



Department for  
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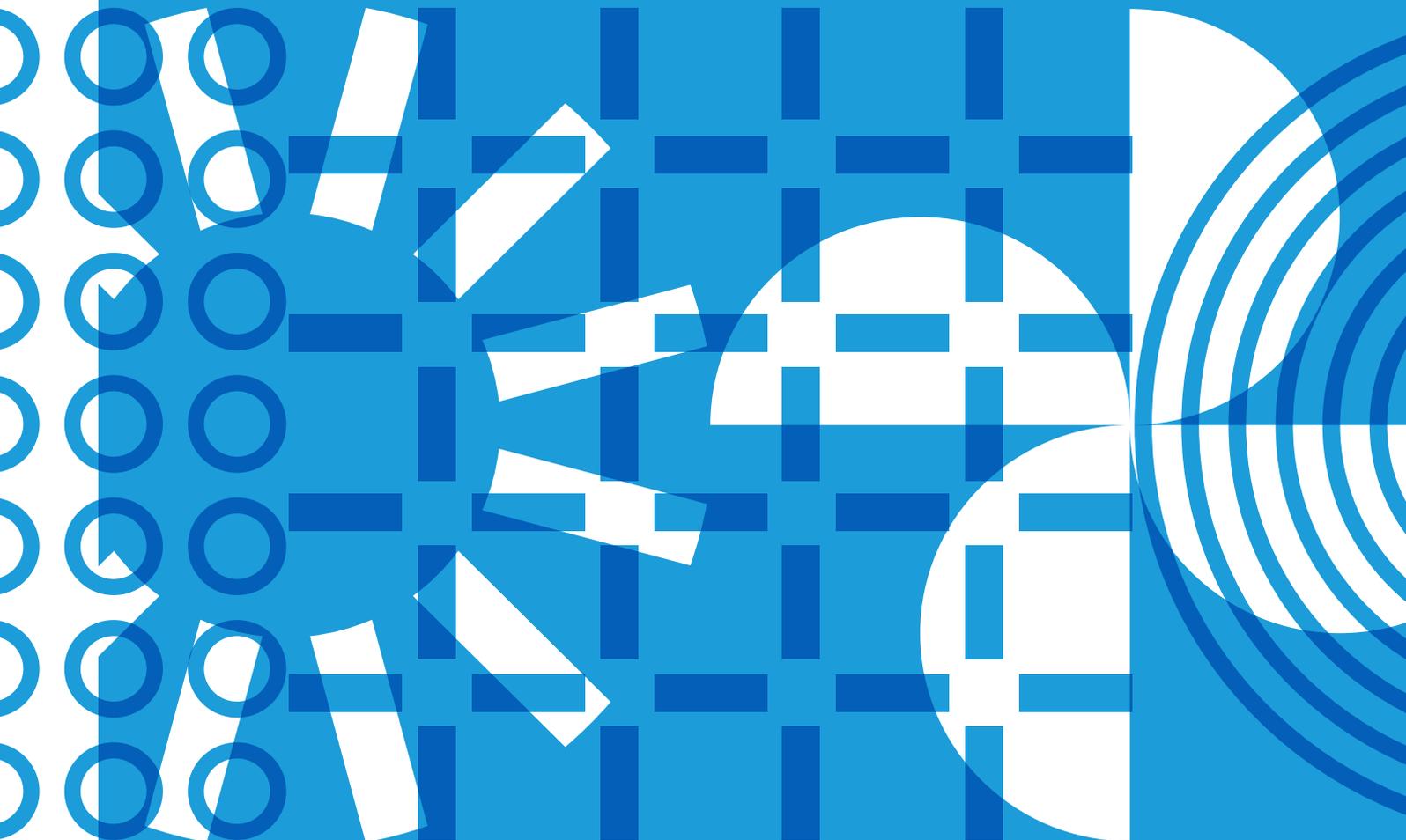


Government  
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**CATAPULT**  
Energy Systems

# Modern Energy Partners Phase 2

## Chapter 2: Decarbonisation Delivery Strategy



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# 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.

**Philip New** CEO  
Energy Systems Catapult



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.

A handwritten signature in blue ink that reads "Philip New".

# Introduction

Modern Energy Partners (MEP) is a ground-breaking innovation programme undertaken in collaboration with selected government departments and the NHS. MEP aims to develop a scalable and replicable methodology for the decarbonisation of campus-style sites based on the experience gained from a testbed of 42 sites.

