

UK EVENTS AND DIESEL USE: RESPONDING TO A PUBLIC HEALTH EMERGENCY

‘How events are contributing to deadly air pollution and what we can do about it’

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SUPPORTING PARTNERS



Julie's Bicycle
SUSTAINING CREATIVITY



THE SIZE OF THE PROBLEM...

Diesel fuel use is a major environmental and public health issue. The UK festival, live and sports event industry uses a huge volume of diesel through the widespread use of generators at events. The emissions from this diesel burn has a large impact on the environment and human health...

The wider issue

Air pollution from burning fossil fuels, like diesel, may be causing damage to every organ and cell in the human body.

90% of the *global population* endure toxic outdoor air
30.4 billion litres of *diesel* were used in the UK *in 2017*

15% of total UK diesel use is in Non-Road Mobile Machinery (NRMM) including static diesel generators

1 litre of diesel releases **2.97kgs** of **CO2e** into the atmosphere

Diesel also releases various types of emissions and particulates that are damaging to health and the environment - including particulate matter [PM], oxides of nitrogen [NOX], Carbon Monoxide [CO], Carbon Dioxide [CO2], Benzene and other carcinogens.

Emissions from NRMM are not covered by the Euro standards. It's believed they emit up to 93 times more Nitrogen Oxides (NOx) and 165 times more Particulate Matter (PM) than the standards for a Euro 6 diesel vehicle.

UK EVENTS

- Over **85 Million** attendees every year at all types of live events in the UK, including corporate & business events, conferences, sporting events, country fairs, music events and product launches.
- More than **7,000** major outdoor events are held each year.
- Nearly all temporary power at events is provided by diesel generators, including many that are in permanent venues connected to grid power.

THIS CONTRIBUTES TO

- **A Climate Emergency** - Greenhouse gases are released and become a major cause of climate disruption.
- **A Public Health Emergency** - Diesel emissions have been linked to premature deaths due to heart and lung disease and strokes, as well as asthma and other respiratory conditions in children and adults. There are links with learning disabilities in children and Alzheimer's Disease in adults.
- Air pollution is one of the most serious environmental and human health problems facing the world today with the WHO, UN, UNICEF, British Lung Foundation and various academic bodies raising the alarm on this problem.
- Outdoor air pollution is contributing to approximately **40,000** early deaths a year in the UK.
- **9,000** deaths annually in London alone.

CO2E

WHAT IS CO2E?

CO2e = Carbon dioxide equivalent

Emissions are calculated as 'CO2e' or 'Carbon Dioxide Equivalent'. This is the universal unit of measurement used to indicate the global warming potential (GWP) of each of the main Kyoto greenhouse gases in terms of Carbon Dioxide equivalent impacts. It is used to evaluate the impacts of releasing (or avoiding the release of) different greenhouse gases in a consistent way.

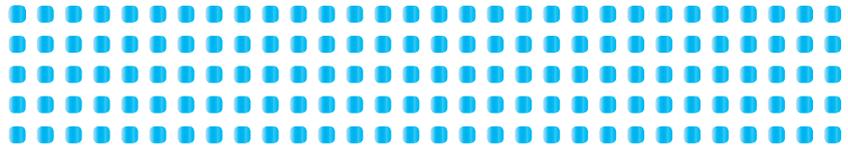
UK EVENT INDUSTRY NUMBERS

Based on findings from industry wide data analysis



The UK event industry uses an estimated **380 million** litres of diesel annually

That's equivalent to over **150 Olympic** swimming pools full of diesel



Monitoring shows that average generator efficiency is between **10%-20%** Ideal range is **50%-70%**

Diesel use in generators at events equates to **nearly 1.5%** of **total UK diesel** use.



Over **8%** of all **red diesel** use.

