

# COMBINED HEAT AND POWER (CHP) IN THE CHEMICALS INDUSTRY.

## A guide to improving total cost of ownership.

Looking to cut down on your energy bills?  
Have a look at our guide to how CHP can boost  
the efficiency of your processing plant.

**BUILT FOR IT.**



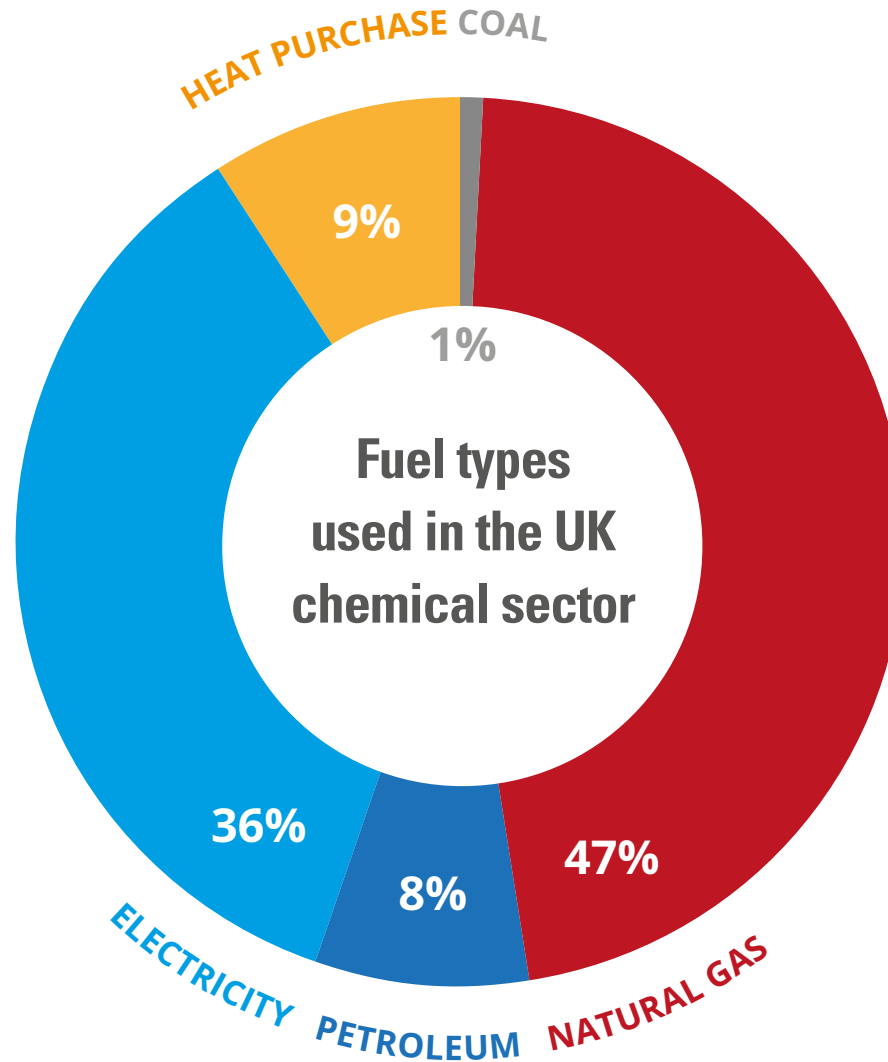
# What is CHP?

CHP stands for Combined Heat and Power and is sometimes known as cogeneration. It involves generating electricity while capturing the huge amounts of heat that is wasted in conventional power plants.

By taking advantage of this waste heat, CHP plants can reach efficiencies of more than 80%, while coal and gas fired plants struggle to achieve more than 40% <sup>[1]</sup>.

This massive boost to efficiency can mean a significant drop in overall energy costs, which has a huge impact on overall spending in the heat and power-hungry chemicals industry.

