ENERGY: FREQUENTLY ASKED QUESTIONS

Photo credit: Rob Scully

About this Factsheet

This Factsheet answers questions that have come from UK festival organisers in the annual Industry Green Survey (2014, 2015, 2016) conducted by Powerful Thinking, as well as questions asked by members of the steering group and power companies.

Q: Isn't 'renewable' power unreliable?

A: Not if the system is well designed. Most newer systems have battery back-ups, which store energy, and will continue to produce power if there is an issue e.g. in overcast conditions in the case of solar. Many providers come with a reserve in place. Some also say that as there are fewer or no moving parts, renewable power is actually more reliable. However, it should be noted that there is more of a need to work out power requirements in detail to match supply and demand.

Q: Do 'renewable' solutions cost more?

A: Sometimes they do, but sometimes they don't, so the pros and cons need to be evaluated just as with any other decision. In many cases where a large amount of power is required (for example above 45 kVA), there may not be a viable solution or costs may be prohibitive. But for smaller requirements, you may be able to reduce the amount of power you need in the first place by working efficiently, and then use cost-effective renewable solutions. Feedback from festivals suggests that it is often forgotten that there are no fuel bills post-event for solar and wind systems (so initial cost comparisons are misleading). There are many examples at small to medium scale events of renewable and hybrid approaches that have delivered significant cost savings. Savings will be dictated by circumstance, so it is very important to maximize planning and explore all available options.

Q: Isn't it the case that we always need a margin of error in the capacity of generators for the unexpected?

Yes, but Powerful Thinking's research suggests that current margins are often excessive. See also **Factsheet #15 – Identifying Fuel Wastage** and **Factsheet #11 – How Energy Actually Works and Essential Terminology**.

Q: Can you power entire events on renewable low carbon solutions?

There are many examples of small to medium festivals (under a capacity of 20,000 people) being entirely powered by temporary renewable and WVO solutions. Examples include Croissant Neuf, London Green Fair, Shambala, The Green Gathering, Boom Festival, We Love Green, and Dekmantel.

See **Factsheet #9 – Five Easy Steps to Greener Power at Small Events** for tips and ideas for powering your event or areas of your site with renewable energy.

Q: Does festoon lighting need to remain on during the day to manage loads on generators?

A: No this is fiction! Festoon switched on in the daytime other than for decorative purposes only increases load and fuel consumption, and you would need a lot of festoon for a decent load! If a generator is dedicated to festoon lighting it can be switched off. For maximum efficiency ensure you use automatic sensors that switch off all site lighting during daylight hours. Also consider using LED festoon lamps as these have lower energy consumption and create less waste (they last considerably longer), and you can do longer festoon runs because you can get more lamps on a 16 A supply!

Q: Do I have to leave amps and stage lights on overnight?

A: Most companies say this is necessary in order to keep equipment warm and avoid condensation – most electronics do not like the damp British countryside! Always consider a smaller secondary power source so the main generator can be switched off when the stage is not in use overnight i.e. when load is reduced. If you do use a secondary smaller power supply ideally this should be synchronised with the main generator to avoid turning off the equipment and switching it on again as this can also cause issues. See **Factsheet #3 – Using Hybrid Power at Events**.

Q: How significant is the impact of changing traditional stage lighting for LEDs on fuel and equipment needed?

A: The impact of LED stage lighting on efficiency and fuel use can be huge – in the example below a saving of 70% was made. There are also other ways to reduce main stage fuel use, for example using smaller gensets or hybrid units to manage low loads overnight.

Photo credit: ZAP Concepts

Example of reducing emissions and fuel use by 70%

In this example scenario PAR lights, with a conventional lamp of 650 W, are changed for LED lights of 36 W each saving 614 W per light.

Let's say that during a ten hour show the total time the PAR light is actually used is approximately two hours. If in a stage 50 PARs are used, the energy savings will be 614 x 50 x 2 = 61,4 kWh. As a result of the change the total power demand of the stage will be reduced by 30.7 kW. If in this example the original maximum power demand of the total stage was 80 kW, a generator of minimum 100 kVA would have had to be used. The average load on the generator would be approximately 20 kW. This load on a 100-kVA diesel generator leads to an efficiency of approx. 18%. Per show day, the fuel consumption of a generator in this situation will be approximately 110 litre diesel.

After replacing the conventional lamps with LED lights, the maximum power demand of the total stage will be 50 kW. A generator of minimum 60 kVA will be needed. The average load on this generator then will be approximately 14 kW. This load on a 60-kVA diesel generator leads to an efficiency of approx. 23%. Per show day, the fuel consumption of this generator in this situation will be approx. 32 litres of diesel.

