



Department for
Business, Energy
& Industrial Strategy

Testing the practicalities of public sector decarbonisation

Executive Summary

A report by the Modern Energy Partners (MEP) team at the Energy Systems
Catapult

September 2021



© Crown copyright 2021

This publication is licensed under the terms of the Open Government Licence v3.0 except where otherwise stated. To view this licence, visit nationalarchives.gov.uk/doc/open-government-licence/version/3 or write to the Information Policy Team, The National Archives, Kew, London TW9 4DU, or email: psi@nationalarchives.gsi.gov.uk.

Where we have identified any third-party copyright information you will need to obtain permission from the copyright holders concerned.

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

Contents

Foreword	4
Overall conclusions and recommendations	5
What does decarbonisation look like?	9
Theme 1: Having an agreed organisation estate-wide decarbonisation strategy	13
Theme 2: Understanding costs and cash flow in line with funding and finance	14
Theme 3: Build the right capacity and capability to deliver	16
Theme 4: Use the practical knowledge from MEP to decarbonise in practice	18
What next for MEP?	21
Modern Energy Partners In detail	21

Foreword

Climate change is recognised by governments across the globe as an emergency which must be addressed, with far-reaching and irreversible implications for life on earth should immediate action not be taken.

In June 2019, the UK Government made a legally binding commitment to reach net zero greenhouse gas (GHG) emissions by 2050. This commitment, combined with an interim ambition to halve direct emissions from the public sector by 2032, requires radical action now to decarbonise our buildings.

We know public sector estate accounts for 2% of all UK emissions, and overall, emissions from the built environment direct account for 34% of UK emissions. It is therefore essential that the public sector demonstrate leadership and drive down emissions by using credible and consistent approaches to decarbonise the public sector estate.

The Modern Energy Partners (MEP) programme, which was funded through BEIS's Energy Innovation Portfolio and co-sponsored by BEIS and Cabinet Office, is a clear example of this ambition.

Over the last two years we have worked with some of the largest emitting government departments to develop a systematic and innovative integrated approach to decarbonising campus- style sites. Many people at sites and central offices around the country have supported the programme generously and we are very grateful for their contributions. These innovative tools and approaches can now be utilised, scaled up and applied more widely to the wider public sector estate.

The lessons learned, new ideas, and refined systems developed by the MEP programme are explained within this report. We hope this report is used to improve awareness and understanding of the opportunities and challenges which lie ahead on this journey.

We encourage Government to take the next step and exploit this learning — the successes and challenges we have encountered — and embed it across the public estate and the Property Profession. There is a great opportunity here for the public sector to lead the way and support the creation of new value chains, build new skills and support economic growth.

Meeting the commitments in the Clean Growth Strategy, the Ten-Point Plan for a green industrial revolution, and the 25-year Environmental Plan, require total focus on transforming the public estate. This report, the work of the MEP programme, is a major part of that drive.

I hope you find it useful.

Philip New CEO

Energy Systems Catapult



Overall conclusions and recommendations

The public sector, through the fifth Carbon Budget, has the challenge of achieving a 50% direct emissions reduction by 2032 against the 2017 baseline. Further commitments such as the Clean Growth Strategy, the Ten Point Plan, and the Energy White paper, are driving the UK's commitment to net zero by 2050.

The path to net zero is further defined through the sixth Carbon Budget which sets a national target of a 78% emissions reduction by 2035 against the 1990 baseline. The public sector estate accounts for 2%¹ of all UK emissions, and overall, emissions from the built environment direct account for 34%² of UK emissions. This demands tough and urgent action by the public sector to reduce emissions, especially those for which it is directly responsible, like emissions from heating buildings.

This executive summary report provides findings and recommendations, based on the learning from Phase 2 of the Modern Energy Partners (MEP) innovation programme. MEP is a collaborative cross-departmental programme, coordinated and delivered by the Energy Systems Catapult. Phase 2 is funded by BEIS's Energy Innovation Portfolio, overseen by BEIS and the Cabinet office, with additional match funding from pathfinder sites, and implementation from participating departments (primarily MOD, MOJ and NHS).

MEP focused on learning-by-doing, carrying out specific activities and generating consistent repeatable approaches for scalable delivery of decarbonisation, and taking into account whole system thinking on campus-style sites. Public sector campus-style sites, like those found on the NHS, MOD and MOJ estate are challenging to decarbonise as they use a lot of energy, have varying and unusual usage patterns, and must consider how the site use will evolve over time.