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**FACT** – CHP systems can be designed to make use of fuels or waste heat provided by the chemical processes themselves, using this to generate more electricity and steam.  
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# Energy demands

The chemicals sector is the UK's biggest single industrial energy consumer. Every year plants all over the country use the equivalent of 3.4m tonnes of oil and spend around £2bn buying in fuel and electricity <sup>[2]</sup>, emitting 18 million tonnes of CO<sub>2</sub> in the process <sup>[3]</sup>.

According to a report commissioned by the UK government, only 36% of the energy consumed by the chemicals sector is electrical. The rest is used to produce process heat and steam, with natural gas alone representing 47% of the fuel used by the industry.

With such a high, steady demand for both electricity and heat, the chemicals sector is perfectly positioned to take advantage of the benefits offered by CHP.

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**FACT** – Over the past ten years most industrial energy users had their costs rise by more than 120%. CHP users saw their costs rise by less than half that <sup>[4]</sup>.  
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## How much could CHP save?

The exact savings that can be achieved through CHP depend on several factors, ranging from the cost of natural gas to the long-term quality and reliability of the system itself.

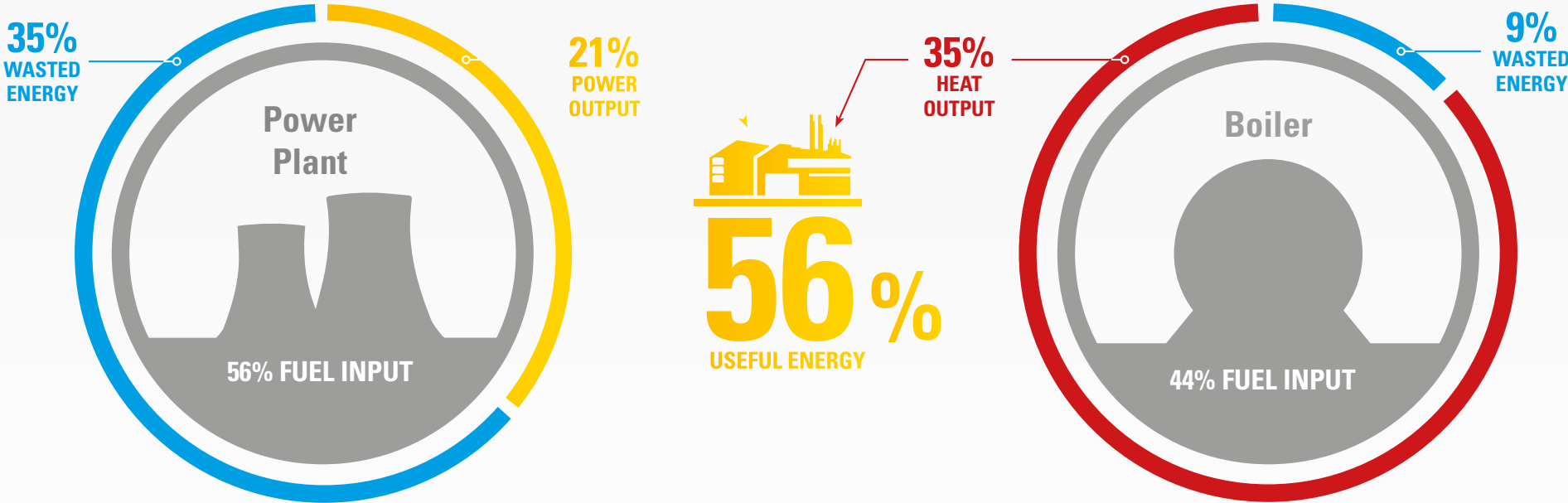
The biggest variable will be how energy-intensive a site is. For example, a chlor-alkali facility that is spending half of its operating costs on fuel and electricity could potentially make huge savings.

