





# Managing and improving your energy use

Part of the Low Carbon Lincolnshire Programme



# David Knight

Principal Environmental Consultant at PECT

We're working on behalf of Business Lincolnshire to deliver the Low Carbon Lincolnshire programme.









### Low Carbon Lincolnshire

A programme to help small-medium businesses in Lincolnshire and Rutland with their journey to Net Zero.

- One-hour introductory webinars in February.
- Half-day workshops in Lincoln, Grantham and Market Rasen.
- Virtual workshops.

All open for registration on the Business Lincolnshire website now.









### The Net Zero Agenda



Paris Climate Agreement 2015 – to limit warming to well below 2°/1.5°C above pre-industrial levels

The UK has set, in law, their goal of becoming **Net Zero by 2050.** 

- 'Reaching Net Zero emissions; the activities within the value-chain result in no net impact on the climate...
- This is achieved by reducing emissions... balancing any remaining emissions through carbon removals.'







# What you can do to get to Net Zero

- 1. Make a pledge by joining the internationally recognised SME Climate Commitment.
- 2. Measure your carbon emissions using a free carbon calculator.
- 3. Use the <u>Calculate the cost of your carbon emissions</u> page to find out how much you could save by switching to greener business practices.
- 4. Make a plan to reduce your carbon footprint
- 5. Reduce your carbon footprint now you can take <u>no-cost or low-cost</u> <u>actions to reduce energy costs now</u>
- 6. Involve your team
- 7. <u>Get your team involved</u> to engage them in initiatives that reduce carbon and save on energy costs.



UK Business Climate Hub - find advice on energy saving and net zero for SMEs







### Scope 1:

Direct GHG emissions from sources a company owns or controls.

Emissions from boilers / furnaces Emissions from vehicles (fleet) Fugitive emissions of F-Gases / Process emissions 2

### Scope 2:

Indirect GHG emissions from purchased energy

Electricity
Heat (district heat network)
Steam (less common)

3

**Scope 3:** All other GHG emissions from sources not owned or controlled by the reporting company but that the organisation indirectly impacts its value chain

Procurement

Waste management

Business travel (public transport or grey fleet)

Investments







# **Energy management**

- Strongly recommend all organisations develop and introduce some form of energy management
- While not essential, accredited schemes offer significant benefits, plus third-party engagement ensures continual improvement is identified and acted upon
- Energy management self-assessment tool | The Carbon Trust
- Free guides and toolkits that allow high level review of how well you currently manage energy from policy, to training, to on-site improvements
- Resources are key including personnel; introduce energy roles into your organisation with opportunity to train and develop better energy knowledge and management











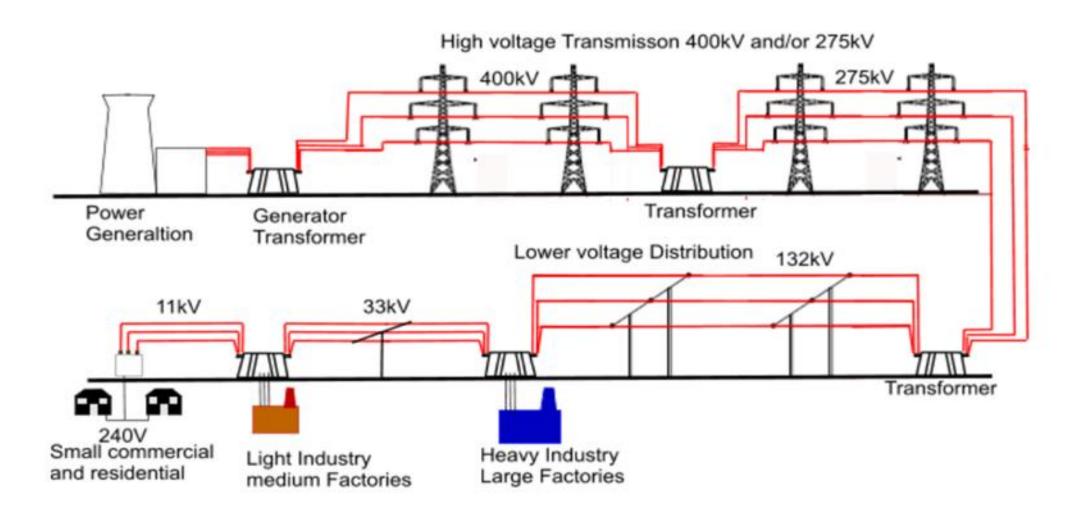
# Need for energy management

- Accurate monitoring and recording of resource use is critical for accurate reporting
- Target setting and action plans co-ordinate efforts to making improvements for high priority resources
- Auditing yourself helps to continually review performance and identify improvement opportunities
- Good communication keeps employees engaged

