



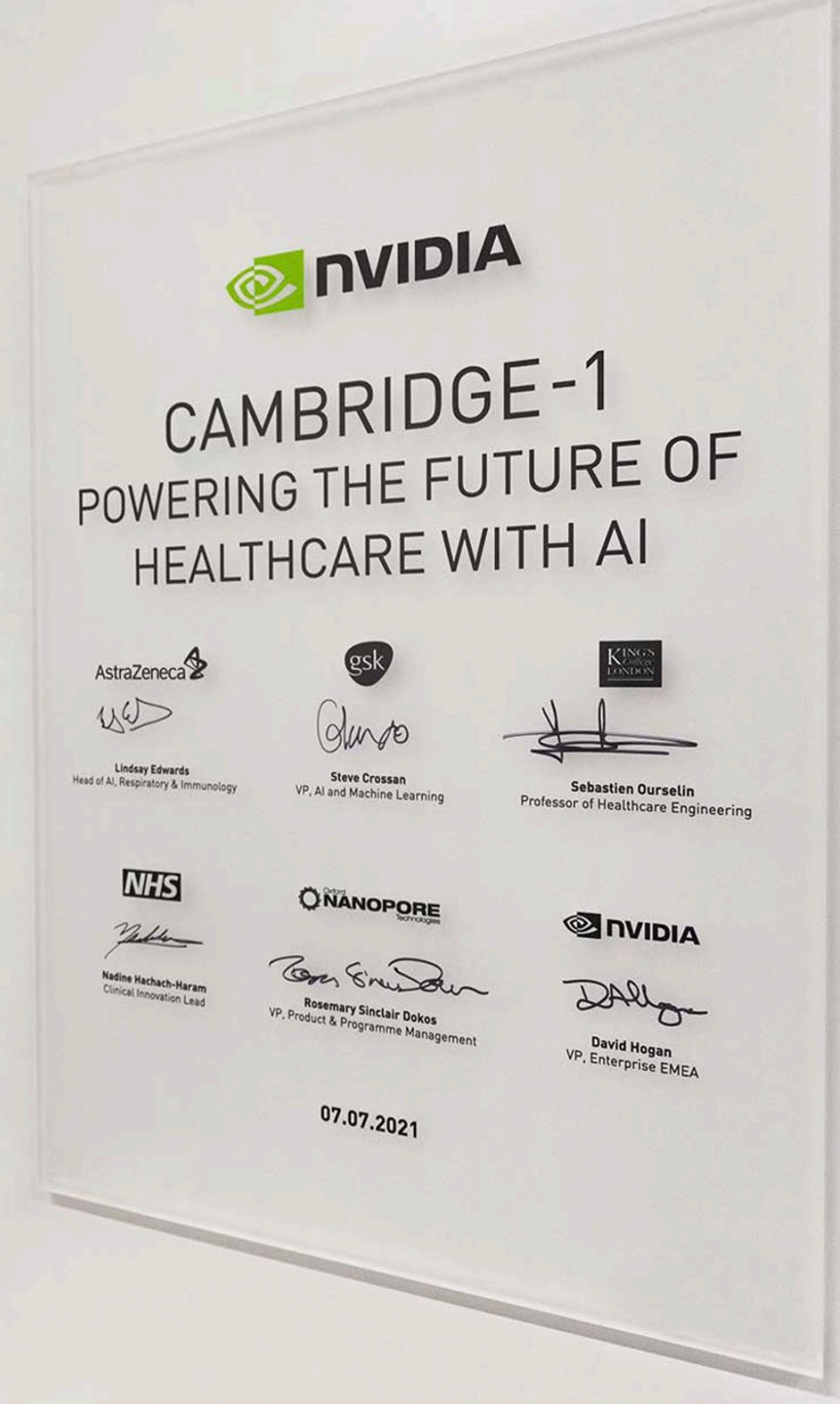
Kao Data – Transitioning to HVO Fuel



How Kao Data moved to HVO fueled generator backup – saving 90% of CO₂ emissions

KAO DATA

Founded in 2014, Kao Data develop and operate high performance data centres for advanced computing. With hyperscale-inspired facilities east and west of London, we provide enterprise, cloud, HPC and AI customers with a world-class home for their compute.





