



November 29, 2021

California Air Resources Board  
1001 I Street  
Sacramento CA 95814

Dear CARB Board Members,

The National Association of Landscape Professionals (NALP) is the national trade organization representing the \$98 billion landscape industry employing over 1.4 million employees in the United States. Member companies specialize in lawn care, landscape maintenance, tree care, irrigation and water management. Landscape professionals throughout the nation work daily performing essential services to homes and businesses to maintain their landscapes, sustain the environment and enhance and maintain healthy and safe green spaces.

We are writing to you on behalf of our member companies concerning *Proposed Amendments to the Small Off-Road Engine Regulations: Transition to Zero Emissions*, Initial Statement of Reason (ISOR) published October 12, 2021. We are respectfully requesting you to support an amendment to the ISOR and delay implementation of the transition to Zero Emissions Equipment (ZEE) ONLY for commercial/professional grade small off-road engines (SORE).

NALP and the California Landscape Contractors Association (CLCA) submitted a letter<sup>1</sup> articulating this position to CARB staff on November 9, 2021. These comments echo many of the same points made in that letter but also provide greater detail and context to support our position of record into the public docket for the proposed SORE rule.

We share Governor Newsom and other California policymakers' intent to reduce carbon emissions from gas-powered landscape equipment as quickly as possible. Still, we must do so in a responsible manner that mitigates the negative financial impact on the landscape industry. The landscape industry in California is a \$9 billion industry annually with more than 55,000 companies employing over 133,000 employees; 99% of these businesses are considered small businesses and a vital industry for entrepreneurs throughout the state of California, many of which are Latino, or minority owned.

Landscape professionals work every day to take care of California's green spaces – we care deeply about the environment - so we support a responsible transition to zero-emission equipment. However, the two-year timeline is simply too fast of a transition for commercial users. We believe that CARB can accomplish their goals by extending the time to transition to

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<sup>1</sup> See Appendix A "CLCA and NALP Letter to CARB" November 9, 2021

zero emission “commercial/professional grade” equipment beyond 2024 but maintain the 2024 end of sale date for ZEE residential SORE. We do not believe that CARB has adequately addressed the technical feasibility and impacts for COMMERCIAL, not residential uses. In these comments we will detail the following:

- I. Technical Feasibility is Inadequate Based on
  - a. Performance
  - b. Cost
  - c. Infrastructure
- II. The Solution
  - a. Delay implementation on commercial/professional grade equipment
  - b. Numbers and life cycle of commercial vs. residential equipment
  - c. Support OPEI and other industry alternatives
- III. CA AB 1346 and Legislative Intent
- IV. Funding & Transition
  - a. Funding
  - b. Education & training
  - c. Recycling
- V. Conclusion

## **I. Technical Feasibility**

The Clean Air Act (CAA) is the federal statute that outlines the statutory and regulatory paradigm that emissions are regulated in the United States. Under the CAA, Congress delegated to California the exclusive authority to also regulate emissions but only after being granted a waiver that must be approved by the U.S. Environmental Protection Agency (EPA). The other 49 states are federally preempted to act in this manner until California has been granted this waiver.

In order to obtain this waiver, the California standard being approved by EPA must:

1. California’s standards are **at least as protective as federal standards**, and that **the state’s determination of that fact was not arbitrary and capricious**;
2. California’s standards are needed to meet **compelling and extraordinary conditions**.
3. California’s standards are not inconsistent with certain Clean Air Act provisions related to **technical feasibility and lead time to manufacturers**.<sup>2</sup>

When considering the technical feasibility EPA will look at both technology **performance** and **cost**<sup>3</sup>. The problem with the CARB proposal is that CARB failed to adequately assess the technical feasibility with compelling quantitative and qualitative data and a lack of engagement

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<sup>2</sup> California Air Resources Board (CA.gov) “California and the Waiver: The Facts”

<https://ww2.arb.ca.gov/resources/fact-sheets/california-waiver-facts>

<sup>3</sup> U.S. Environmental Protection Agency “Setting Emissions Standards Based on Technology Performance”

<https://www.epa.gov/clean-air-act-overview/setting-emissions-standards-based-technology-performance>

with the landscape industry earlier in the process. Additionally, CARB does not sufficiently address the differences between commercial and residential equipment and the heightened requirements and impacts on commercial businesses that rely on this equipment to provide for their income.

#### **a. Performance**

Equipment performance and run-time are common concerns for landscape professionals and present technological challenges that must be overcome for widespread use of zero-emission equipment (ZEE) landscape equipment. Unlike a homeowner that uses an electric powered leaf blower or mower for less than an hour, maybe in a given week, the landscape industry is operating commercially using this equipment daily, under rigorous conditions and during long durations. Also, many landscape professionals operate on commercial properties like corporate campuses, parks, resorts and other large green spaces which demand stronger performance and power capabilities. Unfortunately, the available ZEE is not capable of this sort of use pattern currently. Equipment such as riding mowers and leaf blowers present some of the largest challenges with lack of run time and power for both being significantly different than their most modern gas-powered counterparts.

CARB relied upon a survey conducted by California State University of Fullerton (CSUF) to compile a large portion of their data. Within this survey it was concluded that only 3% of chain saws, 3.5% of lawn mowers, 0.3% of riding mowers, and 5.9% of trimmers used by professional landscape companies in California are ZEE, compared to over 50% for residential homeowners.

**This low adoption rate is not due to an unwillingness to use ZEE equivalents but rather evidence that the equipment is not technologically capable to be the exclusive equipment used by commercial landscape companies at this time.**

During trial programs that CARB has relied upon to form their proposal, equipment was provided to groundskeepers. One of these trial programs involved groundskeepers for the Los Angeles Zoo. Important to note that these are groundskeepers in a static location, not a landscape professional crew that is traveling from site to site. The problems identified below will only be compounded by a landscape professional moving around from site to site. This was the opinion of end users at the zoo:

*“Several of our employees had trouble with the battery life and power output of the equipment when compared to gas powered equipment. Our surveys also concluded that most electric cutters and trimmers are inadequate for the time being. Survey results did not give us enough information to recommend a full overhaul of gas equipment for electric powered tools. Low user scores regarding being able to perform "normal work" when using the equipment. Husqvarna 436LiB worked well. The main negative takeaways from our crew was the lack of power output when compared to gas-powered*

*equipment and battery life of electric equipment (including remember to charge the equipment the day before rather than fill up with fuel as needed). ”<sup>4</sup>*

NALP also conducted a survey<sup>5</sup> in conjunction with CLCA to poll professional landscape companies in California. Both performance and cost remain tremendous hurdles, specifically for the larger commercial equipment that requires significantly more run time and power. From a performance perspective the industry continues to hear from landscape professionals about ZEE landscape equipment:

- The power is just not comparable yet
- Impossible to use exclusively on large scale commercial jobs like HOAs, resorts, business parks and other public and commercial green spaces
- Requires too many batteries to conduct their job function in an efficient manner
- Charging issues in the field and in the workshop
- Durability concerns
- Batteries are too heavy
- Cannot mow slopes on riding mowers because of the weight issue
- Mow times are longer and batteries cannot last a full work day
- Leaf removal during seasonal changes is very difficult
- Debris removal to mitigate fire spread is significantly more difficult
- Lack of dealers and maintenance shops to support transition
- Batteries are not interchangeable between brands

Additionally, some specific concerns from landscape professionals that participated in the survey include:

*“Product availability. While many products are available and the technology is advancing, commercial use electrical hand-held equipment is still limited and presents challenges. Product reliability, charging station access, and maintenance operations are just a few challenges that I feel are at the forefront of the issue.”*

*“Durability of the machines, the batteries are so heavy the frame has to be light. Mowing slopes, they are so heavy they don’t hold hills. Lack of repair expertise loyalty. Parts are difficult to acquire and take a long time to get. Battery life in heavy cutting conditions and longer mow times due to double cutting.”*

*“Blower power and battery life especially during leaf removal. Building out branch charging infrastructure is also a challenge as it is costly and often requires rewiring the whole building to supply enough power to recharge a whole branch.”*

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<sup>4</sup> Survey of Small Off-Road Engines (SORE) Operating within California: Results from Surveys with Four Statewide Population, Prepared by the Social Science Research Center (SSRC) at CSU, Fullerton (May 15, 2019)

<sup>5</sup> See Appendix B “CLCA and NALP Battery Powered Equipment Survey” CLCA conducted the survey separately from NALP but the data was then merged. CLCA polled California landscape companies in September 2021 while NALP conducted the same survey in June 2021 with larger national companies that have operations in California. NALP and CLCA presented this information through six of the companies that participated in the survey to CARB staff on October 13, 2021.

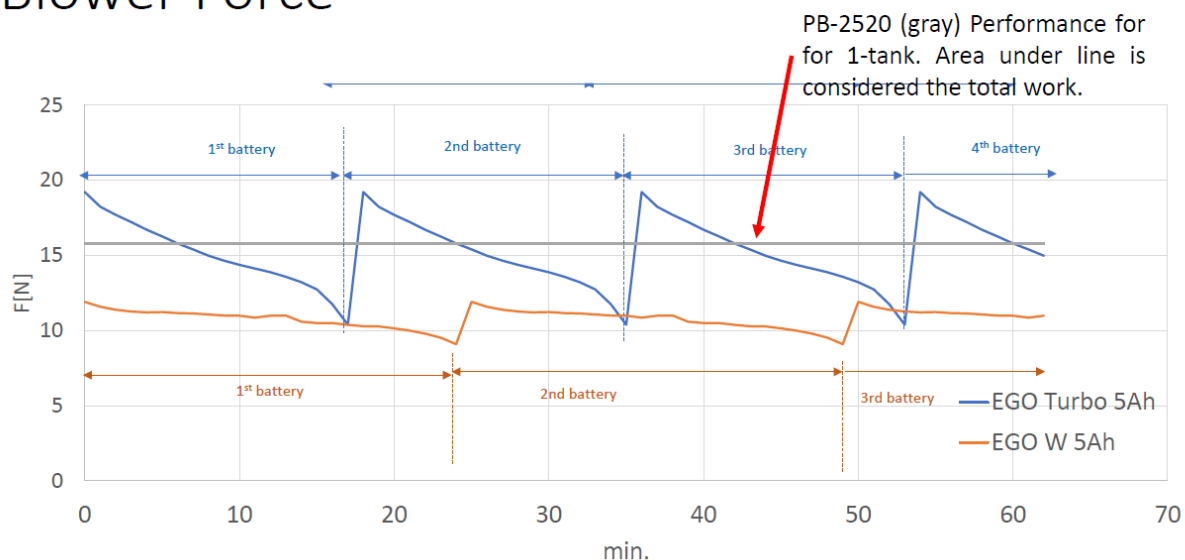
This is some of the most compelling evidence NALP can provide in support of our position and echoes the sentiment of what we hear from our members on this issue daily, not only in California but throughout the Nation.

NALP also acknowledges that in some instances companies have been able to successfully transition, detailed in NALP survey results. BUT those companies are significantly in the minority and operate in very affluent and wealthy areas. We highlight this fact because our understanding is that the cost increase for using only ZEE is approximately a 30%-40% increase over average industry pricing for the customer. This point is critically important as this proposed rule will further disadvantage small and minority owned businesses, but ALSO those lower income communities they service that deserve properly maintained healthy green spaces at affordable prices.

Unfortunately, CARB seems to be putting a greater weight and emphasis on the small minority of companies that are transitioning. CARB has minimized the fact that all the data that both CARB and NALP have collected via both surveys indicate that the equipment is lacking for commercial/professional purposes and the vast majority is not ready for nor can accomplish a complete transition in only two years.

To further support the performance deficiencies is data from a report<sup>6</sup> provided by a major equipment manufacturer that produces ZEE and non-ZEE SORE.

## Blower Force



The graph clearly shows that a ZEE blower is not comparable at this time. The performance of the ZEE immediately begins to decline the moment it begins until the battery dies only 18 minutes later, while the gas-powered blower maintains a strong performance the entire hour and without unnecessary downtime to change batteries.

<sup>6</sup> See Appendix C Industry technology feasibility Comparison of Handheld Leaf Blowers

## **b. Cost**

Costs associated with a complete transition is a significant impediment for the landscape industry; however, understanding how the increases actually impact the landscape industry has not been fully appreciated by CARB. Frustratingly, CARB seems to acknowledge significant cost increases are associated with a complete transition yet nothing CARB has put forth makes accommodations for the landscape industry. CARB's approach seems to lack any attempt to ease this transition on the industry and pointedly assumes small businesses and the customers they service will just have to bear the brunt of this transition.

*"Sole-proprietorships and other small business landscapers may be significantly affected by the direct economic impacts of the Proposed Amendments. Small business landscapers make up more than 99 percent of landscaping businesses in California. The higher upfront costs of ZEE and the batteries needed to power ZEE for a full work day may be a significant expense for many landscaping businesses."*<sup>7</sup>

The acknowledgement by CARB that the costs is significant but a failure to provide some additional timeline delays for commercial uses or incentives to ease the transition is tremendously disappointing. NALP asserts that pursuant to the Clean Air Act that the failure by CARB to make accommodations to account for the economic impacts associated with the cost on the industry that relies on this equipment will result in EPA rejecting California's waiver.