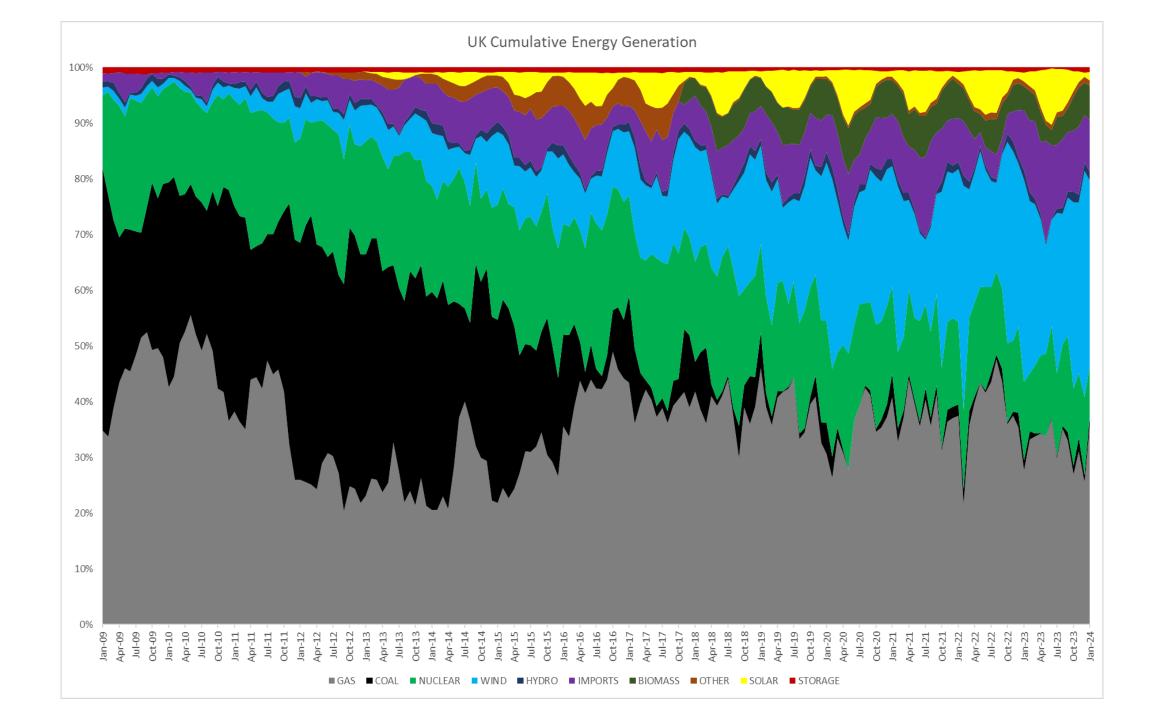


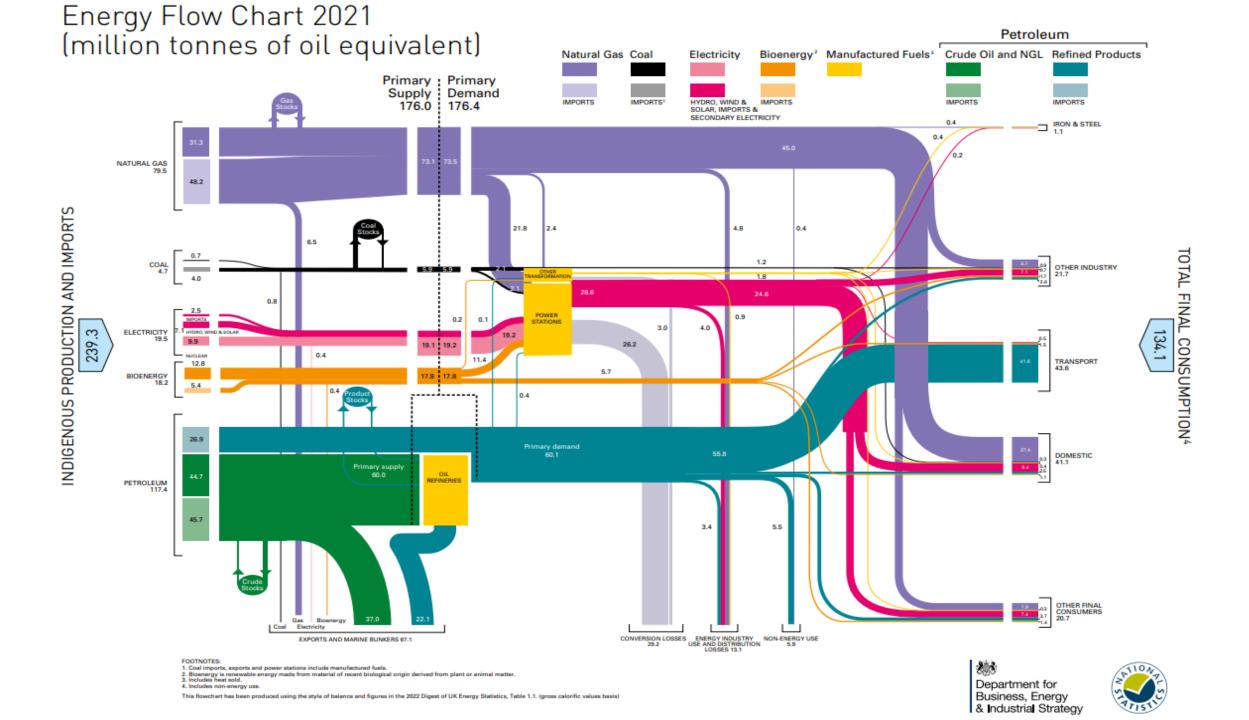


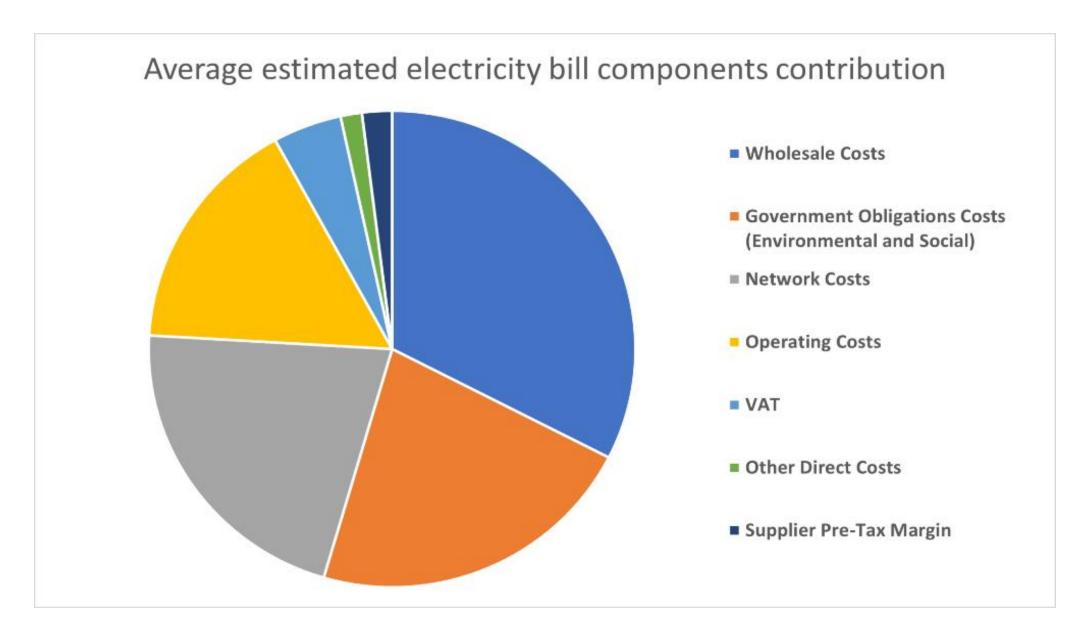




Simplified UK Electical Power Transmission system





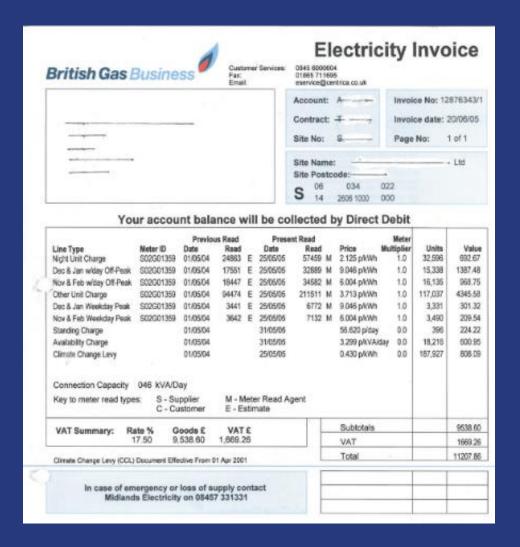




Information correct as of: February 2024

# **Energy bills**

- Understand your energy bills:
  - Are they estimated or actual?
  - Do you have a smart meter or half-hourly meter?
  - Are you entitled to one?
- Half-hourly data is king. If you have a half-hourly meter, use the data provided regularly.
- If you can, switch to a smart meter
  - Government mandated installation by energy suppliers of smart meters in domestic or smaller non-domestic premise by 2025
  - Speak to your supplier to find out
  - https://www.smartenergygb.org/en







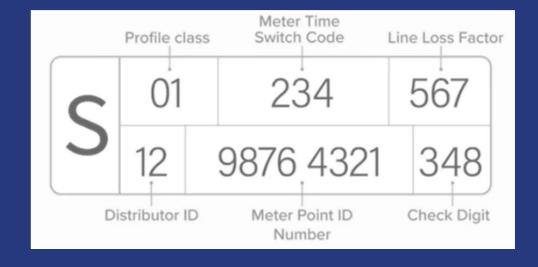


### Energy bills – useful resources

https://www.ofgem.gov.uk/consumers/householdgas-and-electricity-guide/understand-your-gas-andelectricity-bills

https://www.moneysavingexpert.com/utilities/understanding-energy-bills

Your MPAN (Meter Point Administration Number) is used to determine how charges are applied to your meter, as well as what type of meter you have



Who's my energy supplier or network operator? – Energy Networks
Association (ENA)

National Grid - Charging Statements (as an example)







# Half hourly meters

- Half hourly meters offer the best detail to how energy is being used within a building – but often this data is not utilised.
  - Half hour intervals
  - Data can be viewed in many different ways
  - Provides a good overview of patterns of consumption
  - Can show unexpected anomalies in patterns
  - Only shows the whole site so if there is a lot going on then it does not show the detail
- Smart meters are half hourly, data can be requested
- Half hourly meters (00 profile class) are mandatory for any site that has a peak load of 100kVa (kW) or more.
- For sites that have capacities above 70kVa (profile 05-08) should have been converted to HH meters.

