Department for
Business, Energy
& Industrial Strategy

Non-Domestic Smart Energy Management Innovation Competition

Evaluation case study: Energy Sparks

November 2020

Acknowledgements

This report was prepared by Ipsos MORI, in partnership with the Carbon Trust and Technopolis. The research would not have been possible without the cooperation of all of those who participated in interviews, surveys and workshops.

Any enquiries regarding this publication should be sent to us at: smartenergymanagement@beis.gov.uk

Contents

Executive summary

This report describes findings and lessons from the evaluation of Energy Sparks, an energy management and education tool piloted by the Energy Sparks initiative as part of the UK Government's Non-Domestic Smart Energy Management Innovation Competition (NDSEMIC). Energy Sparks is an online platform and educational programme aimed at helping schools reduce energy use, lower their energy bills, and engage pupils with energy efficiency. It was piloted across 65 schools.

There is clear evidence from the evaluation that schools who piloted the tool and made active use of it reduced their energy use. More than a third of all pilot sites made use of the tool on several occasions, with at least one fifth using it more regularly and adopting improved energy management practices as a result. On the basis of the qualitative and quantitative evidence combined, the evaluation has a very high level of confidence that the Energy Sparks tool has contributed to energy savings in at least some schools.[1]

Energy managers in pilot schools reported that, after using the tool, they introduced operational changes to reduce energy use, or were better able to justify and promote new energy use policies already introduced to staff and pupils. Teachers used the Energy Sparks tool to raise pupils' awareness of the science behind energy and the environmental and social impacts of its use. Pupils used the tool for learning and to encourage energy saving behaviour within the school, leading – in some cases – to staff behaviour change.

The educational offer of Energy Sparks was crucial to gaining the initial interest of schools, while the induction given to the schools' main users was pivotal to its uptake. By offering learning resources that were accessible to and achievable for pupils, it empowered pupils to become drivers of energy saving action within schools. The leader board of participating schools (which compared schools on points awarded for completed energy saving activities and savings achieved) engaged pupils beyond those participating in eco-schools and helped sustain full-school interest in energy efficient actions.

The findings from this report suggest that the Energy Sparks initiative could consider the following points as it progresses its offer, which may also be relevant for other innovators:

- Consider offering introductory training to all schools, even those which are enrolled via a third party (e.g. a local authority). Providing training to a local authority alone might be insufficient, as in some cases the local authority staff might have limited time and capabilities to pass on the knowledge.
- Consider ways to make tool training less dependent on a single face-to-face trainer or 'champion' in the school (e.g. through an introductory video for instance) so that engagement with the tool is not compromised when a trained staff member leaves.
- Continue building on existing and new partnerships with sustainable schools' initiatives and with local authorities which have declared a climate emergency to further disseminate the tool.

[1] This is the conclusion reached from applying the evaluation's strength of evidence framework (see Chapter three). This framework triangulated various quantitative and qualitative data sources to give a level of confidence that savings had been achieved in some pilot sites.

- Consider introducing the assignment of an ‘Energy Champion’ as an obligatory element for tool implementation.

1 Introduction

This report describes the findings and lessons from the evaluation of the Energy Sparks tool, an energy management and education tool developed by the Energy Sparks initiative as part of the UK Government's Non-Domestic Smart Energy Management Innovation Competition (NDSEMIC). NDSEMIC (from here on referred to as 'the Competition') is an £8.8 million programme, funded by the Department for Business, Energy and Industrial Strategy (BEIS). It aims to maximise the potential for energy saving in three priority sectors (hospitality, retail and schools). To do this, it has developed energy management products and services that use smart meter data to help smaller organisations to manage their energy consumption better.

Nine projects were selected as part of the Competition to receive initial development funding. Seven of these passed through to the next 'feasibility and initial testing' stage. All seven project developers, including the Energy Sparks initiative, also went through to the final stage of the Competition (from February 2019 to January 2020) during which the innovations were piloted with small businesses and schools in a real-world setting.

This report is part of a package of reports published as products of the Competition, which also includes six other pilot evaluations, an overall final evaluation report, insights for innovators, user impact case studies and an evaluation technical report. These are available on www.gov.uk.

Overview of Energy Sparks

The Energy Sparks tool featured four different dashboards, each tailored to a specific audience: the general public, pupils, teachers and school management. The same energy data was accessible to all, but was presented in a different way for each:

- The school management's dashboard provided disaggregated data and highlighted opportunities for savings, as well as benchmarking and comparisons with other schools.
- The pupil's dashboard was presented more simply using language the children would understand e.g. "your school uses [number] kWh of energy; that's enough to heat a house for X years' or 'you spend this much on electricity, that's enough to buy [number] books/ computers".
- The teacher's dashboard is a mix between the two, with some level of detailed data, but also access to activities for pupils.
- The teacher and pupil dashboards contained teaching resources and learning activities for engaging pupils with energy efficiency.
- The public dashboard (see Figure 1) was available to anyone and was used by local authorities to track the energy consumption in schools under their remit.

Figure 1: An example of a school's dashboard (also available to the public)[2]

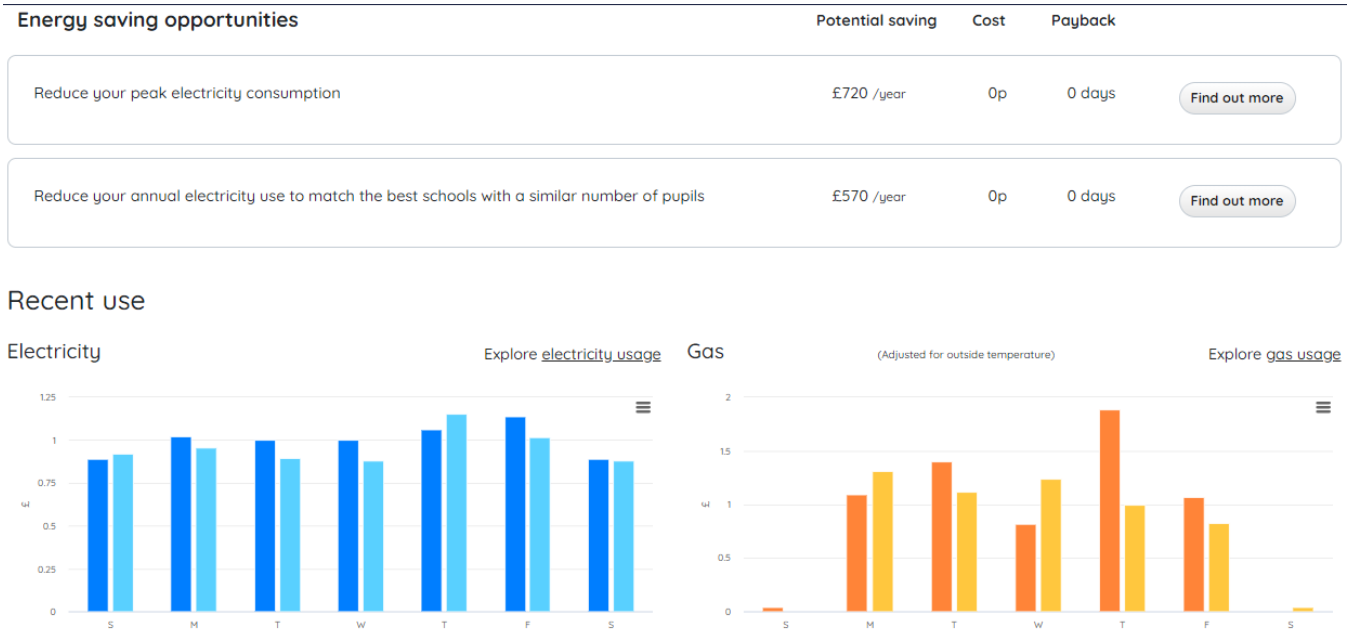


Figure 2: An example data comparison from the Pupil Dashboard

The key features of the Energy Sparks tool available across the manager, pupil and teacher dashboards were:

- **Live energy data**:[3] which provided smart meter readings **every 30 minutes**.
- **Historic benchmarking data**: to help users compare current usage to the same day in previous weeks, months or years.
- **Data analysis**, which rated a school's energy usage out of five stars in different categories for electricity and gas (see Annex 3).
- **A school comparison tool**: for users to benchmark their school's energy saving performance against that of other participating schools.
- **Alerts** (available via the manager dashboard only): to inform users of changes in their school's energy use, long-term problems with energy consumption and

[2] Available at: https://energysparks.uk/schools

[3] Live data in the context of this Competition describes energy consumption data at half hourly (or more detailed) granularity fed to the tool or platform on an on-going basis. Non-live data may provide the same level of granularity but is not updated on an ongoing basis, for example being uploaded to the tool or platform once a day (and in arrears).

recommendations for saving energy, and how the school is performing compared to other schools. Users could choose to receive alerts via email or text message (SMS).

