

ZERO EMISSION MOWING

The case for change



Report prepared for Councils
August 2017

Landscape and mowing operations are a significant contributor to noise and air pollution and to Australia's overall greenhouse gas emissions.

Zeromow is a non-profit initiative aimed at creating awareness that there are powerful, reliable, clean and quiet battery electric alternatives available to petrol powered mowing and gardening equipment.

The vision of Zeromow is to see the rapid transition to battery electric equipment, powered by 100% renewable energy, reducing noise and air pollution and producing zero greenhouse gas emissions.

We hope that this report will provide the impetus for change and encourage individuals, property owners and landscape and mowing maintenance professionals to reduce or eliminate their use of fossil fuel powered equipment in favour of cordless battery powered alternatives.

Sally Perini

Director

Zeromow Pty Ltd

E: info@zeromow.com.au

M: 0488 066 948

W: www.zeromow.com.au

ABN: 92614682076

For the last hundred years lawn maintenance practices were based on fossil fuels.

The 21st Century model will now be all-electric, with lithium-ion batteries.

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KEY FINDINGS

- The use of fossil-fuel powered outdoor mowing and landscaping maintenance equipment is a growing source of air and noise pollution and greenhouse gas emissions.
- Advances in battery technology mean there are now powerful, clean and quiet cordless battery alternatives (mowers, leaf-blowers, brush cutters, hedge-trimmers and chainsaws) available to replace petrol powered mowing and landscaping equipment.
- By encouraging mowing and landscape contractors to make the switch to the latest lithium-ion battery technology, Councils can help to provide a cleaner and quieter environment in which people can live, work, shop and eat.
- Battery powered outdoor equipment is cheaper to run and maintain than fossil fuel equivalents, and can be powered by 100% renewable energy. Councils can provide contractors with access to onsite power produced from renewable energy sources, such as rooftop Solar PV.
- The use of battery powered equipment will reduce workers exposure to hazardous noise levels, fumes and vibrations from fossil fuel powered equipment.
- Switching to battery equipment will reduce contamination of local water and soil by spilt fuel and oil. Spent air and oil filters, spark plugs and cleaning solvents won't end up in land-fill.
- The use of zero emission outdoor mowing and gardening equipment is consistent with the sustainability objectives of the Council.



WHY WE NEED ZERO EMISSION ALTERNATIVES

Greenhouse gas emissions and air pollution

The use of fossil fuel powered outdoor mowing and landscaping equipment, such as mowers, leaf blowers, brushcutters, hedgetrimmers and chainsaws, contributes significantly to noise and air pollution and to greenhouse gas emissions.

The demand for outdoor mowing and gardening equipment is projected to increase in the coming decades along with Australia's population growth. Emissions from the landscape and mowing maintenance sector will continue to increase, unless there is a switch to lower-emitting alternatives.

*2016 was the hottest year on record globally and the 40th consecutive year with above average global temperatures. The scientific case for urgent climate action could not be clearer. We need to lower greenhouse gas emissions urgently to limit global warming.*¹

It is estimated that Australia could prevent the creation of over 1.9 million tonnes of CO₂ over the next 20 years if we were to transition to lower-emitting outdoor equipment.²



*A two-stroke leaf blower used for one hour can produce as much hydrocarbons as **150 cars** over the same time period.*



Fossil fuel powered outdoor equipment are especially high polluters relative to their engine size and usage. According to the Department of the Environment, non-road spark ignition engines and equipment (NRSIEE), which include outdoor lawn and garden maintenance equipment, can contribute up to 10% of overall level of air pollutants, including particulate matter, oxides of nitrogen, volatile organic compounds, carbon monoxide and a range of other air toxins.³



*One hour use of a brush-cutter produces around the same emissions of air pollutants as **ten cars** operated over the same period*