Activities included:

- Supporting retrofit improvements to energy systems at three, large campus-style, public sector "pathfinder" sites.
- Creating strategic long-term concept design decarbonisation plans at 24 sites and,
- Improved monitoring through better data collection, collation and some test installations of telemetry items such as sub- meters and sensors at 23 sites.

This was mainly to understand the challenges and benefits of such actions. Learning-by-doing underpins the recommendations made about achieving net zero targets through action programmes in the public sector. More detail is available in the main report.

¹ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/957887/2019_Final_greenhouse_gas_emissions_statistical_release.pdf

² https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/957887/2019_Final_greenhouse_gas_emissions_statistical_release.pdf

MEP's overall conclusion is that for the public sector to meet commitments it must rapidly scale up its decarbonisation activities. MEP observed that although expensive, difficult and time consuming, it was possible to put individual sites on track to hit the 50% direct emissions target through a sustained effort by people with a mix of skill sets. However, the team concluded that whilst some action is already being taken, it is not at the scale necessary, nor at a sufficiently rapid pace, to be confident that organisation-wide targets will be met.

Only by cutting timelines through the simplification of processes and decision-making, by being able to access finance, and by immediately increasing scale and pace can changes happen in time to meet the national net zero commitments.

MEP at a glance

Innovation programme
from BEIS

£12.4m

Months duration

24

Covering a test bed
of 42 sites and
over 294,000 tCO₂e
carbon emissions

42
sites

Testing out implementation

- ✓ 3 pathfinder sites (Sheppey prison cluster, HMS Collingwood and Goole and District Hospital)
- ✓ 3 programmes of works under way or complete, match funded by BEIS and the participating organisation
- ✓ Over 9 GWh saved annually, over 2,400 tCO₂e saved in 2032 and £970k saved next year and then onwards