1.2 million tonnes of CO2e is released from diesel emissions in generators **OR 1.2 billion kilograms of CO2e** Approximately the same level of emissions as Malta annually



It would take **a forest** four times **the size of Birmingham** planted every year to offset these emissions

Emissions from static diesel generators at events are equivalent to adding **220,000 additional cars** to the road every day



Diesel generators are often running well **under their full capacity**. Monitoring shows that average generator efficiency of operation (electrical load vs capacity) is between 10%-20%. **Ideal range is 50%-70%**



Running **below 30%** leads to significant increases in emissions per kWh (unit of electrical energy) used

FINANCIAL IMPLICATIONS

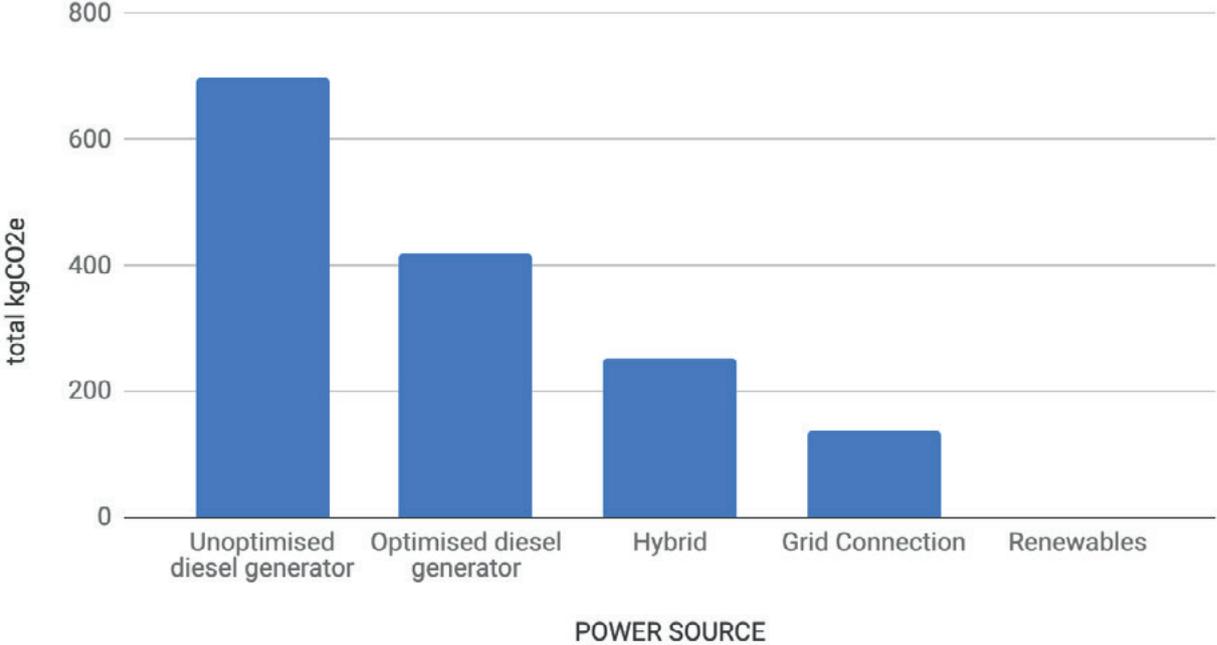
There is a vast amount spent by UK event organisers on diesel fuel. It's often just accepted as an inevitable part of the event budget - however, the cost is highly volatile and not often quantifiable in advance due to variations in efficiency of use and in the market price of the fuel itself.

The UK event industry spends an estimated **£230,000,000** on diesel for generators every year

The cost of diesel rises year on year meaning events budgets are constantly stretched

