

Basics of Energy Efficiency

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Energy in Horticulture

- Heating
- Lighting
- Irrigation
- Storage



What is a kWh?

- Often called a 'unit'
- Measure of energy – on bills and meters
- The amount of energy needed to run a 1kW (1,000 Watt) device for 1 hour



What is a kWh?

- Watts are a unit of power, i.e., rate of energy use/output
- Easy to mix up kW (power) with kWh (energy)
- kW – equipment rating
- kWh – billed units of energy



What is a kWh?

- kWh:
 - k – kilo-, prefix, 1,000
 - W – Watt, unit of power
 - h – hour, unit of time
- MWh:
 - M – mega-, prefix, 1,000,000
 - W – Watt, unit of power
 - h – hour, unit of time

What is a kWh?

- These heaters are common in small office spaces
- They are typically 3kW
- How much energy will this use if left on full for 3 hours?



What is a kWh?

- 9kWh...
- Electricity costing between 20-60 p/kWh
- That's £1.80 - £5.40 for 3 hours of heating



What is a kWh?

- As a comparison, natural gas costs around 8p/kWh
- Including the losses in burning the gas, the cost to deliver the same heat is only £0.85...
- Heating office spaces with a small boiler or connecting to the larger site heating system can be a significant saving

What is Energy Efficiency?

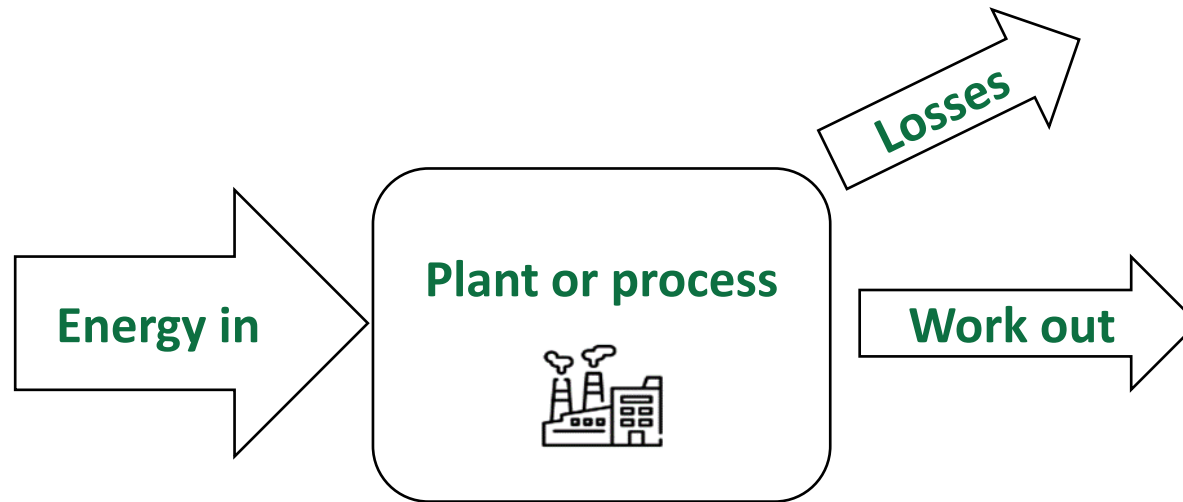
Output Work/Energy
(Work / Energy generated by the system)

$$\text{Efficiency} = \frac{W_{out}}{W_{in}}$$

Input Work/Energy
(Work / Energy supplied to the system)