Florida.						
Fixed Charges	Units		04 02	Rate	1000-100	Net
Period 01/12/2020 to 31/12/2020						
TRIAD Estimate Charge		31	Days	206.43	£/mth	£206.43
Supply Standing Charge		31	Days	0.00	£/mth	£0.00
CM Supplier Levy Cost (Estimate)		31	Days	105.49	£/mth	£105.49
DUoS Fixed Daily Charge		31	Days	12.76	p/day	£3.96
DUoS Capacity Charge	242 kVA	31	Days	3.64	p/kVA/day	£273.07
Sub Total						£588.95
Consumption Charges	Units	400	2016	Rate	DESCRIPTION NO.	Net
Period 01/12/2020 to 31/12/2020						
BSUoS Estimate	27506.0	kWl	h	0.5800	p/kWh	£159.53
CfD Supplier Obligation Levy (Est)	27506.0	kWł	h	1.013	p/kWh	£278.61
Energy Rate (Metered Cons)	24732.3	kWf	h	4.7262	p/kWh	£1,168.90
Energy Rate (Dist. Losses)	2365.6	kWf	h	4.7262	p/kWh	£111.80
Energy Rate (Tran. Losses)	408.1	kWl	h	4.7262	p/kWh	£19.29
Non-Energy Charges at NBP	27506.0	kWl	h	0.8093	p/kWh	£222.61
Non-Energy Charges at GSP	27097.9	kWł	h	0.0392	p/kWh	£10.62
CFD Operational Levy	27506,0	kWi	h	0.0065	p/kWh	£1.79
Feed-in Tariff Charge	24732.3	kWi	h	0.6920	p/kWh	£171.15
Renewables Obligation	24732.3	kW!	h	2.3574	p/kWh	£583.04
DUoS Red Unit Charge	1684.5	kWi	h	9.800	p/kWh	£165.08
DUoS Amber Unit Charge	18289.0	kW!	h	0.314	p/kWh	£57.43
DUoS Green Unit Charge	4758.8	kWl	h	0.110	p/kWh	£5.23
Excess Reactive Power Charge	2478.1	kVA	۸rh	0.315	p/kVArh	£7.81
Sub Total						£2,962.89
Reconciliation	Units		SUST	Rate	NEW YORK	Net
BSUoS Adjustment 31/10/2020	1			(£58.80)		(£58.80)
Sub Total						(£58.80)
Climate Change Charges	Units		TEGE	Rate	BANKS / Tox	Net
Period 01/12/2020 to 31/12/2020						
Climate Change Levy	24732.3	kW	h	0.8110	p/kWh	£200.58
Sub Total				2.2.10		£200.58









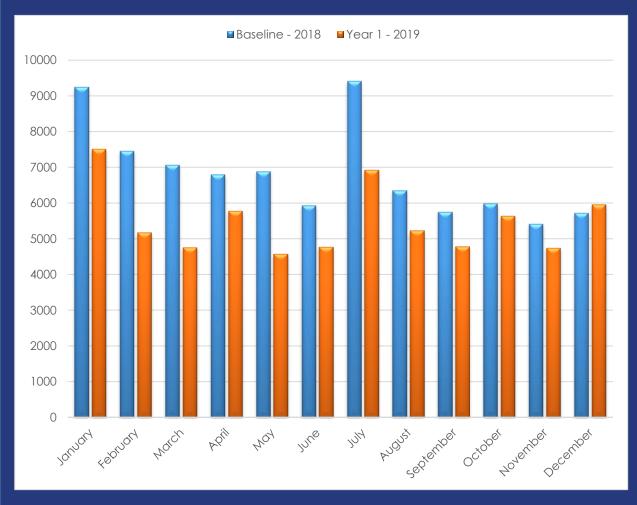
What gets measured, gets managed







### Why should you measure data?



- To set credible targets
- To measure performance
- To support action development
- To validate efficiency savings from improved technology / actions







### Understand energy need and uses

Develop and conduct an energy review – record all findings and do this periodically

- Analyse energy use and consumption
- Identify current types of energy in use
- Evaluate past & current energy use(s) and consumption
- Based on the analysis, identify SEUs (Significant Energy Uses)

- Determine relevant variables
- Determine current energy performance
- Identify those doing work 'under its control' that influence/affect the SEUs
- Determine and prioritise opportunities for improving energy performance
- Estimate future energy use and energy consumption







### Understanding your energy data

Useful information for when you start to measure energy:

#### **Utility bills**

 Utility bills provide energy in kWh – this has been converted from the meter readings

#### **Electricity meters**

- A running total of all the electricity your building has drawn from the grid
- To calculate use, deduct one meter reading from the other to provide your kWh
- Dual tariff, day and night, meters provide an excellent opportunity to assess energy consumption outside of operational hours

#### Gas meters

- Measure the volume of natural gas in cubic meters (m3)
- Older meters may measure in cubic feet (cft)
- Your gas bill will convert the volume of gas into kWh
- If you switch to meter readings, be aware that the meter does not provide kWh but volume

   this is fine and can be measured, you just need to be aware when converting to carbon what the measurement is

#### Oil

- Oil boilers, etc., are typically not metered and use is provided in purchased litres
- A flow rate meter can be installed to improve the accuracy of measurement (which is what a gas meter is)







### Baseline data

When planning for energy management, you need to set your baseline energy use using a reference year

This aligns to carbon reduction targets and timescales, to be selected from your starting position – allows you to track change over time

Baseline can be retrospective where data is available

Baseline needs to be comparative







### Where to start?

You have to start with meaningful data.

This is not the cost of energy but the level of consumption – measure the kWh / litre / etc.

Data can come from a number of sources:

- Bills
- Main meters
- Sub meters
- Expense Claims

Some data may need to be estimated.