In examining the cost, the first thing to consider is the actual equipment. For example, commercial-grade handheld electronic leaf blowers have significant cost concerns for the landscape industry. One popular manufacturer's electric leaf blower retails for approximately \$350 - \$400, similar to the same manufacturer's gas-powered unit. However, to use this electric leaf blower for an entire workday requires the purchase of extra batteries and chargers thus, driving the up-front cost to exceed \$3,000. More alarming is when you look at larger equipment. Popular commercial gas-powered riding mowers range from \$8,000-\$11,000 while the few commercial riding ZEE mowers available with 4-5hr run time range from \$16,000 to 21,000+. These are significant up-front investments for landscapers, the majority of whom are sole-proprietor (single employee) businesses, with no guarantee they will recover the difference based on energy costs and maintenance.

In other instances, landscape companies switching to battery powered equipment may need to also purchase portable generators to charge their equipment. The Portable Generator Manufacturers Association concluded that 2000W zero-emission generators, the size needed to power critical home appliances in the event of a power outage, would provide continuous power for just 35 minutes to 3 hours (depending on the unit), and cost between \$1,300 and \$6,000; meanwhile, popular gas-powered 2000W generators can run continuously, and range from \$300 to \$500.

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<sup>7</sup> California Air Resources Board "Public Hearing to Consider Proposed Amendments to the Small Off-Road Engine Regulations: Transition to Zero Emissions" Staff Report: Initial Statement of Reasons (p. 96) October 12, 2021

Now let's talk batteries. Batteries remain a significant barrier for the transition to occur based on cost, amount needed, how they're charged and how they're disposed. Run time for the batteries varies by equipment. For a rider mower the run time for a battery is somewhere between 4 and 6 hours, while for handheld equipment that run time is somewhere between 10 and 30 minutes per battery. With this data we examined what a typical three-person landscape crew may require from a battery standpoint.<sup>8</sup>

|                | Active Use Time of Equipment per lawn | X 20 Lawns          | # of Batteries Needed |
|----------------|---------------------------------------|---------------------|-----------------------|
| Rider Mower    | 20 Minutes                            | 6 hours, 40 minutes | internal              |
| String Trimmer | 10 Minutes                            | 3 hours, 20 minutes | 14 batteries          |
| Edger          | 5 Minutes                             | 1 hour, 40 minutes  | 10 batteries          |
| Blower         | 5 Minutes                             | 1 hour, 40 minutes. | 10 batteries          |

Looking at this data it would take an average crew 34 batteries in ONE day to complete a typical day; while the rider mower would not have enough charge to complete all 20 lawns. The rider mower is an important piece of landscape equipment that currently has the largest cost and efficiency hurdles between gas and ZEE models. Switching batteries this frequently reduces productivity and efficiency for the landscape crew. The costs associated with those batteries:

| Battery Cost                                                                           | Charger Cost                                                                          | Total                                                                                                     |
|----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| \$179<br><i>-price based on retail price at Home Depot from a leading manufacturer</i> | \$50<br><i>-price based on retail price at Home Depot from a leading manufacturer</i> | \$229 x 34 = \$7,786<br><i>just for this <b>one</b> crew which also excludes the riding mower battery</i> |

Considering that the batteries will need to be replaced every 300-500<sup>9</sup> charge cycles which would mean that they would likely need to be replaced at least once during the product's life cycle we can estimate a total for this three-man crew to be (2 x \$7,786) = \$15,572. The costs associated with these batteries is significant and charging each battery for approximately 8 hours will add an additional \$5 to \$6 daily in energy costs associated for charging each battery prior to each day the battery is used.

Compatibility is also an issue for batteries. Battery technology for ZEE is proprietary information and therefore the batteries are not compatible between different manufacturers. This

<sup>8</sup> Similar to the universe of companies that NALP polled for the CLCA/NALP Survey, NALP created an advisory group of larger national landscape companies. This group provided NALP with a range of data and technical guidance and the information in this table are conservative estimations. This scenario is based more off residential services as they are simpler to model based on quarter acre lots. The reality is that total batteries needed is likely higher in exclusive commercial and larger settings where landscape services are performed.

<sup>9</sup> GrePro Blog "The Charging Cycles of Lithium-Ion Polymer Batteries" March 25, 2020  
<https://www.grepow.com/blog/charging-cycles-of-lithium-ion-polymer-batteries/>

presents a problem because it would require landscape companies to move to a single manufacturer approach rather than using different equipment from different manufacturers. This could lead to companies being locked into one manufacturer, reduce competition, and strengthening manufacturer influence over the company based on their specific needs.

The last issue with cost that we want to address is labor. ZEE lacks the same performance capabilities detailed above and requires frequent battery changes both of which reduce the productivity and efficiency of a landscape crew in the field. This reduction in productivity puts landscape companies in a tough spot since they are already faced with a historic work force crisis. This proposal pushes an industry that cannot find enough willing and capable employees to now rely on less efficient equipment that takes more time and requires additional labor to perform the same task in the same amount of time to remain competitive and profitable.

All of this considered together (equipment cost, battery cost, increased labor) represents significant cost impediments to make a complete transition. We believe in addition to extending this transition beyond 2024 that a much more robust rebate program must be properly funded and made available prior to moving forward with any restrictions on the sale of non-ZEE SORE.

### **c. Infrastructure**

The infrastructure on both the micro and the macro level is not currently in place to fully support this transition. On the micro level landscape companies will need to fully retrofit their shops to support the amount of voltage that will need to be used each day to safely charge all of the ZEE equipment. Vehicles used to transport crews and equipment will also need to be redesigned to support charging stations to ensure complete operational capabilities once out in the field, this will raise the overall “cost” factor detailed above significantly.

On the macro level the landscape industry continues to have concerns that infrastructure issues in the state of California could cripple their ability to operate. California has ranked #1 in the United States for power outages recently<sup>10</sup>. Even worse, power outages are on the rise in California. There were 25,281 blackout events in 2019, a 23% increase from 20,598 in 2018. The number of utility customers affected jumped to 28.4 million in 2019, up 50% from 19 million in 2018.<sup>11</sup> It’s difficult for the landscape industry to embrace being forced to use inferior equipment with continued concerns on how to ensure the equipment can be operated and charged all-day and every day.

Additionally, maintenance has been woefully under examined by CARB’s failure to acknowledge the lack of dealers and repair shops currently in California that have the expertise or are prepared to handle repairs and maintenance issues. One Los Angeles Landscape Company attempted to make the transition but then had issues with support, stating:

*“For a commercial company like us with large acreage properties, definitely the duration of the Batteries, Responsiveness from the manufacturers, lack of support from*

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<sup>10</sup> Generac “Top 5 U.S. States for Power Outages” <https://www.generac.com/be-prepared/power-outages/top-5-states-where-power-outage-occurs>

<sup>11</sup> Bloomenergy “California Power Outage Map” <https://www.bloomenergy.com/bloom-energy-outage-map/>

*manufacturers, we have even considered filing a lawsuit using the Lemon-Law! When a large riding mower is seating in a repair shop for over two months! Very few repair shops that have training, knowledge or have support from manufacturers, equipment is less powerful.”<sup>12</sup>*

This company was forced to go and purchase non-ZEE traditional SORE to maintain their customer base.