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**FACT** – CHP can reduce industrial users' primary fuel use by up to 30% <sup>[4]</sup>.  
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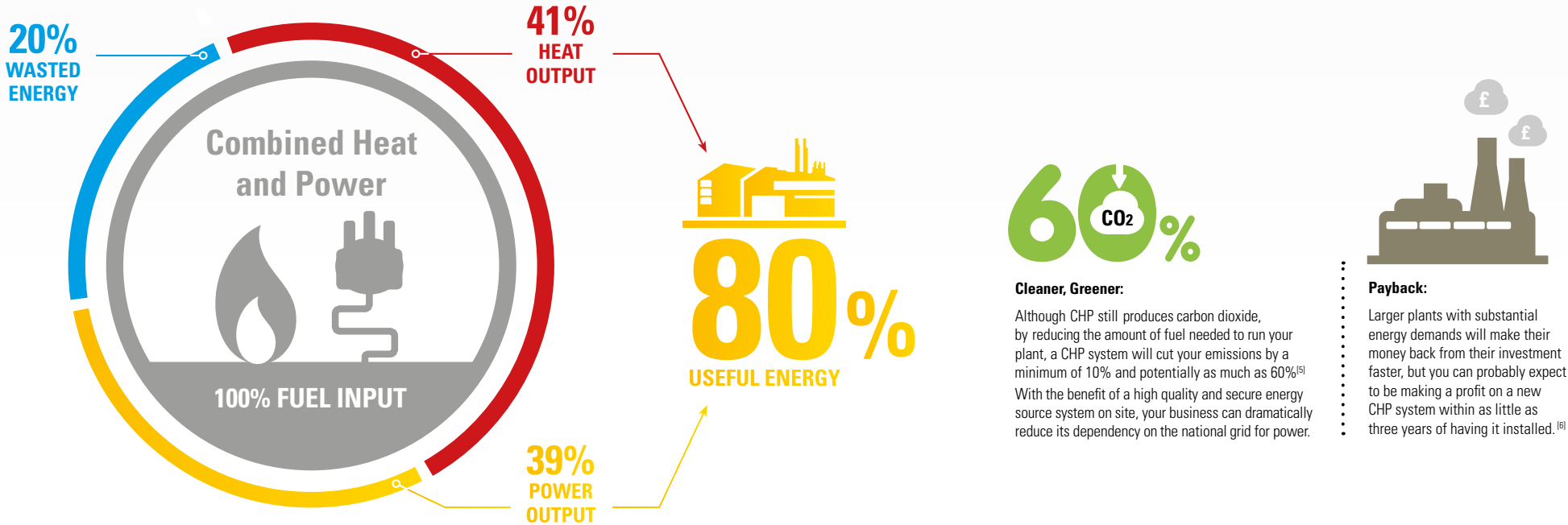
**FACT** – CHP is already being used at 53 chemical sites across the UK and generates a significant proportion of the energy used in the sector <sup>[5]</sup>.  
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# Output for CHP compared to conventional power plants

## Conventional boiler power plant



## Combined heat and power plant



# Why quality matters

When it comes to specifying a CHP system, reliability and quality are absolutely vital. For one thing, some government subsidies, payments and tax relief can only be applied to systems that are certified as 'Good Quality'.

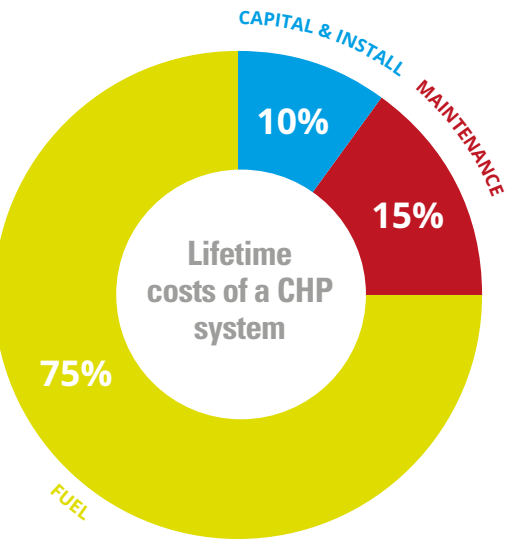
In order to meet this standard a CHP systems' electrical efficiency must be over 20% and deliver significant savings compared to conventional energy generation.

