Kao Data – Transitioning to HVO Fuel

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How Kao Data moved to HVO fueled generator backup – saving 90% of CO_2 emissions

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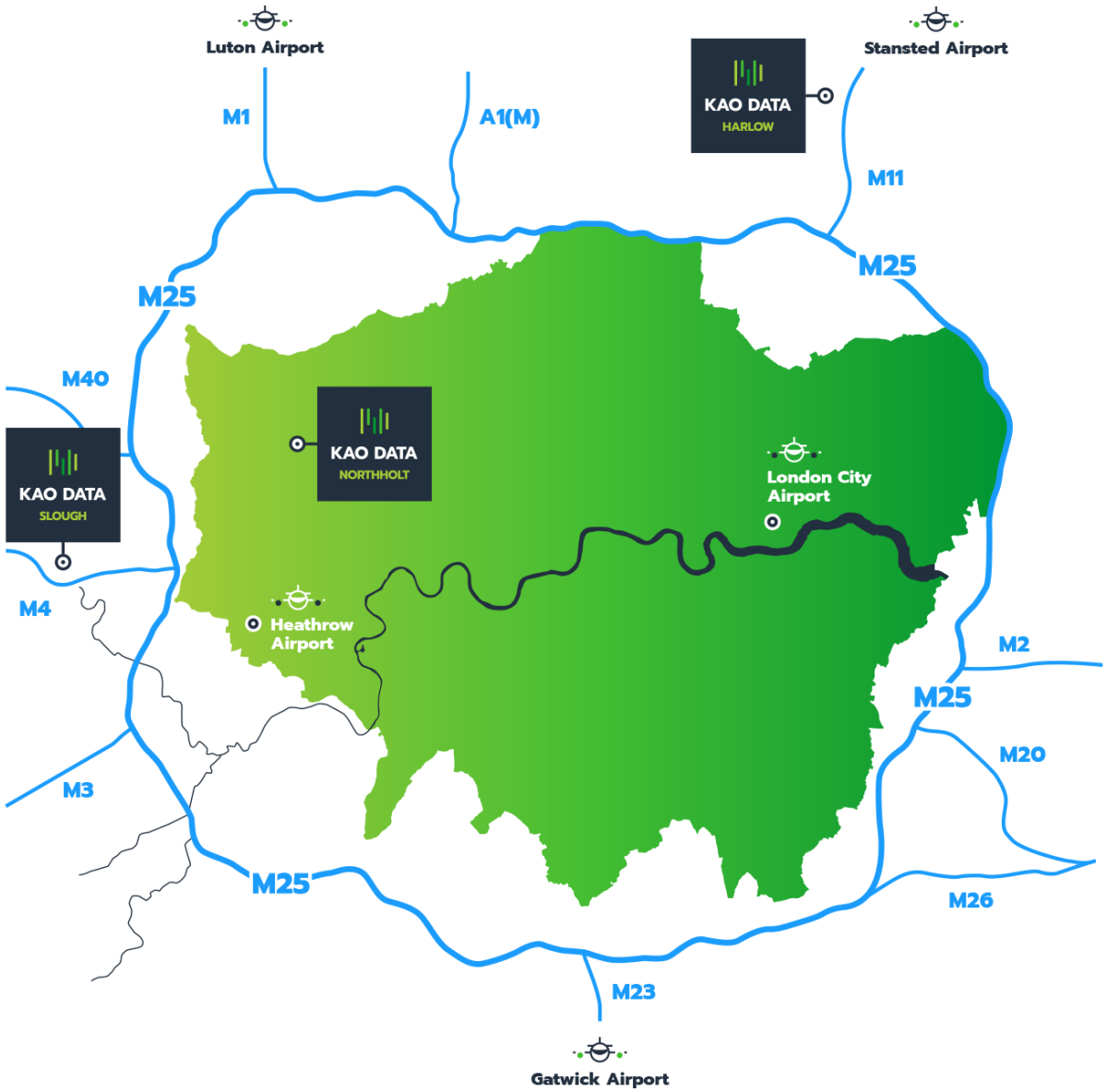
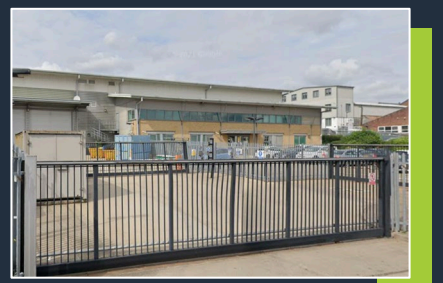
Founded in 2014, Kao Data develop and operate high performance data centres for advanced computing. With hyperscale-inspired facilities east and west of London, we provide enterprise, cloud, HPC and AI customers with a world-class home for their compute.