**II. SOLUTION - Extend the time period to transition to zero emission “commercial/professional grade” equipment beyond 2024 but maintain the 2024 end of sale date for zero emission residential SORE.**

**a. Delay implementation on commercial/professional grade equipment**

Despite our efforts, connecting with CARB staff early in the process to bring forward the daily realities of ZEE use in commercial landscape operations was limited. Unfortunately, this resulted in a proposal that lacks understanding of the difficulties of full commercial grade ZEE adoption by 2024. Furthermore, it lacks recognition of inadequacies of the equipment and impediments to full scale adoption. Since the publication of the ISOR in October, CARB staff has been very open and NALP has had many conversations. Unfortunately, this should have happened sooner and likely would have resulted in a more reasoned approach to emissions reductions and impacts of transitioning to ZEE on the landscape industry. Based on the recent conversations with CARB staff at this point we believe that the staff is unwilling to amend their proposal prior to December 9<sup>th</sup> despite industry input and public comments. This is disappointing and not reflective of CARB’s statutory duty pursuant to the California Administrative Procedures Act.

But there remains a path forward. The ISOR admits that in a considered Alternative 2 that changing the date of 2024 to 2026 for both residential and commercial grade equipment would still meet targeted emissions goals:

“Alternative 2, only 89.3 percent of the small off-road equipment population subject to the SORE regulations would be ZEE in 2035, as compared to 93.4 percent under the Proposed Amendments. The remaining 10.7 percent would continue to turnover to ZEE over the following years, reaching 98.8 percent ZEE in 2043. Emission benefits under Alternative 2 in 2031 would be 6.8 tpd and 50.2 tpd of NO<sub>x</sub> and ROG, respectively. These emission reductions are both smaller than those that would occur with the Proposed Amendments. **While these emission reductions would meet the 2016 State SIP Strategy expected emission reductions for SORE. . .**”<sup>13</sup>

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<sup>12</sup> See Appendix B “CLCA and NALP Battery Powered Equipment Survey”

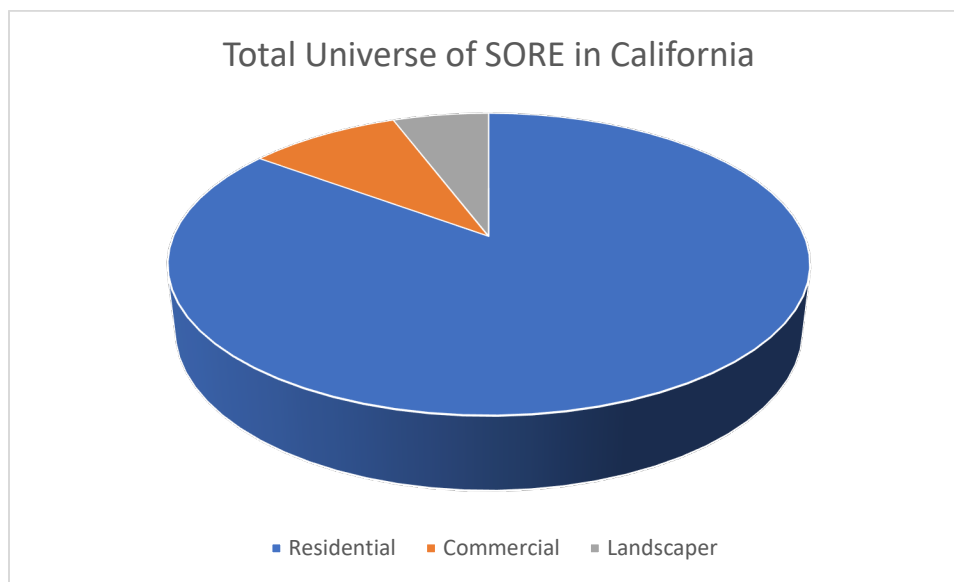
<sup>13</sup> California Air Resources Board “Public Hearing to Consider Proposed Amendments to the Small Off-Road Engine Regulations: Transition to Zero Emissions” Staff Report: Initial Statement of Reasons (p. 135) October 12, 2021

According to CARB waiting until 2026 would still enable CARB and Governor Newsom to accomplish their 2031 and 2035 targeted goals. A primary goal is to reduce the amount of non-ZEE SORE in California by the year 2031 and 2035. Understanding the universe of equipment we are currently dealing with in California is important to consider to achieve these goals.

Our proposed amendment would ONLY delay the transition to commercial/professional grade equipment which would make CARB's analysis significantly more different. Manufacturers certify professional grade SORE to the highest durability periods, therefore implementing different dates to transition to ZEE based on how the equipment is typically used should not be an impediment for CARB or retailers/dealers.

#### **b. Numbers and life cycle of commercial vs. residential equipment**

According to the CSUF<sup>14</sup> survey the current universe of SORE in the state of California that is gas powered and needs to be transitioned out is 12,813,596. Of this number 10,902,041 (85%) is used by residential while the remaining 1,911,555 (15%) is used by businesses and landscape professionals. Further looking at the data only 738,875 (6%) of existing non-ZEE SORE is used by the landscape industry. Of the 15 % of non-ZEE SORE used by commercial businesses we recognize a small percentage may not be commercial/professional grade equipment. Despite asking CARB directly, a determination of the amount of commercial/professional grade equipment is not available, but it is certainly LESS than 15% of all the non-ZEE SORE in California today.



The difference of 4% between the target ZEE SORE of the market share by 2031 of 93.4 % and 89.3% by the year 2031 proposed by the ISOR and Alternative 2 respectively could certainly be narrowed and/or mitigated when 85% (residential) of the equipment begins to be phased out and only 15% (or likely less) is extended beyond the 2024 date. Further supporting this goal to eliminate non-ZEE SORE is that commercial grade equipment has a much shorter life cycle than

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<sup>14</sup> CSUF Survey

residential, typically commercial grade equipment is about half that of residential<sup>15</sup>. This life cycle difference would support extending the sale of commercial/professional grade products until closer to 2028 or 2029, by which 2031 targets can still be achieved. Our proposed amendment, which would extend the sale of non-ZEE to 2028 or a later date, we believe would produce very similar results to the current proposal in the ISOR and would certainly meet the 2016 State SIP and Governor Newsom's Executive Order on climate change.

### **c. Support OPEI and Other Industry Alternatives**

In addition to our proposal, NALP has also been working closely with the Outdoor Power Equipment Institute (OPEI) and the Far West Equipment Dealers Association (FWEDA). NALP has experience and expertise using SORE while OPEI and FWEDA has much more experience and expertise with manufacturing the equipment and going through the certification process with CARB. Because of this, NALP apologizes if some of the jargon used in this section is inexact but NALP would also like to publicly endorse proposals coming from OPEI and FWEDA that also delays implementation timelines and would ease the transition on professional users of SORE.