## Long-term thinking

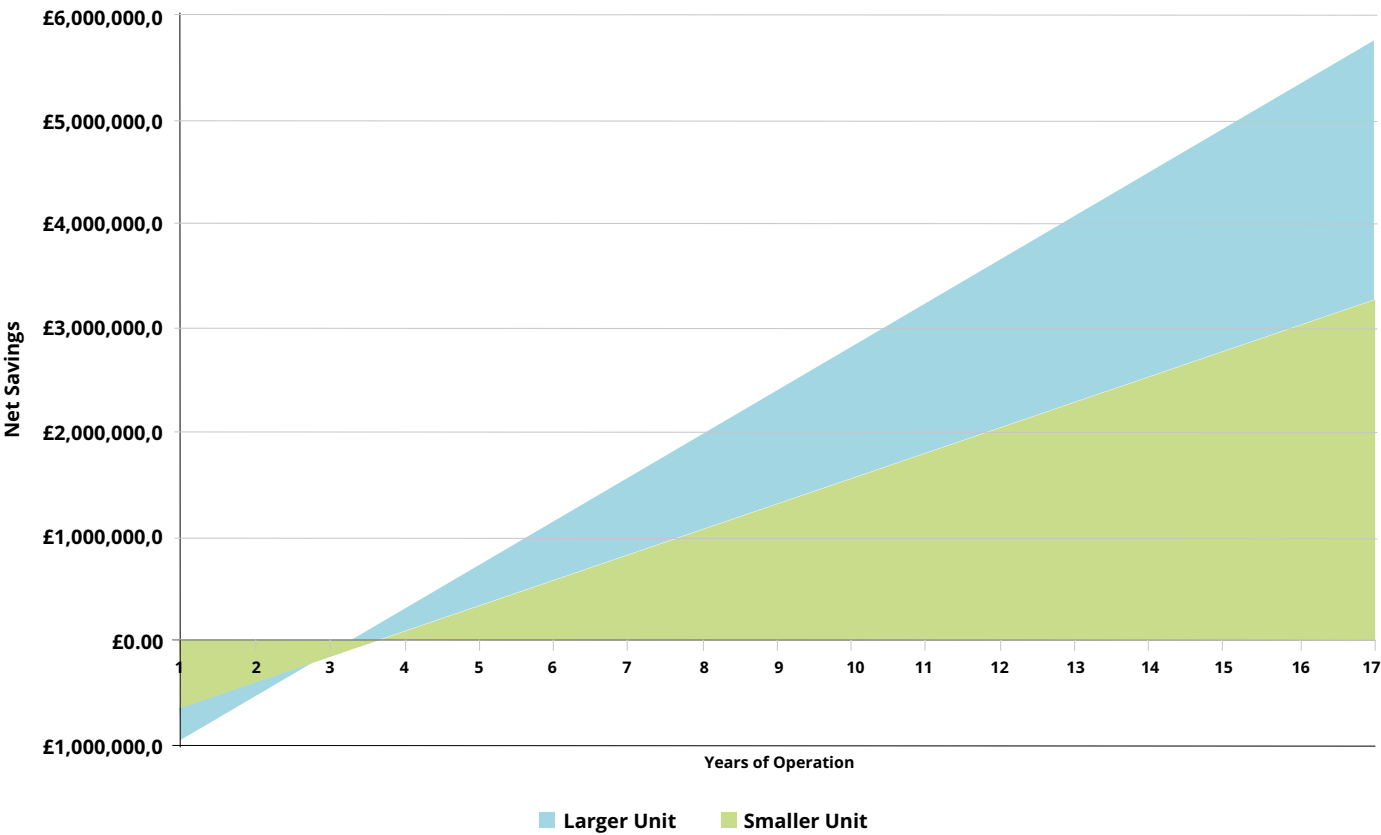
Despite the savings it offers, a new CHP system is likely to represent a substantial capital investment for a chemicals plant. Considering the tight margins on which the industry operates, it can therefore be tempting for companies to opt for a cheaper, less efficient system in a bid to generate up-front savings.