So changing the conventional 650 W PAR lights into 36 W LED PAR lights would save 70% of fuel consumption and therefore 70% of the stage's CO_2 emissions.

This huge effect is not only because of lower power consumption by the lights itself, but also because of a reduction of the peak demand. Because a smaller generator can then be used, the average load on this generator is relatively higher and thus the efficiency of the generator is also higher. NB Although designing out large demand peaks in power systems is desirable, as it means smaller generators can be used and fuel savings achieved, this isn't always possible in the case of stages as there may be peaks due to the quality of the show.

Q: Doesn't the extra transport from bringing in additional specialist equipment undo all the environmental benefits of fuel savings from efficiencies onsite?

A: Often it does not. The savings that can be made from the reduction of fuel use over a period of time (of anything between a few days or a few weeks) onsite will often outweigh any additional transport fuel used to either bring additional equipment from another supplier or bring equipment from further away. Let's look at some examples that demonstrate this:

Using a Hybrid Generator

Photo credit: Firefly Clean Energy

A 24 tonne artic with a Euro IV tier engine travelling at an average of 50mph produces 685 g of CO_2 per kilometre travelled. So, this vehicle driving from Brighton to London and back to deliver a Hybrid Power Generator for an event would generate only 137.4 kg of CO_2 (97 km x 0.685 kg x 2 journeys = 137.4 kg). However, over a five-day period the hybrid might reduce a 60-kVA diesel generator's run time by 10 hours per day, equating to an overall fuel saving of 200 litres which reduces CO_2 emissions by 593 kg (200 litres x 2.96572 = 593 kg). So, where modern fleet vehicles are used, there are definite benefits to going that extra mile to deploy hybrid systems.[1]

Using a Biofuel Generator

Whereas a hybrid unit (above example) needs to be brought in to work alongside a standard CI (combustion ignition) generator, meaning that it takes up extra lorry space or that an additional vehicle needs to be booked, a biodiesel generator is a direct replacement for a standard diesel generator and therefore requires no additional trucking, unless you have to book through a specialist plant hire company that might be located further from your site. Even if you are transporting a biodiesel generator over a longer distance, in terms of carbon emissions, it will probably work out as the better option: The carbon emissions associated with 1 litre of standard fuel are 2.676 kg, whereas for biofuel they are 0.019 kg (effectively zero). So, if your generator burns 250 litre per day, of normal fuel it would produce 669 kg CO_2e, whereas the equivalent biodiesel emissions would be 4.75 kg CO_2e. Using the same transport emission assumptions as above (685 g CO_2/ km), then you could drive that truck an extra 970 km before you would make up the difference in carbon emissions from fuel use in a single day.[2]

Q: What is biofuel?

A: There is now an increasing range of 'biofuels' available. Biofuels are specifically those made from crop-based resources, for example soya, palm oil, rapeseed and jatropha. Hydrated vegetable oil (HVO) and glycerine (or glycerol) also fall within this category of fuels. In contrast, the term biodiesel (or renewable diesel fuels) refers to fuels that can be made from recycled cooking oil (WVO) and animal fats.

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1. Source: Transport Research Laboratory & National Energy Foundation.
2. See the Carbon Emissions by Power Type Table, pg. 8 of this guide.

Q: Is Biofuel more environmentally sustainable than diesel?

A: Yes. Waste Vegetable Oil (WVO), the most common alternative fuel to red diesel used at events, is regarded has having a lower environmental impact because the carbon emitted when it is burned as a fuel has already been absorbed by the growth of the plant during its cultivation. In addition it is a recycled waste product.

Hydrogenated Vegetable Oil (HVO), on the other hand, is a virgin crop and is cultivated specifically for biofuels. This raises ethical questions on land usage; should communities be displaced, swathes of land deforested and water sources diverted to grow fuel crops?

Glycerine based fuels, a new type of fuels emerging in the market, are a natural byproduct of biodiesel production. Provided that the resources used in its manufacture are considered to be ethically sourced, i.e. no palm oil or virgin crop derivatives, then its environmental impact is very low.

Q: How important is the source of the biofuel I use?

A: The provenance of biofuel is very much part of how sustainable the fuel is considered to be, and this can sometimes be a complex issue. Nationally sourced fuels (such as WVO) can be a safe option in terms of guaranteeing their source. The provenance of other fuels can be less straightforward to ascertain. Ask your supplier for certification and avoid virgin fuels or fuels sourced from outside Europe.