Health Impacts

The World Health Organisation states that “air pollution is now the world’s largest single environmental health risk”.⁷ The collective emissions from fossil-fuel powered machines contribute significantly to primary health risks, including lung disease (such as asthma, bronchitis, emphysema and lung cancer). It is estimated that over \$1.7 billion could be avoided in potential health costs if Australia was to transition to lower emitting alternatives.³

The use of fossil-fuel powered landscape maintenance equipment also produces prolonged and frequent periods of loud noise, especially in spring and summer, and often on a daily basis in residential areas, schools, shopping areas and workplaces. The World Health Organisation identifies that there are significant health effects and impacts on quality of life from exposure to environmental noise, including noise induced hearing impairment, disturbance of rest and sleep, interference with communication and social interaction and the creation of stressful levels of frustration.⁴

Waste

The operation and maintenance of fossil-fuel powered mowing equipment contributes to solid and toxic waste. Residual oil can end up in landfill or spilled on the ground. Harsh chemical solvents are sometimes used to clean petrol engine carburetors, spark plugs, fuel and air filters as well as decks and the exterior of engines.

There needs to be a rapid transition to battery-electric outdoor equipment, powered by 100% renewable energy, reducing noise and air pollution and producing zero greenhouse gas emissions.



BATTERY POWERED EQUIPMENT

CLEAN, QUIET, POWERFUL

FOSSIL FUEL POWERED EQUIPMENT

- Noisy
- Heavy
- Often difficult to start
- Fumes
- High maintenance
- Considerable vibration
- Leakage and spillage of petrol and oil
- High emitting
- Inefficient
- Costly to run and maintain

BATTERY POWERED EQUIPMENT

- Quiet
- Light
- Simple to use, no cords to pull
- No fumes
- Low maintenance
- Minimal vibration
- No petrol or oil
- Zero emissions
- Efficient
- Cheaper to run and maintain



Improvements in battery technology

Advances in battery technology and reductions in battery cost, mean there are now high performance, affordable cordless battery alternatives available to petrol based equipment.

The last few years have seen impressive advances in lithium-ion battery technology. The high energy density batteries now used in many of the brands of cordless outdoor equipment have longer running times and shorter charging times. They can deliver petrol like performance without the harmful emissions.

Cordless battery powered mowers and gardening equipment use interchangeable lithium-ion batteries. The batteries all plug in, just like in a cordless drill. They can be quickly and easily removed and exchanged to power the mower and equipment all day long.

Reduced fuel and maintenance costs

Savings on fuel, maintenance and operation quickly offset any additional upfront cost of the batteries. Operators start saving on fuel from day one.

If the batteries are charged using electricity produced from 100% renewable energy, such as from rooftop Solar PV, there can be zero 'fuel' costs.

Increased Sales Momentum

Most outdoor equipment manufacturers are now producing cordless battery powered equipment. A list of these manufacturers is provided in *Appendix A*. The investment being undertaken by these manufacturers is a clear indication of the future of cordless battery equipment.

Currently in Australia there is no emission standard on outdoor equipment. However, legislation is due to be introduced this year 2017, that will see regulations placed on emissions from NRSIEE². It is predicted that the sale and use of battery powered outdoor equipment will rapidly accelerate when this comes into effect.

HOW COUNCILS CAN HELP

There is an opportunity for Councils to build on the strong environmental sustainability initiatives that they are currently implementing.

Councils can help to provide a cleaner and quieter environment for residents, businesses and visitors to the area by encouraging mowing and landscape contractors to make the transition to the latest lithium-ion battery technology.

The use of zero emission outdoor mowing and gardening equipment, together with the increasing rollout of rooftop Solar PV and future provision of EV charging, will position the Council as a leader in sustainability and clean energy technology and deliver a positive environmental legacy.

The Council can facilitate the adoption of battery powered outdoor equipment by:

1. Encouraging Council landscape and mowing contractors to make the transition to zero emission equipment

2. Providing contractors with access to electricity that is produced from renewable sources, such as rooftop solar PV.

3. Offering demonstrations and in-field trials of battery powered equipment, as well as consultation, training and safety.