LEDs replaced
at pathfinder sites

20,000

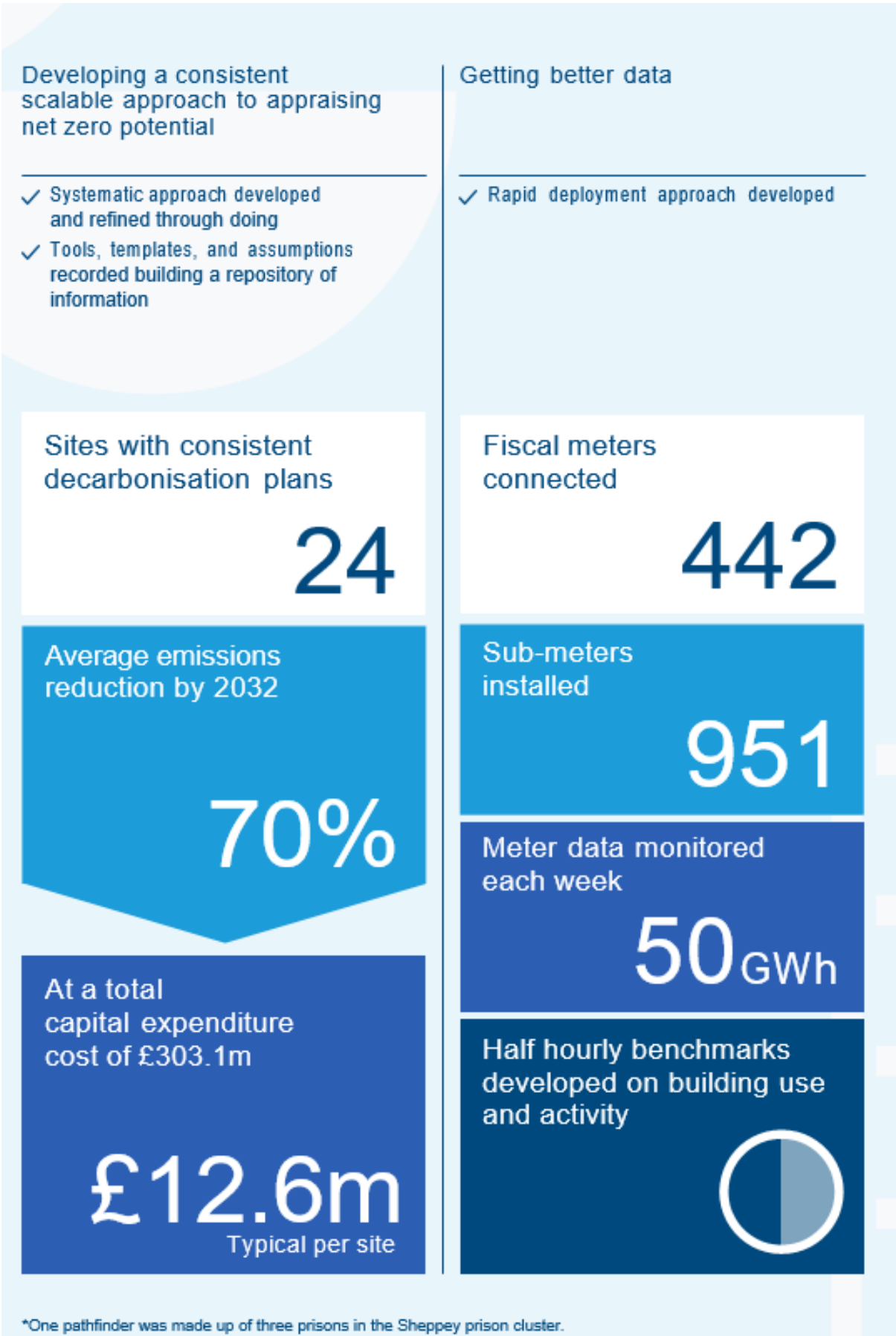
Controlled with BMS

177,000m²

Equating to the following public sector estate coverage

	NHS England*	MOJ	MOD
Sub-metering only	2%	4%	3%
Sub-metering plus concept design	4%	13%	5%
Total coverage	6%	17%	8%

* In addition to coverage of NHS in Scotland, Wales and Northern Ireland



What does decarbonisation look like?

To decarbonise, MEP targeted a whole systems approach both on campus and for the surrounding area, looking to achieve maximum benefits for both.

The objective being to:

- Find the most financially and economically viable pathway;
- Develop a plan that accounted for end of asset life;
- Avoid the occurrence of stranded assets in the future; and
- Identify and manage network constraints as they arise with an electric transition.

At a technical level on site the approach was to reduce demand as much as possible through building fabric improvements, energy efficiency measures (including LEDs) and better controls. These measures enable a revaluation of the heating system size requirement. Lastly, a renewable solution to support additional heat and Electric Vehicle (EV) demand may be added. This sequence is shown in the whole system diagram below.

Consider appropriate sequencing dependent on site (items 2 to 5 are often interdependent); consider age of asset and likely replacement timeline

	What	Why
1 Implement no regrets measures	Energy efficiency including LEDs, better control through BMS, and Building Fabric improvements all to cut demand	Demand reduction of any energy scope (1 or 2) will support managing network constraints
2 Remove fossil fuels in heat and assess EVs	Resize heat solution to match amended demand, capture future EV charge point demand	Shifting away from fossil fuels is where future site decarbonisation will be achieved as the electricity grid decarbonises
3 Amend heat distribution system	If needed, improve heat network to match circulation temperature changes required for new heat source	The heat distribution system must have the ability to deliver heat even with a lower heat temperature from heat pumps
4 Review potential network constraints	Consider impact of additional heat demand through vector transition and increased EV charging demand	Additional capacity to support EVs and heat pump load may not be available without upgrade
5 Supplement electricity demand	Consider onsite or local renewable generation, electricity storage, and demand management to manage peak times	Solution will help reduce network capacity issues, and financially support overall system

To make implementation scalable, multiple institutional challenges must be understood and overcome. To enable this, the key recommendations from the MEP programme are grouped into themes and presented in the table below. Each theme is further expanded upon in the following sections.

Theme 1	Theme 2	Theme 3	Theme 4
<i>Having an agreed organisation estate wide decarbonisation strategy</i>	<i>Understanding costs and cash flow in-line with funding and finance</i>	<i>Build the right capacity and capability to deliver</i>	<i>Use the practical knowledge from MEP to decarbonise in practice</i>
Senior engagement and commitment are needed for effective prioritisation and governance	Plan budget expenditure and track progress to help manage expectations and support funding bid applications	At scale decarbonisation requires individuals and teams with a range of capabilities spanning the delivery lifecycle, embedded throughout the organisation	Systematic consistent repeatable approach to decarbonisation can save time, cost, and aid comparison
Think at scale for the long-term view on costs, delivery timeline and funding	Speed up net zero business case sign off by assessing the whole system solution and if the lowest cost option is the best option solution	Driving delivery effectively is easier when those involved have knowledge of energy issues	Common patterns and themes emerged for the most financially and economically viable pathway
Think at scale for delivery routes required to decarbonise	Selecting the best value delivery route for the technology or activity, considering scale	Seeking the right skills from others will help. However, the drive must be managed by the organisation	Better data will improve robustness of designs and enable tracking of progress
Think at scale for resources, skills capability and fluency should be expanded	Synchronising with maintenance programmes will support best value and help with delivery	Capability must be built to provide competent challenge of delivery	Portfolio management could speed up delivery. Use MEP outputs as guidance to prevent repetition

