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
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.

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], Benzenes 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.

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 have a large impact on the environment and human health...

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.

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.
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.
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.

**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.

**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.

**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.

**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.

**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.

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

1. Prevention - do you actually need power in this location/for this application?
2. Efficiency - use less power & use it in a more fuel efficient way
3. Sourcing - can you use mains instead of generators? Can you use renewables?
4. Hybrids - can the system be backed up or bolstered by battery technology?
5. Alternative fuels - can you use HVO or other sustainable fuels?
6. Diesel-fuelled generators only - where nothing else can be used
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.

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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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