Benefits

The use of battery powered outdoor equipment will:

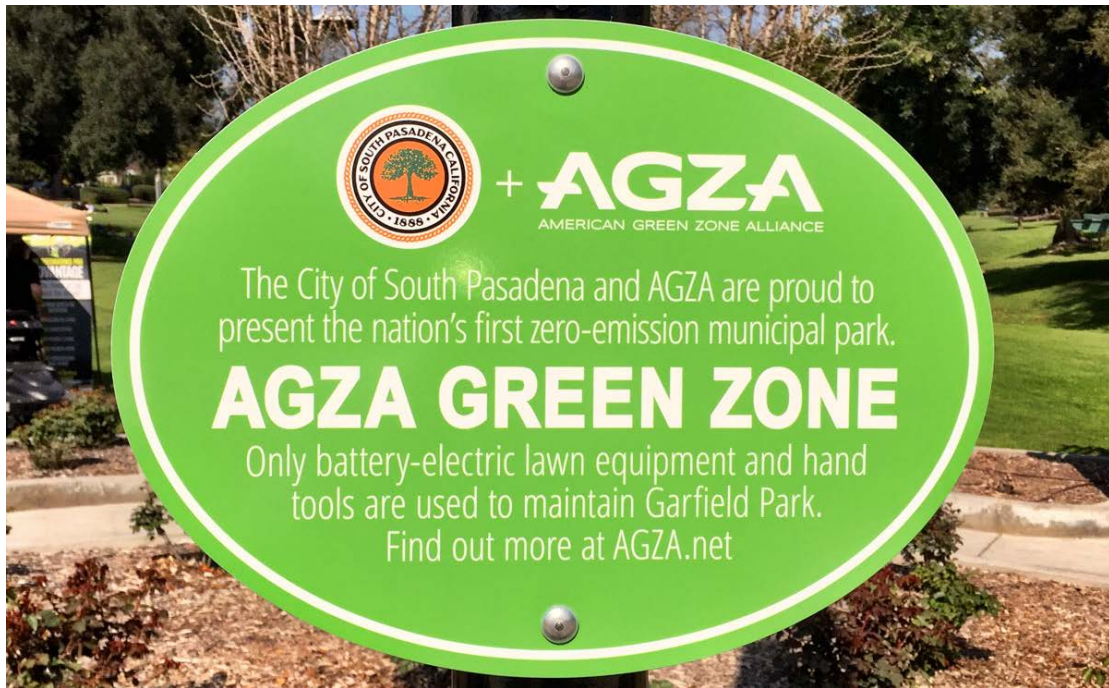
- Create a cleaner, quieter and healthier environment for everyone to enjoy.
- Send a positive sustainability message and be in keeping with the stated sustainability objectives of the Council.
- Position the Council as a leader in clean energy technology.
- Attract visitors to the area who place a premium on a clean and quiet environment.
- Encourage other Councils and landscape and mowing contractors to make the transition to zero emission alternatives.
- Encourage individuals who use fossil-fuel powered outdoor equipment at their own properties to make the transition to zero emission battery powered equipment.
- Improve the health and working conditions for landscape and lawn maintenance workers.

CASE STUDY

THE CITY OF SOUTH PASADENA, USA

In September, 2016 the City of South Pasadena was officially recognized as the first American Green Zone Alliance (AGZA) *Green Zone City* in the United States.⁵

The AGZA Green Zone certification means that all grounds maintenance on municipal properties - mowing, hedging, edging, trimming, leaf-blowing and sawing - are serviced exclusively with low-noise zero emission, battery-electric machinery and manually held tools.



An AGZA certification sign in Garfield Park, South Pasadena

The city has 13 properties spanning 41 acres, with 20 acres of mowing, 15 acres of leaf-blowing hardscapes, one acre of hedge trimming and over 11kms of edging.