The Energy Systems Catapult, under contract for the Department for Business, Energy & Industrial Strategy, has produced this report and derived independent recommendations based on its experience of running the MEP programme.

Over the past two years, our findings have demonstrated that it is possible for the public estate to achieve at least 50% non-traded or direct<sup>1</sup> carbon emission reduction by 2032 against a 2017 baseline. The public sector estate accounts for 2% of all UK emissions<sup>2</sup>, and overall, emissions from the built environment direct account for 3%<sup>3</sup> of UK emissions. Through cross-government collaboration, the practicalities of decarbonising public sector estates have been tested at four pathfinder sites to underpin the methodology, while recording observations and insights and developing a wealth of information.

This chapter is the first of five that examine different aspects of our key learnings. There is also an overarching executive summary that provides a concise overview of those key learnings.

<sup>1</sup> Non-traded or direct carbon emissions are from sources that are owned or controlled by the reporting entity and do not fall within the scope of the EU ETS

<sup>2</sup> [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/862887/2018\\_Final\\_greenhouse\\_gas\\_emissions\\_statistical\\_release.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/862887/2018_Final_greenhouse_gas_emissions_statistical_release.pdf)

<sup>3</sup> [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/957887/2019\\_Final\\_greenhouse\\_gas\\_emissions\\_statistical\\_release.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/957887/2019_Final_greenhouse_gas_emissions_statistical_release.pdf)

The chapters are as follows:

**Chapter 1**  
**Introduction and programme  
delivery summary**

**Chapter 2**  
**Decarbonisation  
delivery strategy**

**Chapter 3**  
**Finance and funding**

**Chapter 4**  
**Capacity and capability**

**Chapter 5**  
**Public sector  
decarbonisation  
in practice**

## MEP at a glance

Innovation programme  
from BEIS

£12.4m

Months duration

24

Covering a test bed  
of 42 sites and  
over 294,000 tCO<sub>2</sub>e  
carbon emissions42  
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 tCO<sub>2</sub>e saved in 2032 and £970k saved next year and then onwards

LEDs replaced  
at pathfinder sites

20,000

Controlled with BMS

177,000m<sup>2</sup>

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%
<b>Total coverage</b>	<b>6%</b>	<b>17%</b>	<b>8%</b>

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

### Developing a consistent scalable approach to appraising net zero potential

- ✓ Systematic approach developed and refined through doing
- ✓ Tools, templates, and assumptions recorded building a repository of information

### Getting better data

- ✓ Rapid deployment approach developed

Sites with consistent decarbonisation plans

24

Average emissions reduction by 2032

70%

At a total capital expenditure cost of £303.1m

£12.6m

Typical per site

Fiscal meters connected

442

Sub-meters installed

951

Meter data monitored each week

50 GWh

Half hourly benchmarks developed on building use and activity



\*One pathfinder was made up of three prisons in the Sheppey prison cluster.



## Summary of key findings

MEP experienced multiple barriers through its delivery that have to be resolved for decarbonisation to happen at scale and pace. MEP considers that a good starting point must be a central deliverable strategy and plan that covers all the facets of delivering at scale.

Phase 2 of MEP started in April 2019 to demonstrate the practicalities of how to achieve emissions reduction. Using decarbonisation testbeds and learning by doing in three specific areas, three main activities were undertaken (for more detail see chapter 1):

- the concept designs;
- the pathfinder implementation activity; and
- the installation of sub-metering.

Each of these activities tested specific elements in a wider decarbonisation strategy. As they evolved, they provided programme insights and contributed lessons learned towards organisational strategies.

**For a decarbonisation programme to succeed, it must be properly planned and integrated across an organisation's estate, ideally as part of a formalised asset management approach.**

MEP's three key findings for decarbonisation delivery are:

<p><b>Organisational integration</b></p>	<ul style="list-style-type: none"> <li>○ In practice, the delivery of the pathfinders and sub-metering were the most time consuming and intensive parts of the programme. This stemmed from a bureaucratic scrutiny and approvals process, complexity in clearance processes required for contractors and differences in the understanding and application of processes at a site level within the participating departments. Indeed, each phase of the programme revealed procedural and policy barriers that were not exposed at the outset. However, this has enabled MEP to identify what needs to be done to mitigate the risk of delays moving forward.</li> <li>○ For a decarbonisation programme to succeed, it must be properly planned and integrated across an organisation's estate, ideally as part of a formalised asset management approach. MEP also found that success was dependent on there being sufficient technical skills, capability, and capacity to plan and deliver the required strategies and plans. This included procurement and the monitoring of benefits.</li> <li>○ Integration of the decarbonisation strategy into existing operating practices and processes is critical. Where required, processes should be adapted and updated across the whole organisation to speed up enablement.</li> </ul>
<p><b>Timing</b></p>	<ul style="list-style-type: none"> <li>○ MEP also observed the time taken to deliver each initiative, recording the activities undertaken in the build-up to delivery, the duration taken for decision-making, approvals, and the procurement route.</li> <li>○ MEP now understands that, whilst 2032 seems like some time away, the duration of delivery demonstrates that time is of the essence and we need to act now. Failure to plan and act now is likely to result in an inability to deliver by 2032. Delays are also likely to impact more challenging targets linked to the 6th carbon budget and net zero.</li> </ul>
<p><b>Developing a clear strategy</b></p>	<ul style="list-style-type: none"> <li>○ MEP's learnings from the overall programme are around how to plan and develop a clear strategy that incorporates all of the aspects listed below, as well as identifying how to deliver a scalable programme.</li> </ul>

In developing a decarbonisation strategy, MEP suggests that the following elements are considered:

<p><b>1. Governance</b></p>	<ul style="list-style-type: none"> <li>○ How is the programme going to be structured, owned, managed, and monitored?</li> <li>○ What will the governance and decision-making structure be?</li> </ul>
<p><b>2. Cost</b></p>	<ul style="list-style-type: none"> <li>○ How much is the programme going to cost?</li> <li>○ Where will the funding come from?</li> </ul>
<p><b>3. Delivery Model</b></p>	<ul style="list-style-type: none"> <li>○ What needs to be delivered?</li> <li>○ What is the procurement/delivery model for each element?</li> <li>○ If these are not in place, how will that be achieved?</li> </ul>
<p><b>4. Timeline</b></p>	<ul style="list-style-type: none"> <li>○ How long will it take given known processes and delivery methods?</li> </ul>
<p><b>5. Resources, skills, and capability</b></p>	<ul style="list-style-type: none"> <li>○ Who is going to oversee the programme delivery?</li> <li>○ What skills and capability do they need?</li> </ul>

# Organisational strategy

Much of MEP's focus was on developing decarbonisation plans for sites. However, findings from the pathfinder element of the programme have provided powerful insights on the importance of an overall organisational strategy for decarbonisation. These are reflected in MEP's recommendations on building a strategy, testing, and refining it, then moving to scalable delivery.

Key points are:

## **Learn from the evidence**

For a plan to be successful, the practical MEP insights must be used and incorporated into the overarching decarbonisation strategy. To plan how decarbonisation can be delivered, it is important to understand: the cost of decarbonising each key building archetype; what a set level of investment might achieve, and the types of technology required.

MEP provided the participating organisations with budget estimates and cost benefit analysis based on the cost estimates to decarbonise the testbed sites. MEP saw some variation in estimates. Being able to check against previous prices on other sites offered reassurance or the ability to challenge.

## **Plan to make investment decisions at a portfolio level**

MEP has shown that it is easier to decarbonise some sites than others. A decarbonisation strategy must consider variation in abatement opportunities across an organisation's portfolio. Knowing where emissions savings can be best achieved at a site-by-site level gives direction to an overall strategy and initial investment focus. For example, sites in rural areas may be more likely to achieve more decarbonisation, at a lower cost, than urban sites.

**Knowing where emissions savings can be best achieved at a site-by-site level gives direction to an overall strategy and initial investment focus.**

The sample chosen by MEP has built this knowledge covering scope 1 and 2 emissions for the built environment.

- 6% of the NHS in England (2% sub-metering only and 4% sub-metering plus concept design)
- 17% of MOJ prisons (4% sub-metering only and 13% sub-metering plus concept design)
- 6% of MOD sites (1% sub-metering only and 5% sub-metering plus concept design)

### Plan implementation approaches

Organisations should consider where savings may be achieved most easily, either site-by-site or technology-by-technology or via existing planned maintenance works. Some technologies, such as LED lighting, lend themselves to wider roll-out without further feasibility studies. Others, such as low-carbon heating, require specific site consideration. MEP tested some aspects of implementation and their delivery models.