- **A requirement for schools to set up eco-clubs**, with suggested activities for pupils including: investigating energy usage, raising awareness, taking action around the school and whole-school activities. The eco-clubs were made up of volunteer pupils who met several times a term during lunchtime or after school.[4] These pupils learned about energy issues and took part in activities to help identify and promote opportunities to reduce energy waste within the school. Users could record which activities they had completed on the website, which earned the school points; points were then displayed on **a scoreboard, so schools could compete with each other** by completing activities. Schools with top scores were then granted cash prizes which they could use to fund energy-related goods or activities (workshops, efficient lighting, etc.).
- **Learning resources** (available via the teacher and pupil dashboard) which comprise downloadable lesson plans, activity guides, pupil worksheets, data recording sheets, and model policies and posters designed for use with all pupils or at eco-clubs. Screenshots of the resources are provided in Annex 3.

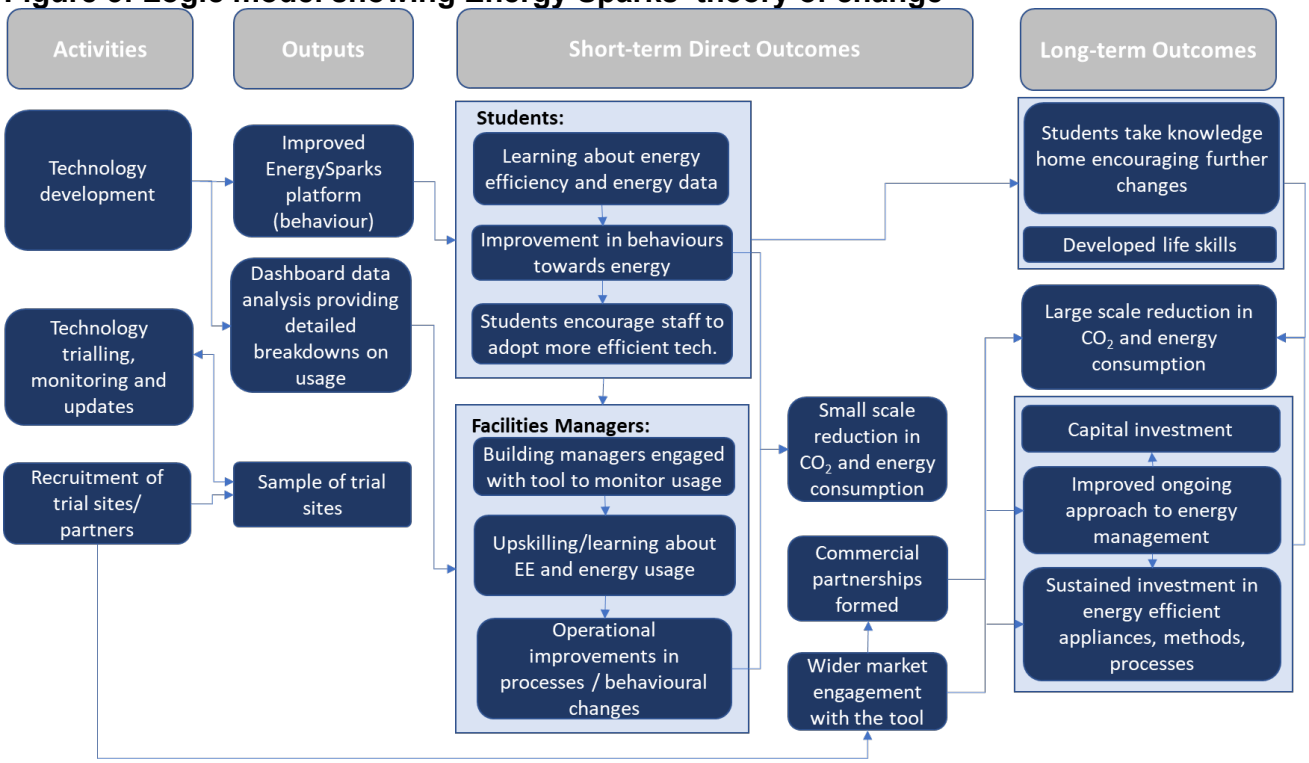
The anticipated effect of Energy Sparks (its theory of change)

The Energy Sparks tool aimed to help pupils, teachers and school management reduce their school's carbon emissions. In doing so, it also aimed to provide pupils with an understanding of energy and its role in climate change. It also aimed to empower pupils to have a role in saving energy in their school and homes.

Figure 3 presents the theory of change underpinning Energy Sparks' design.[5] It describes: the activities that Energy Sparks conducted to develop the tool, the direct outputs of these activities, and anticipated short-term and long-term results ('outcomes'). By the end of the project's close in January 2020, it was expected to have met, or be contributing to, all of its proposed short-term outcomes, as well as showing evidence towards meeting some of the longer-term outcomes such as pupils developing life-skills, schools progressing to adopting more efficient technologies and wider adoption of the tool.

[4] See Annex 3, Figure 6 for further information on the eco-club programme set out by Energy Sparks.
[5] A theory of change describes how change is assumed to come about through an intervention. It often shows in a diagram the connections between interventions and outcomes – these are often called 'causal pathways' or results chains.

Figure 3: Logic model showing Energy Sparks' theory of change



How Energy Sparks was piloted

Overall, 65 primary and secondary schools across five local authorities, with approximately 24,000 pupils between them, piloted the Energy Sparks tool during the Competition. Although the Energy Sparks tool was developed for use in both primary and secondary schools, most schools piloting it (around 50) were primary schools, which is potentially a reflection of the nation-wide ratio between numbers of primary and secondary schools.[6]

Energy Sparks recruited schools to pilot the tool through the following channels:

- **Local authorities**: Prior to the Competition, Energy Sparks had developed partnerships with three local authorities, and a further two were secured during the Competition. Prior to the Competition, approximately ten schools from one local authority had already been piloting the Energy Sparks tool and providing feedback on its development.
- **Existing energy initiatives**: Energy Sparks partnered with initiatives already promoting sustainability and energy efficiency in schools. These organisations then marketed the Energy Sparks tool directly to partner schools when carrying out their own activities.
- **School trusts**: Two independent schools were recruited into the pilot via a partnership with a school trust.

[6] https://explore-education-statistics.service.gov.uk/find-statistics/school-pupils-and-their-characteristics

This evaluation

The research for this evaluation was conducted by Ipsos MORI in conjunction with their consortium partners the Carbon Trust and Technopolis Group. Ipsos MORI designed the overall evaluation approach. It also designed and delivered all aspects of the methodology, except for the energy consumption analysis which was designed and conducted by the Carbon Trust and quality assured by Technopolis.

The evaluation takes a theory and case-based approach which is described in more detail in Annex 1. The findings draw on insights from pilot participants based across seven schools and three local authorities that piloted Energy Sparks. These insights were gathered through site visits to four schools (six users interviewed), in-depth telephone interviews with school and local authority representatives at a further three schools, an online survey of nine users, and a paper survey with 41 pupils at three schools. It also draws upon data provided by Energy Sparks and a trend analysis of the energy consumption across all schools participating in the pilot.

Schools were selected for visits and telephone interviews based on purposive sampling by the evaluation team, targeting a diverse geographical coverage.[7] The qualitative evidence covers 15[8] of the 65 schools registered to use the Energy Sparks tool; the energy consumption analysis covers 64[9] with four explored in detail.

This report

The following chapters cover: the extent to which schools and local authorities in the pilot engaged with the Energy Sparks tool (Chapter two – How schools used Energy Sparks); the extent to which engagement resulted in intended effects (Chapter three – The results of the pilot of Energy Sparks); and ends with a summary of the findings (Chapter four – Conclusions).

[7] Although the evaluation team tried to control for other parameters, such as school size, governance (academy, state, independent, etc), grade (primary and secondary) etc., it was only possible to control for the location as there was only a small number of schools willing/available to host a visit or participate in a telephone interview due primarily to time constraints.
[8] In total, nine schools participated in the survey, two of which also participated in on-site interviews. Eight other schools (who had not responded to the survey) participated in interviews.
[9] Data was not available for one of the schools.

2 How schools used Energy Sparks

This chapter discusses how users of the Energy Sparks tool engaged with it in terms of different user experiences, frequency of access and the features accessed. Schools engaged with Energy Sparks in different ways: some used it for energy management only, some for its educational features, and others for both.

How Energy Sparks promoted the use of the tool

Once schools had signed up to use the Energy Sparks tool, they were offered induction training via a visit, phone call or Skype video meeting. The training was directed at the school "Energy Champion", i.e. the main user of the tool, who would act as the Energy Sparks account administrator for the school, support pupil energy saving activities, receive Energy Sparks alerts about energy use and commit to checking the school's Energy Sparks online account regularly.