However, while this thinking may look good on this year's budget sheet, it can cost a business a significant amount of money in the long run. Assuming a standard 20-year lifespan for a system, maintenance costs alone will likely be larger than the initial outlay.

Even these will be dwarfed by the amount spent on fuel, which means that even a seemingly slight difference in performance can add up to major savings over the years.



*Economies of scale mean that as the size of a CHP plant increases its capital, installation and operation costs per kW of energy generated all fall<sup>[6]</sup>.*





## Funding your system

According to the UK government, so long as an industrial site has a steady demand for heat and power for more than 4,500 hours a year – a category most chemicals plant will fit into – a CHP system will almost certainly save it money <sup>[7]</sup>.

Securing finance can prove a major barrier to installing CHP. Although CHP is a long-term investment, it will often have to compete with other potential business projects that are closer to the company's core area activities. Furthermore, it may have to compete within a short-term appraisal environment.

By working with a supplier such as Finning it is possible to put together a firm business case that shows the benefits of CHP, and therefore makes it significantly easier to secure capital funding or debt financing.

## Leasing

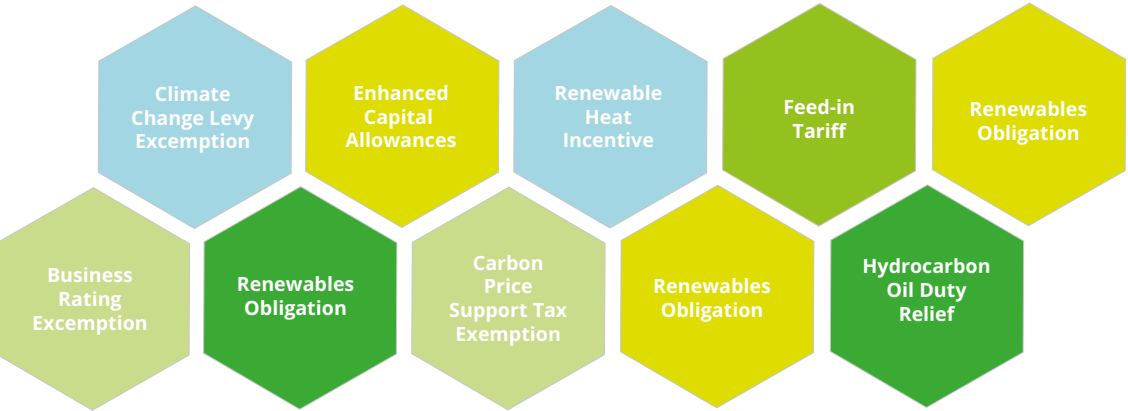
In many cases it can make more sense to lease a CHP system rather than buy it out-right. This may be in the form of a hire purchase, a finance lease or an operating lease.

Under a hire purchase agreement, the purchasing company pays in a series of payments over several years. The CHP system would initially remain the property of the supplier, but the customer becomes the legal owner once all the agreed-upon payments have been made <sup>[8]</sup>.

## Government support

As CHP can dramatically cut the amount of energy a business uses – and therefore the amount of carbon it emits – the technology is supported by a number of government incentives.

Many of these depend on a system being certified as 'Good Quality'. These include:



Bear in mind, however, that the rules around these various support mechanisms can change over time. The UK government maintains a guide detailing the current schemes at [www.gov.uk/guidance/combined-heat-and-power-incentives](http://www.gov.uk/guidance/combined-heat-and-power-incentives).

## Operations & maintenance

Arranging an operations & maintenance (O&M) contract when purchasing a CHP system can guarantee peace of mind and save you significant expense over the lifetime of the system.

Though each supplier will offer slightly different terms, these contracts usually guarantee that a system will receive regular maintenance from expert engineers and that any faults are corrected as quickly as possible.

Finning's own O&M contracts provide customers with regular services, priority on replacement parts and a guarantee that all equipment used is genuine. It specifies that you only pay when the system is operating, so Finning is sure to fix any issues as soon as possible.