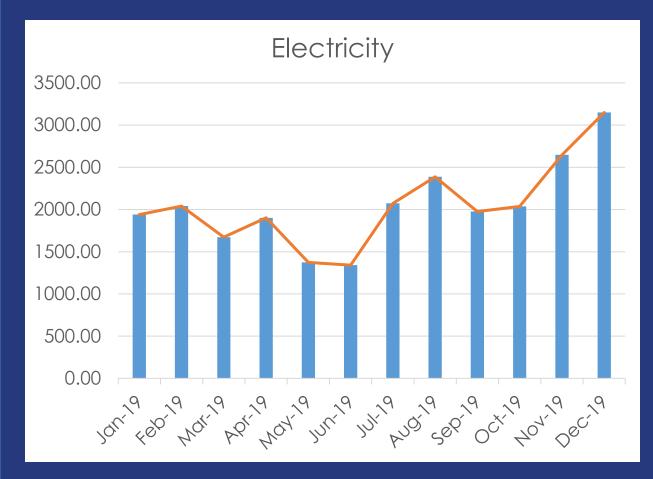


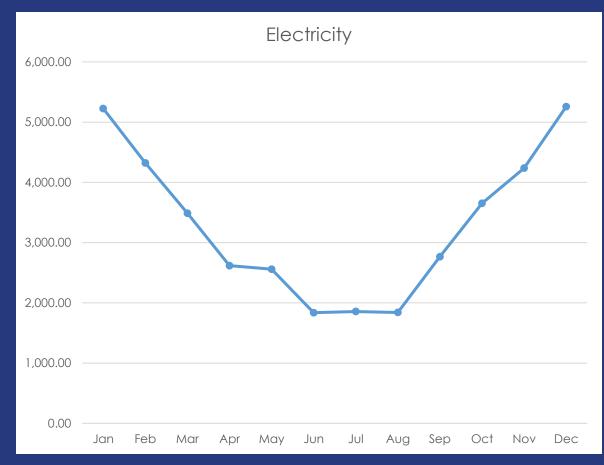






# Interpreting your data - electricity

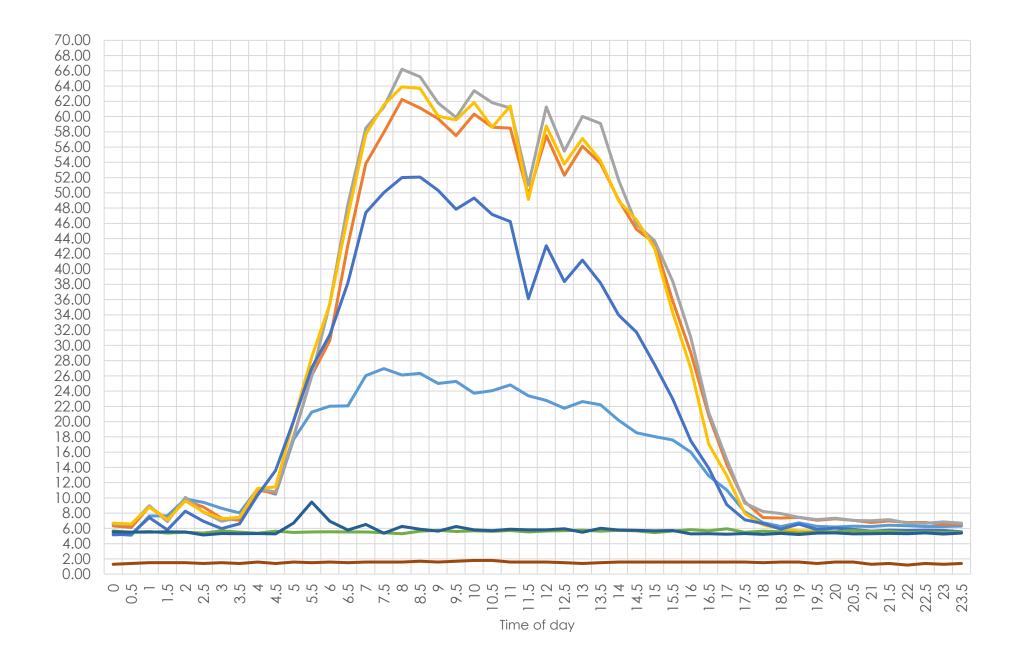












Average
Consumption
Mon
Average
Consumption
Tue
Average
Consumption
Wed
Average
Consumption

Thu

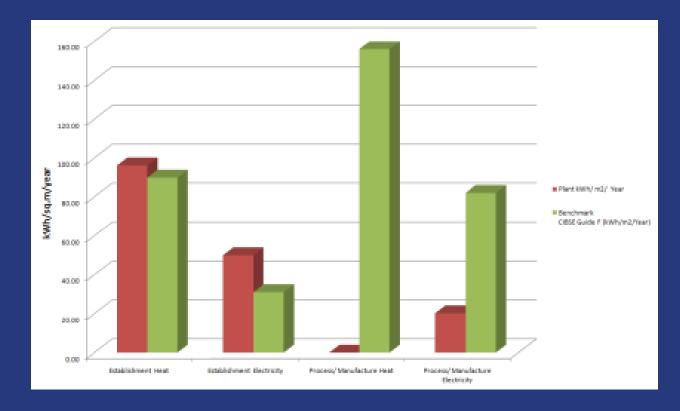
### Benchmarking

For the measurement of energy use to be meaningful you need to compare the consumption against something relevant to the nature of your organisation –

examples include:

Production volumes

- Running hours
- Size of premises
- No. of staff
- Degree days









### Sub meters?

- Data is needed to understand how and when energy is being consumed
- Meters measure the overall energy consumption
- Sub meters provide opportunities to look at individual areas / systems
- Collars can be tied to different electrical lines to measure the energy flow
- Useful for big machinery or sites with different room uses (office vs factory)
- While there is a cost, this can often be paid back through improvements identified