### **III. AB 1346 and Legislative Intent**

We also believe CARB has a statutory requirement to further analyze this difference between residential and commercial use. In March 2021, Assembly Berman introduced Air Pollution: Small Off-Road Engines (AB 1346<sup>16</sup>) which codified much of what CARB had detailed in a March 2021 workshop. NALP and CLCA worked with members of the California Legislature to make amendments to reduce the harm on landscape professionals. In the Senate the following amendments were added in August 2021<sup>17</sup>.

(2) In determining technological feasibility pursuant to paragraph (1), the state board shall consider all of the following:

(A) Emissions from small off-road engines in the state.

(B) Expected timelines for zero-emission small off-road equipment development.

(C) Increased demand for electricity from added charging requirements for more zero-emission small off-road equipment.

(D) Use cases of both commercial and residential lawn and garden users.

(E) Expected availability of zero-emission generators and emergency response equipment.

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<sup>15</sup> California Air Resources Board 2020 Emissions Model for Small Off-Road Engines- SORE 2020 (page 9 Table 16) September 2020

<sup>16</sup> CA AB 1346 Chapter No. 2021-753 (Approved by the Governor October 9, 2021)

<sup>17</sup> CA AB 1346 Amendments Adopted August 26, 2022

We believe these amendments require CARB to further examine both commercial and residential lawn and garden uses. Furthering this legislative intent at an April 28, 2021 hearing on AB 134 Assembly Member Luz Rivas spoke candidly about her support for the bill but that the legislation should take into consideration the concerns raised in the analysis regarding commercial application. Assembly Member Ruiz also stated concerns over those that also need to make a living specifically the large number of landscapers and gardeners that live in her district that use lawn equipment and potentially could not afford the new ZEE technology.

Considering that Governor Newsom did not sign this bill into law until October 9<sup>th</sup>, just three days before the release of the ISOR we don't feel a proper analysis of the technical feasibility was conducted, nor were alternatives like our proposal to extend only commercial/professional grade equipment properly explored and vetted.

#### **IV. Funding and Education for the Transition**

##### **a. Funding**

To assist a transition to ZEE there must be a robust rebate and tax incentive program put into place. We understand and acknowledge that the “power of the purse” is vested in the California Legislature, but we must highlight how concerned we are as an industry that our voices are not being heard. While we appreciate that the California Legislature approved \$30 million to support AB 1346 and this transition, that amount is woefully inadequate. Based on the CSUF data mentioned above, if ALL of that money went to ONLY commercial business (1,911,555) that would mean that only \$15 dollars would be provided per piece of equipment traded in. We are talking about investing 10s to 100s of thousands of dollars for each company to transition and \$15 does not come close to supporting the landscape industry and our majority small business demographic. This further highlights how a delayed transition for commercial grade equipment will make this transition easier and less costly for all those involved.

##### **How much would a strong rebate program cost?**

One way to model the amount a rebate program would cost is to look at existing rebate programs already in place in California. San Joaquin Valley offers the following for businesses<sup>18</sup>:

| <b>Eligible Electric Landscape Maintenance Equipment</b> | <b>Maximum Amount Per Equipment</b> |
|----------------------------------------------------------|-------------------------------------|
| Edgers, Trimmers, Chainsaws, & Polesaws                  | 70% of purchase price, up to \$200  |
| Blowers & Vacuums                                        | 70% of purchase price, up to \$250  |
| Walk-behind Mowers                                       | 70% of purchase price, up to \$750  |

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<sup>18</sup> San Joaquin Valley Air Pollution Control District “Incentive Program” <https://www.valleyair.org/grants/cgym-commercial.htm>

**Eligible Electric Landscape  
Maintenance Equipment****Maximum Amount Per Equipment**

Ride-on / Stand-Ride Mowers

70% of purchase price, up to \$15,000

Additional Batteries and Chargers

100% of purchase price for up to two (2) batteries and one (1) charger per piece of equipment purchased

**Funding will be limited to \$25,000 annually per applicant**

Based on sales data and estimates we conservatively calculated the percentage of type of equipment that would be eligible to be replaced. We have also combined vendor and commercial to provide the following calculations.

|                    | Number of Units                           | Rebate Cost  | Total             |
|--------------------|-------------------------------------------|--------------|-------------------|
| Riding Mowers (1%) | 19,115.55                                 | \$ 15,000.00 | \$ 286,733,250.00 |
| Push Mowers (15%)  | 286,733.25                                | \$ 750.00    | \$ 215,049,937.50 |
| All Other (84%)    | 1,605,706.20                              | \$ 250.00    | \$ 401,426,550.00 |
|                    | 1,911,555.00<br>(Comm/Vendor)<br>combined |              | \$ 903,209,737.50 |

This exhibit illustrates that there would need to be OVER \$900 million in rebate funds just to satisfy demand for businesses, like the landscape industry that rely on the equipment.

**b. Education**

In addition to funding for the actual equipment there should be money allocated to properly educate the workforce to operate the equipment. Additionally, there are safety issues concerning lithium-ion battery fires that should be considered<sup>19</sup>. There must also be training for the equipment dealers and maintenance of this equipment and also opportunities for mechanics within landscape companies to learn how to make both minor and major repairs to keep ZEE SORE in operation.

**V. In Conclusion**

<sup>19</sup> U.S. Department of Labor Occupational Safety and Health Administration "Preventing Fire and/or Explosion Injury from Small and Wearable Lithium Battery Powered Devices"  
<https://www.osha.gov/sites/default/files/publications/shib011819.pdf>

For the reasons stated herein, NALP supports a responsible transition to ZEE SORE. Unfortunately, we believe the ISOR as presented is deeply flawed but can be amended to address these flaws. NALP also believes that based on the technical feasibility prong of the Clean Air Act section 209 waiver process that the Environmental Protection Agency will not grant CARB a waiver and therefore the 2024 date will need to be adjusted. NALP believes we can make this adjustment now, gain industry support, push for more financials support from the California Legislature and chart a path forward on this transition with complete buy-in from all interested stakeholders. NALP looks forward to accomplishing this collective goal and hope that CARB makes the necessary adjustments to reduce the detrimental impacts on the 55,000 landscape companies in California; 99% of which are considered small businesses.

Sincerely

A handwritten signature in blue ink, appearing to read 'A. Bray', with a stylized flourish at the end.

Andrew Bray  
Vice President of Government Relations  
National Association of Landscape Professionals

# Appendix A



NATIONAL  
ASSOCIATION OF  
**LANDSCAPE  
PROFESSIONALS**

November 9, 2021

California Air Resources Board  
1001 I Street  
Sacramento CA 95814

CARB Board Member,

The California Landscape Contractors Association (CLCA) and the National Association of Landscape Professionals (NALP) represent the landscape industry in California. Member companies of our collective Associations specialize in lawn care, landscape maintenance, tree care, irrigation and water management. Landscape professionals throughout California work daily performing essential services to homes and businesses to maintain their landscapes, sustain the environment and enhance and maintain healthy and safe green spaces.