In addition, MEP found other wider systemic barriers that are likely to slow progress towards net zero targets. MEP focused on demonstrating that it is possible for the public sector to meet its 5th Carbon Budget target of 50% direct emissions reduction by 2032 against a 2017 baseline.

To speed-up the action, it recommends:

Enabling access to funding

- Access to funding is not always obvious. It must be recognised that net zero is going to require significant financial investment despite the long-term financial and resilience benefits that will ultimately be realised. Alternative thinking may be required such as blending funding options. This can be achieved by ensuring that direct dedicated funding is available or that all public sector organisations can access funding through other finance routes. Many organisations, particularly central government departments, currently have limited funding routes and are unable to access private finance yet there is a demand to decarbonise while maintaining outputs

Incentivising adoption and making the case for decarbonisation more appetising by valuing carbon appropriately

- Updating carbon values to reflect the changing net zero targets. This will incentivise earlier adoption. Current values indicate adoption later in the decade to be more beneficial
- Requiring the benefits of decarbonisation to be considered in project business case sign off. Currently, the lowest priced option is often accepted, and the Green Book valuation not always considered
- Adjusting the imbalance in energy prices, currently gas is much cheaper than electricity due to the green tariffs applied to electricity which discourages decarbonisation
- Continuing and extending the incentivisation of some technologies, such as the adoption of heat pumps through a mixture of policy mechanisms

Developing and implementing a clear public sector wide reporting framework

- The GGC provides a high-level reporting framework for central government however expanding and applying a clear reporting framework for all public sector organisations and within organisations will enable better transparent, consistent reporting thus capturing progress against net zero targets and verifying that large-scale action is in hand. This will expose and remove a risk that different parts of the public sector may report in different ways, against different baselines, with different emissions factors

Theme 1: Having an agreed organisation estate-wide decarbonisation strategy

MEP observed that challenges are often not around technology gaps, but wider issues that relate to the need for net zero efforts to be embedded in organisation-wide strategies.

The starting point must be a central organisational deliverable strategy, which captures the scale and pace of decarbonisation required to contribute to the UK's legally enshrined net zero commitment. This must cover estates and other emitting sources. Faced with the challenge of decarbonising the estate, MEP experienced multiple barriers which prevent delivery and must be unlocked for the delivery of decarbonisation.

In addition to understanding the technical solution and how progress is going to be monitored (Theme 4) to develop a net zero strategy, MEP suggests that the following four elements are considered:

1. Senior engagement is needed for effective governance

- MEP observed that decarbonisation work is being led by small sustainability teams that have a limited budget on annual cycle. For scalable decarbonisation, the responsibility for delivery needs to be owned at a senior level with the whole organisation understanding their role

2. Plan the long-term view on costs, delivery timeline and funding

- Estimating the realistic cost of decarbonisation and planning the delivery timeline is essential
- MEP has net zero technical solution patterns and information on how long project delivery takes. Using these resources will provide an evidence-based understanding of the action required
- Funding streams should be identified and planned in

3. Plan delivery routes required to decarbonise

- It is likely that multiple delivery routes will be required to cover ongoing operation and maintenance, asset replacement or larger renewal programmes. The strategy should

consider what must be done to enable procurement to happen quickly and to offer best value for money

- The benefits of scale can only be recognised if approached this way

4. Resources, skills capability, and fluency should be expanded

- For scaled delivery carbon fluency must be prevalent throughout the organisation and not just limited to the sustainability team. Ensuring that everyone is fluent and understands their responsibility will lead to organisational decisions passing through processes and sign off more smoothly. It will promote competence that will improve quality of delivery too

Theme 2: Understanding costs and cash flow in line with funding and finance

MEP found that the cost of decarbonisation was a key barrier. To make decarbonisation scalable, funding must be available and deployed efficiently within a department. In more detail MEP found cost and funding needed to be managed in three areas within an organisation and at a wider level across the whole net zero landscape:

1. Plan budget expenditure and track progress to help manage expectations and support funding bid applications

MEP found the Net Zero Trajectory Tool³ supports organisations to do an initial appraisal of their budget's expectations. To improve accuracy and tailoring to the organisation's needs, MEP recommends that in addition prices are drawn from examples of successful decarbonisation projects. MEP developed a repository of cost data which can provide some of this information.