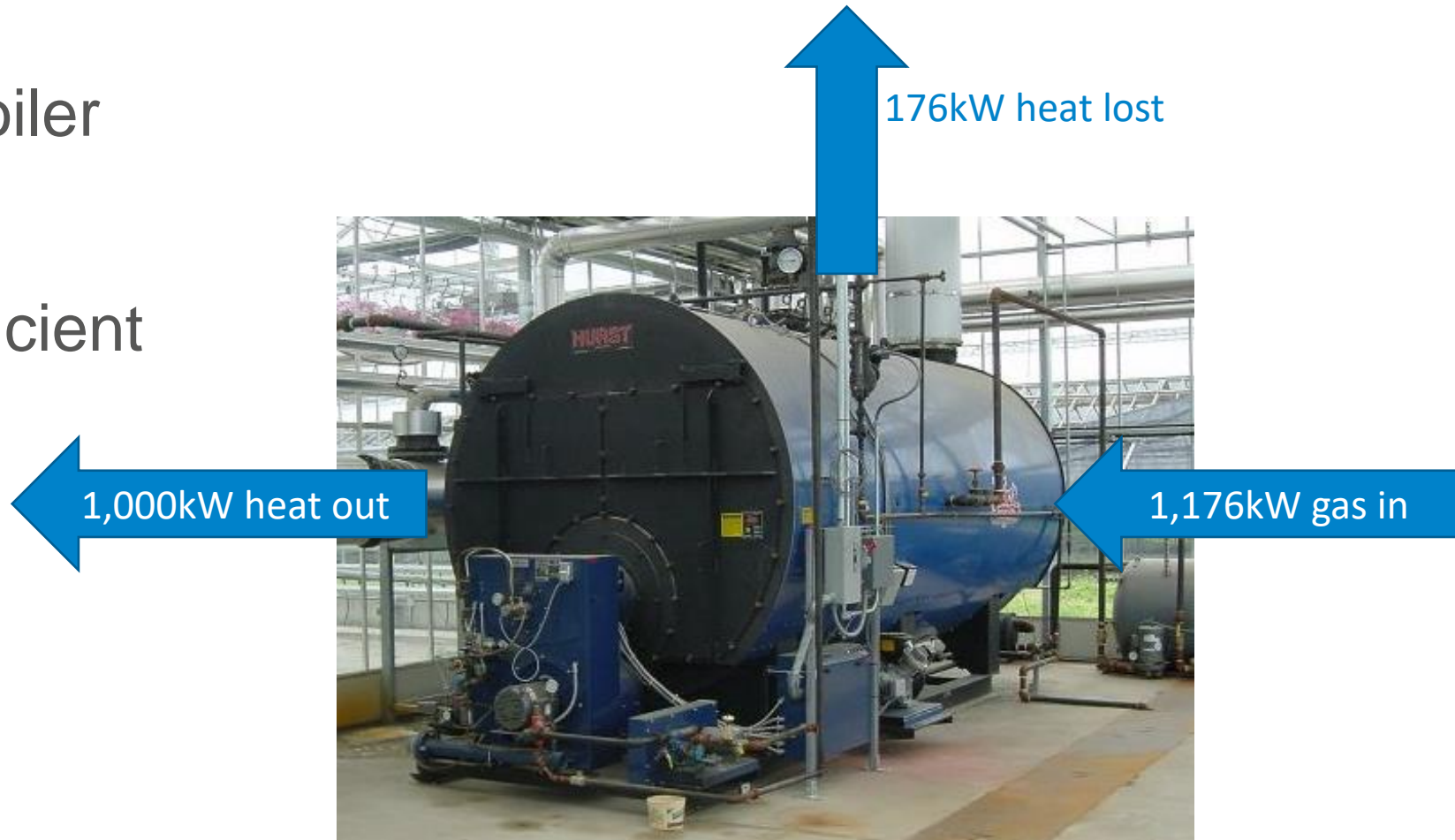


What is Energy Efficiency?