We are writing to you on behalf of our member companies concerning *Proposed Amendments to the Small Off-Road Engine Regulations: Transition to Zero Emissions*, Initial Statement of Reason (ISOR) published October 12, 2021. We are respectfully requesting you to support an amendment to the ISOR and delay implementation of the transition to Zero Emissions Equipment (ZEE) ONLY for commercial/professional grade small off-road engines (SORE).

We share Governor Newsom and other California policymakers' intent to reduce carbon emissions from gas-powered landscape equipment as quickly as possible. Still, we must do so in a responsible manner that mitigates the negative financial impact on the landscape industry. The landscape industry in California is a \$9 billion industry annually with more than 55,000 companies employing over 133,000 employees; 99% of these businesses are considered small businesses and a vital industry for entrepreneurs throughout the state of California, many of which are Latino or minority owned.

Landscape professionals work every day to take care of our California's green spaces – we care deeply about the environment - so we support a responsible transition to zero-emission equipment. However, the two-year timeline is simply too fast a transition for commercial users. In addition, the commercial-grade battery-powered equipment currently on the market has performance issues, cost issues, and infrastructure issues. Because of these reasons, the transition is NOT technically feasible for commercial/professional grade use.

CARB relied upon a survey conducted by California State University of Fullerton (CSUF) to compile a large portion of their data. Within this survey it was concluded that only 3% of chain saws, 3.5% of lawn mowers, 0.3% of riding mowers, and 5.9% of trimmers used by professional

landscape companies in California are ZEE, compared to over 50% for residential homeowners. **This low adoption rate is not due to an unwillingness to use ZEE equivalents but rather evidence that the equipment is not technologically capable to be the exclusive equipment used by commercial landscape companies at this time.**

Both performance and cost remain tremendous hurdles, specifically for the larger commercial equipment that requires significant more run time and power. From a performance perspective the industry continues to hear from landscape professionals about ZEE landscape equipment:

- The power is just not comparable yet
- Impossible to use exclusively on large scale commercial jobs like HOAs, resorts, business parks and other public and commercial green spaces
- Requires too many batteries to conduct their job function in an efficient manner
- Charging issues in the field and in the workshop
- Durability concerns
- Batteries are too heavy
- Cannot mow slopes on riding mowers because of the weight issue
- Mow times are longer and batteries cannot last a full work day
- Leaf removal during seasonal changes is very difficult
- Debris removal to mitigate fire spread is significantly more difficult
- Lack of dealers and maintenance shops to support transition
- Batteries are not interchangeable between brands

This is a non-exhaustive list of concerns we here from landscape professionals but these are the types of concerns that CARB has not fully considered in their analysis and a further indicator of low adoption rates.

From a cost perspective a complete transition is a significant impediment for the landscape industry, specifically to undertake in only two years. For example, commercial-grade handheld electronic leaf blowers have significant cost concerns for the landscape industry. One popular manufacturer's electric leaf blower retails for approximately \$350 - \$400, similar to the same manufacturer's gas-powered unit. However, to use this electric leaf blower for an entire workday requires the purchase of extra batteries and chargers thus, driving the up-front cost to exceed \$2,000. More alarming is when you look at larger equipment. Popular commercial gas-powered riding mowers range from \$8,000-\$11,000 while the few commercial riding ZEE mowers available with 4 to 5 hour run time range from \$16,000 to 21,000+. These are significant up-front investments for landscape professionals, the majority of whom are sole-proprietor (single employee) businesses, with no guarantee they will recover the difference based on energy costs and maintenance. These costs also do not consider the number of recharges batteries can sustain, and, as a result, the need to replace batteries over a product's life. Maintenance has been woefully under examined by CARB's failure to acknowledge the lack of dealers and repair shops currently in California that have the expertise or are prepared to handle repairs and maintenance issues.

As the national and state associations representing the landscape industry, not manufacturers or other groups with separate agendas, we emphatically state that it is NOT technically feasible to transition commercial/professional grade landscape equipment to ZEE by 2024. We believe there is a solution and one that we are urging CARB to adopt prior to the December 9<sup>th</sup> vote on this very important proposal.

***SOLUTION - Extend the time period to transition to zero emission “commercial/professional grade” equipment beyond 2024 but maintain the 2024 end of sale date for zero emission residential SORE.***

Despite our strong efforts, connecting with CARB staff to bring forward the daily realities of ZEE use in commercial landscape operations was limited. Unfortunately, this resulted in a proposal that lacks understanding of the difficulties of full commercial grade ZEE adoption by 2024. Furthermore, it lacks recognition of inadequacies of the equipment and impediments to full scale adoption. The ISOR admits that in a considered Alternative 2 that changing the date of 2024 to 2026 for both residential and commercial grade equipment would still meet targeted emissions goals:

“Alternative 2, only 89.3 percent of the small off-road equipment population subject to the SORE regulations would be ZEE in 2035, as compared to 93.4 percent under the Proposed Amendments. The remaining 10.7 percent would continue to turnover to ZEE over the following years, reaching 98.8 percent ZEE in 2043. Emission benefits under Alternative 2 in 2031 would be 6.8 tpd and 50.2 tpd of NO<sub>x</sub> and ROG, respectively. These emission reductions are both smaller than those that would occur with the Proposed Amendments. **While these emission reductions would meet the 2016 State SIP Strategy expected emission reductions for SORE. . .**”

According to CARB waiting until 2026 would still enable CARB and Governor Newsom to accomplish their 2031 and 2035 targeted goals. A primary goal is to reduce the amount of non-ZEE SORE in California by the year 2031 and 2035. Understanding the universe of equipment we are currently dealing with in California is important to consider to achieve these goals.

Our proposed amendment would ONLY delay the transition to commercial/professional grade equipment which would make CARB’s analysis significantly more different. Manufacturers certify professional grade SORE to the highest durability periods, therefore implementing different dates to transition to ZEE based on how the equipment is typically used should not be an impediment for CARB or retailers/dealers.

According to the CSUF survey the current universe of SORE in the state of California that is gas powered and needs to be transitioned out is 12,813,596. Of this number 10,902,041 (85%) is used by residential while the remaining 1,911,555 (15%) is used by businesses and landscape professionals. Further looking at the data only 738,875 (6%) of existing non-ZEE SORE is used by the landscape industry. Of the 15 % of non-ZEE SORE used by commercial businesses we recognize a small percentage may not be commercial/professional grade equipment. Despite asking CARB directly, a determination of the amount of commercial/professional grade

equipment is not available, but it is certainly LESS than 15% of all the non-ZEE SORE in California today.