Sector	Existing system and control or energy spend	Good use of existing controls and/or Smart meters	aM&T	BEMS & aM&T	SCADA
Office (small – medium)	Time clock heating and hot water control	YES			
Office (medium to large)	Centralised HVAC with central control panel		YES	YES	
Retail (small to medium)	Time clock heating and hot water control	YES	YES		
Retail (medium to large)	Centralised HVAC with central control panel. Cooling.		YES	YES	
Small industrial	<£50k	YES	YES		
Medium Industrial	£50k - £500k		YES		YES
Large Industrial	£500k+		YES		YES
Hospitality	Café, Bar, Restaurant, small Hotels	YES			
Hospitality	Hotels, entertainment venues	YES	YES	YES	

DTEM: Selecting the right system | The Carbon Trust

# General approach to auditing

- Identify purpose what is the requirement of the audit, what information is available against what information is required
- Who needs to be involved who has the relevant knowledge of equipment, processes, access to data, etc.
- Collect and analyse the relevant data gather all the necessary data to be analysed, which will help to produce usable energy breakdowns, as well as identifying opportunities for energy reduction
  - Historical energy data and other related information
  - Equipment and systems using energy, include any design and maintenance documents where available







### General approach to auditing

- **Conduct the audit –** this could be broad and include the building, installed equipment, 4 operational and control processes, or very specific considering only one of more of these
- **Consider your recommendations –** what are the identified opportunities consider savings and costings (payback)
  - May also need to include lifetime costs, maintenance costs, effect on staff time
- **Build your action plan –** what next steps will be acted upon
  - Which actions are quick wins Which recommendations fit into any larger objectives / goals and need to be
  - planned







# Auditing techniques - general

When conducting any audit, there are key questions to consider:

What is the process and what equipment is used to achieve its function?

How does occupation / business activity affect this operation?

What are the behaviours
—manual (employee)
and automated
(controls)?

Can these be improved?

What is the age and efficiency?

Does it need replacing?

What is the financial consideration for the identified opportunity?

What does the shutdown look like?







# **Energy auditing**

Ensure everything is documented (pen and paper / electronic device)

Take photos of key areas / equipment for future review (camera)

Depending on the type of audit or review, there are additional items that could prove useful

- Light meter to measure lux levels in key areas
- Infrared camera or laser thermometer – to assess insulation levels / areas of heat loss / temperatures
- Multi meter/clamp on meter to either measure energy consumption or assess for inefficiencies within more complex systems







### Post-audit...

- Optimisation / efficiency first ensure what you have works as it should, to reduce waste (often no cost and can save up to 40%)
- Asset replacement once you have an optimised system, which elements need
  replacing (this may need to happen simultaneously, but replacing a new system within
  an inefficient management process will not realise savings as quickly as it could)
- Energy generation once you have the right process, using the right equipment, and have reduced energy to within acceptable limits, then consider generation (again, this may need to happen simultaneously, but if you size a system that is 40% larger due to existing inefficiencies, then reduce by 40%, you have paid more than necessary and have a system that is 40% less effective)







### Control checklist

What is the purpose of the control – time, temperature, speed, etc? Is it performing as expected?

What is the occupancy need and does the control match this (movement/lux sensor, timer, etc.)? What still operates outside operational hours?

How is it the equipment setup to run; on/off control, full speed, variable speed, modulated, etc.? How does it actually run?

Is there a better way to control the equipment?

How easy is it to change the control system, can it be automated and is it likely to be financially viable?







### Energy management tips – vampire loads

- Out of hours electrical use can range from good (8%) to average (13%) to bad (18%+).
- Economy 7 (day and night rate) meters are great at identifying night usage; otherwise
  manual reading at end of day and beginning of next day will provide information as well
- Shut down checklists and procedures help to reduce
- Computers, printers, vending machines, extractor fans, compressors, air conditioning
- This is wasted energy you are paying for
- Identify what can and cannot be switched off, by plug where possible
- Fit 7 day timers (~£3 £10) on hard to access plugs or wherever possible







### Energy management – heating & cooling

What heating / cooling needs do you have on site?

What kind of systems do you have and how do they work?

Are they doing what they are they supposed to do?

What does the control system look like?

Does the system match the need?

Has the building changed since plant was installed?







### Energy management – temperature

What is the right temperature?

Building / Sector	Room Type / Area	Temperature (°C) – Based on winter operation, and assumed normal clothing levels
Office / Service provision	Banks, Post Offices	19-21
	Computer Rooms	19-21
	Conference / Board Rooms	22-23
	General Office / Open Plan	21-23
General Areas	Corridors, Reception Areas, Lobbies / Entrance, Toilets, Waiting Areas	19-21
	Kitchens (Commercial)	15-18
Retail / Food Provision	Bars / Lounges, Restaurants / Dining Rooms	21-23
	Small Shops / Supermarkets	19-21
Factories / Warehouse	Heavy Work	11-14
	Light Work	16-19
	Sedentary Work	19-21
Hotels	Bathrooms	20-22
	Bedrooms	19-21

