture of energy efficiency across pilot schools and kept energy efficiency front-of-mind.

Lessons for future market development

25. At the close of the Competition, the market for innovative energy management tools that the Competition sought to develop is still at a relatively early stage and the evaluation does not reach any definite conclusions about longer-term commercialisation of the

tools it piloted. However, **there are some positive indications that at least some of the tools piloted have reached a degree of commercial readiness with partnerships being formed and plans being made for commercialisation before the end of 2020**.

26. 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 are summarised below.

Possible factors affecting future market development
How the market responds to the requirements of early adopters, who (like those participating in the Competition pilots) 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 SMETS metering[7] to offer a more streamlined, lower cost route to accessing energy data than AMR 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.

[7] Non-domestic settings in Great Britain use two types of smart metering: AMR, considered 'advanced' meters and which provide one-way communication of data from customers to energy suppliers; and next generation meters which conform to the SMETS standards, which permit two-way data flow between parties. Non-domestic sites which do not have (AMR or SMETS) smart metering rely on traditional 'pulse' meters. More information is provided in '*Developing smart energy management services for SMEs - NDSEMIC insights for innovators*' published alongside this evaluation.

Conclusions

27. The evaluation has shown that under existing market conditions there are consumers in all three 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. However, wider uptake and market expansion will be partly dependent on broader cultural shifts within schools and businesses towards carbon emission 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 (including those related to building and equipment efficiency).

28. In particular, ongoing tool support proved an important driver of both engagement and impacts across all three target sectors. In addition, some pilot participants participated as they had 'nothing to lose' – in such cases, willingness to pay for these tools may not be universal. 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 commercialise and scale up solutions in these circumstances. For example, the bundling of smart energy management tools as part of supply tariffs, or new combinations of innovative technologies and people-led support (such as consultancy or advice services).

29. Government action may also impact the scale and nature of market development moving forwards. 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),[8] may also be important to facilitate access to potential customers and energy consumption data.

30. More broadly, the development and use of non-domestic smart energy management solutions will be affected by, and may also affect, the broader energy transition, commitments to net zero and initiatives such as climate emergency declarations. For example, public commitments to tackling climate change and reducing carbon emissions have been shown during this Competition to motivate energy efficient action in schools and catalyse engagement with energy efficiency products and services.

31. Learning developed within the pilots has the potential to be applied more widely and to support progress towards net zero. This is not limited to how smart energy management solutions can best support demand reduction, but also the broader social learning around their introduction. The pilots have generated examples of how organisations such as schools can engage with and use such tools, the support they need and the benefits they get from using them, beyond energy saving. How to support and disseminate such approaches more widely could be the subject of further work.

[8] See '*Developing smart energy management services for SMEs - NDSEMIC insights for innovators'* published alongside this evaluation.

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