The difference of 4% between the target ZEE SORE of the market share by 2031 of 93.4 % and 89.3% by the year 2031 proposed by the ISOR and Alternative 2 respectively could certainly be narrowed and/or mitigated when 85% (residential) of the equipment begins to be phased out and only 15% (or likely less) is extended beyond the 2024 date. Further supporting this goal to eliminate non-ZEE SORE is that commercial grade equipment has a much shorter life cycle than residential, typically commercial grade equipment is about half that of residential. This life cycle difference would support extending the sale of commercial/professional grade products until closer to 2028 or 2029, by which 2031 targets can still be achieved. Our proposed amendment, which would extend the sale of non-ZEE to 2028 or a later date, we believe would produce very similar results to the current proposal in the ISOR and would certainly meet the 2016 State SIP and Governor Newsom's Executive Order on climate change.

We also believe CARB has a statutory requirement to further analyze this difference between residential and commercial use. In March 2021, Assembly Berman introduced Air Pollution: Small Off-Road Engines (AB 1346) which codified much of what CARB had detailed in a March 2021 workshop. NALP and CLCA worked with members of the California Legislature to make amendments to reduce the harm on landscape professionals. In the Senate the following amendments were added in August 2021.

(2) In determining technological feasibility pursuant to paragraph (1), the state board shall consider all of the following:

(A) Emissions from small off-road engines in the state.

(B) Expected timelines for zero-emission small off-road equipment development.

(C) Increased demand for electricity from added charging requirements for more zero-emission small off-road equipment.

(D) Use cases of both commercial and residential lawn and garden users.

(E) Expected availability of zero-emission generators and emergency response equipment.

We believe these amendments require CARB to further examine both commercial and residential lawn and garden uses. Furthering this legislative intent at an April 28, 2021 hearing on AB 134 Assembly Member Luz Rivas spoke candidly about her support for the bill but that the legislation should take into consideration the concerns raised in the analysis regarding commercial application. Assembly Member Ruiz also stated concerns over those that also need to make a living specifically the large number of landscapers and gardeners that live in her district that use lawn equipment and potentially could not afford the new ZEE technology.

Considering that Governor Newsom did not sign this bill into law until October 9<sup>th</sup>, just three days before the release of the ISOR we don't feel a proper analysis of the technical feasibility

was conducted, nor were alternatives like our proposal to extend only commercial/professional grade equipment properly explored and vetted.

Lastly, to assist a transition to ZEE there must be a robust rebate and tax incentive program put into place. We understand and acknowledge that the “power of the purse” is vested in the California Legislature but we must highlight how concerned we are as an industry that our voices are not being heard. While we appreciate that the California Legislature approved \$30 million to support AB 1346 and this transition, that amount is woefully inadequate. Based on the CSUF data mentioned above, if ALL of that money went to ONLY commercial business (1,911,555) that would mean that only \$15 dollars would be provided per piece of equipment traded in. We are talking about investing 10s to 100s of thousands of dollars for each company to transition and \$15 does not come close to supporting the landscape industry and our majority small business demographic. This further highlights how a delayed transition for commercial grade equipment will make this transition easier and less costly for all those involved.

In conclusion, the landscape industry cares deeply for the environment, and we genuinely want to support a transition to ZEE. We believe that time is coming but not by 2024 for a complete transition. The landscape industry relies on this equipment to support their employees, customers and families and their concerns must be considered. If an amendment is adopted it is a win for all parties involved and we can work with the Governor, CARB, the legislature, and air districts throughout the state to promote and assist in this transition.

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CLCA

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NALP

# Appendix B

| City         | Type of Company                                                        | List the types of battery-powered equipment your company uses (eg. blowers, robotic mowers, trimmers, etc.) | What % of the equipment your company is using right now is battery powered? (An educated guess is fine.) | List the types of battery equipment that your company has tested but you don't use regularly (if any). Why don't you use it? (Example - you've tested robotic mowers but aren't using them for XX reason) | List all the challenges, you see, when it comes to your crews using battery-powered small hand-held equipment, and please use specific examples when answering.                                                                               |
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| Pomona/Chino | Commercial maintenance and installation. One location.                 | none                                                                                                        | 0%                                                                                                       | none                                                                                                                                                                                                      | charging                                                                                                                                                                                                                                      |
| Greenbrae    | Commercial and residential maintenance and installation. One location. | None                                                                                                        | 0%                                                                                                       |                                                                                                                                                                                                           | Cost of equipment, multiple backup batteries, recharging                                                                                                                                                                                      |
| Martinez     | Commercial maintenance and installation. One location.                 | None                                                                                                        | 0%                                                                                                       | None                                                                                                                                                                                                      | Retro fitting trucks as charging stations for multiple charging Un proven reliability Service issues Lost batteries Disposal of old batteries Cost to replace current gas powered equipment Contractor grade equipment Repair costs and parts |

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| Bakersfield | Commercial and residential maintenance and installation. One location. | None at this time                    | 0% | I never have tested battery powered equipment. | The battery life throughout the work day. |
| Tracy       | Residential maintenance. One location.                                 | Sprayers 5 gal                       | 1% | NA                                             | NA                                        |
| St. Helena  | Residential and commercial landscape installation. One location.       | Drills, Chainsaws, sawsalls, Jigsaws | 2% |                                                |                                           |

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| Santa Ana  | Commercial maintenance and installation. One location.                 | Blowers             | 2% | Only leaf blowers have been tested. Electric leaf blowers are only being utilized by crews in cities where it is mandated.                                                          | 1. Product availability. While many products are available and the technology is advancing, commercial use electrical hand-held equipment is still limited and presents challenges. Product reliability, charging station access, and maintenance operations are just a few challenges that I feel are at the forefront of the issue. |
| Sacramento | Commercial and residential maintenance and installation. One location. | Blowers, Weedeaters | 3% | 21" Mower, Zero Turn Riding Mower, Weedeaters, Blowers. Batteries do not last all day. Many of our Service yards do not have the electrical capacity to carry large scale charging. | Batteries do not last very long. Setting up charging stations for all the equipment. commercial battery packs are very expensive and easy to steal.                                                                                                                                                                                   |

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| Vacaville  | Commercial maintenance. One location.                                  | Drills                          | 5% | Blowers, trimmers<br>Don't use them do to low power and inability to charge them during the work day.                                                           | Battery powered equipment will require means of charging. As a company that leaves the yard each day and completes an 8-10 hour work day away from the yard, finding the means to charge equipment will be difficult and inconsistent. |
| San Diego  | Arboreal maintenance. Multiple locations statewide.                    | Chainsaw and blower             | 5% |                                                                                                                                                                 |                                                                                                                                                                                                                                        |
| Clovis     | Commercial maintenance. One location.                                  | Drills Roto hammer              | 5% | NA                                                                                                                                                              | Lack of charge Lack of power                                                                                                                                                                                                           |
| Healdsburg | Commercial and residential maintenance and installation. One location. | chainsaw, blower, hedge trimmer | 5% | Back pack battery blower - too expensive<br>21" walk behind mower - crew did not like pushing it (prefer self propelled)<br>Hedge trimmer - not powerful enough | Price and durability. Battery discharge anxiety (how long a charge lasts) Inability to recharge batteries in the field                                                                                                                 |