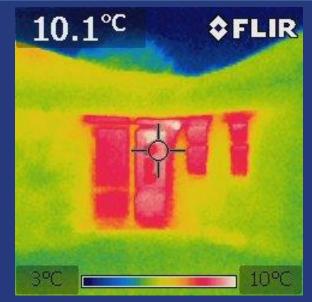


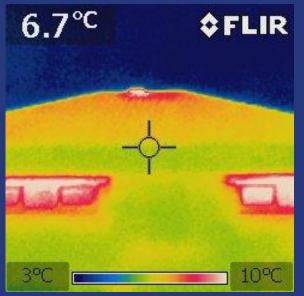




# Building fabric

- Important to consider the age of the building and its thermal performance
- This should include building elements such as windows, doors, ventilation, etc.
- Check conditions of all elements for draughts to ensure all are airtight
- Pressure tests can be used to help assess airflow within a building
- EPC can help determine thermal performance of building
- Alternatively, age of construction using building regulations L2A/B





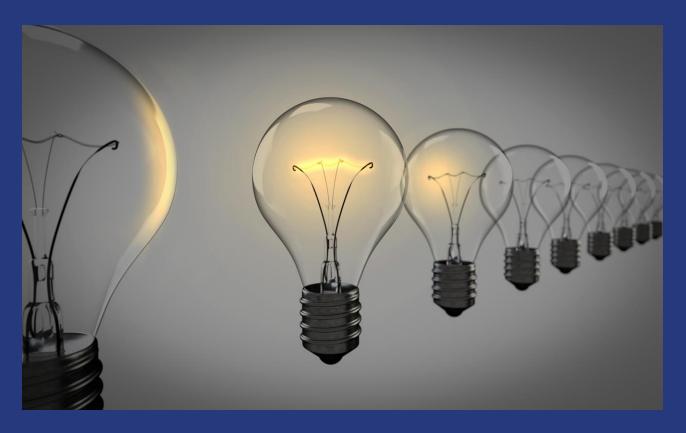








# Lighting



- What is the need for lighting?
- What natural lighting does the building receive?
- What lighting does the building use?
- How is lighting controlled?
- Do light switches control areas adequately?
- Are there opportunities to improve lighting behaviours?







### Generation

Energy efficiency should always be prioritised, but where this is problematic, large reductions can be achieved through generation

Consider need for generation, electricity, heat, or both, and if this is practical to produce and consume on site

Do occupancy hours match generation and can the energy be consumed appropriately or is there risk of excess energy being produced and wasted

Is generation possible – DNO permissions are required over 4kW

How is the generated energy going to be integrated into the existing system? How closely located is the generation plant from site's need?







### Recommendations

#### When making recommendations, consider the feasibility and timelines

- Stick to facts and limit assumptions to those required.
- Consider what information was decided and agreed upon from the audit
- Order or recommendations to consider:
  - Metering or monitoring improvements such as sub-metering
  - Equipment replacement
  - Equipment optimisation
  - New innovation equipment
  - On-site generation







## Actions to consider

LED lighting Sensors (PIR / LUX) Switch off campaigns Timed plugs for equipment

Vehicle trackers

Heating needs Heating timers Thermostats Zonal control Weather compensation Insulated pipes (lagging) Building insulation levels Age of plant Convection vs infrared

Hot water Is DHW needed? Kettles vs instant taps Leak checks

Renewable generation (solar, wind, etc.) Heat pumps Battery storage EV charging

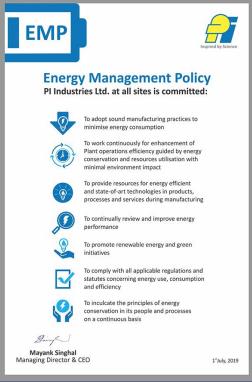
Asset list Travel needs (surveys)















#### solutions

#### **ENERGY MANAGEMENT POLICY**

At Environmental Solutions (Asia), efficient energy management is at the core of our strategy to remain competitive and achieve energy security

We are committed to continuously to improve our energy efficiency in order to reduce energy costs and limit our impact on the environment. We achieve our goals through the use of embedded generation as well as by creating a culture of environmental

The fulfilment of this policy is the joint responsibility of the management and employees. To achieve these goals, we have adopted the following practices

- · Increase employee awareness and accountability for actions influencing energy management
- . Conduct technical energy assessments to measure and track our progress

Additionally, we have set the following performance targets

- . Attain nett 0 in energy consumption for operational and facilities usage by 2018
- · Embark on embedded generation of heat and electrical energy through the harvesting of waste wood and solar energy by 2016
- Achieve Platinum level for Green Mark Certification by 2016

**Energy Policy** 



**ENERGY POLICY** 

Gharda Chemicals Limited shall be committed to continual

improvement of the Energy Performance in all their activities

> Incorporating Energy efficient technologies.

Encouraging use of Non-conventional energy.

Complying applicable legal and other requirements.

> Training and developing employees and contractors for

Supporting the purchase of energy efficient products and

> Ensuring the availability of information and of necessary resources to achieve energy objectives and targets.

> Setting up Energy management cell to monitor energy

management programme & energy performance with

services and design for energy performance

> Utilizing Energy efficiently through good operational and

including products and services, by the way of

maintenance practices.

energy conservation.

regular audits.

Mr. D. K. SHENOY

DIRECTOR FACTORY OPERATIONS

#### **ENERGY MANAGEMENT SYSTEM POLICY**

All of our employees at our integrated prodution plant in the textile sector must keep in mind the importance that saving energy has to the economy of our company and country, and must adopt an approach that is focused on the efficient use of energy resources, as we all are responsible to fulfill our commitment by increasing energy efficiency, commence and complete actions related to energy savings by starting from important points of consumption, and to reach the projected improvements at the end of these acitivities. In order to ensure that energy resources are used properly and to improve energy performance;

- \* To comply to the current energy regulation and to fulfill our legal obligations.
- \* To regularly review and to continously improve our energy performance.
- \* To create an infrastructure to follow up the energy performance criteria and targets.
- \* To provide all information and resources to reach our energy performance targets.
- \* To keep our energy consumption in line with our work and production capacities.
- \* To use products and services that have a high energy efficiency during the entire production and sales process, starting from design.
- \* To regularly train all of our present and newly hired employees.