A way of tracking and updating / refining costs should be incorporated as MEP observed price variations of up to 100% dependent on the stage of design, and the type of working conditions such security, safety, or hygiene. MEP looked at how to track changes at a portfolio level. Budgets for planning should consider the cost of delivery at all levels, including staffing, feasibility studies and implementation. This is not covered in the Net Zero Trajectory Tool.

³ Office of Government Property (OGP) 'Government Property Online' portal

2. Speed up and support net zero decision-making and business case sign off

MEP found that business case sign-off processes were complex and time consuming.

The lowest cost option may not deliver best carbon value

- MEP observed the lowest tender being selected only to establish subsequently it might not deliver the same level of savings. Using other metrics in line with the Green Book, will provide an understanding of carbon value

Ensure that the whole system or bundle of measures are captured as part of the business case

- Initial no regret measures including energy efficiency and BMS have shorter paybacks than other elements. If taken forward first this leaves more expensive higher abatement elements to be dealt with separately, making the more important measures harder to get agreed

3. Managing budgets to their optimum throughout delivery

Selecting the right delivery route to get the best price

- MEP found that there was a variation in the price dependent upon the delivery route. The selection of the delivery route for technology or project will impact price, value for money and delivery time. Risk should also be considered
- Synchronising with maintenance programmes for efficiency MEP found that in an ageing estate, the implementation of decarbonisation should always be synchronised with asset replacement programmes, and therefore be incorporated into existing operations and future plans for estate retainment
- Using increased sustainability budgets to supplement existing maintenance programmes offers a way to understand the cost of decarbonisation

Theme 3: Build the right capacity and capability to deliver

Overall MEP found that capability is limited to the centrally based carbon and estates focused sustainability teams and not embedded in all roles. Under the current conditions, delivery is time-consuming and relies on these small teams. This is not scalable.

1. Building capacity throughout the organisation will enable rapid scale-up

Using the MEP programme team resource and skills as a basis, MEP observed that the following roles are likely to be required for decarbonisation at scale.

Whilst a central team was seen as essential (to provide guidance) the vast proportion of effort was from the project managers overseeing delivery.

2. Driving delivery effectively is easier when those involved have knowledge of energy issues

MEP observed that whilst central knowledge is held within the sustainability team, carbon fluency needs to be imparted to the teams who will be involved in the delivery. MEP found that where people were unsure, approvals stalled.

Providing carbon fluency will lead to expediting internal sign offs and improved competency to challenge contractors with intelligent questions.

3. Seeking the right skills from others will help, but the drive must be managed by the organisation

MEP observed that the private sector has some capacity to support these skills needs, for example, the delivery of the technical assessments. However, their inputs can be very varied in quality and consistency of outputs (often based on varying assumptions for example differing emissions factors). This means therefore that those overseeing the work must have the time, confidence, and competency to scrutinise and challenge and push back on outputs. MEP found that this lack of knowledge led to overcharging and varied quality of outputs.