AGZA has calculated that the adoption of the new battery-electric equipment is preventing the creation of 31 tons of pollutants into the local community every year. Families, schools and businesses of South Pasadena are enjoying quieter, cleaner and more peaceful public spaces. Groundskeepers are not exposed to hazardous noise levels and toxic fumes from out-dated fossil fuel powered equipment, and considerable cost savings have been made on fuel and maintenance.

The AGZA Green Zone model has been successfully reproduced in the New York towns of Southampton and Huntington, as well as establishing the nation's first zero-emission golf course in California. AGZA is in various stages of discussion and development t in several other cities, counties, schools and sports complexes.⁵

“In keeping with our pledge to become a more sustainable city, South Pasadena worked with AGZA to transition Municipal grounds maintenance from fossil fuel based operations to advanced cordless battery equipment, manual tools and ecologically friendly landscape practices. As a result, the city has been able to eliminate all fossil fuel consumption and toxic emissions, and has reduced noise by half”

Michael Cacciotti, Mayor Pro-Tem of The City of South Pasadena. ⁵



“One year’s worth of zero-emission landscaping at South Pasadena Garfield Park will prevent the release of 80,000 pounds of greenhouse gases in one year.” ⁶



LANDSCAPE AND MOWING MAINTENANCE PROVIDERS

Contractors who make the switch to zero emission battery powered equipment will be able to provide the same level of performance and quality of work, without the harmful emissions.

Making the switch will have several benefits, along with reducing air pollution and greenhouse gas emissions:

Savings on fuel and maintenance

There is zero fuel, zero oil, no spark plugs or oil filters and minimal routine maintenance. Cost savings add up quickly since the cost to recharge batteries is dramatically cheaper than the cost of petrol and oil.

For a single commercial grade battery powered leaf-blower, it is estimated (based on the US experience) that contractors can expect to see a return on their investment in as little as 12 to 18 months.



Convenience

Making the switch to cordless battery powered equipment means the convenience of not having to carry containers of highly inflammable fuel in the back of vans and trailers. No more fuel spillages or leaks, no breathing toxic volatile organic compounds (VOCs) or skin contact with poisonous chemicals, and no more wasted time refuelling containers at petrol stations.

Reduced operator fatigue and reduced health risks

- Cordless battery equipment is much lighter than petrol equivalents making operation a lot more enjoyable for the user.
- There are no cords to pull. Power is instant at the touch of a button.
- There is minimal vibration.
- The batteries are easy to remove and take seconds to lift out and replace.
- The equipment is much quieter than petrol equivalents so operators do not have exposure to long-term high levels of noise.
- Cordless battery equipment produces zero emissions so operators are not put at risk from the adverse health impacts of repeated exposure to harmful air pollutants.

The future of quieter, cleaner, healthier mowing and landscape maintenance requires vision and commitment.

First Mover Advantage

Landscape and mowing contractors and mowing services who use zero emission battery powered equipment will:

1. Differentiate themselves in a competitive market.
2. Attract customers who place a premium on clean, quiet environments, such as business parks, schools, hospitals, parks, retirement villages and municipalities.
3. Send a positive sustainability message and encourage other contractors to make the transition.

FREQUENTLY ASKED QUESTIONS

Charging the batteries

The batteries are removed from the equipment and charged using a fast-charger that can fully charge from empty to full in as little as 30 minutes, depending on battery size and charger speed. The charger can be plugged into any 10 amp powerpoint. If contractors have access to power on the job they can plug in the fast charger and replenish the batteries during the day if required. The fast charger is light and compact.

Some manufacturers also offer back-pack battery options with high capacity for long lasting periods of operation.

If onsite power is not available it is possible to carry a mobile power unit (lithium-ion battery bank). This gives contractors flexibility if they are away from a power supply connection. The battery bank can be fully charged overnight.