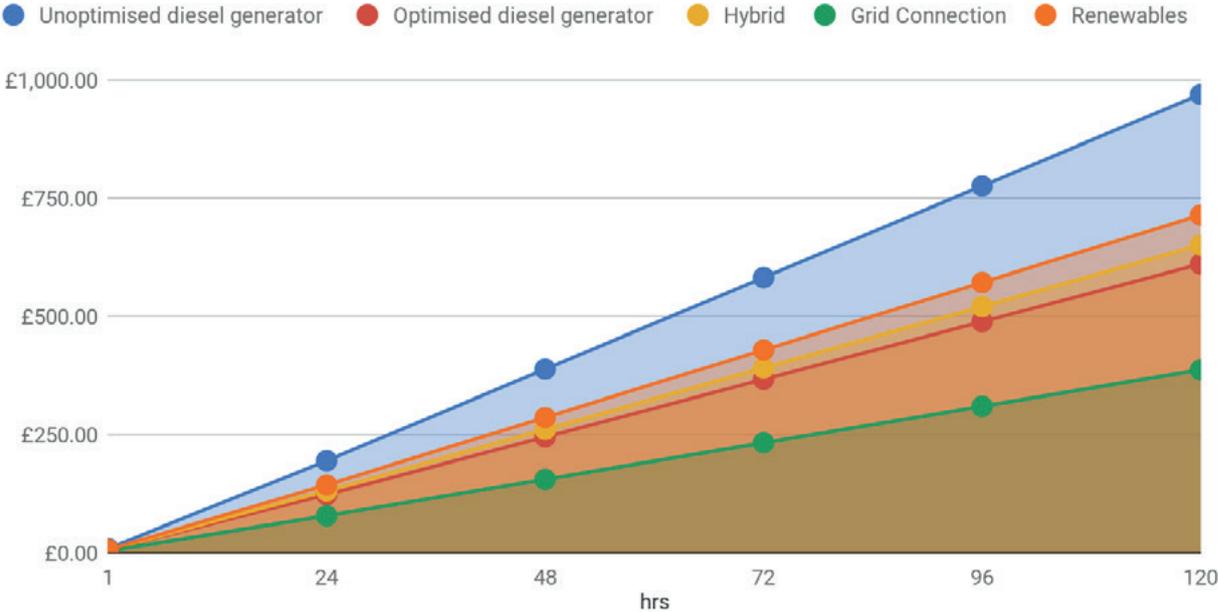
IMPACTS

24hr emissions by Power Source (@20kW Average Load)

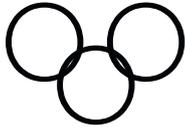


It not only makes sense to be more efficient with event power from a public health and climate change perspective, it also makes financial sense

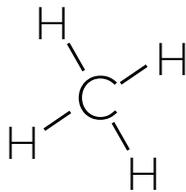
Cost of use - different power sources over time @20kW load



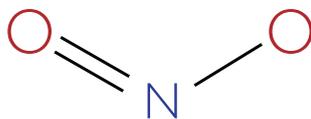
MAJOR POLLUTANTS FROM GENERATOR EXHAUSTS



- **Particulate Matter**, including Black Carbon (PM10 PM2.5 & BC). These particles of soot and heavy metals give smog its murky colour. Fine particles – less than one-tenth the diameter of a human hair – pose the most serious threat to human health, as they can penetrate deep into lungs and cells. PM is both a primary pollutant and a secondary pollutant from hydrocarbons, nitrogen oxides, and sulphur dioxides. Diesel exhaust fumes is a major contributor to PM pollution.



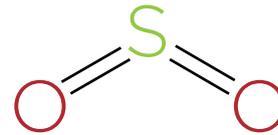
- **Hydrocarbons (HC)**. These pollutants react with nitrogen oxides in the presence of sunlight to form ground level ozone, a primary ingredient in smog. Though beneficial in the upper atmosphere, at the ground level this gas irritates the respiratory system, causing coughing, choking, and reduced lung capacity.



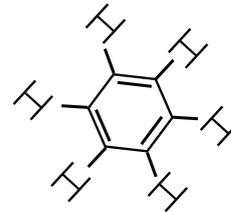
- **Nitrogen Oxides (NOx)**. These pollutants cause lung irritation and weaken the body's defenses against respiratory infections such as pneumonia and influenza. In addition, they assist in the formation of ground level ozone and particulate matter.



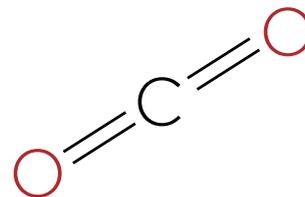
- **Carbon Monoxide (CO)**. This odourless, colourless, and poisonous gas is formed by the combustion of fossil fuels and is emitted primarily from engine exhausts. When inhaled, CO blocks oxygen from the brain, heart, and other vital organs. Fetuses, newborn children, and people with chronic illnesses are especially susceptible to the effects of CO.



- **Sulphur Dioxide (SO2)**. Generators create this pollutant by burning sulphur-containing fuels, especially diesel. Sulphur dioxide can react in the atmosphere to form fine particles and poses the largest health risk to young children and asthmatics.



- **Hazardous air pollutants (toxics)**. These chemical compounds have been linked to birth defects, cancer, and other serious illnesses. It is estimated that the air toxics emitted from engine exhausts – which include Benzene, Acetaldehyde, and 1,3-butadiene – account for half of all cancers caused by air pollution.



- **CO2 and Greenhouse gases**. Generators also emit pollutants such as carbon dioxide and water vapour, that contribute to global warming and climate disruption.