Finning can also operate a system remotely, taking the day-to-day management out of a company's hands and making sure that experts are monitoring all the performance data.



# How much could CHP save?

Heat demand: **2 MW**  
Electricity demand: **2 MW**

Price of electricity: **8.81 p/kWh**  
Price of gas: **2.2 p/kWh**

Annual operating hours: **8,100**  
Equipment lifespan: **20 years**

Total CapEx: **£1,087,030**  
Annual O&M: **£204,120**

Annual net savings: **£1,373,207**  
Payback period: **9 months**

Total savings over equipment lifespan: **£27,464,144**



# The information you need before proposing a project

- 1 Your site's annual heat and power requirements.**
- 2 Your site's electrical load profile.** It's more important to understand the base load profile rather than the mean or peak.
- 3 Your site's heat demands in both kWh and °C.** The exact configuration of a CHP system depends on both the amount and temperature of heat required.
- 4 How much you currently pay for heat generation using gas or oil and electrical power.** By knowing your current billing figures, you can produce a precise cost comparison demonstrating the potential savings to be made from each CHP system.
- 5 Which government support you can apply for.** CHP schemes can be supported by a large number of subsidies and tax breaks that can boost the savings they offer dramatically.

## Total cost of ownership

A CHP system represents a substantial investment and when budgets are tight it can be tempting to try and make savings wherever possible, even if this involves specifying a cheaper – but lower quality – system or opting out of an O&M contract.

However, it's worth bearing in mind that a CHP system is an investment that will pay for itself over a course of years, if not decades. Over this length of time, quality and reliability that comes from choosing a well-respected and trusted supplier will always be more than worth it.

# What Finning can do for you

Finning is the sole UK supplier of Cat® engines and CHP systems. When you buy Cat equipment you can be guaranteed world-leading quality and reliability that provides you with the maximum efficiency available.

Finning also supplies O&M contracts that will provide you with peace of mind and ensure maximum uptime. You only get charged while the equipment is operating, so it is in our engineers' best interests to make sure any issues are resolved as quickly and smoothly as possible.



## References

- [1] Combined Heat and Power, Department for Business, Energy & Industrial Strategy.  
<https://www.gov.uk/guidance/combined-heat-and-power>
- [2] UK Chemical and Pharmaceutical Industry Facts and Figures, The Chemicals Industry Association.  
<http://www.cia.org.uk/Portals/0/20150217%20CIA%20facts%20and%20figures%202015.pdf>
- [3] Industrial Decarbonisation & Energy Efficiency Roadmaps to 2050 – Chemicals, DECC and BIS.  
[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/416669/Chemicals\\_Report.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/416669/Chemicals_Report.pdf)
- [4] Backing Industrial Productivity: The Combined Heat and Power Opportunity, The Association of Decentralised Energy.  
[http://www.theade.co.uk/medialibrary/2015/12/07/166db3ef/Backing%20industrial%20productivity%20-%20the%20opportunity%20for%20combined%20heat%20and%20power\\_web.pdf](http://www.theade.co.uk/medialibrary/2015/12/07/166db3ef/Backing%20industrial%20productivity%20-%20the%20opportunity%20for%20combined%20heat%20and%20power_web.pdf)
- [5] Digest of United Kingdom Energy Statistics (DUKES) 2016, Department for Business, Energy & Industrial Strategy.  
<https://www.gov.uk/government/statistics/digest-of-united-kingdom-energy-statistics-dukes-2016-main-chapters-and-annexes>
- [6] CHP Finance, Department of Energy and Climate Change.  
[https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/345190/Part\\_5\\_CHP\\_Finance.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/345190/Part_5_CHP_Finance.pdf)
- [7] Combined heat and power, The Local Government Association.  
[http://www.local.gov.uk/climate-change/-/journal\\_content/56/10180/3510573/ARTICLE](http://www.local.gov.uk/climate-change/-/journal_content/56/10180/3510573/ARTICLE)