Department for Energy Security & Net Zero

Cabinet Office

Government Property Function

CATAPULT Energy Systems

Developing and delivering your strategy: Understanding your energy data

Public Sector Decarbonisation Guidance

Contents

Disclaimer:

1. What is the purpose of this guide?

As part of a programme funded by The Department for Energy Security and Net Zero (DESNZ), and working with the Government Property Function (GPF), Energy Systems Catapult (ESC) has produced guidance to support the public sector to decarbonise their built estate. These guides cover seven themes and give an overview of all the activities required to successfully develop and deliver a decarbonisation programme.

This document provides guidance on the importance of managing your energy data, covering best practice management. It builds on the Theme 1 guide and provides more details on particular areas.

We welcome your feedback on these resources, please email ESC at PSDecarbGuidance@es.catapult.org.uk

Why is energy data so important?

Understanding the use of energy across your estate will be a key contributor to reducing your carbon emissions. The old adage of "you can't manage what you don't measure" applies here - understanding where, when and how you use energy is critical to taking steps to reduce it.

Historically when energy prices are low, managing consumption has not been a high priority, but with the volatile and rapidly increasing energy prices seen throughout 2022 and into 2023, the benefits of understanding how much energy is being consumed and where are clearer:

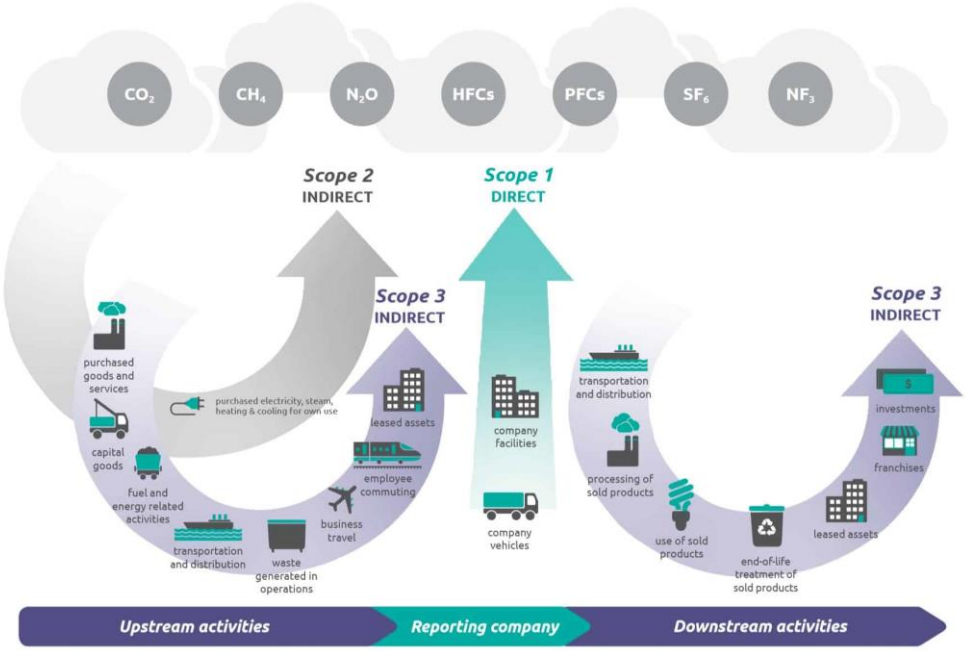
Understanding your energy consumption will not only allow you to better manage your energy costs, but also to develop energy resilience plans and understand and mitigate the risk of any loss of energy supply.

Defining your boundaries

As explained in the Theme 1 guide, the first step in understanding and managing

your consumption is to define boundaries and what is part of your estate, so that you can accurately and rationally account for energy use. Information on how to do this is set out in the Theme 1 guide, and the Net Zero Estates Playbook.

The diagram below provides a reminder of common sources of energy (and emissions) and how they can be categorised using the "scopes" methodology of the GHG Protocol.



Further useful resources on defining boundaries are set out below.