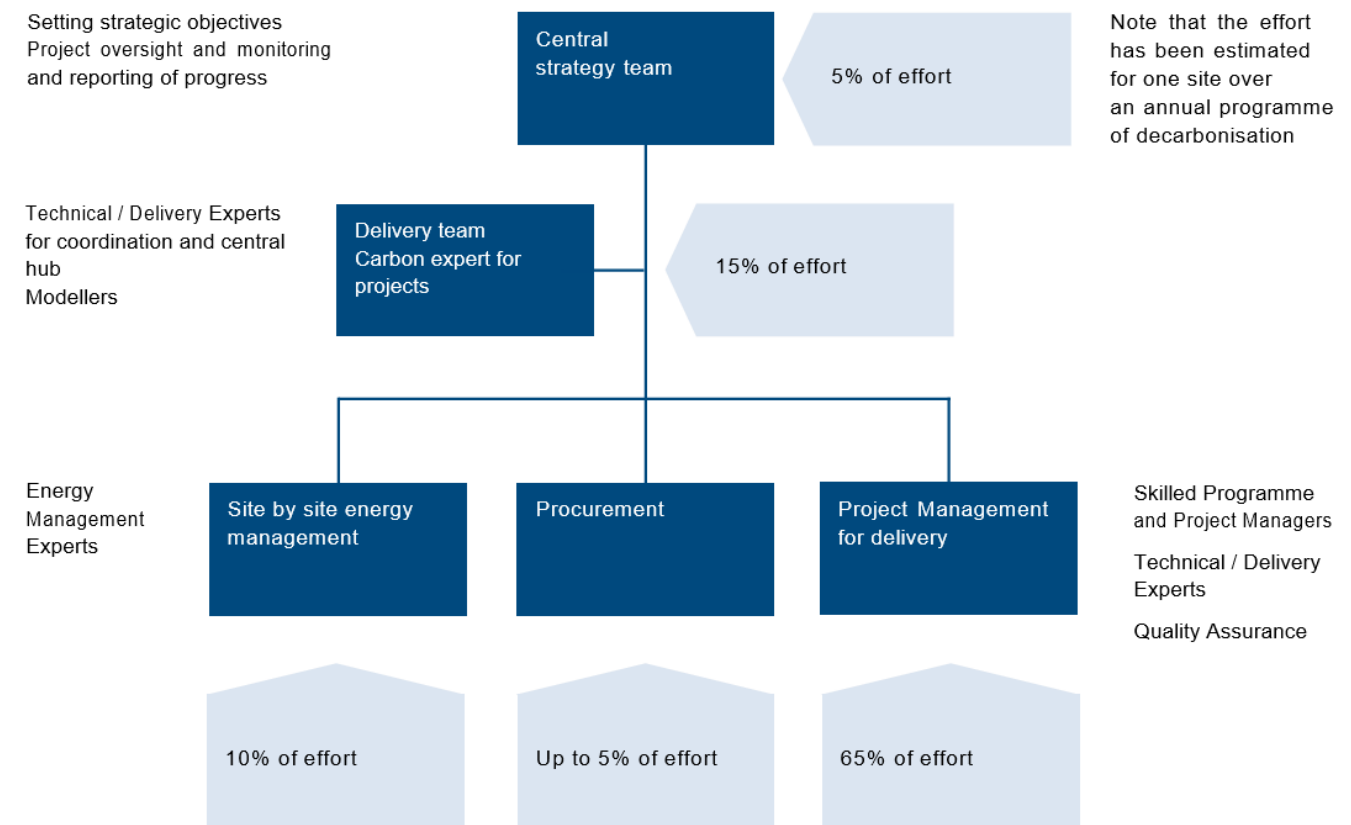


Figure 1: Ratios of effort, skills, and roles

Theme 4: Use the practical knowledge from MEP to decarbonise in practice

Overall MEP found that decarbonisation of a campus- style site was possible and could be delivered at scale and pace using a standard consistent approach. MEP found there were patterns in similar use campuses. MEP also uncovered significant variation in approaches adopted by industry and a lack of understanding of the whole system approach.

1. Systematic consistent repeatable approach to decarbonisation can save time, cost, and aid comparison

MEP found that it was possible to develop decarbonisation plans in a repeatable way, which was less expensive and faster than a bespoke plan. Working with a small proportion of the supply chain, it has been possible to deliver plans for decarbonisation across 24 sites in less than 13 months. This included testing the process and documenting the approach.

The approach was understood by the supply chain who were guided with tools, models, and templates for each step of the process including taking engineering outputs, modelling against Green Book requirements, and providing business case ready analysis. This was not considered something that was normally incorporated into a decarbonisation plan by the supply chain. All 24 plans were comparable and consistent in their underlying assumptions so investment could be considered at a portfolio level.

2. Common patterns and themes emerged in searching for the most financially and economically viable decarbonisation route

MEP observed standard patterns for specific types of activity and site characteristics.