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

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Harlow (KLON-01)

- **Address:** Kao Data Campus, London Road, Harlow, CM17 9NA
- **Area:** 61,000m^2 (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 **c**arrier neutral with all major carriers on-net
- **Certifications:** OCP-Ready, DGX-Ready and all major ISO accreditations

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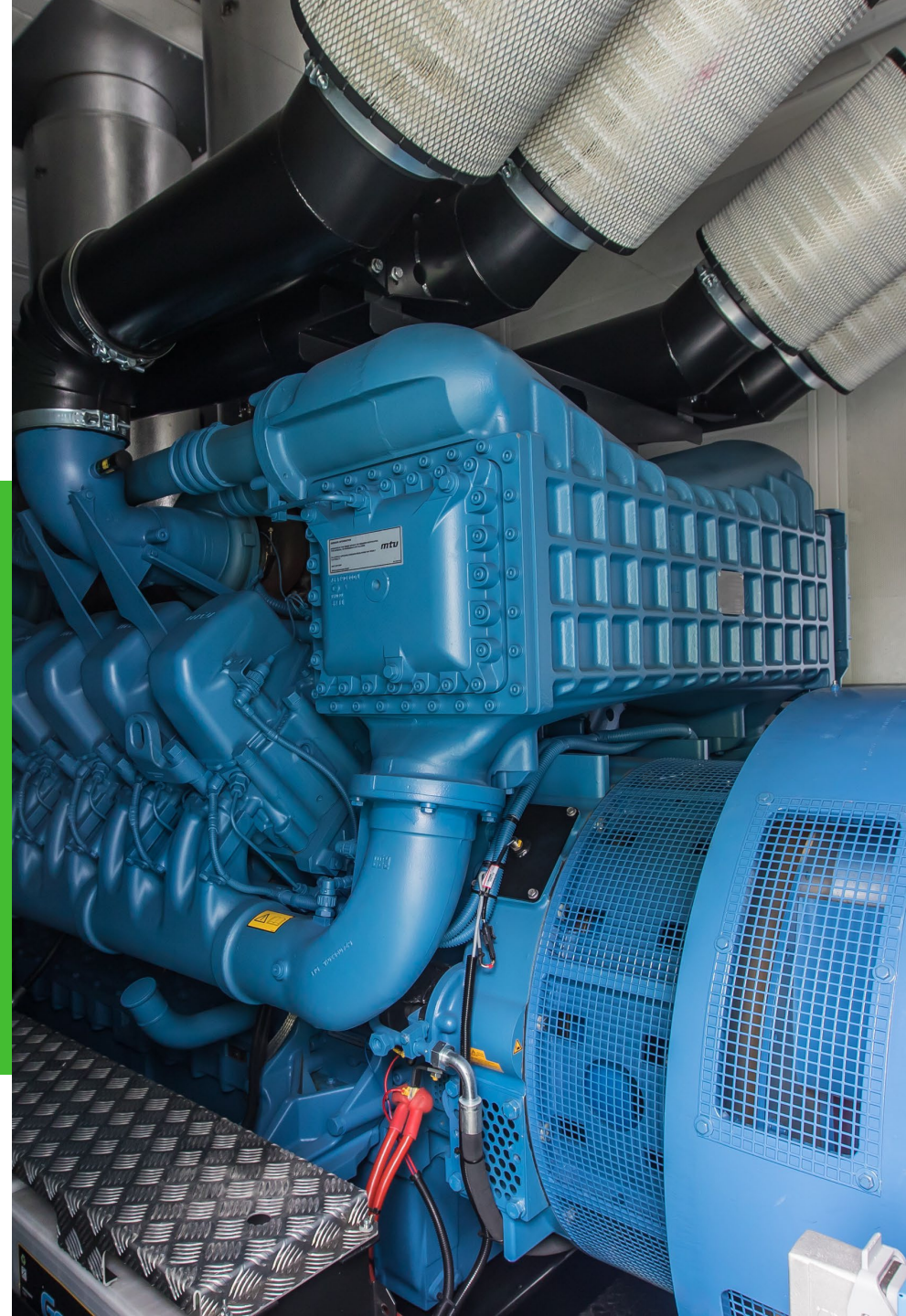
The Need For Generators…