Interviews with councils and schools indicate that **lower engagement with the Energy Sparks tool seems to have been associated with the absence of this induction stage** and, as a result, the absence of explicitly assigning an Energy Champion role to one of the schools' staff members. This was the case, for instance, where councils partnered with Energy Sparks to sign-up a group of managed schools, but where Energy Sparks had limited direct contact with users within the schools. In these circumstances, Energy Sparks relied on the council to deliver induction training. One council employee explained that their team had received good training from Energy Sparks but had not successfully pushed this training out to the schools, adding that those schools had not fully engaged with or asked about the benefits or functionality of the tool. The importance of this induction training is well illustrated by the case of a school facilities manager who was aware of Energy Sparks through email updates, but had remained unaware of the website until asked about it in the interview:

> *"I just realised that if you click on the name of the school [in the email] it actually brings me up to […] our annual usage [in the webpage]. But without having this [interview] I was not aware of that." – Facilities manager, Primary school*

Even in those cases where the induction was provided, staff turn-over meant a risk of the knowledge being lost in the medium-term. This was the case of a school business manager who had signed up for Energy Sparks and planned for a specific colleague to be an Energy Sparks Champion. After the colleague left, the knowledge was lost, and the school no longer fully engaged with the tool. Had the training been accessible to any interested party (through an introductory video for instance) this may have ensured the knowledge was not lost.

Frequency of tool use

Overall, across the 65 schools signed up to use the Energy Sparks tool, at least 27 accessed it once or more and 20 accessed it twice or more.[10]

[10] Based on data on compiled from the Energy Sparks portal on the number of schools logging eco-club activities.

Amongst the nine survey respondents, one stated that they had never used the tool and one reported that they had only used it once, but the remaining seven were using it on a monthly basis or more regularly (e.g. one used it weekly).

Amongst the seven schools participating in face-to-face or telephone interviews for this evaluation, five had made active use of the tool. At one of these, users had only recently been onboarded, but were already heavily engaging with the tool with the school student council making use of it. Pupils were excited by the competitive aspects of the tool and teachers were planning to refer to it in their maths and statistics lessons.

At two other schools consulted through interviews, the schools were not engaging with the tool because, in one case, the school had not received induction support and were therefore not aware of the tool's full features, including the dashboard, and at the second school, due to a changeover in staff there was no longer any assigned Energy Champion to promote the tool. **These findings further underline the importance of training and the Energy Champion mechanisms as drivers of Energy Sparks outcomes**.

Reasons for user engagement with Energy Sparks

Most schools heard about Energy Sparks via word of mouth through governors or at headteacher meetings or through Energy Spark's partners' programmes (including Eco-Schools, Bath: Hacked, Less CO2).

Users of the Energy Sparks tool reported a mix of reasons for participating in the pilot of the Energy Sparks tool, but **the main driver for schools taking up the tool was its educational features** (i.e. the learning activities for engaging pupils with energy).

Many of the participating schools were seeking to raise awareness and inspire pupils to have a sense of agency over energy use and environmental issues.

For local authorities that promoted the Energy Sparks tool across their schools, the main value of the tool was the opportunity to help schools save energy, contributing towards the schools' budgets and the councils' progress toward carbon reduction targets.

The profile of Energy Sparks users

The Energy Sparks tool was designed to accommodate different types of users and purposes: energy management by school decision makers, learning for teachers and pupils, and inter-school comparison by local authorities. Generally, teachers used Energy Sparks to support their eco-club, while staff responsible for energy management within the school would access it to check whether energy use in the school was in line with their expected use.

How energy managers used Energy Sparks

Energy managers reported that before using the Energy Sparks tool they had tended to monitor their bills manually, by comparing bills to previous bills and/or to meter readings. After

using Energy Sparks, half of those interviewed[11] commented that they found **the Energy Sparks tool more useful than previous methods they had in place to track energy use.**

> *"I used to keep a spreadsheet of the meter reads, but with Energy Sparks, I don't really need to do that anymore*." *– Manager, Primary school*

For energy managers, the live data and the historical consumption reports of the Energy Sparks tool provided the most value. It enabled them to track energy use and wastage and to identify inefficiencies, such as whether equipment had been left on over weekends. Some of these users also found the benchmarking feature helpful for identifying targets and best (and bad) practice. A local authority representative explained that:

> *"[Because of the Energy Sparks tool, the schools] can see [how much energy] they're using every half hour during the school week, during weekends and during school holidays. That's been the biggest benefit of Energy Sparks. […] They can then, obviously, put interventions in place and then track the benefit of those interventions." – Local authority representative*

Some users also accessed the Energy Sparks tool to help with budgeting and the forecasting of energy costs, explaining that they could easily access all the data needed for these tasks in a quicker way than manually recording costs and calculating predictions in a spreadsheet.

However, there are indications that the Energy Sparks tool was **most useful for energy managers in the initial months of use**, with a couple of interviewees indicating that they had **reduced the frequency with which they accessed the portal over time**. For instance, one facilities manager who had used the tool for over a year indicated that having taken all the actions within their remit, the tool had essentially served its main purpose. They still checked it but would do so less often and only to ensure that the were no sudden changes in consumption.[12]

Local authorities were mostly interested in the tool's standardised and publicly available energy data to enable comparison across schools under their remit, though they were also keen for schools to take up the learning resources. They introduced the Energy Sparks tool to schools either through a member of council staff responsible for monitoring energy use and facilities within several schools, or through existing channels of communications such as emails, online platforms and occasional face-to-face meetings. Where the councils did not have a member of staff embedded within the schools,[13] they reported challenges in motivating schools to access the resources. Even in one council where most schools had been using the tool to monitor their energy use and save on bills, only a small number were engaging in the learning resources. The findings highlight the importance of a careful induction process to introduce users to all key features, particularly when users have been given access to the tool by external organisations rather than directly.

[11] Six out of 12 interviewees with energy management responsibilities.
[12] It is not clear from the research whether longer and more frequent engagement would be associated to more significant results and hence it is not possible to indicate whether longer term engagement should be sought by Energy Sparks.
[13] That is, a council staff member responsible for monitoring energy use and facilities within the school.

How teachers and pupils used Energy Sparks

The Energy Sparks tool was mostly used by pupils and teachers as part of extra-curricular activities, with over a third of the participating schools (27 of 65) having established an eco-club to engage pupils with the Energy Sparks tool.[14]

Teachers involved in eco-clubs would typically use the Energy Sparks tool to walk the pupils through the historical data (typically by day, week or month) and to discuss with pupils how energy use differed at certain times (class time versus break/lunch time) or on certain days (weekdays versus weekends or school holidays). Sometimes they structured the eco-club activities around the Energy Sparks tool learning resources.

> *"Because it has these discrete activities, as long as you sort of plug into the ones that you think are achievable within the [session] time frame you've got, then that's quite a useful sort of thing to just have that." – Teacher, Primary school*

Teachers found that the learning activities were accessible and achievable for pupils. They also stressed that allowing pupils to plan and complete tasks with a degree of independence was engaging for them whilst it created a sense of responsibility and empowerment.

> *"I think what they enjoyed about it was having a job. They like that little bit of responsibility. […] they were putting their hands up for all sorts of things […]. They were really keen to just be assigned a role and have that little job to do. […] just because they want to be involved with some aspects of school life on a responsibility basis." – Teacher, Primary school*

Teachers leading eco-clubs found the following aspects to be the most useful within the Energy Sparks tool:

- **The competitive aspect**: the leader boards, which recorded points for completed activities and energy savings achieved were helpful for sustaining engagement with the tool and ongoing action.

  "[Pupils] can see [historical data] like that and being able to compare themselves to other schools as well is really powerful for them." – Teacher, Primary school

- **The simple and visual approach**: having clear and easy-to-use charts to display the data was critical for engaging pupils. The comparison of school energy consumption to everyday activities such as boiling kettles (see Figure 2) was also valued.

  "They know the money side is important but the kids, [...] they want to reduce the greenhouse gases." – Teacher, Primary school

  "(...) the things where it says to the children (…), that's enough energy to boil a kettle a million times in a year or something. (…) you know, just, it's more accessible, isn't it?" – Manager, Primary school

One teacher suggested that having data by emissions or providing air quality insights would help further engagement from pupils. Several councils have declared a climate emergency since 2019 and, as such, having this information could help schools respond appropriately.

[14] At least one school piloting Energy Sparks had an eco-club before taking up the pilot of Energy Sparks. This school already had an interest in reducing their energy use and waste and, for this reason, were keen to make use of a tool that helped show them how to do this.

“I think the council has declared a climate emergency, so they want to be zero emissions by the end of the next decade and, therefore, I think there's a real opportunity for us to link in with education and awareness programmes [being carried out in] schools.” *– Local authority representative*

3 The results of the pilot of Energy Sparks

This chapter discusses the extent to which the expected results (outcomes) of Energy Sparks were achieved (as anticipated in its theory of change (see Chapter one)).

