Case study

Outdoor Event - Earthcore

Greener Live Performances

through energy efficiency

Background

Earthcore music, arts and lifestyle festival (Earthcore) is Australia's original electronic music festival, and has been a feature on the international festival circuit for over 20 years.

Held annually over 4 days in late November, the festival showcases live performances from international and local electronic music artists, and has become renowned for its cutting edge sound and visual displays.

This case study focusses on the 2014 Earthcore festival, held in Pyalong, Victoria.

Earthcore is a four-day music, lifestyle and arts festival, which includes onsite camping and is powered using temporary mobile generation.

Aspects of the festival include a lifestyle village with an extensive range of food, beverages and merchandise, an arts precinct, workshops, healing spaces, music across three stages, an outdoor cinema, and various entertainment activities.

At its peak in the mid-1990's, Earthcore drew crowds of up to 30,000, however as new festivals emerged, patron numbers declined, until operations eventually ceased in 2009.

In 2013 Earthcore re-emerged with new management approach and an increased focus on sustainability.

After staging a successful 20th Anniversary return festival in 2013 in Pyalong, central Victoria, the festival was held at the same site in 2014, attracting around 5,000 patrons.

Earthcore by numbers

- Festival duration: 4 days
- Operational hours: 120 hours
- Patrons: 4,660
- Staff and contractors: 550
- Stages: 3
- Camping and parking areas: 4
- Stallholders: 76
- Generators: 13
- Total generator capacity: (kVA): 830
- Total fuel consumption: (L): 3,472

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Drivers for energy efficiency

Drivers for energy efficiency within festival operations included:

Key Drivers

Financial: Improving energy efficiency has an associated financial benefit.

Environmental: Reduced use of fossil fuels reduces greenhouse gas (GHG) emissions;

Industry leadership: Demonstrating leadership in sustainable practices can have a positive influence on the festival supply chain, other festivals, and attending patrons;

Education: Festivals provide a good opportunity to raise awareness of energy efficiency best practices and technologies.

Stakeholder expectations: Rising consumer awareness means patrons now expect festival organizers to be green / socially responsible.

Compliance: Earthcore is required to operate in accordance with an environmental management plan addressing issues such as air quality, energy, and fuels management.

Reducing GHG emissions associated with energy generated from stationary sources (i.e. generators) was less of an influencing factor than it usually would be, because a large reduction in GHG emissions had already been achieved by relocating the festival to a venue closer to Melbourne, where about 80% of Earthcore's patrons originate.

This led to a significant reduction in total travel emissions, lowering the overall greenhouse footprint for the event (considering direct and indirect emissions).

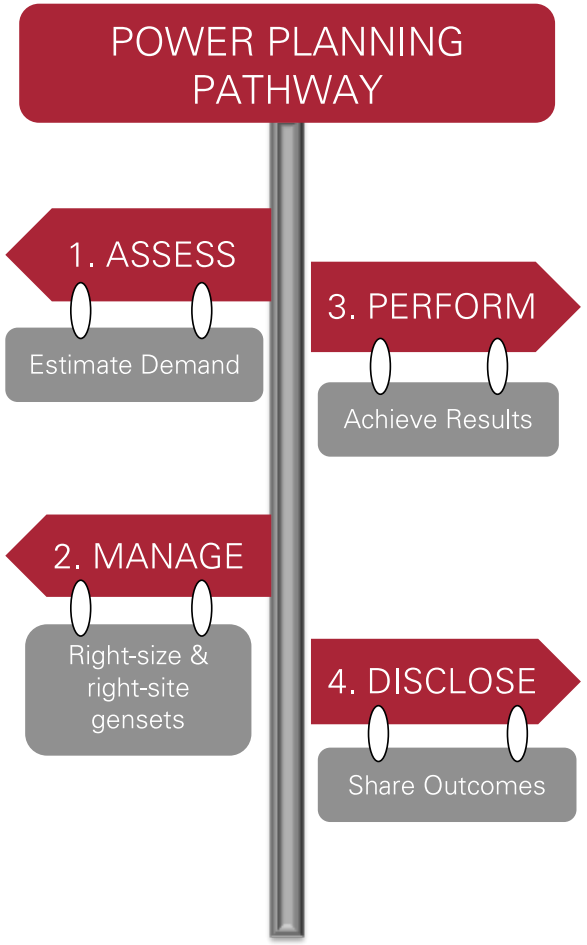
Overall, it was recognised by the festival organisers that embedding energy efficiency into event operations was a good way to provide multiple benefits, while also addressing industry / compliance obligations.

Energy Efficiency Opportunities

A systematic approach to identifying energy opportunities was undertaken, based on *ISO20121: Event Sustainability Management System*. The adjacent figure from the Energy Efficient Outdoor Events Fact Sheet [i] shows the approach undertaken, which led to the identification of energy opportunities in the following areas:

- Stages;
- Infrastructure;
- Traders; and
- Transport.

A Sustainability Policy was developed for the event, which was used to guide decision making during festival operations. The Policy included commitments to *"conserve resources by promoting renewable energy and adopting efficient practices"* and was communicated to employees, contractors, and patrons, who were also asked to adhere to these.



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Opportunities were assessed considering potential impacts and benefits of the approach, the cost to implement (i.e. equipment and labour costs), and reliability, with strategies adopted including:

- Investigating renewable energy options (e.g. solar generators);
- Maximizing use of passive energy;
- Incorporating energy requirements into contracts and agreements; and
- Incorporating efficient technology such as LED lighting into stage design.