- 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 CO_2**
- 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 CO_2



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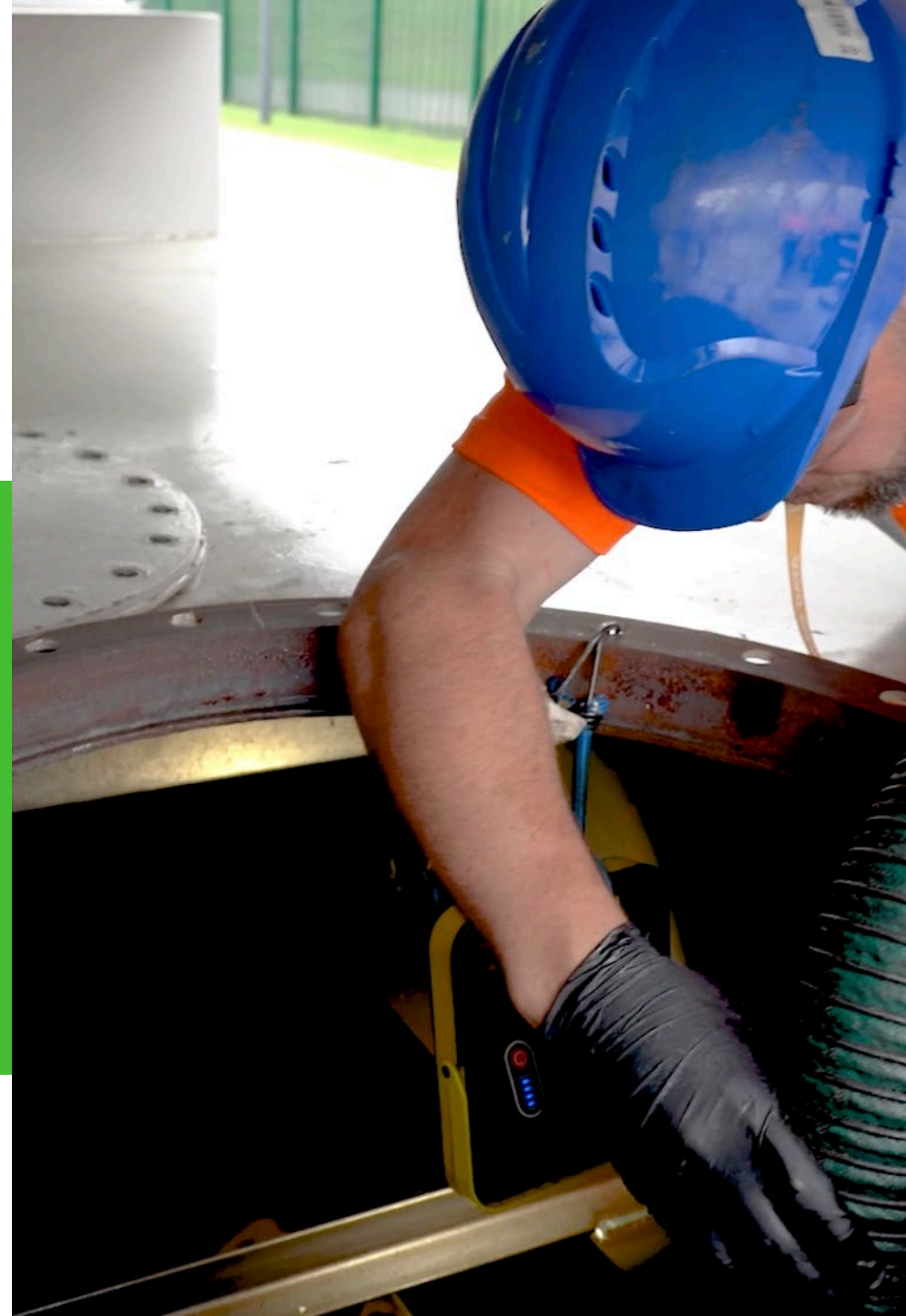
The Bigger Issue - London

- 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 CO_2 *(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 it's backup power generation from mineral diesel to HVO fuel.

The Engineering team spent months carrying our 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.



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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.

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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 CO_2** and significantly reduces harmful emissions such as nitrogen oxide, particulate matter and carbon monoxide. It does not contain sulphur so totally eliminates SO_2
- **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%

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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!'

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Further Information

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

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Thank You

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