MEP often found the payback for the whole system's decarbonisation was over twenty years, based on a combination of building fabric improvements, energy efficiency, control improvements, electrification of heat, renewable generation, and energy storage. Generally, a typical whole system pathway followed the sequence shown below:

No regrets measures pave the way with some early savings

MEP showed that typically no regret measures such as LEDs and BMS control will offer 15-20% savings, though cost 5–10% of the total budget. LEDs, whilst not contributing to the decarbonisation of direct emissions is seen to support the whole system of the site, providing financial returns and reducing overall electricity demand from a local network that could be constrained

Building fabric improvements cut the heat demand and reduce the need to replace heat distribution networks

Investment in building fabric was seen as essential to unlock heat load reduction and any change in distribution of heat temperatures, with steam or higher temperature heat networks common. A pattern for investment for building fabric improvements was hard to establish and these measures are likely to require bespoke assessment

Moving heat away from fossil fuels makes a step change

Moving heat generation away from fossil fuels (assuming by 2050 electricity consumption will be net zero) is where decarbonisation of direct emissions happens. Ageing plants are common so synchronising with asset replacement is logical. In most instances, this was linked to a move to heat pumps, a reduction in heat circulation temperature and additional electrical load. Hydrogen and other sources were also considered in instances where applicable

Electric vehicles will place a higher demand on electricity supply

The transition over to electric vehicles will demand additional power. This, with any additional heat loading, needs to be considered when looking at sizing renewable energy generation on site, and network constraints requiring upgrades

Renewable generation on site supports the financial case and resilience

Onsite renewable generation (primarily wind and Photovoltaics (PV)), sized to match the additional loads, was found to offer better site power supply resilience (when coupled with storage) and improved the financial business case for the whole system. Wind was more financially viable and matching demand profiles better, despite being more challenging to implement. Renewable generation offered multiple benefits to the whole system solution for the site including supporting localised network constraints, generating zero carbon power at low cost, and building resilience against any local power outages

Energy storage manages demand profiles

Energy storage and the management of heat and power use were seen as essential to balancing the whole system over a daily, weekly, and annual cycle

Importantly, the decarbonisation pathway may be perceived as a series of discrete steps in financial investment, but the environmental and economic benefits may only be fully realised (and optimised) once all steps have been completed. Each step effects change to a system as a whole, and that change can only be planned and delivered optimally where a collection of component steps are considered together.

3. Better data will improve robustness of designs and enable tracking of progress

MEP developed a rapid assessment method for developing sub-metering strategies and installed 827 sub-meters. These sub-meters will provide better data for those sites and enable half hourly benchmarks to be generated for use where data is not available.

4. Portfolio management could speed up delivery by collating multiple site's outputs together

MEP's systematic process is enabling participating organisations to compare sites and begin to plan investment decisions across their portfolio for scalable implementation. This feeds back into financial budget planning and delivery.

This also assists organisations when judging site investment on whole system costs using the financial and economic modelling outputs provided.

5. Use MEP outputs as guidance to prevent repetition

MEP developed and tested methods for parts of the decarbonisation process and recommends that these methods are used widely as the basis for any strategy on areas around:

- Profiling sites and understanding a portfolio;
- Considering where investment decisions are made;
- Planning implementation approaches;
- Assessing the needs and procurement routes for delivery; and
- Developing a realistic timeline for delivery.

The MEP process takes less time and costs less than many consultants would quote. MEP continue to streamline the cost and duration of the process based on further work with the MOD.

What next for MEP?

This executive summary and the supporting main report record the main findings and learning from the programme to date. To support on-the-ground delivery, the standardised site planning approach refined at MEP sites is also being shared through tools, templates, and associated benchmarks so more sites can apply it.

These outputs deliver on the MEP phase 2 aims of learning by doing and developing practical support to help the public sector rapidly scale up decarbonisation.

MEP is continuing in a new form, with a shift in emphasis from innovating in process terms to sharing the tools and refining them, as well as providing advice to public sector bodies reflecting the team's engineering and project management expertise and phase 2 experiences. The next phase is being guided by BEIS and OGP (Office of Government Property, in the Cabinet Office family) and is likely to be an interim step to be built on after the usability of the tools and the need for bespoke advice is better understood.

Modern Energy Partners In detail

What is Modern Energy Partners?

The Modern Energy Partners (MEP) programme is a ground-breaking collaboration within Government. Since the programmes' inception in 2019, its aim as an innovation programme has been to develop a replicable and scalable method to decarbonising campus-style sites, demonstrating that it is possible for the public estate to deliver at least 50% direct carbon emission reduction by 2032.

Who supported Modern Energy Partners?