Useful source	Relevance
Theme 1 – Developing and delivering your strategy	This guide provides high-level insight into how to approach strategic definition, planning and briefing when developing an organisational decarbonisation strategy for existing buildings.
Net Zero Estate Playbook	Step 2 details how to define the scope of your organisation and calculate your emissions footprint and includes additional helpful links.
Greenhouse gas reporting tool	This tool explains the basics of GHG reporting and compares all the different reporting frameworks helping you to consider which approach to use.

Better Buildings Partnership: Net Zero Carbon Pathway Framework	The framework sets out the information that property owners should include in their Net Zero Carbon Pathways, including the investment boundaries, carbon scope and delivery strategies.
Greenhouse gas reporting guidance	GHG Protocol have developed guidance that provides clarity on how specific sectors can apply the GHG Protocol standards and further support organisational reporting.

Understanding your energy use by gathering energy consumption data

Once you have a defined boundary for your estate, the next step is to work out where energy consumption data may be gathered from.

The energy hierarchy concept can be used to establish the best source of data available to you, starting with the most granular and automated sources, down to estimates based on benchmarks.

Best quality energy data
Half hourly data from fiscal meters, representing a premises or a substantial part of a premises, which is captured automatically and can show energy consumption patterns in detail. This is likely to be the most accurate.
Metered data which shows the energy consumed for the building digitally, however it may not have half hourly outputs
Metered data that is not digital and has to be manually read
Billed data which shows how much has been paid over periods of time which can be used to estimate energy consumed. This can be made up to a year
Estimated energy data based on an estimate for the building for part of it, based on m^2 or another metric
Estimated energy data that is based on a similar type of building operations or activity that is estimated on m^2 or another metric
Estimated energy data based on best practice energy benchmarks for a similar type of building
Lowest quality energy data

Based on the type of information you have available, a picture of the energy consumed for each building or part of building can be built up. Energy consumption should be recorded against the type of energy being used, for example electricity, natural gas, heating oil or LPG.

Prices and amounts consumed should be captured so that energy costs can be estimated, and emissions can be calculated using emissions factors.

Sources of energy benchmark information

Where energy data is not available (as per the hierarchy above) it can be estimated using benchmarks. A bespoke calculated benchmark based on energy consumption of a similar activity within your estate would be preferable as this will more closely

resemble the energy consumption for your particular sites than more generalised benchmarks. This can be established by considering the other buildings within your estate with better energy data that are similar to those where you have gaps. You can then use the energy consumption data to calculate how much is used per square meter. You may have several similar activities, and if so, they can be combined to give the benchmark.

In addition, there are a number of sources of publicly available energy benchmark information that can be applied or used to develop energy consumption estimates. Typically, they are applied as energy consumption by energy type per square metre. They often assume that heat is sourced by natural gas and general small power equipment using electricity, and so care must be taken to ensure the assumptions made for those benchmarks match your own buildings/activities.

Further useful resources for energy benchmarking are listed below.

Useful source	Relevance
CIBSE TM46 Energy benchmarks	This publication offers a comprehensive outline of building energy benchmarks; what they are, how they were developed and how to use them. As well as the benchmarks themselves, it provides details of separable energy uses and includes weather and occupancy adjustments.
CIBSE guide F (Energy efficiency in buildings)	CIBSE Guide F provides guidance on benchmarking, monitoring and targeting (M&T)
CIBSE Energy Benchmarking Tool	CIBSE's Energy Benchmarking Tool is an online platform which uses energy data as it becomes available to provide relevant and reliable benchmarks that represent the current trends of energy use in buildings.
Half-hourly energy consumption benchmarks	These benchmarks have been created for different building use types on campus style sites. They provide a standard set of benchmarks that can be used to split aggregated site energy consumption into a building-by-building profile. Whilst the benchmarks reflect energy use for MOD, MOJ and NHS buildings they are categorised against different activity uses and therefore could be adapted for other purposes or

	uses.
BEES benchmarks	The Building Energy Efficiency Survey (BEES) 2014–15 sets out to improve and update the evidence of how energy is used, and to provide an assessment of the abatement opportunities for all non-domestic premises across England and Wales.
Site energy demand estimator	An estimator developed to help in assigning energy consumption across a number of buildings or areas of a site where only aggregated consumption data is available. This supports a better understanding of what individual buildings' energy requirements are as a first step in developing a decarbonisation pathway.