Data Centres



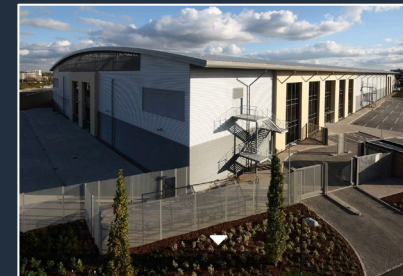
KLON-01 (Harlow)

- 40MW data centre campus
- London/Cambridge proximity
- DGX-Ready, OCP-Ready
- High density HPC & AI provision
- Carrier neutral
- 100% renewable energy



KLON-05 (Northolt)

- 4MW data centre (*fully occupied*)
- Within the West London Availability Zones
- Carrier neutral
- 100% renewable energy



KLON-06 (Slough)

- 16MW data centre
- Prime, central Slough location
- DGX-Ready, OCP-Ready
- Carrier neutral
- 100% renewable energy



Harlow (KLON-01)

- **Address:** Kao Data Campus, London Road, Harlow, CM17 9NA
- **Area:** 61,000m² (when fully built-out))
- **Power:** 10MW utilised and when Phase 1 fully built-out will be 40MW – all powered with 100% renewable energy
- **Rating:** The design provides a concurrently maintainable (Tier III equivalent) environment
- **PUE:** An SLA-backed PUE of <1.2, even at partial loads
- **Connectivity:** Data centre carrier neutral with all major carriers on-net
- **Certifications:** OCP-Ready, DGX-Ready and all major ISO accreditations

The Need For Generators...

- Data centres need generators to ensure power resiliency and maintain continuous operation during outages – power storage!
- Traditionally fuelled with mineral (EN590) diesel
- Testing regime for a generator (MTU 1965KW) is 2 hours per month (running at full load). This is equivalent to 24 hours per annum
- An MTU 1965KW generator consumes around 450-500 litres per hour. (1,000 litres for every 2 hour test-run)
- Burning 1,000 litres of diesel produces on average **3.6 tonnes of CO₂**
- Burning diesel also contributes to other greenhouse and toxic gas emissions such as nitrogen oxide, sulphur dioxide, particulate matter and carbon monoxide.

ANNUAL FIGURES - Single Generator (MTU 1965KW)

- Mineral diesel (EN590) consumed per year: 12,000 litres
- Carbon emissions per year: 43,200 tonnes of CO₂