The Energy Sparks tool was designed to help schools reduce energy use, lower their energy bills and engage their pupils with energy efficiency. It was expected that the pupil-targeted materials (learning activities, energy dashboard and leader board) would enhance awareness of energy use, leading to behaviour change amongst pupils, and leading them to influence school management staff to adopt more efficient behaviour and processes. Furthermore, it was expected that the energy dashboard would help school management understand school energy usage and wastage, enabling them to address inefficiencies.

As explained in the next sections, **in those schools which engaged with Energy Sparks, pupils became more aware and more engaged with energy efficiency in their schools**, at times effectively driving changes in staff behaviour. **Management staff also made changes to how they used equipment based on the granular information from dashboards**.

Changes in pupils' and staff behaviour **led to clear energy savings in some schools** (as demonstrated by quantitative evidence) and can be inferred to have led – or be leading – to energy savings at other sites where there was also clear evidence of behaviour change.

Immediate outcomes for pupils and management staff

Pupils' awareness and learning outcomes

As described above, the outcomes of using the Energy Sparks tool for pupils were two-fold:

- By building it into pupil education it increased pupils' energy-efficiency awareness; and,
- It empowered pupils to actively drive behaviour change within their school.

Increasing energy awareness

In the schools running eco-clubs, **Energy Sparks helped teachers raise pupils' awareness of energy as a concept (what is energy and how electricity and gas are used) and of energy use (what equipment uses the most energy and how the consumption could be reduced)**. Among the 41 pupils surveyed in three schools for this evaluation, 31 (75%) said they now know more about saving energy at school and 27 (65%) said they now know more about their school's energy use.[15] Generally, teachers using the tool were pleased with how it supported them in this task:

> *"I've always wanted to think, how can I get the kids more engaged with [energy], how can we reduce emissions at the school. This is the perfect tool that you can do all those things. I'm really pleased with it."* - Teacher in primary school

[15] The school staff survey did not fully support this finding (with four in nine respondents not seeing a change in pupil awareness). However, such respondents did not work with pupils themselves and most of them were within schools that did not have pupil eco-clubs. Therefore, the in-school pupil survey is assessed to be stronger evidence for answering this research question.

In some of the participating schools, the eco-clubs have motivated pupils to enhance their understanding around how energy is used within the school. For instance, in one school, pupils reviewed the historical energy data and worked with staff to work out which activities within the schools might explain the variation in consumption trends.

> *"They want to do the touch screens, because they think that, because we use them a lot, that they'll use the most energy. I said 'well you might be surprised. Let's try a couple of things over the term and let's see'." – Teacher, Primary school*

The Energy Sparks tool awarded cash-prizes to schools with the highest score in the leader boards. One of the schools used the cash to buy smart plugs[16] which will allow them to assess the energy usage at equipment level, while at another school it was used to fund a workshop to teach pupils about electricity generation.

Pupils encouraging behaviour change across the school

In many cases, pupils in the eco-clubs used knowledge gained through the Energy Sparks tool to encourage energy saving behaviour among other pupils and staff. Among pupils surveyed for the evaluation, seven in ten (68%) reported they are doing new things to try and save energy and around half (48%) were reminding their teachers to do the same. **Several teachers and staff reported that pupil efforts had successfully led to changes in staff behaviour.**

Across several schools interviewed, there was evidence that pupils had actively encouraged teachers and managers to increase energy efficiency in the school.

> *"I've got three children doing a lighting spot check, I've got classroom children measuring the temperatures […] And then they were going to make posters to [encourage staff and pupils to] save energy" – Teacher, Primary school*

> *"[The student council, which contains the eco-club meet] once a half-term, but then they do things like, you know, reminding people about turning lights off, turning all equipment off at the end of the day and just go out and, sort of, do the engagement stuff. You know, it's maybe more powerful coming from a child than a [member of staff], so I think that's worked really well and they really enjoy it." – Management staff, School*

School staff members' awareness and improvements in energy management

Overall, **staff with energy management responsibilities felt that the Energy Sparks tool provided them with better energy data than their previous sources** (energy bills, meter readings and building management systems).[17] Being able to access granular, frequent and historic data, as well as clear costs and savings, helped make them more aware of the impact of small changes, and in turn **made them more focused, more likely to query potential waste and careful about turning off appliances**. Most survey respondents felt that the Energy Sparks tool made them more confident of knowing when the school uses the most

[16] Smart plugs are plugs fitted to the end of traditional equipment power plugs and they allow tracking the energy being consumed by that particular equipment. In some cases, they can be connected to a mobile app to allow the user to remotely control when the equipment is turned on and off.

[17] A building management system (BMS) is a computer-based control system installed in buildings that controls and monitors the building's mechanical and electrical equipment such as ventilation, lighting, power systems, fire systems, and security systems.

energy, the patterns of energy usage out-of-hours and of knowing what changes could be made to their school equipment, processes or building(s) to save energy.[18]

> *"I think it's just that being conscious of the impact of leaving your lights on in the classroom, naturally, just putting it a bit more to the front of your mind than it was before, perhaps." – Manager, Primary school*

> *"Just seeing it immediately it there and […] comparing it with this time last year, comparing it with the weather […] it's just so smart, it's such a useful tool, […]. Also, having a benchmark […] [makes] it really easy to see how it should be*." *– Manager, Primary school*

Generally, management staff found that **seeing costs and savings linked to changes they made was motivating, and it equipped them with evidence they could use to strengthen their school policies.** Where there had been resistance to shutting classroom doors during breaks, the Energy Sparks tool could show how much money drafts cause in terms of energy use and costs and this has reportedly led teachers to become more inclined to follow the recommendations.

Furthermore, about half of the surveyed schools reported changes in behaviours towards energy saving practices, with five out of nine survey respondents saying that energy is more of a priority in their schools now and reporting that they discuss ways to save energy more often now. Five in nine reported that their schools have tried to reduce energy use in the school.

Users at four schools reported that they had implemented changes to schools' processes and equipment as a result of the Energy Sparks tool. This included changing the times at which equipment (heaters, boilers) was turned on either manually (e.g. by changing the school shut-down process pre-holiday) or automatically (i.e. through smart plugs). These changes were implemented following the tool's notification of where energy savings could be made or following pressure from pupils. For instance, one school was prompted to start turning the heaters off over the holiday period after having been notified of the energy misuse through the Energy Sparks tool.

The boxes below provide a deep dive into three of the pilot schools that had implemented changes to their energy processes and equipment as a result of their engagement with the Energy Sparks tool. They provide a summary of the schools' profiles, why they decided to engage with Energy Sparks, and how the tool usage drove the changes implemented.

School #1 – Primary school

Size: 100-500 pupils; Years 1-6 | **Energy supply**: Electricity and Gas | **Pilot start**: November 2018

The local council's commitment to helping schools save energy was the main driver for School #1 taking up the Energy Sparks tool and taking action to reduce energy waste. The council had two dedicated facility managers who were responsible for energy management within the participating schools and who were tasked with embedding the Energy Sparks tool within them. In School #1 the take-up was primarily led by one of these members of staff.

The main Energy Sparks tool users within the school were the facility manager and the school manager, with the facility manager checking the tool "*fairly regularly*" to monitor and

[18] Eight out of nine schools responding to the survey said they felt more confident in knowing these aspects.

find ways to improve energy use. Although there was a desire to introduce the Energy Sparks tool to teachers and pupils, a lack of teacher availability had delayed this thus far.

As a result of Energy Sparks, the managers had made changes to the way the school used energy, including changing the heating schedule (gas-fired). The facility manager reported an intention to keep using the Energy Sparks tool in the future though they did not feel there were additional changes that could be made to save energy further.

> "*We've altered all the [heating] timings, we don't need it on until five o'clock at night and we've just tweaked it and we've got it coming on later in the morning. Just things like that […]. It's more savings for the school, which then obviously helps us because we can direct money to other areas. Energy is a big cost to a school.*" – *School manager*

The school is also upgrading the lighting to LED* bulbs, which was to some extent driven by the Energy Sparks tool, according to survey responses submitted by School #1.

**Light-emitting diode*

School #2 – Primary school

Years: 1-6 | **Energy supply**: Electricity | **Pilot start**: May 2019

This school was already engaged with Energy Sparks in some capacity before joining the formal pilot, having completed a number of energy saving activities and becoming a top-ranking school on the Energy Sparks leader board. Prior to using the Energy Sparks tool, the school manager and a governor had started tracking energy use through a manual spreadsheet, and pupils had already implemented energy efficiency practices.

When their formal Energy Sparks pilot started, this catalysed further action; they implemented changes to equipment use, automating the times when equipment was turned on and off. Although there had been a prior intention of automating the equipment, there were indications that the Energy Sparks tool accelerated its implementation. The initiative was driven by the governor, who found that Energy Sparks helped increase the school's understanding of how much energy was being wasted and saved, and implemented by the school manager, who reported being "*more worried*" about energy wastage and more "*data-driven*" since engaging with Energy Sparks.