### Prepare the supply chain

The volume of equipment and delivery needs to be considered. A plan to best procure certain materials and services is required. This must fit with existing or future facilities management (FM) agreements allowing for ongoing maintenance. MEP observed several pilot technologies that had been installed but were not covered under ongoing maintenance contracts, and often not fully operational.

### Understand timing

The timeline of deployment is important. Working back from 2032 (with time contingency) will show how rapidly an organisation needs to scale up, accounting for onsite activity and the capability needed for programme management. This too can help with financial planning for spending review bids and other funding routes. Through working with the MOD, NHS and MOJ, MEP was able to reflect on the timings for organisational delivery.

The plan must also be signed off and owned by a senior stakeholder. They must have authority and the responsibility to make sure that it is implemented.

#### MEP Recommends

- The key facets in Figure 1 (overleaf) should be combined to produce a framework for a comprehensive decarbonisation strategy at the organisation level. This will ensure that barriers and challenges are dealt with in advance of them causing delays or additional cost.
- The areas MEP tested are shown in green and reflect the practical level of insights available which can be fed into strategy development and wide-scale implementation.

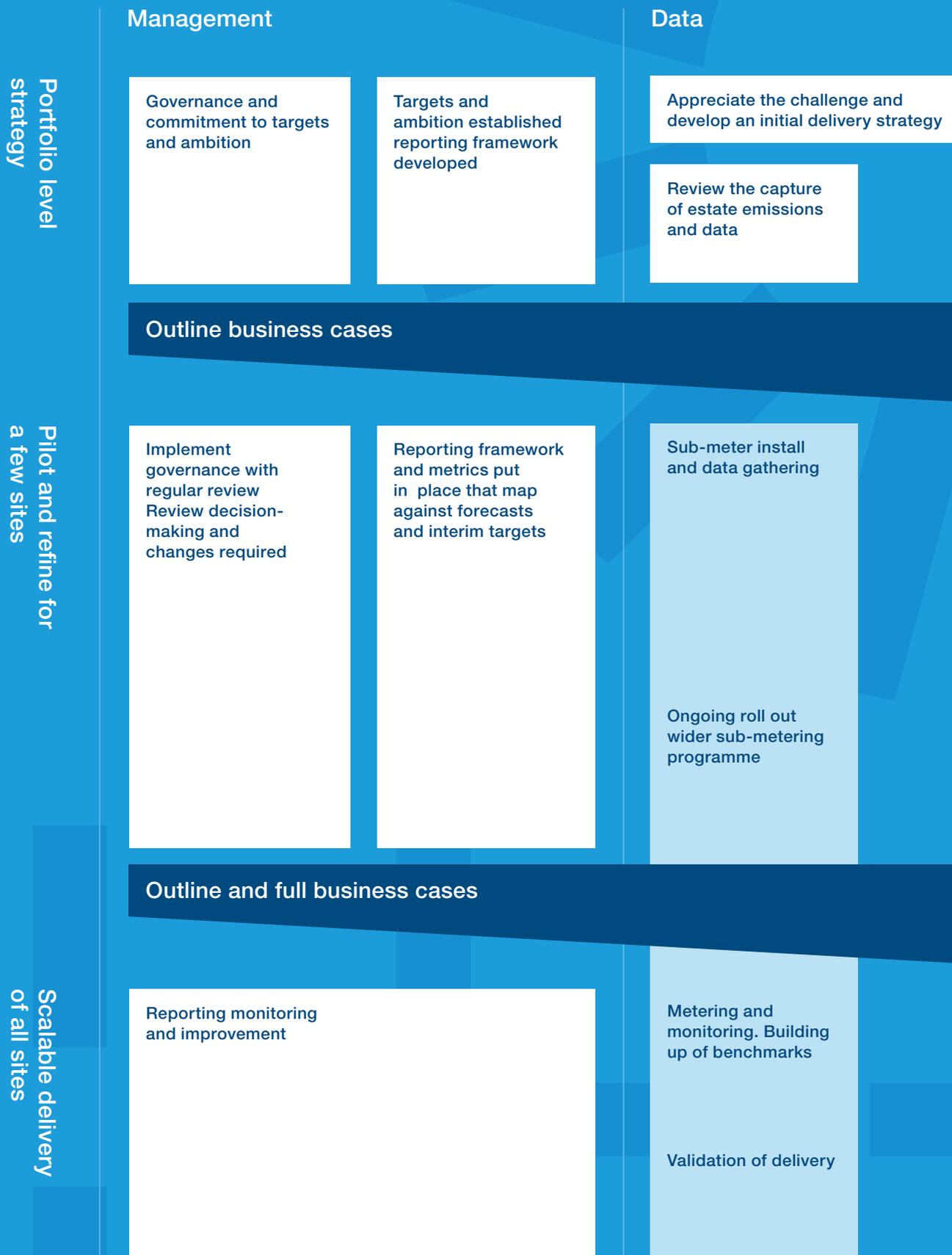


Figure 1: Key Facets for a Comprehensive Decarbonisation Strategy

People	Funding	Technical	Delivery route
<p>Review resource and capability</p>	<p>Budget costs and funding OGP Net Zero Trajectory tool</p>	<p>Appraise estate condition and solutions</p>	<p>Delivery routes and current delivery timelines</p>
<p>Build core team</p> <p>Develop core and determine department skills requirements</p> <p>Training</p>	<p>Test sites against representative sample</p> <p>Build up understanding of actual cost from on the ground estimates condition and solutions for sites representative sample</p> <p>Funding routes and bids with timing</p>	<p>Understand condition and solutions for sites representative sample</p> <p>Model impact and cost for sites, test implementations extrapolate up</p>	<p>Appraise potential routes and strategy for implementation</p> <p>Set up procurement routes for delivery either existing or new</p>
<p>Building up of team and embedding throughout organisation</p>	<p>Ongoing modelling and refinement of budgets. Securing of funding through agreed routes</p>	<p>Programming/timelines</p> <p>Technical delivery through chosen procurement routes — likely to be multiple to manage with different technologies, sites, regions, asset replacement and new installations</p> <p>Maybe different commercial models for different technologies/sites</p>	



# Decision-making and approvals

The key challenges inhibiting the rapid delivery of on-site activity were the complexity of the project sign-off processes, and lack of experience with decarbonisation project delivery. As a result, project sign-off often took longer than necessary. Achieving signoff required providing clarity and familiarisation to those who were involved in the objective.