The programme, whilst cross government collaborative, has been overseen by the Department for Business, Energy and Industrial Strategy (BEIS) and funded by BEIS under the £505m Energy Innovation Portfolio. Collaborative support was provided by the Cabinet Office's Office for Government Property (OGP), Treasury and the BEIS Public Sector Decarbonisation Team. The NHS, MOD and MOJ primarily offered-up testbed sites and participated in steering the programme.

What did MEP do?

Over two years, the programme tested out the practicalities of decarbonisation through getting better data, understanding what the most cost-effective route was to achieve decarbonisation on a site and testing out the ease of taking the first few actions.

Overall MEP worked with forty-two testbed sites split across NHS, MOD, MOJ, HMRC and HEI and in doing so evolved a standardised rapid process to assess:

- Sub-metering needs and deployment of meters (including testing out Crown Commercial Services Helga Framework to deploy sub-meters).
- The decarbonisation potential of a site, including a pathway to enable the next steps and associated costs to be recorded, planned for, secured and actioned.

In addition, it developed a repository of:

- Tools, templates, and methods for use which apply consistent thinking to allow comparability across different sites.
- Benchmarks and data on energy consumption for different activities and costs for all parts of the decarbonisation process.

It also saw MEP observing the current:

- Condition and management of the estate.
- Levels of capacity and capability.
- Decision-making and governance processes.
- Delivery and procurement routes.

Licence and disclaimer

Energy Systems Catapult (ESC) Limited Licence for the MEP Final Report Executive Summary and Chapters. ESC is making this report available under the following conditions. This is intended to make the Information contained in this report available on a similar basis as under the Open Government Licence, but it is not Crown Copyright: it is owned by ESC. Under such licence, ESC is able to make the Information available under the terms of this licence. You are encouraged to Use and re-Use the Information that is available under this ESC licence freely and flexibly, with only a few conditions.

Non-warranty and liability

The Information is made available for Use without charge. In downloading the Information, You accept the basis on which ESC makes it available. The Information is licensed 'as is' and ESC excludes all representations, warranties, obligations and liabilities in relation to the Information to the maximum extent permitted by law. ESC is not liable for any errors or omissions in the Information and shall not be liable for any loss, injury or damage of any kind caused by its Use. This exclusion of liability includes, but is not limited to, any direct, indirect, special, incidental, consequential, punitive, or exemplary damages in each case such as loss of revenue, data, anticipated profits, and lost business. ESC does not guarantee the continued supply of the Information.

Using information under this ESC licence

Use by You of the Information indicates your acceptance of the terms and conditions below. ESC grants You a licence to Use the Information subject to the conditions below. You are free to; copy, publish, distribute and transmit the Information; adapt the Information; exploit the Information commercially and non-commercially, for example, by combining it with other information, or by including it in your own product or application. You must, where You do any of the above:

- acknowledge the source of the Information by including the following acknowledgement:
 - "Information taken from the MEP Final Report Executive Summary and Chapters, by Energy Systems Catapult".
- provide a copy of or a link to this licence.
- state that the Information contains copyright information licensed under this ESC Licence.
- acquire and maintain all necessary licences from any third party needed to Use the Information.

These are important conditions of this licence and if You fail to comply with them the rights granted to You under this licence, or any similar licence granted by ESC, will end automatically.

Exemptions and non-endorsement

This licence only covers the Information and does not cover personal data in the Information; trademarks of ESC; and any other intellectual property rights, including patents, trademarks, and design rights. This licence does not grant You any right to Use the Information in a way that suggests any official status or that ESC endorses You or your Use of the Information.

Governing law

This licence and any dispute or claim arising out of or in connection with it (including any noncontractual claims or disputes) shall be governed by and construed in accordance with the laws of England and Wales and the parties irrevocably submit to the non-exclusive jurisdiction of the English courts.

Definitions

In this licence, the terms below have the following meanings: 'Information' means information protected by copyright or by database right (for example, literary and artistic works, content, data and source code) offered for Use under the terms of this licence. 'ESC' means Energy Systems Catapult Limited, a company incorporated and registered in England and Wales with company number 8705784 whose registered office is at Cannon House, 7th Floor, The Priory Queensway, Birmingham, B4 6BS. 'Use' means doing any act which is restricted by copyright or database right, whether in the original medium or in any other medium, and includes without limitation distributing, copying, adapting, modifying as may be technically necessary to use it in a different mode or format. 'You' means the natural or legal person, or body of persons corporate or incorporate, acquiring rights under this licence.

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.