Temporary power provision from diesel generators creates air pollution. Air pollution from diesel use is split into primary and secondary pollution. Primary pollution is emitted directly into the atmosphere; secondary pollution results from chemical reactions between pollutants in the atmosphere. The above are the major pollutants from generator exhausts.

THE AIR POLLUTION SOLUTION

A new industry approach - Breathing fresh air into the events industry

Studies into fuel use and power management by ZAP Concepts at events across the UK and world, showed that diesel consumption could be reduced by up to 40% on average, with some events being able to negate them all together

If the UK event industry reduced diesel use by 40% it would annually save:

150 million litres of fuel
60 Olympic swimming pools



450,000 tonnes of CO2e from being released



Equivalent to the emissions from over 55,500 homes



Equivalent to taking 6 million cars off the road for a day



£90,000,000 being spent on unnecessary diesel burn



Generators are often oversized and not matched to their loads. More efficient use of generators and load profiling could help reduce diesel burn significantly



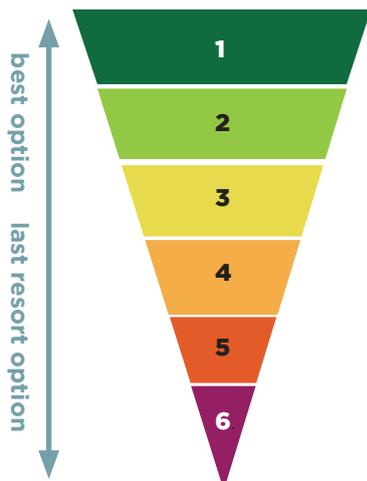
Mains or grid power can often negate the need for generators but is often overlooked and under utilised - especially in urban areas. Many events have the option and capability to utilise grid power but decline to do so or are blocked by land owners, venues or local authorities



Renewables and hybrid battery technologies can help further reduce emissions by offering entirely fossil fuel free sources of energy. Renewables and battery hybrid systems are zero emission at point of use. They use no fuel and have the same or lower impact of manufacture & transport as diesel generators.

POWER MANAGEMENT HIERARCHY

Following this hierarchy would lead to reductions in fuel use and emissions.



Prevention - do you actually need power in this location/for this application?

Efficiency - use less power & use it in a more fuel efficient way

Sourcing - can you use mains instead of generators? Can you use renewables?

Hybrids - can the system be backed up or bolstered by battery technology?

Alternative fuels - can you use HVO or other sustainable fuels?

Diesel-fuelled generators only - where nothing else can be used

GUIDE NOTES

Events backing this new industry approach will be working to:

- **Reduce** overall power *demand* through energy efficiency.
- **Match generator sizes** and runtimes to actual power demand - this will *improve* generator *efficiency*.
- Use actual kit inventory and power requirements to *size generators* NOT just connection size
- Identify times when it is possible to turn off generators when not required (and then do it). Not all operations require 24hr power, but generators are often left running just because no one actually knows what they are connected to. Make this information readily available at the machine and it can be labelled as being able to be turned off between certain hours.
- Use timers, or do it manually.
- **Avoid running multiple machines** 24/7 just for backup. There are other ways to back up systems and maintain baseload, without constant running.
- **Configure generators** to operate on a Load on Demand system so only the generators that are actually required at any given point are running.
- **Synchronise large sets** with smaller sets to manage reduced baseloads e.g. overnight
- Utilise grid power, battery power and renewable energy to reduce or *remove the need* for running diesel fuelled generators.
- Seek independent advice to supplement that of the power contractor

DATA SOURCES

UK event diesel use data from independent study by ZAP Concepts & Hope Solutions from information supplied by UK event organisers, A Greener Festival, Julie's Bicycle and Powerful Thinking, and measured on site at the events

www.who.int/airpollution/en/

www.thelancet.com/commissions/pollution-and-health

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www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2018

www.yousustain.com/footprint/howmuchco2?co2=450%2C000+tonnes

consult.defra.gov.uk/airquality/non-road-mobile-machinery-and-red-diesel/

airqualitynews.com/2019/04/05/exclusive-government-accused-of-ignoring-clean-fuels-as-red-diesel-tax-loophole-stays/

www.globalcarbonatlas.org/en/CO2-emissions

For more detailed information about the supporting partners:

www.powerful-thinking.org.uk

www.agreenerfestival.com

www.juliesbicycle.com

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