



CFE

Carbon Focus Engineering

www.cfeng.co.uk

**Fuel efficient, Low Carbon
solutions to suit individual
business needs**

**Specialist in renewable technology supply, installation and
commissioning - Delivering fuel efficient energy solutions to
business and industry.**



Carbon Focus Engineering

Our Partners



Business Registration Number: 9185





Carbon Focus Engineering

About Us



Carbon Focus Engineering (CFE) harnesses the extensive experience of our team to design, install, and commission Low Carbon Energy systems for businesses and organisations across various sectors throughout the UK.

Our founders and directors boast a rich background in mechanical engineering, renewable energy, energy efficiency, carbon modelling and environmental sciences, demonstrating a proven track record in delivering highly efficient projects.



Over the past 20 years, our projects have evolved in response to government legislation, engaging diverse sectors, including agriculture, horticulture, public sector (schools/NHS), business-to-business, construction supply chain, manufacturing, and industry.

Our portfolio encompasses a range of cutting-edge technologies, including biomass heating, solar thermal, solar PV, heat pumps, and heat recovery, complemented by turnkey mechanical and electrical solutions, district heating, project management, and compliance services.



Our team specialises in bioenergy projects, handling an array of fuels, from mainstream wood chip/pellet to niche alternatives like straw, miscanthus, waste wood, waste residues, and poultry manure. All our biomass fuels offer significant carbon and cost savings compared to fossil fuels and grid electricity. We assess your unique needs and utilise our custom Carbon Calculator to design a tailored solution employing the most suitable technology for your business.



Innovation is at our core, with several ongoing R&D projects focused on energy reduction, unconventional fuel sources, and Carbon Capture and Storage (CCS).

In light of the growing emphasis on carbon reduction, energy efficiency, and escalating fossil fuel expenses, the time is ripe to explore low carbon energy systems for your heating, power, and waste utilisation needs.



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Low Carbon Technologies for Business

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Biomass Hot water/ Steam Heating Systems

Biomass refers to organic materials such as wood chips, pellets, straw, miscanthus, or organic waste and manure, used as fuel in biomass boilers for heat generation. This sustainable energy source is reliable, unaffected by weather conditions, and contributes to combating climate change by replacing conventional fossil fuels. Biomass is a cost-effective, low-carbon energy solution, adaptable to various scales from domestic to large power stations. CFE specialises in biomass systems, offering expertise in design, installation, and commissioning for diverse sectors, including education, defence, poultry production, and horticulture. With a 20-year track record, the company tailors solutions to meet specific heating needs,



Pyrolysis and gasification securely bind carbon from residual materials into biochar, thus preventing the release of CO₂ into the atmosphere. By enabling the long-term retention of CO₂, Biochar is a form of Carbon Capture and Storage, endorsed by the IPCC as a viable carbon dioxide removal solution. Referred to as Negative Emissions Technology (NET), this innovative approach operates through controlled thermal decomposition within an oxygen-depleted environment, producing biochar and hot gases. Biochar, derived from materials like wood or crop residues, offers benefits such as enhanced water retention and residual minerals for plant growth. CFE collaborates with feedstock producers, utilising Pyrolysis technology to reduce waste streams, CO₂ emissions, and produce valuable by-products, showcasing expertise as an engineering partner in an INNOVATE UK project.

Pyrolysis & Gasification

Solar PV & Storage

Solar photovoltaic (PV) panels, a widely embraced renewable energy source, generate electricity by harnessing sunlight for residential and commercial properties. Embracing solar PV offers advantages such as a reduced carbon footprint, contributing to climate change mitigation, substantial cost savings by diminishing reliance on traditional power grids, minimal maintenance requirements with impressive lifespans of up to 25 years or more, adaptability for installation on various surfaces. With the addition of Battery storage, Solar PV provides a reliable and cost-effective means of generating renewable energy.



Within the power production sector, a significant challenge involves optimising the utilisation of rejected heat from existing anaerobic digestion (AD) plants. CFE's solution is to divert this rejected heat (500 kW) to a new underground heating mains. This rejected heat can then be utilised for various uses such as heating Poultry sheds or in one example serving a Heston straw bale drier associated with a local straw-fired power station. Key components of the solution include mechanical pipework, heat exchangers, and electrical and controls infrastructure. This system is expected to annually mitigate 3,200,000 kWh of rejected heat, contributing to increased efficiency and sustainability in the energy production process.