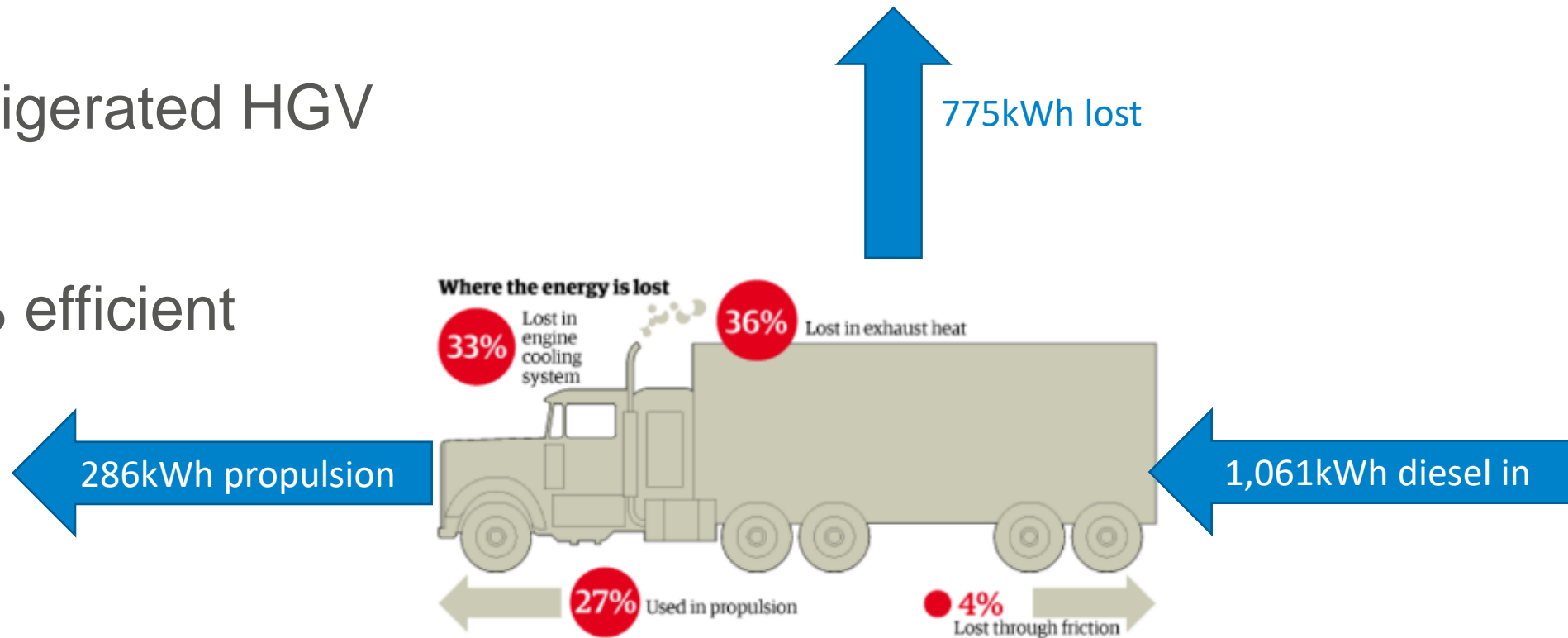
Energy Efficiency Examples

- 1MW boiler
- 85% efficient



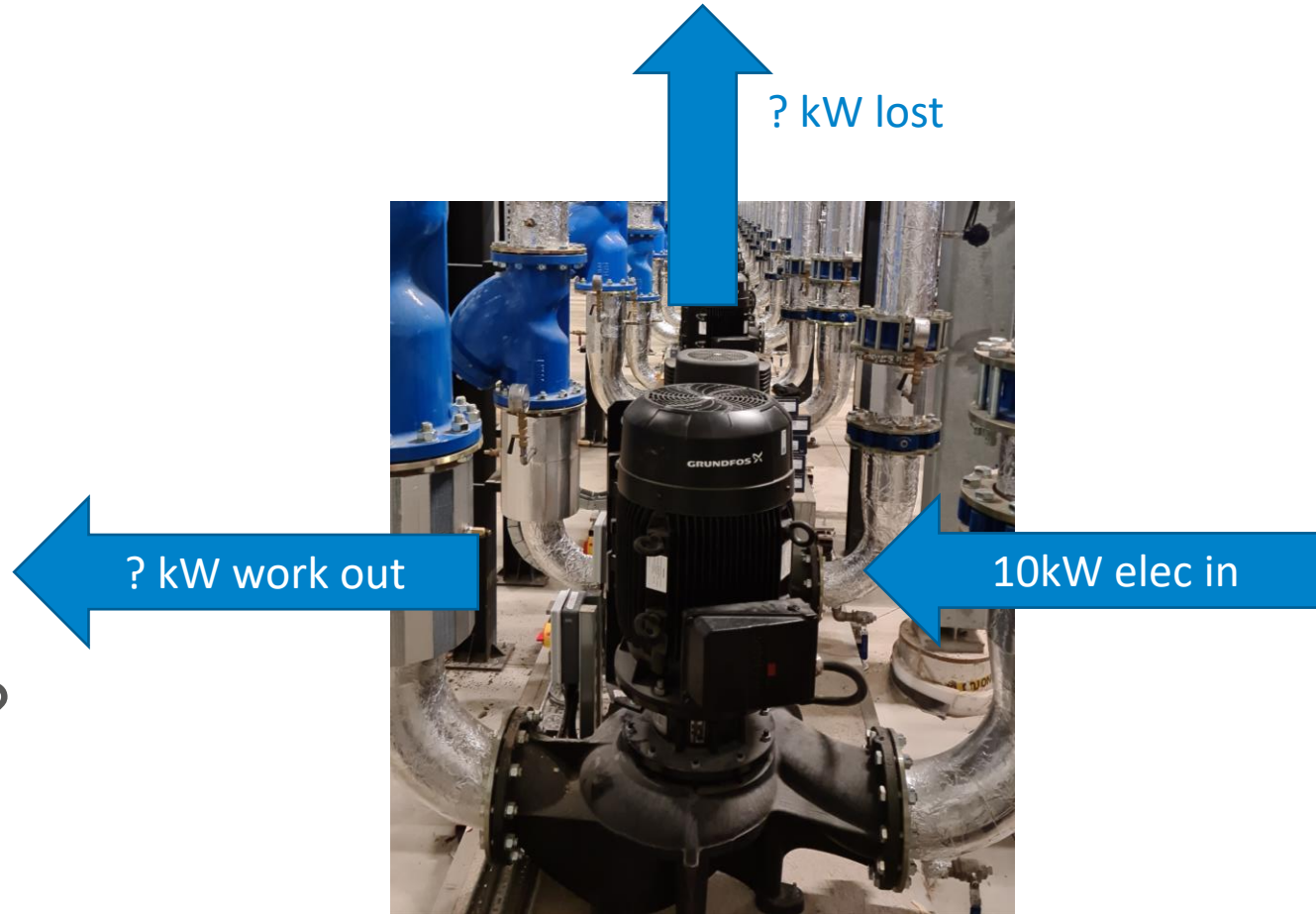
Energy Efficiency Examples

- Refrigerated HGV
- 27% efficient



Energy Efficiency Examples

- 10kW pump
- 95% efficient
- How much useful work is produced?

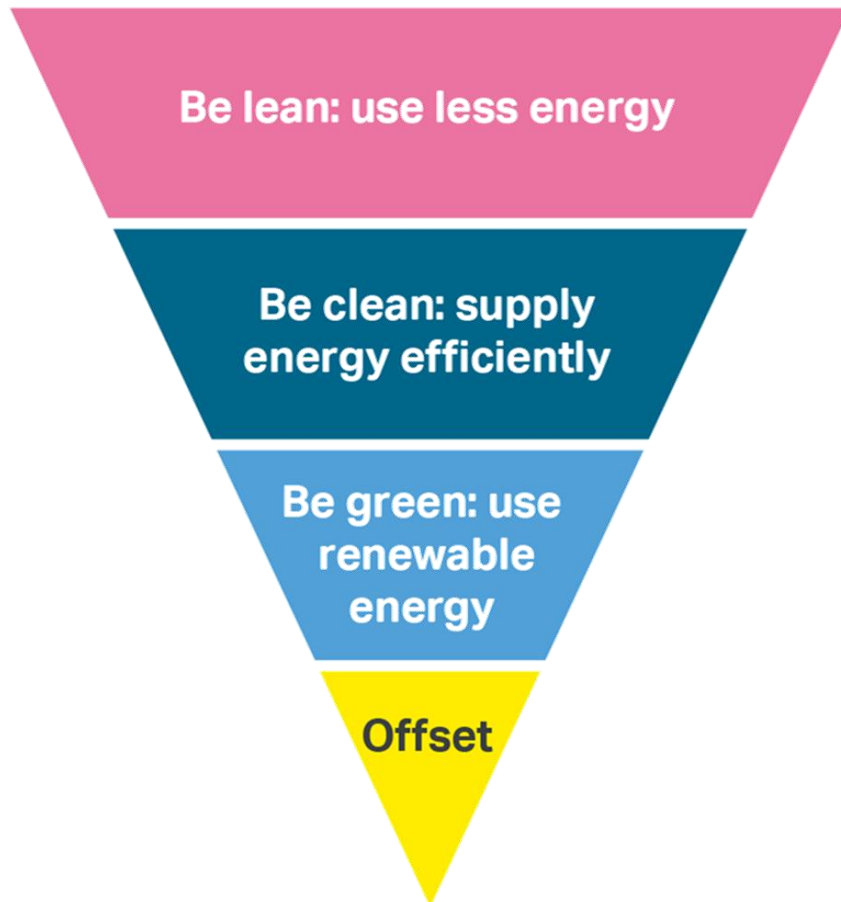


Improving Efficiency

- Maximise useful energy out while minimising energy in:
 - Improve metering/sensors
 - Benchmark against production
 - Adjust heating/cooling setpoints
 - Install timers
 - Upgrade old/inefficient equipment
 - Improve insulation
 - Training & behaviour changes
 - New installations



Improving Efficiency



1. Reduce **power** consumption
Smaller or more efficient
2. Reduce **time**
Setpoints, sensors, behaviour
3. Improve Fuel Efficiency
Renewables, higher energy density fuel
4. Pay less (£/kWh)

Improving Efficiency

- Focus on the largest energy use first!
- Conduct an energy audit:
 - Highlight opportunities
 - Quantify savings
 - Give an idea on paybacks - prioritise



A wide-angle landscape photograph of a lush green field, possibly a wheat or barley field, under a dramatic sunset sky. The sun is low on the horizon, creating a bright glow and long shadows. A dirt path or road winds through the field towards the horizon. The sky is filled with scattered clouds, some illuminated by the setting sun. In the foreground, there are several thin, white, wavy lines that look like stylized musical notes or sound waves, curving across the bottom of the frame.

Thanks for listening!

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