> "*[The heaters automation] was coming, but the Energy Sparks [tool] has, sort of, kicked it a little bit more.*" – *Governor*

The Energy Sparks tool was also used by the pre-existing eco-club and was adopted by teachers as a way of helping pupils engage with and "*take ownership*" of energy management within the school. Participating pupils would already do "*energy checks*" three times a week and award prizes to the most eco-friendly classroom each week. Thus far, the club has engaged with the Energy Sparks tool to log the activities that they already had in place (which led them to a leading position in the scoreboard) and to plan new activities. As such, although pupils already had a sustainability drive, teachers report that the Energy Sparks tool is helping the school to *sustain* pupil engagement:

> "*[The tool is] giving them a bit of motivation and direction as well. […] it sets out really what else you can be doing. Some of the big projects, some of the little things you can do. It's been really helpful." – Teacher leading the eco-club*
>
> *"The activities have got different points levels. [The pupils] immediately want to go in on the highest points level possible. […] even though they're like, 50 times more difficult to achieve.*" *– School manager*

School #3– Primary school

Size: 100-500; Years 1-4 | **Energy supply**: Electricity and Gas | **Pilot start**: Jan-Feb 2019

This school is also one of the top schools on the Energy Sparks tool scoreboard, where pupils' and staff engagement with the tool seems to be driving behaviour changes and adjustments to equipment usage.

The pupils in the eco-club met twice a term to implement the learning activities, raising awareness across the school. Interviewees indicated that the simple charts as well as the links to videos and websites within the learning activities were useful for engaging pupils, who were in the younger age brackets (four to seven-year-olds). The competition aspect of it was also helpful:

> *"[Getting] stickers and reward points and badges, […] that's more exciting for little children, seeing this. […] we were [close to the top of the scoreboard] for ages. So, they were like, 'We need to do more.' So, the sense of competition, they love that" – Teacher*

While the Energy Sparks tool was not regularly used by the management staff directly, the pilot has reportedly led to changes in behaviours and awareness across school staff and other pupils. For instance, the caretaker now makes sure that computers and tablets are turned off at the end of the day and the school manager regularly reminds school staff to turn lights off when rooms are not in use. Furthermore, the tool has also led the management to embed energy efficiency principles into the pre-existing plans of school building expansion:

> "*We are looking at a heating system in the roof because it's more efficient. That is a knock-on effect of seeing how much more efficient [the building] is.*" *– School manager*

Medium-term outcomes: the effects of Energy Sparks on energy consumption and energy bills

As described above, where schools were active users of the Energy Sparks tool, it seems to have raised the awareness and understanding of energy use across users (pupils, teachers, staff and school managers). Engaged pupils have at times helped encourage behaviour change across the school, while engaged school managers have used the information from the Energy Sparks tool around potential savings to trigger or support decisions to improve energy use.

Based on an assessment of the available evidence, there is a **very high level of confidence that the Energy Sparks tool contributed to energy savings in at least some sites** (see Table 1 for the rating framework). This is based upon the following sources of evidence:

- **Self-reported behaviour change**: among the five interviewed schools that engaged with the Energy Sparks tool, four had implemented changes to schools' processes and equipment as a result of the Energy Sparks tool or used the data. The remaining one had not made such changes but was only recently recruited and had not had much opportunity to benefit from the tool but was already actively using it.
- **The perspectives of multiple users at a single site**: at three schools, more than one user was consulted, and they converged in their opinion that the tool had led to behaviour change that would be expected to lead to a reduction in energy use.
- **Self-reported energy savings**: schools #1, #2 and #3, presented in the previous section, reported having seen cost savings following the implementation of the behaviour and process change measures. Additionally, one council member indicated that a school under their remit saved £20,000 a year by shutting down a heater which was being left on overnight.
- **Survey results**: five out of nine respondents agreed that their school has tried to reduce the amount of energy used since they started engaging with Energy Sparks and six out of nine reported that their school implemented or has plans to implement energy efficiency or clean energy measures.
- **Analysis of energy consumption trends**: schools that engaged with the learning activities from Energy Sparks[19] **saved on average 4% in their average daily electricity consumption and 10% in average gas consumption**. The analysis of aggregate energy consumption across all pilot schools (i.e. regardless of their engagement with the learning activities) shows smaller reductions in average daily consumption of around 2% in electricity and gas[20] . It is possible that this is being driven by a lower engagement across some schools within this wider group.
- **Analysis of school-specific consumption trends**: the energy consumption analysis of Schools #1, #2 and #3 (whose cases were detailed in the previous section) and of a fourth school[21] indicates that **measures implemented as a result of the Energy Sparks tool drove savings of between approximately 10% and 20% in gas and electricity consumption.** These values already discount any variations that might have been driven by the weather (for instance lower consumption driven by a mild winter).
- At sites visited, it was also possible to **test the assumptions underpinning the overall theory of change**, for instance, that the school leader board and points system contributed to maintaining pupil engagement over time and the assumptions were found to hold true.
- Across most sites visited, the **potential for other factors to be driving any changes** (e.g. change in building/business operating hours or reduced building use) observed was investigated, but no evidence of this was identified. Only one school which

[19] Covers 19 schools which had logged at least one learning activity (beyond establishing an eco-club) in the Energy Sparks portal.
[20] Exact percentage reductions were 1.6% in electricity and 2.3% in gas.
[21] Given limited data on this fourth school, it was not possible to build a case-study box on their experience.

implemented changes had a pre-existing initiative to save energy and interviewees still acknowledged the contribution of Energy Sparks to the measures implemented.

For each Competition tool, the evaluation assessed the extent to which the tool had contributed to energy savings at pilot sites, and the strength of the evidence supporting this. Eight 'types' of evidence were defined and scored for strength (see Table 2 in Annex 2). A higher score was given to evidence which was observed (e.g. energy consumption data) and triangulated (displaying a convergence in qualitative evidence and energy consumption data) or identified at a larger number of sites.

An overall score was derived to give an **average confidence rating in the evidence available: Energy Sparks scored 4.06, i.e. there is a 'very high level of confidence that the tool has contributed to energy savings in at least some sites'**. The scores and associated confidence ratings are outlined in Table 1 below. Annex 2 provides more detail on how the score was derived.

Table 1: Energy savings confidence ratings (Energy Sparks rated 4.06 'very high level')

0- 1	Low level of confidence that the tool has contributed to energy savings at any site*
1 – 1.99	Medium level of confidence that the tool has contributed to energy savings in at least some sites
2 – 2.99	High level of confidence that the tool has contributed to energy savings in at least some sites
3 to 4.5	**Very high level of confidence that the tool has contributed to energy savings in at least some sites**

** A low level of confidence does not preclude the tool from working in the future, if some adjustments / lessons learned are taken on board.*

Taking a case-based approach, the remainder of this section explores in further detail the factors which drove energy savings at the three schools presented previously. In all cases, participants reported seeing savings in their energy bills, which was corroborated by the assessment of their energy consumption trends, completed as part of this evaluation.

School #1 – Primary school

Size: 100-500 pupils; Years 1-6 | **Energy supply:** Electricity and Gas | **Pilot start:** November 2018

Measure implementation and potential: The manager changed the heating schedule (gas-fired), turning it on closer to the school's opening time and turning it off earlier. At the time of interview, the school was also planning to upgrade its lighting to LEDs, which was to some extent driven by the Energy Sparks tool, according to survey responses submitted by School #1.

Energy data analysis: This evaluation's review of the school's energy consumption data before and after their pilot of the Energy Sparks tool confirmed that the school did indeed shift its times for turning on the heating (from ~4:30am in 2018 to 6:30am in 2019), which led to 19% savings in gas usage during the pilot year.

School #2 – Primary school

Years: 1-6 | **Energy supply:** Electricity | **Pilot start:** May 2019

Measure implemented: The school started using smart plugs to programme the times when critical equipment was turned on (boilers, electrical heating equipment, lights, etc.). Thus, the school avoided energy waste from users leaving equipment on when not in use: after-hours, at weekends and over holiday periods. As highlighted in the previous section, there are indications that Energy Sparks helped catalyse the implementation of this measure.

Energy data analysis: This evaluation's review of the school's energy consumption data before and after their pilot of the Energy Sparks tool confirms that the school did indeed change how they used energy on weekends and holidays. A 30% reduction was observed in energy use over weekdays, with out-of-hours consumption coming close to weekend and holiday consumption levels. In total, changes in the use of equipment when the school was closed resulted in savings of approximately 10% in the yearly electricity consumption.

School #3 – Primary school

Size: 100-500; Year 1-4 | **Energy supply:** Electricity and Gas | **Pilot start:** Jan-Feb 2019

Measures implemented: School #3 made use of several of the Energy Spark tool's learning activities, which, together, had a significant energy saving potential, including: a campaign to switch off electrical equipment overnight (February 2019); spot checks to see if lights or electrical items were left on at lunch time (March 2019); a campaign to close windows and doors when heating was on (in March and October 2019); and a campaign to switch off heating over holidays, including liaison with the caretaker (in April and May 2019).