Waste Heat Utilisation



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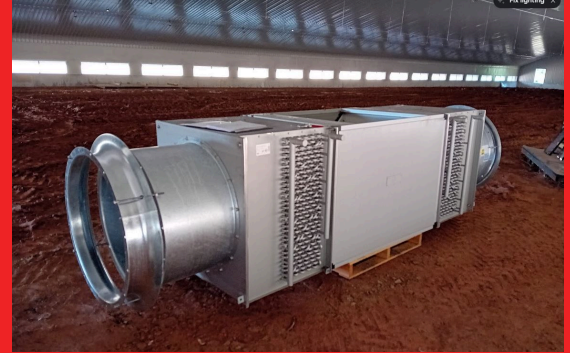
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Low energy air movement

Specialising in low-energy air movement, we focus on optimising Air Handling Units by collaborating with fan manufacturers to develop variable speed solutions for cost-effective operation in challenging environments. Our approach includes comprehensive Airflow Computational Fluid Dynamics (CFD) simulations and on-site testing, including smoke testing and confirmation of airspeed. This ensures the efficiency and reliability of our systems, meeting the specific needs of diverse environments while prioritising energy efficiency and performance.



Combined Heat & Power/ ORC

By employing the Organic Rankine Cycle (ORC), waste heat with temperatures exceeding 70°C can be efficiently converted into clean electricity, forming a Combined Heat & Power solution. The electricity generated by ORC systems can be sold to the grid or used to offset power demand, establishing a sustained revenue stream. Beyond financial advantages, ORC systems contribute to environmental goals by recycling wasted thermal energy and reducing emissions. Additionally, they serve as integral components in micro-grids, supplying electricity to remote locations and offering diverse benefits to businesses.

Manure and Waste drying

Using innovation and cost-effective manufacturing, CFE is actively developing products to address pollution challenges encountered by Farmers and Producers. A key concern involves the restriction on spreading manure or waste organic matter on farmland during winter. To tackle this issue, CFE is designing a drying solution for such waste, enabling convenient storage, transportation, and utilisation as a valuable nutrient source for future application. The company is in the process of evaluating different engineering solutions and anticipates the rollout of these systems in the very near future.



Boiler Replacements, RHI Tariff transfers & RHI Compliance

RHI-accredited boiler/CHP systems represent a valuable business asset, providing a 20-year RHI income span from the original acceptance date into the scheme. Under Ofgem guidance, flexibility allows for both tariff and equipment movement, allowing the utilisation of the full 20-year RHI period from the initial acceptance. This includes options such as transferring boilers to new owners along with the RHI tariff, facilitating RHI tariff-only transfers to new owners for the installation/commissioning of new boilers, increasing boiler capacity to extend Tier 2, incorporating additional boilers into existing schemes, replacing boilers when uneconomical to repair, and enhancing boiler system capacity to cater to site expansion or increased heat demand. For Combined Heat & Power (CHP) accredited systems, complete transfers of both the boiler and CHP system, as well as tariff-only transfers enabling new equipment installations, are feasible. CFE offers a comprehensive turnkey service, encompassing RHI due diligence and proficiently handling the transfer process.



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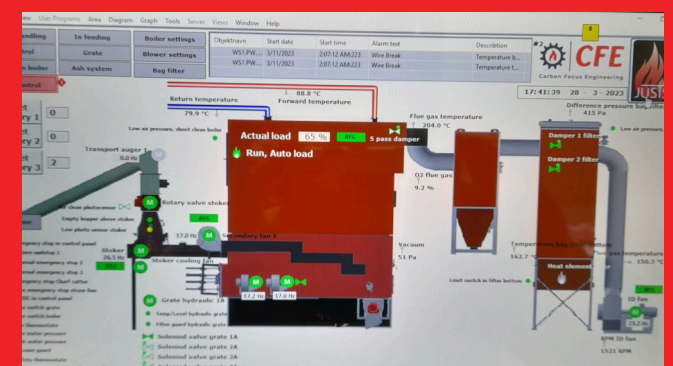
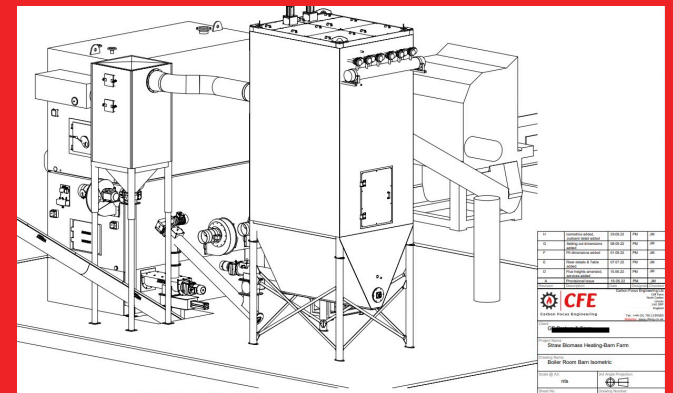
Our services step by step