As a supplement, some contractors have installed solar panels on the roof of their vehicle to provide a renewable source of energy to recharge batteries during the working day.

Equipment running time

The latest lithium-ion battery technology delivers high energy density, long running times and short charging times. Running time per charge will vary between equipment and depends on a number of factors, including terrain, length and moisture content of the grass etc. A guide to approximate running times can be found on most manufacturers' websites.

Battery life

The batteries can be charged several hundred times without any measurable loss of energy, even when they are only partially discharged. Unlike previous generations of lead-acid NiCad and NiMh batteries whose power faded during operation, the power curve of advanced lithium-ion batteries remains constant over operating time.

A guide to battery life can be found on most manufacturers websites.

Renewable energy

The batteries can be recharged using electricity produced from clean renewable energy sources, such as rooftop Solar PV, or solar with battery storage. Alternatively Greenpower can be purchased from any electricity retailer.

If battery electric tools are charged using electricity produced from coal-fired power stations, they still have a smaller carbon footprint than those that burn petrol, due to the efficiency of brushless electric motors compared to petrol engines.

CONCLUSION

By making the switch to lower emitting battery powered alternatives, that can be charged using electricity produced from 100% renewable energy, landscape contractors, mowing services and individuals can help to improve air quality, reduce health risks, reduce noise pollution and most importantly, reduce greenhouse gas emissions.

We hope that Councils, Business Parks, schools, hospitals, retirement villages, shopping centres, commercial properties and anyone who uses landscape and mowing services, will encourage contractors to make the switch to clean and quiet battery-electric outdoor equipment, and in doing so, help to fast-track the transition to a clean energy future.

“With powerful lithium-ion batteries, fast chargers, brushless motors, very minimal maintenance, extraordinarily low operating costs, thousands of charge cycles, and half the noise of gasoline, the lawn and garden industry is sprinting into the biggest transformation since the invention of the mower almost 200 years ago.”⁵



APPENDIX A

Table 1: Manufacturers of cordless battery powered outdoor mowing and garden equipment

Manufacturer	Website
Stihl Australia	http://www.stihl.com.au/STIHL-Products/01608/Battery-Power-System.aspx
Husqvarna Australia	http://www.husqvarna.com/au/products/battery-series/
Ego Power Plus	https://egopowerplus.com.au/
Victa	https://www.victa.com/au/en_au/products/battery-powered.html
AEG Power Tools	https://aegpowertools.com.au/products/outdoor-power
Bosch	https://www.bosch-garden.com/au/en/garden-tools/garden-tools/electric-lawnmowers-199956.jsp
Ryobi	http://www.ryobi.com.au/outdoor/products/home
Makita	https://www.makita.com.au/power-garden/platforms/18v-18vx2
Greenworks*	https://greenworkscommercial.com/
Mean Green Mowers*	http://www.meangreenproducts.com/

* Currently unavailable in Australia

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Backcover photo: Fully electric Mean Green ride-on mower that gets up to 7 hours running time per charge (only one in Australia), and the fully electric Renault Kangoo ZE van.

ABOUT THIS REPORT

There is a growing awareness of the need for more sustainable alternatives to reduce greenhouse gas emissions and pollution.

Landscape and mowing operations - mowers, leaf-blowers, brush-cutters, hedgetrimmers and chainsaws - are a significant contributor to noise and air pollution, and to Australia's overall greenhouse gas emissions.

This report has been prepared by Zeromow Pty Ltd, a non-profit initiative that is helping to raise awareness that there are clean, quiet and powerful battery-electric alternatives available to fossil fuel powered outdoor equipment and vehicles.

If your organization would like to explore any aspect of this report please use the contact details below.

Zeromow Pty Ltd

ABN: 92614682076

PO Box 3013

Grose Vale NSW 2753

E: info@zeromow.com.au

W: www.zeromow.com.au