Different scenarios – examples of what to do?

This section provides advice on accessing and using energy data in more complex scenarios: where only part of a building is occupied, where no data is available, and when alternative fuels like LPG or heating oil are used.

When only part of a building is occupied

There are three possible scenarios:

- You occupy only part of the building and the rest is vacant
- You occupy only part of the building but the rest is currently occupied by someone else
- You occupy only part of the building and the rest has been vacant, but you want to benchmark based on full occupancy which will be representative of the use going forward

If you have the fiscal energy consumption data for the whole building you should be able to develop accurate estimates for all of these scenarios. In the first scenario the raw data will accurately represent your consumption. In the second scenario you will need a robust methodology for apportioning the consumption between your occupancy and that of other occupants. In the third scenario you will need a robust methodology for estimating how the consumption would change if the building was fully occupied. In the second and third scenarios your estimates can be checked against suitable benchmark data to provide assurance.

What do I do if my building has no data?

Consider the use of energy data from sites with comparable properties and activities to fill any gaps in the first instance. If these are not available, you may be able to use publicly available benchmarks where these are appropriate for the areas in which you have data gaps.

When LPG or heating oil is used

When using LPG or heating oil, delivery of the fuel and actual usage differ (which is not the case for mains gas and electricity which are effectively delivered and used "on demand") and you will need to consider whether to use delivery or usage data. Usage data is most accurate but may not be readily available. Sometimes there are meters showing use that can be read (electronically or manually), and whilst the frequency of usage shown may vary it will still show usage over a period of time. Where there is no meter you can use delivery data to estimate how much fuel has been used over a period of time, and this can be checked against the building energy use estimator.

2. Recording a method statement and improving data over time

It is important to develop a method statement and record how data is established and can be repeated in future years, and quality can be improved on.

Your method statement should include:

- A list of buildings and the types of data available for them
- Where data gaps are identified, how the hierarchy has been applied and where benchmark data is sourced from
- Metrics which enable you to rate the quality of the data
- Any improvements which could be made, for example through fitting of automated/digital metering and additional submetering.

Further useful resources for this topic are listed below.

Useful source	Relevance
Theme 1 – Developing and delivering your strategy	This guide provides high-level insight into how to approach strategic definition, planning and briefing when developing an organisational decarbonisation strategy for existing buildings.
Net Zero Estate Playbook	The Net Zero Estate Playbook provides guidance to support UK Government departments and public sector bodies to transition their estate towards Net Zero
Greenhouse gas reporting guidance	GHG Protocol have developed guidance that provides clarity on how specific sectors can apply the GHG Protocol standards and further support organisational reporting.
Theme 3 guide – Procurement	Contains guidance and resources on energy procurement

Metering types

Dependent upon the amount of energy consumed on your estate, you are likely to have different types of meters from which you will be able to gather your energy usage data.

- Fiscal/boundary meters are the main meters typically found on the incoming supply to a building. There are several types of fiscal meters you may find:
    - A standard meter is one which has a single rate and requires manual submission of meter readings to energy suppliers. The cost paid will not vary by the time of day in which the energy was consumed.
    - Some meter types (e.g. Economy 7 and Economy 10) have multiple rates dependent on the type of meter. These can offer lower unit costs at non-peak times, but greater unit costs at peak hours.
    - Smart meters are the latest generation of gas and electricity meters, and allow for the automatic transmission of energy consumption to energy suppliers at up to half hourly intervals. The two types of smart meters used by non-domestic consumers are Automated Meter Reading (AMR) and Smart Metering Equipment Technical Specifications (SMETS) meters. AMR devices consist of Advanced meters, Data loggers and Gas embedded meters.
- You may also have sub-metering in place. This allows energy consumption to be monitored at a more granular level, with additional meters being installed downstream of the main utility meters so that

To improve the quality of data recorded you need to be able to identify and record the types of meters you use, so that you can identify where replacements and upgrades may be required.