**Everyone involved in decision-making must have familiarity with decarbonisation projects being taken forward and understanding of the processes required.**

## Observation 1

- During the delivery of MEP activities, organisational escalation was often required to unlock process blockages. These arose from two underlying issues; i) the person involved in the sign-off process was unaware of the overall goal; and, ii) the process did not inform them of it.
- To speed up decision-making and project approvals, stakeholders need to be more aware of what they are being asked to approve. Those signing-off need to understand project dependencies and the impact of delays on other projects. This requires process amendments to provide decision-critical information. Approvers require education to inform them about what they are looking at.

## Observation 2

- Individual projects need to be considered in the context of the whole solution. The approach must include an understanding of how measures interact within a whole plan. This may be over several phases and an extended timeline. It is important to consider the value that the whole plan offers, not just the incremental elements, otherwise, it risks core elements being dropped, for example, building fabric.

### Examples



- One example saw MEP struggling for over four months to get approval for the installation of a data cable. This was down to a lack of familiarity with the process that needed to be followed and a lack of understanding of the objective at the point in the process where it became blocked. Unblocking the sign off took multiple attempts to understand where the sign off had got to, followed by reaching out to the team involved to explain what was going on.
- For sub-metering installations, on average, the MEP coordinating team received 113 emails per site from the technical quote stage to installation.

### MEP Recommends



- Everyone involved in decision-making must have familiarity with decarbonisation projects being taken forward and understanding of the processes required. This can be achieved by embedding the delivery of decarbonisation within all the existing processes and project teams that organisations operate.
- If current processes are deemed to take too long to meet timelines, they need to be adapted.

### MEP Recommends



- Changing processes to ensure interdependencies are clearly flagged and known/shown will enable visibility at this level of granularity and will enable better tracking of the benefits realised as the whole programme is implemented. However, it can only be successful if determined and implemented fully from the start.
- Amending and recording process will also support staff changes.

# Delivering at pace

MEP observed that the timescale for most projects, from inception to starting on site, was a minimum of two years. MEP tested if it was possible to deliver projects more quickly by identifying project efficiencies that could cut timescales.