- 1 Consultation/data gathering
 - Site survey
 - Planning permissions/conditions
 - EA permit conditions
 - Existing energy usage
 - Energy / Carbon modelling
- 2 Fuel selections / financial modelling
 - Analysis of fuel choice options.
 - LPG, oil, wood chip, wood pellet, straw, poultry litter, waste wood.
 - Choices influenced by site location, available space, management resource, labour resource.
 - Professional independent modelling (MSc MIDHEE)
- 3 System design
 - CAD design for boiler and fuel feed system, building and fuel store, mechanical/electrical installations, district heating & controls
- 4 Installation
 - Health & Safety file compilation/submission
 - CDM coordination with client/main contractor and other sub contractors.
 - Project management, planning, scheduling etc.
 - Site work.
 - RHI compliance and application service
- 5 Commissioning, System Hand over & training
 - Coordinated system commissioning.
 - Operation and maintenance manuals.
 - Training of site operators and management.
 - System hand over.

Example - Energy cost comparison - Commercial business user consuming 4,352,000 kWh thermal heat energy /yr. Extract from modelling software.

Key: Yellow = Fuel input cost. Red = cost/kWh. Green = Annual cost

| Fuel type | Cost - €/t/ton, £/tonne, £/kwh | kWh/T or kWh/£, net calorific value | kg/m ³ bulk density | kWh/m ³ or L | g/kWh input | Boiler / system efficiency % | £p/kWh Output | Business Triyer | Total energy cost per year / £ |
|---|--------------------------------|-------------------------------------|--------------------------------|-------------------------|-------------|------------------------------|---------------|-----------------|--------------------------------|
| LPG | 0.43 | 7.0 | | 7.0 | 6.14 | 0.85 | 7.23 | | £316,514.26 |
| Kerosene - heating oil | 0.32 | 10.3 | 845 | 10.3 | 6.89 | 0.85 | 8.22 | | £353,802.91 |
| Good quality pellets, 10% plus BT - (105 m.c.) | 100 | 4700 | 600 | 3000.0 | 6.48 | 0.85 | 7.63 | 1089 | £332,258.32 |
| 25 % m.c. roundwood chip (20/30/70) | 136 | 3900 | 210 | 735.0 | 3.40 | 0.85 | 4.24 | 1463 | £184,120.00 |
| 20% m.c. whole tree chip wet | 75 | 2900 | 300 | 690.0 | 3.26 | 0.85 | 3.84 | 2226 | £166,956.52 |
| Straw (17% m.c.) - Whole bale - Home produced | 38 | 4032 | 155 | 625.0 | 0.94 | 0.85 | 1.11 | 1270 | £48,203.91 |
| Straw (17%) - Purchased typical average price £/T | 68 | 4032 | 155 | 625.0 | 1.09 | 0.85 | 1.88 | 1270 | £86,340.21 |
| Miscanthus (17% m.c.) - Whole bale - Home produced cost | 38 | 4400 | 162 | 712.0 | 0.86 | 0.85 | 1.02 | 1264 | £48,216.18 |
| Miscanthus whole bale 17% purchased - on contract | 67.5 | 4400 | 162 | 712.0 | 1.00 | 0.85 | 2.26 | 1264 | £101,618.18 |
| Straw pellet - Wheat | 100 | 4032 | 630 | 2540.2 | 4.71 | 0.85 | 5.54 | 1270 | £241,249.84 |
| Pellet - Miscanthus | 108 | 4400 | 630 | 2772.0 | 4.50 | 0.85 | 5.29 | 1264 | £230,400.00 |
| Waste wood - clean (Grade A/B) (cost 1000) | 60 | 4600 | 294 | 1262.4 | 1.30 | 0.85 | 1.52 | 1113 | £66,788.61 |
| Gas oil - Commercial heating oil, red diesel | 0.82 | 10.3 | 845 | 10.3 | 8.83 | 0.85 | 10.51 | | £447,320.39 |
| Coal | 400 | 8000 | 850 | 6800.0 | 5.83 | 0.85 | 6.82 | | £288,000.00 |
| Electricity - CHP - COP=4.5 | 0.45 | | | | 4.5 | 100% | 0.00 | | £40,000.00 |
| Electricity - CHP - COP=2.5 | 0.45 | | | | 2.5 | 200% | 0.00 | | £78,360.00 |
| Warm gas | 8 | | | | 8 | 0.85 | 8.41 | | £40,600.00 |
| Poultry manure 25% M/C | 4.1 | 3900 | 500 | 1800.0 | 1.19 | 0.85 | 1.41 | 1209 | £61,155.96 |
| Poultry manure 45% M/C | 22 | 2500 | 600 | 1500.0 | 0.88 | 0.85 | 1.04 | 1241 | £45,058.00 |



Project Gallery





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