Implementation

Generator siting, sizing, and distribution

Generator siting and sizing was primarily undertaken by the site electrician and site manager, working in tandem and drawing on their collective experience, as well as lessons learnt from the 2013 festival. An aim of this process was to adopt an event power plan which would allow optimal generator loading (around 80%) based on the total demand from individual uses connected to each generator.

Thirteen generators totalling 830 kVA of power output were used, as follows:

Size	Power distribution
125 kVA	Main stage lighting
125 kVA	Main stage audio
125 kVA	Lifestyle village (food, beverage, and merchandise traders)
125 kVA	Entertainment precinct (cinema, bar, artist compound, theme camps)
60 kVA	Hydra stage audio
60 kVA	Hydra stage lighting
30 kVA	Renegade stage
30 kVA	Emergency and medical compound
30 kVA	Site operations compound
30 kVA	Showers/toilets
30 kVA	Showers/toilets
20 kVA	Entry gate/ lighting tower
20 kVA	Carpark lighting towers

Rather than using a greater number of smaller generators, larger generators were used to distribute power within the festival on a precinct basis, as generators tend to perform more efficiently when connected to multiple areas. Only outlying areas requiring small power demand used single generators.

Powering Down

Stages are one of the largest power users at festivals, and powering down generators where possible should be regarded as 'low hanging fruit' for improving energy efficiency. The Earthcore main stage closes at 2am on the opening night, re-opens at midday the following day, and then runs continuously for the remainder of the festival. During the break, both main stage generators were completely powered down.

Where possible, generators servicing stages were powered down to conserve energy.

Generators servicing low energy demand uses such as carpark lighting were powered down during the day.

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Understanding power use requirements

Power usage requirements were identified for stakeholders participating in the event (e.g. artists, stage designers, stallholders, service providers, contractors etc.).

Traders

Prospective traders were asked about how they could incorporate energy efficiency measures into their respective role at the festival as part of the selection process.

Stages

Energy efficiency was considered during the stage design process, with adopted measures including maximising the use of LED lighting on the main stage.

Methodology

Generator Performance
To compare energy efficiency performance across the generators used, litres of fuel per hour per kVA was used as an indicator of efficiency, with lower L/hr/kVA indicating more efficient generator performance.

Emissions Performance
To calculate GHG emissions associated with stationary energy use, total litres of fuel used was multiplied by the fuel emissions factor for diesel (2.6), with results expressed as kilograms CO2-e.

Summary of Performance

Generator efficiency [ii]

The majority of generators ran continuously across the four days of the festival, however several of the smaller generators were utilised over a longer period by event crew and contractors, conducting site preparation and clean-up activities.

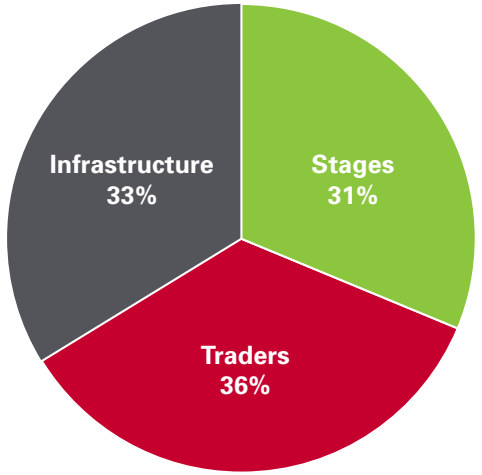
The most efficient generators were those which serviced the Hydra Stage (averaging 0.010 L/hr/kVA), Main Stage (0.024 L/hr/kVA), and Lifestyle Village precinct (0.045 L/hr/kVA).

The least efficient generators were the smallest (20 kVA) which were connected to low demand uses in outlying areas such as carpark and gate lighting towers.

Efficiency results indicate that the generators connected to multiple uses were more efficient than those connected to a single use.

Energy usage Breakdown

The breakdown of energy usage (below) is comparable to figures from a study of UK festivals [iii] which reported a breakdown of 31%, 33% and 36% for infrastructure, traders, and stages respectively).



Earthcore energy usage breakdown

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Fuel Consumption

Generator fuel consumption ranged from 0.515 to 5.895 litres per hour, with an average of 2.873 litres per hour.

Total fuel use per person per day was 0.718 (litres of diesel), which compares well with good practice benchmarks for music festivals with camping published by Julie's Bicycle [iv] (0.7 litres of diesel per person per audience day).

Greenhouse Gas Emissions

GHG emissions from generator use totalled 8,389.16 kg CO2-e, which is approximately equivalent to the annual emissions from[v]:

Passenger vehicles	**1.8**	
Home's energy use for one year	**0.8**	

Energy Efficiency Outcomes

Energy efficiency outcomes arising from Earthcore festival which are transferrable to other festivals included:

- Development of an event Sustainability Policy as a basis for influencing participants to incorporate energy efficiency into their respective roles.
- Minimising the number of generators and sizing them for intended loads to allow generators to run at higher efficiencies.
- Maximising use of LED lights and energy efficient technology in stage designs.
- Connecting generators to multiple uses for improved efficiency.

References

[i] *Energy Efficient Outdoor Events – Temporary Power Fact Sheet, Live Performance Australia*

[ii] *Australian National Greenhouse Accounts: National Greenhouse Accounts Factors, Australian Government: Department of Climate Change and Energy Efficiency, 2012*

[iii] *Reducing Electricity Related Greenhouse Gas Emissions at Music Festivals, Marchini, Fleming, Maughan, De Montfort University, 2014.*

[iv] *Energy Efficiency and Renewable Energy Use for Festivals and Outdoor Events Training Handbook, EE Music, 2014.*

[v] *http://www.epa.gov/cleanenergy/energy-resources/calculator.html#results*

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