For MEP's pathfinder projects, only simple energy efficiency projects were taken forward as the first step to decarbonisation. Just implementing these simple projects took the length of the 2-year programme. Within this time MEP observed the complexity of the decision-making, approvals and procurement processes that are currently available to public sector bodies. To enable decarbonisation to happen at scale, a much more streamlined approach must be adopted. This includes established delivery models and efficient processes for project sign-off.

This challenge scales with the size of an organisation. It is particularly acute for those with the largest estates and portfolios of sites. To make the rapid progress required to reduce direct emissions by 50% in 2032, compared to 2017, the work to streamline delivery approaches needs to begin now.

Across multiple sites, streamlined projects will be created in a continuous wave that sees a high volume of action delivered in a short period.

As a strawman indication, Figure 2 shows graphically the challenges of streamlining a large number of sites from now until 2032. This shows 180 sites, with 30 sites starting every 9 months across 3 delivery phases. The projects are initial no regret measures, such as a heat network project and a renewables activity. Importantly, the diagram shows that the last two rounds do not have enough time to fully deliver. Therefore, if the

## Example



- At one department the standard delivery model for a lighting replacement is through the capital projects team. Using an agreed process, aligned to tasks set out within the Royal Institute of British Architects (RIBA) stages, would have resulted in installation taking 21 months.
- Adopting a different approach, using the FM provider, reduced installation time to 11 months and achieved cost reductions.

## Example



- For one department, an approvals process required nine steps, each step requiring at least six sign-offs. The sign off process took 14 weeks in total for the whole business case approval to be achieved. That included numerous escalations to senior sponsors to try and keep the process on track.

organisation wanted to achieve 50% direct emissions across its portfolio it might need to consider doing more decarbonisation on a proportion of the sites, rather than meeting 50% on all.

Areas worthy of specific attention within any timeline improvements include:

- A rationalisation of the number of scrutiny committees or project approvals required if an overarching business case has already been signed-off.
- Making sure that commissioning is adequate with detailed specifications and contracts.
- Challenging the steps laid out under current contractual obligations for the delivery of projects.

MEP Recommends

- That all organisations review typical project timelines and consider the time available as a constraint.
- Ensure an initial plan identifies how many sites need to be addressed and how quickly they need to be taken forward to achieve the timeline constraints. This plan can be used to instigate thinking about delivery models, cash flow and when funding may be available.