Smart meters

In particular, you should explore the installation of smart meters where these are not already in place. These can not only be an important monitoring tool that greatly improve on the efficiency of data collection and the granularity of information you have available, providing both half hourly data and greater access to that data, but wider rollout of smart meters across the energy system will be a key part of having a more flexible energy system.

The amount of information an AMR and SMETS meter provide is different. AMR meters, at a minimum, provide energy usage information whereas SMETS also provide tariff information.

Both SMETS and AMR can provide automated meter reads up to every 30 mins. SMETS electricity meters are connected to the mains and monitor how much energy

is being used in near real-time. SMETS gas meters are battery-powered and "asleep" most of the time. They wake up every half hour to send a reading via the SMETS electricity meter's comms hub.

Sub-metering

You should also consider what level of metering is appropriate based on the size of the site and also your capacity to make good use of the data you can collect from it. Sub-metering is worthy of consideration on larger and more complex sites, and where you have experienced resource analysing the data this can provide extremely useful insights into how your site is performing. However, for smaller sites or where you are in the beginning stages of energy management and developing a decarbonisation strategy, it is key to first ensure that the basics are in place to support your strategy.

Useful source	Relevance
Metering type regulations for replacement	Regulations to ensure that meters register the correct quantity of gas and electricity consumed.
Smart meters in the public sector	This introduction to smart meters is aimed at decision makers in the public sector, and illustrates the benefits of installing smart meters.
Government consultation: Maximising non-domestic smart meter consumer benefits, improving the data offer and enabling innovation	This provides more information about the Government policy on smart meter data access for business and public sector energy customers.
NDSEMIC (Non-Domestic Smart Management Innovation	This was a competition aimed to maximise the potential for energy savings in 3 priority sectors that included schools. Findings were published in 2020 with a number of case studies, including a school.

Competition)	
Theme 3 guide – Procurement	Contains guidance and resources on energy procurement.

Collecting data more efficiently

In developing a method statement, you should consider and act on any opportunities identified to improve on your processes to make the data you collect more accurate and more granular to enable useful levels of monitoring and analysis, and also to make the collection of that data more efficient and less time intensive.

One key way to do this will be by automating this process as far as possible. You may have an existing Building Energy Management System (BEMS) which is collecting energy data already. AMR and SMETS meters can also be a significant tool in how you can improve on your data collection processes.

You should be aware of how you can access data from a smart meter - from 1st December 2022 license conditions were changed so that energy suppliers are required to ensure compliance with:

1. On-request data offer. Businesses and public sector organisations of all sizes (and any third parties acting on their behalf with their consent) can contact their energy supplier to request their smart meter energy use data from the past year. Energy suppliers must provide this for free and meet requests within ten working days.
2. Awareness raising requirements with respect to data. Energy suppliers must regularly raise their business and public sector customers' awareness of how they can go about accessing (or nominating a third party to access) their smart meter data for free.
3. From 1st October 2024, energy suppliers will have to provide their smaller business and public sector customers with free and regular information on their energy use, based on their smart meter data. For example, via a data visualisation tool or app.

Suppliers collect data from smart meters once a day, so consumers will have to wait at least 24 hours to see their data on their supplier's website or app – supplier data offerings in the non-domestic space is improving with most providing access to data through a portal. Usually, the data is collected shortly after midnight and loaded into suppliers' systems for release to consumers early the next day.

Consumers can obtain access to more regular energy data if a Consumer Access

Device or CAD is fitted, which can further help with near real-time monitoring. A CAD is a cloud-connected secure smart meter gateway device that accesses near real-time energy data from the smart meter and sends it to a designated cloud service.

There are a range of third-party providers that provide CADs for the energy market. The providers offering should include a consumer display so the energy data can be visualised.

You may also want to consider adopting data collection platforms which connect to meters and other building data systems to gather energy data and provide analysis, with many solutions available on the market.

Useful source	Relevance
Carbon Trust - Digital technologies for energy management - a buyers guide	An online guide which includes guidance on Digital Technologies for Energy Management

3. Understanding what your data is telling you

Energy analysis

There are many established ways to manage data which traditionally would be called MMT (monitoring measuring and targeting).