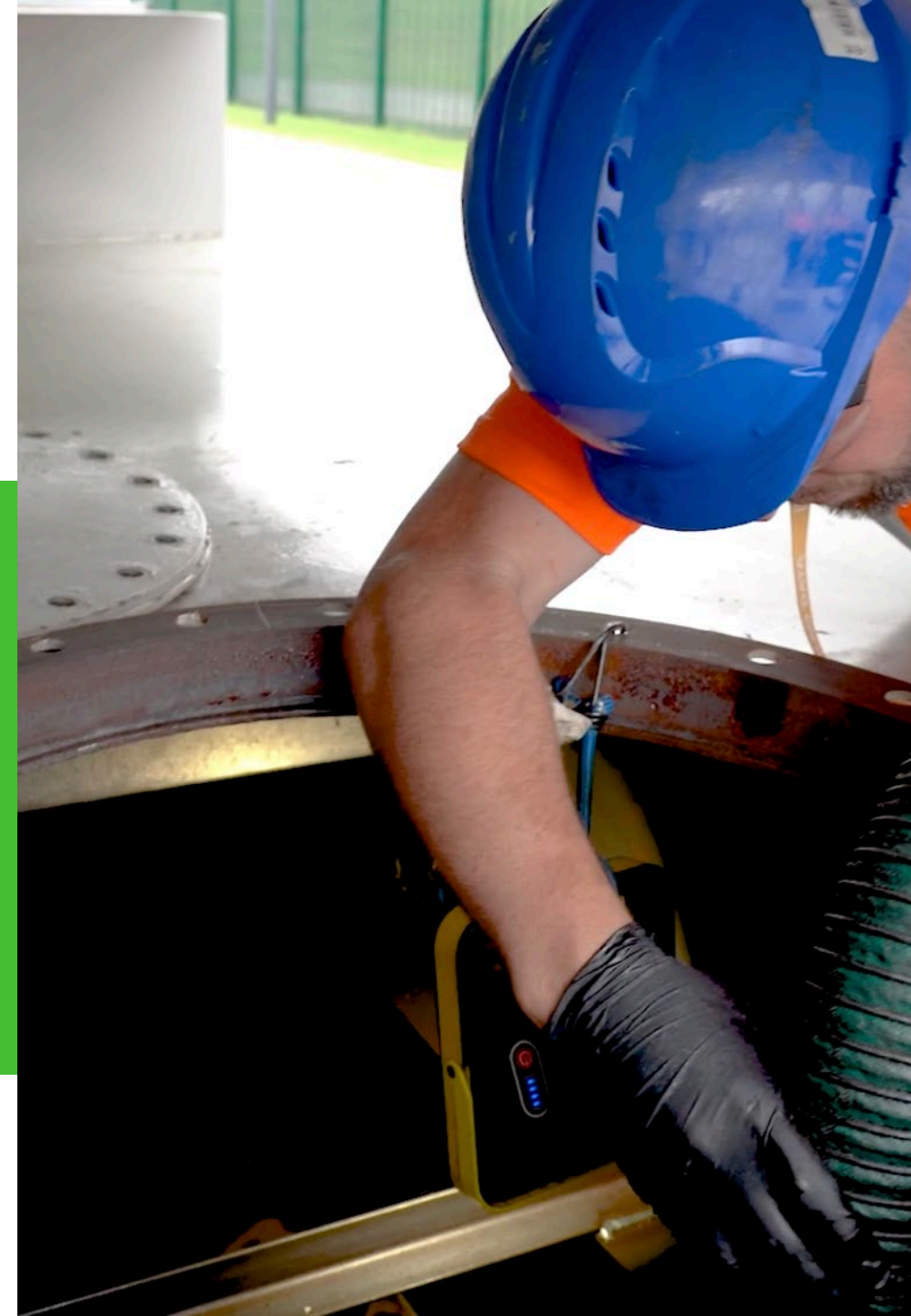
The Bigger Issue - London

- By end 2022 London will be a 'Gigawatt' data centre hub (1,000MW)
- This will require an estimated 450-500 (MTU 1965KW) generators to provide power backup resiliency
- Testing 450 generators (same 2 hour monthly regime) to support London's 1,000MW will take, annually:
 - 5,400,000 litres of diesel (*2 Olympic sized swimming pools*)
 - And emit 19,440,000 tonnes of CO₂ (*the equivalent carbon emissions of 1.9m people*)

This is why, in July 2021, **Kao Data** became the first data centre developer/operator in Europe to transition all its backup power generation from mineral diesel to HVO fuel.

The Engineering team spent months carrying out due diligence with Rolls Royce/MTU to assess the effect of the fuel – conclusion – NO WARRANTY or power deficiency issues!

All new deployments are procured based on HVO operation.



What is HVO Fuel?

A second-generation, recycled and treated natural vegetable oil, refined to burn cleaner and more efficiently than fossil fuels.

- **Manufacture** - HVO can be manufactured from waste food stocks, raw plant oils, used cooking oils or animal fats.
- **Process** - Plants are grown and oils are extracted and used for their main purpose (cooking), recollected and then converted into HVO fuel. This process absorbs carbon dioxide.
- **Refinement** - The conversion is completed via a two-stage process known as hydrotreatment, where oils and fats are saturated with hydrogen at high temperatures (over 300°C), followed by a stage of isomerisation/cracking to give the end product with the desired fuel qualities. Maybe a more stable way of storing hydrogen!
- **Controlled** - The rigorously controlled HVO production process ensures a consistent, resilient and high-quality product and carbon reduction credentials.