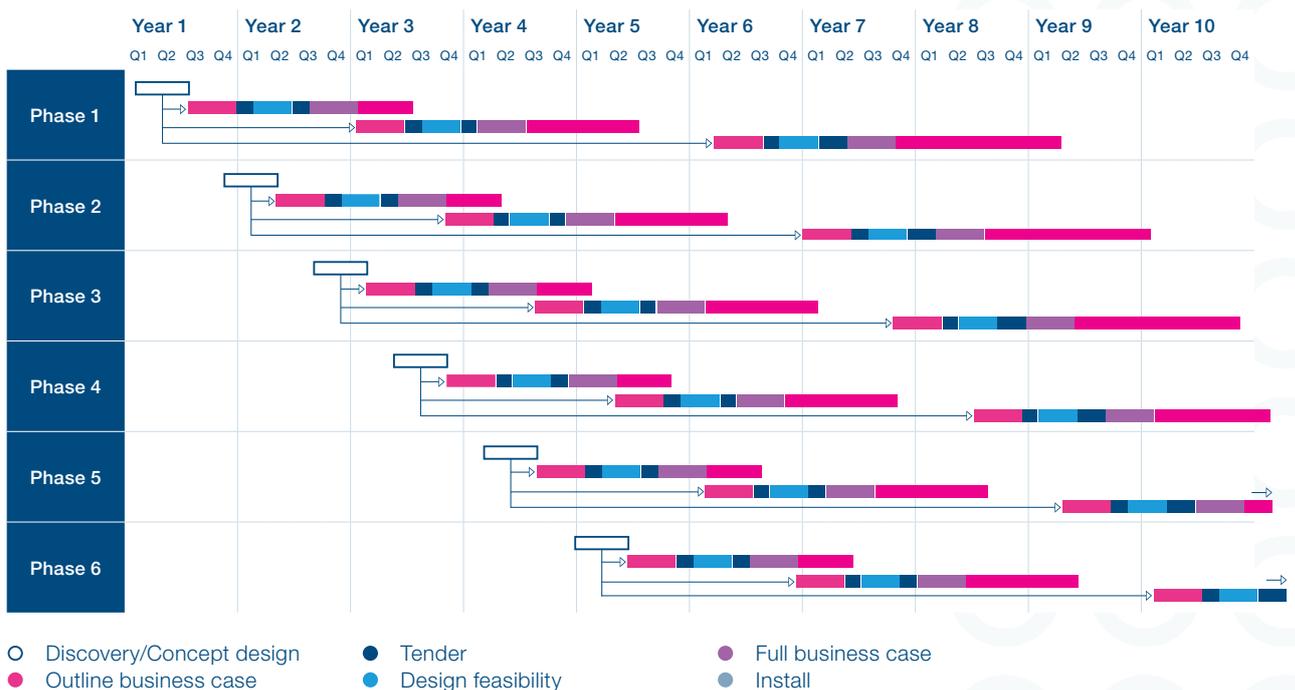


Figure 2: Example of the challenges of streamlining a large number of sites from now until 2032



# Understanding potential delivery models

MEP observed several different delivery models throughout the programme, capturing the strengths and weaknesses of each approach.

## Organisational delivery models

For scalable decarbonisation across the whole organisation, the decarbonisation strategy needs to include a clear plan on how each element of delivery will be approached. At an organisational and site level it is likely that there will not be just one delivery model. The strategy should set out what approach will be taken for different types of activity. This includes ongoing

maintenance; asset replacement programmes; larger capital replacement programmes or new projects.

There will likely be several different models that need to be planned and adopted. Potential options could include:

- Using existing FM contractors for capital works programmes
  - For general maintenance programmed works, energy and carbon upgrades should become business as usual
  - For larger capital projects, existing frameworks can be used, though the description of what is required as an outcome will need to be updated
  - For new projects, Net Zero should be set as a goal.
- Using new frameworks for specific activities, especially easily repeatable activities, such as LEDs or those separate to the main operational systems, like renewables

Each one of these models needs to be considered, asking questions such as:

- Is there capacity to deliver at the scale required available within existing frameworks?
- What is the duration of the framework contract?
- When does the framework need to be renewed?
- Should new frameworks/ procurement routes be developed to fill identified gaps?

### Example



- Across one organisation, many buildings are of the same age and type. Being able to deploy a consistent package of measures across each type or age category would provide a rapid roll out of initial enabling measures.
- Through the pathfinder work MEP sought to understand what consistent package of measures could be deployed. MEP assessed a representative sample of buildings. They determined the cost and outcome for a package of initial enabling measures that could be deployed across that site and wider replicable sites.

The benefits of scale also need to be considered to drive value for money. Can multiple site replacement programmes of technologies be rolled out rather than replacement on a site-by-site basis? Can value for money be leveraged through purchasing equipment and services in volume? Classic energy efficiency measures, such as installing LED lighting, building management systems (BMS), sub-metering and building fabric improvements, have demonstrated the suitability of an economy of scale, 'no regrets' type of delivery model.

Similarly, renewable installations tend to be independent to normal operations, save for connection, on a specific site. These could be delivered separately as an 'off the shelf solution' in advance of other more detailed and bespoke solutions on site. This could form a portfolio-wide programme.

Based on the installations at MEP pathfinder sites, where over 21,000 light fittings were replaced, MEP estimates that over the next ten years a total of 8–10 million lighting fittings, could need to be changed within the MOD, NHS, and prison estate. Similarly, there is a potential demand for 8–10MW of alternative heating systems including heat pumps, and a similar<sup>1</sup> level of renewable energy generation to support additional loading.

Ease of installation needs to be considered when determining a delivery strategy. What type of service will be least disruptive to the site operations? MEP has observed each organisation deliver projects in different ways including:

- Using FM contractors, commissioning single works
- Using capital work projects, commissioning single and multiple projects under one contractor

In both cases, MEP noticed that a traditional consultant was appointed, followed by a contractor. However, MEP also saw end-to-end service support.