This can include lots of different approaches which are well documented from degree day and weather compensation to regression analysis. These are key analytical techniques to help you understand how other measurable factors can affect your energy use so you can account for other variations and how these effects aspects of the energy use which are under your control.

Useful guides are available on this, such as those listed below.

Useful source	Relevance
CIBSE guide F (Energy efficiency in buildings)	Contains information on M&T analysis techniques
CIBSE Guide H - Building control systems	Contains guidance of the use of BMS-derived data for energy monitoring
Energy Institute: Energy data analysis	This covers a more detailed explanation of concepts and techniques for analysing energy data
Carbon Trust - Digital technologies for energy management - a buyers guide	This guide includes information on typical analysis reports which can be generated by Digital Technologies for Energy Management

Using benchmarks to check energy performance

You can use the energy data from your estate to benchmark consumption across it and thereby prioritise where it will be most impactful to take measures to reduce consumption. You can do this by:

- Sorting from largest to smallest energy users in your estate – to help work out where to focus on decarbonisation
- Finding the outliers where sites are not performing well against their peers using intensity metrics such as energy consumed per square metre, per occupant (patient, prisoner, student). There are other factors which could lead to significant variation in these benchmarks, and as such may highlight areas with comparatively worse benchmarks. This may lead to the need to group or "archetype" estate activities for example grouping estate against type of activity or building age.

Another well documented way to use benchmarks is to check how your buildings are performing against typical buildings of a similar type. This would be by establishing what you are using per meter square and then comparing it to the benchmark metrics.

Further useful resources are listed below.

Useful source	Relevance
Theme 1 – Developing and delivering your strategy	This guide provides high-level insights into how to approach strategic definition, planning and briefing when developing an organisational decarbonisation strategy for existing buildings.
Net Zero Estate Playbook	The Net Zero Estate Playbook provides guidance to support UK Government departments and public sector bodies to transition their estate towards Net Zero
Theme 2 – Feasibility and design	This guide covers the development and design of a project to a point where it becomes investible,
Greenhouse gas reporting guidance	GHG Protocol have developed guidance that provides clarity on how specific sectors can apply the GHG Protocol standards and further support organisational reporting.
Theme 3 guide –	Contains guidance and resources on energy procurement.

Procurement	
CIBSE TM46 Energy benchmarks	This publication offers a comprehensive outline of building energy benchmarks; what they are, how they were developed and how to use them. As well as the benchmarks themselves, it provides details of separable energy uses and includes weather and occupancy adjustments.

Calculating energy cost and carbon forecasts

When you have your data on energy consumption, whether based on actual metered consumption, energy benchmarks or some combination of the two, you can begin to model your current and future energy costs and carbon emissions.

For any given current year, the carbon emissions can be calculated by using the Government conversion factors for company reporting of greenhouse gas emissions. However, for a Net Zero strategy we advise that the Green Book factors are used.

It is also useful to calculate emissions on a granular level so that the emissions attributed to each building or asset can be understood. This enables the “large” emitters to be identified and potentially prioritised for decarbonisation, and/or other efficiencies identified.

At this point you will also need to understand your future estate plan and take into account any planned changes to your estate. Buildings that are going to be demolished or disposed of, built, extended or acquired will need to be factored into your forward look.

Further useful resources are listed below.

Useful source	Relevance
Theme 1 – Developing and delivering your strategy	This guide provides high-level insight into how to approach strategic definition, planning and briefing when developing an organisational decarbonisation strategy for existing buildings.
Net Zero Estate Playbook	The Net Zero Estate Playbook provides guidance to support UK Government departments and public sector bodies to transition their estate towards Net Zero
Business as Usual Estimator	An estimator that allows input of building, site or portfolio level energy consumption data. It will provide a baseline of energy use over time from which decarbonisation interventions can be assessed. It also allows for known future changes to the site to be captured and incorporated into the future assessments.
Office of Government Property Tools	The OGP has a range of helpful tools available from the Government Property Portal

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