Energy data analysis: This evaluation's review of the school's energy consumption data before and after their pilot showed a clear trend of reduced electricity consumption. The campaign to switch electrical equipment off overnight was very evident in the data for overnight consumption, leading to annual electricity savings of approximately 20%. Savings in gas consumption were most significant in May, potentially following the engagement with the caretaker. However, this was not carried through to the summer holiday or to the autumn heating season, leading to smaller energy savings across the period (about 3% savings).

Longer-term outcomes

This section considers Energy Sparks' progress towards the longer-term impacts outlined in its theory of change. It was not expected that such outcomes would be realised in full by the end of the Competition.

In the long-term, it was expected that Energy Sparks would:

- Encourage pupils to take home the new energy efficiency knowledge acquired and develop new life skills.
- Generate sustained engagement with energy management in terms of both improved processes and of investment in efficient technologies.

As set out in the following sections, schools intend to keep using the Energy Sparks tool in the future, enabling the results achieved to be sustained in the longer term.

Pupils replicating energy efficiency knowledge and learning life skills at home

All consulted schools which have eco-clubs in place intend to sustain them in the immediate future, and some have plans to make them more frequent and/or bringi Energy Sparks activities into the curriculum, such as maths classes.

> *"I'm interested in things that I can do with my year six maths group. So, the charts and the graphs, they're really purposeful. […] If they could, for example, have a real purge on 'let's turn off the lights at four o'clock', and then see by the graph the following week, […] I think that would really inspire them." – Teacher, Primary school*

Schools which did not have eco-clubs expressed interest in implementing them, although having teachers with time availability remains a challenge to them.

Pupils directly participating in eco-clubs believed they knew more about how to save energy at home since starting to use the Energy Sparks tool.[22] And in three other schools, there was interest from pupils, parents and teachers to encourage such dissemination. For instance, teachers in one school will be supporting pupils to complete one of the Energy Sparks tool's learning activities, which includes devising a questionnaire to examine how much energy is used in their homes.

Engagement with the Energy Sparks tool has also driven enhanced learning around key life skills such as comparative analysis, statistics, research and problem solving. In one school, pupils who were keen on reducing gas consumption did a survey across classrooms to investigate temperature comfort across pupils. In another school a parent felt that participating in the Energy Sparks tool helped pupils engage with world challenges:

> *"There is increasing awareness, isn't there, around climate change and people wanting to do stuff? So, feeling that you can actually make a difference in your own school, the place that you spend most of your time, you know, is quite empowering." – Parent of primary school pupil*

As highlighted by some interviewees, increasing concerns around climate change and air quality are likely to keep driving schools' interest and need to engage with initiatives that help them mitigate their environmental impacts, and there is a role for the Energy Sparks tool in this.

> "*There's been a massive increase in interest in Energy Sparks in [local authority area] in the last six months or so, since all of the climate emergency, and the youth strike activity. […] the staff in schools are getting a lot of demand from their pupils about reducing carbon emissions. I think Energy Sparks was presented [in a schools network meeting] […] as one of the three actively supported programmes that there are currently available that can help schools cut carbon emissions.*" *– Local authority representative*

School managers sustaining efficient processes and investments

Schools whose staff were already engaging with the Energy Sparks tool believe that they will continue using it. **Anecdotal evidence also suggests that the Energy Sparks tool may have had a role in driving small scale investments or encouraging decision makers to**

[22] 30 out of 41 pupils participating across three schools (including School #2 and School #3)

give higher priority to energy efficiency when deciding on a new investment. For instance, one school had plans to broaden the on-going upgrade of their lighting systems as a result of the Energy Sparks tool and another said the tool had led them to re-design their plans for a new classroom, to ensure it uses energy efficiently. As suggested by one interviewee, although funding is critical to investing in more energy-efficient equipment, **a key driver to such investments was schools having an Energy Champion with availability to lead on the administrative side of applying for funding** from councils or through green financing companies.

> *"It's usually the fact that you need someone project managing any improvements, rather than funding. There are ways to get bits of funding [but] if you're a school that only has a caretaker, they're not the person that's going to be project managing things usually. [they need] a business manager or bursar that's able to do that." – Local authority representative*

4 Conclusions

This report explored the extent to which the Energy Sparks tool was able to support school management, teachers and pupils in becoming more aware of their energy usage and reduce energy consumption in schools.

There is clear evidence from the evaluation that where schools have actively used the Energy Sparks tool, it has contributed to the school reducing its energy consumption. There is a very high level of confidence in this evidence. Where schools engaged less with the tool, the lack of an active Energy Champion (either due to low staff resources, or a lack of induction training at which the role would be assigned) appears to have been the main barrier.

The Energy Sparks tool has had an impact on all types of users who have interacted with it:

- Energy managers reported that, after using the tool, they introduced operational changes to reduce energy use or that they were better able to justify changes to energy use that they were already introducing / requesting. Overall, staff with energy management responsibilities felt that the Energy Sparks tool provided them useful energy data which made them more focused, more likely to query potential waste and careful about turning appliances off than they were before. Seeing costs and savings linked to changes they made was motivating, and it equipped them with evidence to justify requests made of other staff.
- Teachers interacting with the Energy Sparks tool used it to raise pupils' awareness of energy as a concept (what is energy and how electricity and gas are used) and of energy use (what equipment uses the most energy and how the consumption could be reduced). Generally, the learning activities and the simple layout of the Energy Sparks tool charts and visuals were useful for teachers organising eco-club meetings.
- Pupils used the tool to build on their enhanced understanding of energy use to encourage energy saving behaviour across other pupils and staff, and, in a few cases, these actions seem to have led to actual changes in staff behaviour. According to teachers and school staff, pupils were clearly motivated by the scoreboard which provided a sense of competition with other schools and were keen to implement more learning activities so the school would move up the scoreboard.

Additionally, local authorities benefitted from the ability of the Energy Sparks tool to provide comparisons of energy use among schools in their region. They were also interested in the tool's educational effects on pupils.

The factors which seem to have facilitated engagement with the tool and energy saving behaviour change are:

- The targeting of schools which were best placed and most likely to take up the tool – i.e. schools with an existing interest in energy efficiency, which had previously participated in programmes to raise energy awareness and promote energy efficiency, or which councils knew to be more engaged or likely to welcome the Energy Sparks tool. These had an existing infrastructure (e.g. teachers and/or management committed to act as energy champions, using the tool and its educational resources) and the networks in place within the school to 'spread the word'.

- The support that Energy Sparks gave to users to introduce them to the tool either face-to-face or remotely. Users often found this support critical to them using the tool to its full advantage.
- The learning resources that were provided alongside the energy management tool, with learning activities which were accessible and achievable for pupils, and appropriate for implementing as an extra-curricular activity within the eco-clubs.
- Linked to the above, the fact that the Energy Sparks tool targeted pupils as one of its key users (and empowered them to engage with energy data, enact change and help the school to save energy) was a critical success factor, as it aligned with the schools' primary motivation to educate pupils, both in relation to the environment and wider skills such as data analysis.
- The competitive element of the Energy Sparks tool – i.e. the fact that it encouraged schools to compete against each other to gain extra points (by carrying out more activities) to get ahead on a 'leaders board' – encouraged pupils' engagement and energy efficient behaviours among participating pupils.
- Similarly, the fact that the tool enabled local authorities to compare energy use across schools within their remit made it an attractive resource to them, and ensured councils were on-board to roll out and promote the tool to schools.

The results achieved by some schools are expected to endure, given overall satisfaction with the Energy Sparks tool. Furthermore, existing partnerships from Energy Sparks, as well as an increasing interest in schools in engaging with climate change could favour Energy Sparks' expansion to other schools within the local authorities where they already operate and beyond. The fact that several schools signed up to use the tool following word-of-mouth recommendations suggests that Energy Sparks may achieve wider dissemination through this channel, as well as through targeted partnerships and wider marketing.

The findings from this report suggest that Energy Sparks could consider the following points as it progresses its offer, which may also be relevant for other innovators:

- Consider offering an introductory training to all schools, even those which are enrolled via a third party (e.g. the council). Providing training to the council alone might be insufficient, as in some cases the council staff might have limited time and capabilities to pass the training along to other schools.
- Consider introducing the assignment of an 'Energy Champion' as an obligatory element for tool implementation.
- Consider ways that tool training may be made accessible to any interested party (through an introductory video for instance) so that engagement with the tool is not compromised when a trained staff member leaves a school.
- Continue building on existing and new partnerships with sustainable schools initiatives and with local authorities which have declared a climate emergency to expand their reach.