Why HVO Fuel?

- **Natural** - HVO fuel is 100% renewable, biodegradable, sustainable and non-toxic
- **Clean** - HVO fuel is dramatically better for the environment compared to traditional diesel. HVO fuel **eliminates up to 90% of net CO₂** and significantly reduces harmful emissions such as nitrogen oxide, particulate matter and carbon monoxide. It does not contain sulphur so totally eliminates SO₂
- **Reliable** – HVO fuel, unlike 'bio-diesel', is Fatty Acid Methyl Ester (FAME) free, preventing microbiological or diesel bug attacks. This makes it more reliable and resilient in operation.
- **Functional** – HVO fuel can be operated at a range of climates and temperatures, is easier to store, and has a lifespan of 10+ years compared to 1 year for traditional diesel
- **Cost Effective** – HVO fuel is easy to transition and requires no expensive modifications to generator equipment. It's also more fuel efficient than traditional diesel. There is a marginal cost increase with similar tax paid fossil diesel fuel – circa 10%



Kao Data Make The Switch

- HVO fuel was supplied by Crown Oil
- 45,000 litres of diesel was removed and replaced with HVO fuel
- Kao Data commissioned Crown Oil and Optimum Power Services to test emissions. Using MCERT test protocol, they undertook emissions testing on one of the installed generator sets.
- Tests found that a **13%** reduction in particulate matter was achieved by the use of HVO fuel, together with a **6%** reduction in nitrogen oxide

Engine Load (Test Load)	Traditional Mineral Diesel (EN590)	HVO Fuel (EN15940)
75%	360 l/h	354.2 l/h
100%	458 l/h	457.6 l/h

- The tables shows we actually get about 2% more output per litre of fuel at 75% load!....or to put it another way, 'more bang for your Buck!'



Further Information

- **Whitepaper** - Download our HVO fuel whitepaper at: https://kaodata.com/hvo_whitepaper
- **Announcement** - <https://kaodata.com/news/the-road-to-net-zero-kaodata-becomes-first-uk-data-centre-to-transition-from-diesel-to-renewable-hvo-fuel>



The Road to Net Zero Data Centres: Reducing Emissions by Transitioning to HVO Fuel

Introduction

Fuelled by the increasing power consumption of global data centres, and society's insatiable demand for the data-supported services they host, over the last five years there has been considerable demand for 'green' data centres.

Whether these are remote data centres directly connected to renewable sources such as hydro-electric, geothermal, solar or wind, or urbanised data centres using 100% certified green energy tariffs, tremendous efforts have been made by developers and operators to reduce data centres' carbon footprints by tackling the root source of their utility power.

However, while this progress cannot be understated, one aspect that has been neglected is data centres backup power generation. Potentially because backup power generation is infrequently used – such is the quality of traditional data centre power resiliency – it is not commonly scrutinised with the same rigour as the main utility power source.

This whitepaper will explore why that approach is a huge oversight and highlight how targeting traditional diesel fuelled backup power generation and transitioning to 100% sustainable hydrotreated vegetable oil (HVO) fuel has the potential to save considerable carbon emissions. Using the example of Kao Data – the first data centre developer/operator in Europe to transition to HVO fuel – the paper explains why HVO fuel was selected, how the transition was performed within an operational, mission critical environment, and the results from the post transition testing.

- In July 2021 Kao Data became the first data centre operator in Europe to transition to 100% HVO fuel for backup power generation.
- By 2023 London could be a Gigawatt data centre hub. The vast majority of these data centres will be backed-up with fossil fuel, mineral diesel generators.
- HVO fuel reduces carbon emissions by 90% and testing by Kao Data showed reductions of 13% in particulate matter, and 6% in nitrogen oxide emissions.

Thank You

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