GENERAL MANAGER







### **Energy policy - overview**

- Commitment: Statement of intent to use less energy, reduce waste, invest in energy efficiency measures and renewable energy and lower your carbon footprint
- It should underpin your drive for effective energy management throughout your organisation
- Objectives: Concise, with a mixture of clear broader long term objectives and shorter term outcomes
- Accessible to all stakeholders







### **Energy policy - content**

#### The policy should include:

- Top level commitment to continual improvement
- The context of the organisation
- The scope of the policy
- Energy focused objectives (e.g. reducing consumption)
- An explanation of how progress will be measured (e.g. targets)







### Changing behaviour of staff

Employees are often the best placed to facilitate energy saving measures, often at little or no cost, and can often contribute ideas for additional saving opportunities.

#### Motivation is key!

Reward receptiveness to change

Engage staff in the development of plans



Increase job satisfaction

Give clear guidance

Recognise support from the team







# Staff engagement - people

- Create an 'Energy Team'
  - Key Team Member(s)
  - Facility Managers / Operators
  - Senior Representatives across departments / organisation
- Appoint Energy (Green) Champion(s)
  - Staff surveys
  - Identify enthusiastic/willing staff
  - Identify relevant individuals with the right responsibilities

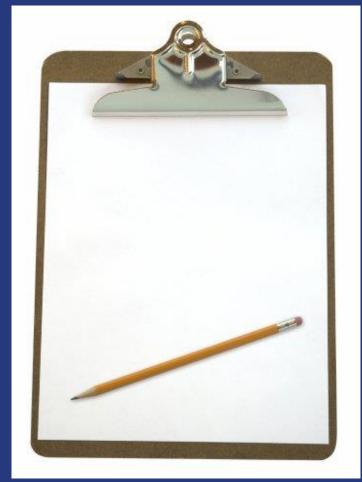






## Staff engagement – energy walkaround

- Open up to relevant/interested staff
- Simple site tour highlighting areas of key energy use and where wastage and/or inefficiencies have been identified









## Staff engagement – knowledge

People are truly engaged when they understand why they are being asked to do certain things.

To ensure staff get behind your efforts, you could provide;

- Short presentations on specific issues or plans;
- Introduce your new Energy Action Plan
- Presentation on the new solar PV system and how it works

#### **Carbon Literacy Training**

https://carbonliteracy.com/

Designed to upskill everyone about the impact of carbon emissions and understand the opportunities and benefits of positive change









# More information & support

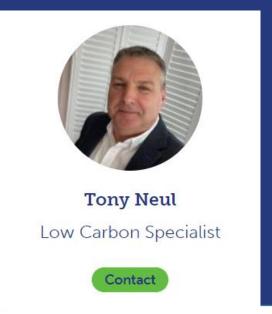
#### Low Carbon Lincolnshire webpage:

<u>Low Carbon Lincolnshire | Make Savings to Grow | Business Lincolnshire | Business Lincolnshire</u>

Our full workshop schedule and resources

Business Lincolnshire Specialist Advisor:

Tony Neul, Low Carbon Specialist









### Specialist Low Carbon Support until April 2025

- Initial diagnostic by Growth Hub Advisor
- Fully funded on-site energy audit
- Carbon Footprint
- Action Plan carbon reduction measures
- Solar PV, Lighting, Heating, Hot Water, Controls...
- Cost of implementation , £ saved ,  $tC0_2$ e saved , simple payback
- Springboard to capital funding £
- Scope for tailored additional support (eg: environment policy - fully funded)



**HELPLINE: 01522 782067. www.businesslincolnshire.com/contact** 

# **Examples of further support**

### zellar

#### Lincs Zellar programmes

Business Lincolnshire and North Kesteven District Council have launched programmes with Zellar to support local businesses on their sustainability journeys. 400 businesses are invited to claim free access to Zellar's online sustainability platform to enable them to reduce their carbon emissions and save up to  $\pounds 4,100$  in energy bills. Scan the QR codes to visit the sign-up page.



#### Investors in the Environment (iiE)

PECT's flagship iiE programme supports businesses to get started or elevate their sustainability journey - and become recognised for it! With over 300 members across the UK in all sectors and sizes, we offer a proven framework for organisations to save time and money and reduce their impact on the environment. Find out more at www.iie.uk.com.







Greater Lincolnshire











# Coming up next...

#### Final webinar:

• Supply Chains - Thursday 29th February 2024, 9am-10am

#### In person workshops:

- Net Zero Lincoln AM Tuesday 16th April 2024
- Decarbonisation Lincoln PM Tuesday 16th April 2024
- Net Zero Grantham AM Thursday 4th July 2024
- Decarbonisation Grantham PM Thursday 4th July 2024
- Net Zero Market Rasen AM Tuesday 10th September 2024
- Decarbonisation Market Rasen PM Tuesday 10th September 2024

#### Virtual workshops (2 hour):

How to manage your energy use – 9<sup>th</sup> May 2024
 More to follow in June, October, November