Annex 1 Evaluation Methodology

The research for this evaluation was conducted by Ipsos MORI in conjunction with their consortium partner the Carbon Trust. Ipsos MORI designed the evaluation approach and designed and delivered all aspects of the methodology, except for the energy consumption analysis which was designed and conducted by the Carbon Trust. The evaluation was led by a dedicated evaluator who followed the implementation of the tool through its design phase (Phase 1), feasibility and initial testing (Phase 2) and roll-out and further testing (Phase 3).[23] The final evaluation report, and reports for the other six case studies, are available on www.gov.uk.

Evaluation approach

This evaluation aimed to assess the extent to which the Energy Sparks tool generated anticipated outcomes and impacts, as well as the circumstances in which these were achieved. A case-study, theory-based approach was taken to provide a framework for in-depth analysis of change across the different recruitment routes set out by Energy Sparks. This design was chosen both for its appropriateness to the intervention design and total sample available for research (N=65 schools that piloted the tool) and because of its fit with the data collection options available to the team.

The theory-based approach uses the Energy Sparks theory of change as its framework. The theory of change was developed in Autumn 2018, by Ipsos MORI in consultation with Energy Sparks through an analysis of their proposal, points discussed at the Energy Sparks inception meetings and through familiarisation interviews with the Energy Sparks project lead and key consortium.

The extent to which anticipated change ('outcomes' and 'impacts') took place as observed – and then evidence to demonstrate that the Energy Sparks tool has contributed to this change – was assessed and is described in this report.

Sources of evidence and fieldwork activities

This evaluation was developed upon the basis of primary evidence gathered via an online survey, qualitative interviews conducted on-site, and qualitative telephone interviews. Details of these are as follows:

Online Survey: The survey[24] included between 20-30 questions[25] covering tool usage habits, attitudes to energy, energy management behaviours, actions taken following engagement with the tool and other questions to understand the context of the business or school and the user (such as the business size, user role). Two versions of the survey were administered:

- **Type A Survey**: This survey was conducted in two waves; a baseline completed by participants before their pilot started, and an end line completed a minimum of three months after participants had been given access to the tool. The impact of the tool is

[23] The evaluation lead met regularly with the tool's design team, liaising with them on the evaluation plan, designed the evaluation's methodology, managed the team of data collectors and the development of this report.
[24] An example survey questionnaire used across NDSEMIC projects is included in the evaluation Technical Report, available on www.gov.uk.
[25] The exact questionnaire length for each respondent varied depending on the project and type of participant/organisation.

evaluated through analysis of any changes in attitudes and behaviours pre and post intervention.

- The Type A baseline survey was completed between January and October 2019, depending on when the organisation was on-boarded, and an end line was completed between January and February 2020, after participants had completed the pilot.
- The Type A end line survey was sent to those pilot participants who had (i) completed the baseline survey; and (ii) agreed to be re-contacted for research.
- **Type B Survey**: This survey consisted of a single wave conducted post-pilot and was administered to pilot participants who had not completed a baseline survey. As a baseline measurement was not available, participants were asked to self-report on any changes in attitudes or behaviours in relation to energy management over the course of the pilot, and whether the Energy Sparks tool was a factor in these changes.
- **All surveys were disseminated by Energy Sparks**.

The total responses from both the Type A and Type B surveys was nine (four from Type A, five from Type B). A single survey was completed per school. The profile of these nine respondents is as follows:

- All nine were completed by primary schools.
- Two were completed by a Facilities Manager.
- Two were completed by a Headteacher / Deputy Head.
- Two were completed by a School treasury / Bursar / Finance Director.
- One was completed by a Teacher.
- One was completed by a Curriculum or Key Stage Lead.
- One preferred not to state a role.

Qualitative telephone interviews with school staff and local council staff: these lasted between 30-60 minutes and applied a discussion guide tailored to Energy Sparks' features and intended outcomes. Discussion guides also included sections to understand how participants monitored energy use, and any impacts and benefits of the Energy Sparks tool to them and their schools.

On-site school visits: the visits covered:

- Qualitative interviews with the main user of the tool and other staff with relevant energy and education attributions where possible, with the intent of gauging a more complete picture of the tool's impact on the schools. These on-site qualitative interviews applied the same discussion guide as the telephone interviews and also lasted between 30-60 minutes.
- Observational elements - to understand how users interacted with the Energy Sparks tool and their interpretation of which appliances and equipment used energy in their school.
- Paper survey with pupils in three of the visited schools, to assess impacts on their energy awareness.

- The sample for qualitative research consisted of all pilot participants, excluding those who had refused to be contacted for research. A selection of pilot schools was designed to ensure good geographical coverage. Although the evaluation team has tried to control for other parameters, such as school size, governance (academy, state, independent, etc), grade (primary and secondary), etc. it was only possible to control for the location, as there was only a small number of schools willing and available to participate in the research.

A total of 15 qualitative interviews were completed across seven schools and three local authorities. Four primary schools were visited; in three of those schools, 41 pupils from eco-clubs participated in a paper survey.

Energy consumption analysis: The Carbon Trust analysed the data on energy consumed before and after the schools started using the Energy Sparks tool to assess the tool's effects on energy consumption from 64[26] pilot schools. The indicators taken into consideration for this assessment are detailed in Table 2 in Annex 2. A more detailed analysis was completed on four schools to triangulate findings on energy data with data obtained in the qualitative and quantitative research. These four schools were selected because of the richness of data available for them, from the on-site visits or from research completed by Energy Sparks.

Limitations of the methodology

The response rate for quantitative surveys was the main limitation of the evidence base. Despite multiple reminders being sent by both Ipsos MORI and Energy Sparks, and the offer of a financial incentive for completion, the overall limited response from schools limited the ability to evaluate the tool behavioural impacts more broadly than just those who participated in the qualitative research. 100% response rates for site visits and telephone interviews were achieved however, and this rich energy consumption data and rich engagement data enabled the evaluation team to assess the extent to which higher engagement correlated with higher energy savings.

[26] The Carbon Trust analysed electricity data from 64 schools and gas data from 42 schools – the balance corresponds to schools for which data was not sufficiently available. The schools energy consumption data is publicly available from the Energy Sparks portal: https://energysparks.uk/

Annex 2 Assessment of Energy Sparks' contribution to energy savings

Assessing the energy saving potential of smart energy management tools was central to the evaluation, however in the context of the Competition it was not possible to collect a single definitive estimate of impacts and there were a range of challenges in using and interpreting energy consumption data for pilot sites. In recognition of the circumstances involved (limited access to historical data, small sample sizes, no control groups), a mixed-methods approach to evaluating energy savings was taken.

This approach drew on a range of evidence (outlined in Annex 1) to create a summary indicator of the evaluation's confidence that the tools had contributed to energy savings for pilot sites (by comparing the findings of energy consumption analysis, self-reported savings, and evidence of behaviour change from qualitative interviews). An analytical framework that considered both the strength of evidence, and its robustness, was used to produce the indicator (see Table 2 overleaf). The methodology for this described in more detail in the Final Evaluation Technical Report published alongside this evaluation.

On the basis of these assumptions and the evidence available, an analytical 'strength of evidence' framework was developed which, when applied, generated a confidence rating in the evidence of energy savings for each pilot. This confidence rating was illustrated in Table 1 in Chapter three and is recopied at the end of Table 2.

Table 2: Energy Sparks contribution to energy savings - evidence strength assessment.

Evidence 'type'	Description of evidence type	Numerical rating of evidence type
Energy consumption analysis (ECA) evidence		
Observed energy consumption reductions – (across all pilot sites, comparing energy consumption in the years before and after the intervention).	Energy consumption data for schools which engaged with the learning activities from Energy Sparks was analysed and found to have saved 4% in their average daily electricity consumption and 10% in average gas consumption. The analysis of aggregate energy consumption across all pilot schools (engaged and less/not engaged) also showed reductions in average daily consumption of gas (2.3%) and electricity (1.6%).	4.5[27]
Observed energy consumption reductions that align with user-reported evidence of changes in energy use behaviour. Suggests *potential* that tool use has contributed to energy savings.	An in-depth ECA was conducted for four sites. For all of these sites, energy data for a full 12-month period for both 2018 and 2019 was available, allowing for comparisons of energy data at similar times of the year pre and post intervention. The analysis accounted for other variables which might affect energy use within the site, such as school holiday periods and weather influence (based on degree day data). 1) For the first site, the analysis shows a clear trend of consumption reduction, perhaps due to a shift in heating times. However, this trend cannot be directly attributed to tool use as additional information on whether site level efficiency measures were taken due to the pilot is needed. 2) For the second site, the analysis shows clear gas consumption reduction of 53% annual savings, which could be attributed to changes made prior to the pilot (May 2018). While these cannot be directly attributed to the tool as they occurred before the pilot, tool usage may have	6[28]

[27] This group of evidence could be rated as either "not evident" (0), evident but only with red quality rating (1), evident with an amber quality rating (3) or evident with a green quality rating (4.5).
[28] This group of evidence could be rated as either "not evident" (0), evident but only with red quality rating (2), evident with an amber quality rating (4) or evident with a green quality rating (6).