<sup>1</sup> Though it may seem to be linear there are several influencing factors that mean it is not directly proportionate and could vary in situ

### Example



- MEP not only wanted to remove the bias that comes from an organisation installing and designing in addition to the bias that comes from personal preferences from the concept design stage. Instead experts with different specialisations from different consultancies were brought together to determine possible options for the site. This approach was particularly successful, and it saw all the consultancies working collaboratively, providing better solutions and them learning from each other.

Understanding potential delivery models — continued

MEP observed that solutions designed and overseen by an independent contractor gave the public sector more influence over the solution and its outcome. Contractors employed for onsite implementation then work to the detailed design. The risk of this approach is that the costs of the project may increase. The benefit is that the customer, the organisation, can commission the work it wishes to see installed and is likely to achieve better Value for Money (VFM).

Replacement programmes are often led and managed by the FM provider, who is contracted to deliver a pre-specified annual maintenance programme. Despite decarbonisation plans being in place or under development, MEP observed pre-specified maintenance programmes being delivered, installing high carbon technology.

As most plant replacements are part of planned maintenance programmes, it is possible that this could not have been stopped. However, this highlights how maintenance programmes need to be integrated to ensure a low carbon approach is adopted and connected to the overall site's decarbonisation plan.

For the installation of sub-metering, MEP tested the HELGA framework to recruit several sub-metering installers. This framework proved quick and easy to use enabling us to access suppliers rapidly. Whilst the framework provides access to suppliers, MEP also found that it was important to develop an appropriate specification. As a result, and like the other work completed by MEP, a standard specification was developed that supported the programme and will be available for future use.

### Transition into operation

New installations or projects must include a plan for ongoing maintenance and operation. Transfer of operation, upgrades, and maintenance from the installer to the FM company needs consideration. Where innovative new technologies are installed, FM companies should demonstrate that they have the skills and knowledge to operate them effectively. For existing known technologies FM should be targeted to demonstrate good operation, for example, BMS.

#### Example



- A decarbonisation plan for a cluster of sites recommended a low carbon heat network. Six months later several of its ageing gas boilers were replaced with new gas boilers.

Delivering and monitoring savings is a critical part of the programme. Standards such as International Performance Measurement and Verification Protocol (IPMVP) must be followed. FM companies should be targeted to operate technologies, such as BMS, to maximise savings. The organisation or an independent entity from the installer or FM companies should be responsible for monitoring savings achieved. MEP found that some commercial agreements where companies were operating and monitoring made accessing savings data difficult.

It is worth noting that whilst there have been several observations around procurement, through the delivery of the pathfinders and sub-metering, developing alternative procurement routes has not been a specific focus of the programme.

MEP sees this element to the strategy as a key risk to overall decarbonisation delivery.

#### Example



- MEP has developed an approach for the rapid deployment of sub-metering that allows for the roll-out of sub-metering across a wide range of sites. It captures half-hourly energy data consistently, monitoring energy reduction across multiple public sector sites.

**Classic energy efficiency measures, such as installing LED lighting, BMS, sub-metering, and building fabric improvements, have demonstrated the suitability of an economy of scale, “no regrets” type of delivery model.**

#### MEP Recommends



- Scalable delivery is enabled by making sure the delivery model is right for all the different routes in advance of roll-out. This includes mapping of existing delivery models; the consideration of scale; ensuring that capital, maintenance, and operation are integrated and a plan to track benefits is in place.



## Enhancing ongoing capacity building and knowledge exchange

Throughout the programme, MEP has observed and captured a wide range of insights. The headlines are in this report, but other insights have been captured in more detail and shared with key stakeholders as the programme has evolved. These insights and methods are not limited to technical observation.

**MEP estimates that, over the next ten years, there is a potential demand for 8–10MW of alternative heating systems including heat pumps, and a similar level of renewable energy generation to support additional loading within the MOD, NHS, and prison estate.**

They will be made available after the programme has been completed for others to benefit from. As more work is done in this area, the evidence base will be expanded.

Technical insights include:

- How to do it — a systematic, consistent approach to decarbonisation with technical papers on how to approach key areas
- Principles for decarbonisation
- Costs of interventions
- Benchmarks — half hourly energy usage data for different building types and usage
- Monitoring — how to monitor and deploy sub-metering rapidly to get going quickly

MEP, OGP and BEIS's ongoing aspiration is to build a broader repository of information and library that is accessible for all public sector bodies to use as they scale-up their decarbonisation activities. It is expected that this information will be available on the Government Property Portal.

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