Evidence 'type'	Description of evidence type	Numerical rating of evidence type
	influenced further change that was not recorded. 3) For the third site, a clear reduction in electricity usage was observed when comparing 2018 (pre-pilot) and 2019 (during the pilot), amounting to annual electricity savings of around 20%. This reduction aligns with energy saving initiatives undertaken at the site, suggesting that electricity consumption at the site reduced due to tool usage. Gas consumption significantly reduced in April to May 2019, but this did not continue into Autumn, and so overall gas savings over the pilot year were minimal (~0.5%). 4) For the final site, the analysis shows a clear trend of reduction in energy usage, with changes in use of equipment when the school is closed amounting to around 10% annual savings. While the school had also taken additional actions, these were taken relatively late in the pilot period and a longer monitoring period would be needed to assess their impact.	
User-reported evidence		
Self-reported energy savings (e.g. user can point to cost reductions in bills) that the user assigns to use of the tool.	Among the five interviewed schools that had engaged with the Energy Sparks tool, four had implemented changes to schools' processes and equipment as a result of the Energy Sparks tool or used the data. The remaining one was a new user of the tool, so hadn't had the time to introduce changes. Additionally, amongst the 41 pupils surveyed for the evaluation, 68% report they are doing new things to try and save energy and 48% reminded their teachers to do the same.	6[29]

[29] This group of evidence could be rated as either "not evident" (0), evident at 1-2 sites (2), evident at more than 1-2 sites (4) or evident at most sites consulted (6).

Evidence 'type'	Description of evidence type	Numerical rating of evidence type
Multiple users at one site converge in reporting behaviour change, inferred to lead to energy savings, that users assign to use of the tool.	In three schools, more than one user was consulted, and they converged in their opinion that the tool had led to behaviour change that would be expected to lead to a reduction in energy use.	6[30]
One user reports behaviour change, inferred to lead to energy savings, that users assign to use of the tool.	Among the five interviewed schools that engaged with the Energy Sparks tool, four had implemented changes to schools' processes and equipment as a result of the Energy Sparks tool or used the data. The changes implemented led to energy savings.	6[31]
Behaviour change reported via survey assigned to use of tool.	About half of the surveyed schools reported behaviour changes such as energy being more of a priority in their schools, discussing more often with colleagues about ways to save energy (four of nine), and having tried to reduce energy use in the school (five out of nine).	2[32]
Theory-based evidence		
Evidence of the assumptions considered necessary for change to occur (as per the theory of change) occur as anticipated. This suggests all of the necessary conditions for energy savings are available.	At sites that participated in qualitative interviews, it was also possible to test the assumptions underpinning the overall Energy Sparks theory of change, for instance, that the school leader board and points system contributed to maintaining pupil engagement over time, and these were all found to hold true.	3[33]
No evidence of alternative theories of change for observed,	Across most sites visited, the potential for other factors to be driving any changes (e.g. change in building/business	3[34]

[30] This group of evidence could be rated as either "not evident" (0), evident at 1-2 sites (2), evident at more than 1-2 sites (4) or evident at most sites consulted (6).
[31] This group of evidence could be rated as either "not evident" (0), evident at 1-2 sites (2), evident at more than 1-2 sites (4) or evident at most sites consulted (6).
[32] This group of evidence could be rated as either "not evident" (0), evident at 1-2 sites (1), evident at more than 1-2 sites (2) or evident at most sites consulted (3).
[33] This group of evidence could be rated as either "not evident" (0), evident at 1-2 sites (1), evident at more than 1-2 sites (2) or evident at most sites consulted (3).
[34] This group of evidence could be rated as either "not evident" (0), evident at 1-2 sites (1), evident at more than 1-2 sites (2) or evident at most sites consulted (3).

Evidence 'type'	Description of evidence type	Numerical rating of evidence type
reported or hypothesised energy savings.	operating hours or reduced building use) observed was investigated, but no evidence of this was identified. Only one school, which implemented changes, had a pre-existing initiative to save energy. However, interviewees still acknowledged the contribution of Energy Sparks to the measures implemented.	
Overall score (max. of 37.5) [35]		**32.5**
Averaged score (max of 4.5[36])		**4.06**
RAG rating		**Very high**

Below, the explanation of the different ratings (as presented in Chapter three) is repeated.

Table 1 (repeated): Energy savings confidence ratings (Energy Sparks rated 4.06)

0- 1	Low level of confidence that the tool has contributed to energy savings at any site*
1 – 1.99	Medium level of confidence that the tool has contributed to energy savings in at least some sites
2 – 2.99	High level of confidence that the tool has contributed to energy savings in at least some sites
3 to 4.5	**Very high level of confidence that the tool has contributed to energy savings in at least some sites**

** A low level of confidence does not preclude the tool from working in the future, if some adjustments / lessons learned are taken on board.*

[35]The maximum overall score differs for some Competition projects as some of the evidence types are not available for some project evaluations.
[36] This is calculated by dividing the maximum possible overall score by the number of evidence types considered (8 in this case) and rounding to the nearest 0.5 decimal.

Annex 3 Examples of the key features of Energy Sparks

The following figures detail some of the key features of the Energy Sparks tool. This includes the overall energy analysis page, a sample learning activity and a programme for running an eco-club.

Figure 4: A school's energy analysis page

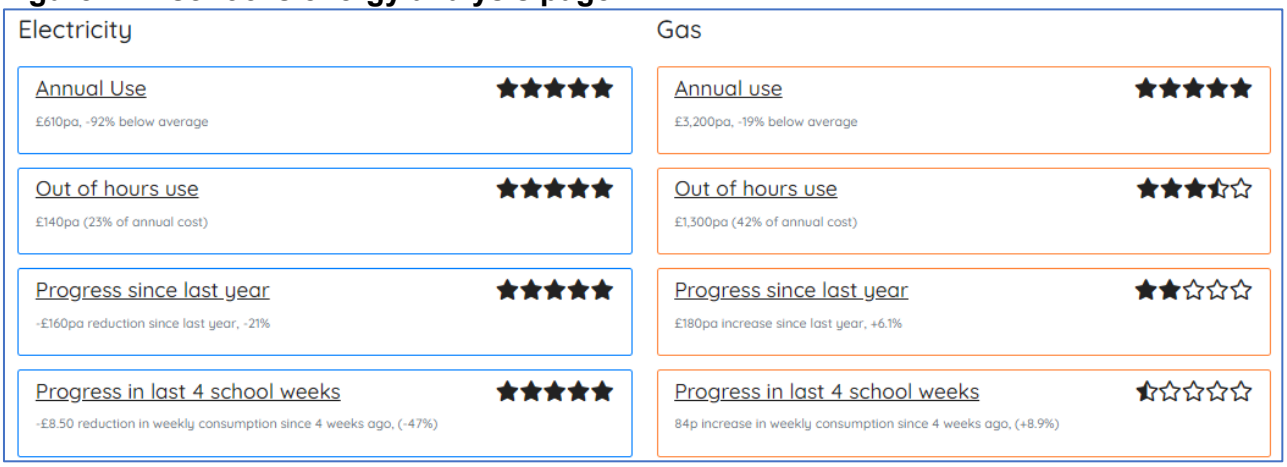


Figure 5: Example of learning activity within the Energy Sparks tool[37]

Activity 45: Measure classroom temperatures

5 points
Learning KS1, KS2, KS3, KS4, KS5

Learning objectives

To set up simple practical enquiries and make systematic and careful observations.

Key questions

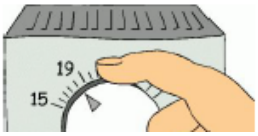
What affects the temperature in our classroom?
How can we control the temperature in our buildings?
Whose responsibility is it to monitor heating in our buildings? To adjust heating?

You will need

Thermometer
Recording sheet
Thermostat pictures

Key vocabulary

Temperature, thermostat, radiator valve



Activity: Why do we need to think about indoor temperatures?

Discuss As a group discuss why it is important to get indoor temperatures right.

Activity: Measure temperatures

Demonstrate how to take an accurate thermometer reading.

Divide class into groups and assign them to measure the temperatures in different parts of the school. Pupils should measure temperatures in each classroom, and in resource rooms, small group rooms, the library, hall, and corridors.

Record the temperature reading on the recording sheet or by entering the temperatures on the Pupil Dashboard at https://energysparks.uk

Discuss as a group what the results tell you about classroom temperatures and energy use at your school. Why do you think some areas of the school are warmer than others?

[37] The complete list of activities suggested by Energy Sparks can be found here: https://energysparks.uk/activity_categories

Figure 6: The eco-club Programme

This publication is available from: www.gov.uk/beis

If you need a version of this document in a more accessible format, please email enquiries@beis.gov.uk. Please tell us what format you need. It will help us if you say what assistive technology you use.