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| San Rafael | Equipment distributor.<br>Multiple locations<br>throughout the state. | Blowers, Trimmers,<br>Edgers | 5% | Blowers, Edger's, Line<br>Trimmers | They don't last long<br>enough in the field. You<br>have to carry a<br>generator to recharge<br>the batteries because<br>you cant charge them in<br>you vehicle. Or buy<br>additional batteries to<br>last through the day. |
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| San Luis Obispo | Commercial and residential maintenance and installation. One location. | Only power tools like drills and saws                                                                   | 5% | Line trimmers and Blowers | Cost, batteries are very expensive, don't last that long. Setting up charging equipment. Lack of power.                      |
| Napa            | Residential installation and maintenance. One location.                | Blowers, Trimmers, Hand-Held tools, (Battery powered reciprocating saws, circular saws, drills, etc...) | 5% | N/A                       | Battery Life...!, Then directly connected to that, the ability to quickly, and affordably, re-charge batteries in the field. |
| Roseville       | Residential installation. One location.                                | drills , saws etc.                                                                                      | 5% | none                      | Start up cost                                                                                                                |

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| Bakersfield | Residential maintenance. One location.                                   | Blowers, hedge trimmers, extendable trimmers, and power hand tools such as drills. | 10% | I have tried a battery-powered chain saw but do not own one.                                                                                 | The battery capacity does not compare to gas-powered engines in terms of torque, longevity-of-use per job, and batteries are dependent upon availability of chargers, which require either available electrical power on the job site or a gas-powered generator. |
| Menlo Park  | Commercial and residential maintenance and installation. Five locations. | Blowers, mowers, hedge trimmers, weed-eaters, etc.                                 | 10% | Robotic mowers. They are not commercial grade and some clients did not like having lines buried on their lawns (to limit robot's boundaries) | Batteries do not last too long. It is a hardship to find outlets where to re-charge them. This means the need to purchase more battery packs which are too expensive.                                                                                             |
| Sacramento  | Residential installation. One location.                                  | Power drills, brick cutters                                                        | 10% | Lawn mower and edge trimmer. Poor performance.                                                                                               | Poor performance, substantial inefficiency vs small engines                                                                                                                                                                                                       |

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| Watsonville   | Commercial and residential maintenance and installation. One location.  | blowers, string trimmers, chainsaws               | 10% | robotic mowers, not quite ready for prime time                              | re-charging during the workday Power for leaf blowers during heavy leaf drop season                                                                      |
| Crockett      | Residential installation. One location.                                 | Drills, walkie talkies,                           | 10% | I've used battery mowers and blowers but do not do lawn maintenance anymore | Have enough charged batteries available                                                                                                                  |
| Burbank       | Commercial and residential maintenance and installation. Two locations. | Stihl BGA Blower and AR 3000 battery pack         | 10% | Other battery blowers have a short run time.                                | -Forgetting to charge equipment -Running out of power during a task - Additional training for new equipment -Less secure in the field due to form factor |
| Scotts Valley | Commercial and residential maintenance and installation. One location.  | Hedgers,Blowers, chainsaws , drills, power brooms | 12% | power hedgers, mowers                                                       | Cost of replacement batters and charging portals availability                                                                                            |

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| Sausalito | Residential installation and maintenance. One location.                | blowers, lawn mowers                                                                                                     | 15% | everything weve tried we are using               | we are constantly charging batteries                                        |
| Richmond  | Commercial and residential maintenance and installation. One location. | Blowers, Hedge Trimmers, 21" Mowers, Stick Edgers, Chain Saws, String Trimmers, Sawzall, Drills, Skill Saws, Impact Guns | 20% | Soil Cultivators - Not enough power to till soil | Keeping charged batteries and security (theft). Cost of batteries           |
| Escondido | Commercial and residential maintenance and installation. One location. | Blowers, trimmers, edgers, mowers                                                                                        | 20% |                                                  | amount of batteries needed are cost prohibitive. charging all the batteries |
| Moraga    | Residential installation and maintenance. One location.                | Blowers                                                                                                                  | 20% | Batteries are too heavy and run down too quickly | Batteries wear down too quickly. The equipment is heavier                   |

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| Torrance         | Commercial and residential maintenance and installation. One location. | Blowers                                   | 20% |                                                                                                                                        | Recharging batteries while in the field                               |
| Carlsbad         | Residential maintenance. One location.                                 | Blowers. Makita                           | 25% | Inexpensive home depot tools. Weak power , not much battery life.                                                                      | Having enough extra batteries. Having a power source to re charge     |
| Redwood City     | Residential installation and maintenance. One location.                | Blowers                                   | 25% | Blowers and we use them                                                                                                                | The power of the equipment is not as strong as gas.                   |
| Turlock          | Residential maintenance. One location.                                 | Hedge trimmer, string trimmers, chainsaws | 30% | mower: crew let 2- \$1500 batteries sit and die (I didn't know mower was down, support only came from Ohio rolling blower: was no good | some of the equipment just isn't powerful enough for commercial work  |
| Laguna Beach     | Residential installation and maintenance. One location.                | mowers trimmers weed trimmers             | 30% | we use the ones we tested                                                                                                              | if it was not placed in charger can ruin a day                        |
| La Mesa          | Commercial and residential installation. One location.                 | Blowers Mower                             | 35% |                                                                                                                                        | Charging                                                              |
| Huntington Beach | Commercial maintenance and installation. One location.                 | Blowers, Mower, Chain Saw, Trimmer        | 50% | N/A                                                                                                                                    | Batteries are heavy. We need to be diligent about charging regularly. |

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| San Rafael    | Residential installation and maintenance. One location.                 | blowers, hedge trimmers, weed eaters, push lawn mower                    | 60% |                                                | When the battery runs out it can be inconvenient to walk for another one. |
| Granada Hills | Commercial and residential installation. One location.                  | Blowers, drills, impacts, saws all, circular saws, air pumps, chain saws | 60% | Have not had an opportunity to test or require | Charging batteries and speed of charging stations                         |
| Oceanside     | Residential installation. One location.                                 | Blowers, Chainsaw, Weed eater, Mower, Drills, Saws.                      | 70% | None                                           | Charge cycles Extra batteries cost Service-Life of batteries              |
| Bakersfield   | Commercial and residential maintenance and installation. Two locations. | Leaf blowers, trimmer and weed wacker                                    | 70% | We have only tested and use sthil              | Charging batteries and equipment breaking down more often                 |

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| Lake Arrowhead | Commercial and residential maintenance and installation. One location. | Blowers, String Trimmers, push mowers, chainsaws, hedge trimmer, extension trimmer, pole saw. | 80% | Lawn mowers - Only using them in limited capacity as the battery life seems limited | Training the guys to use the equipment at a lower power level to extend run time. Eg: The Sthil String Trimmer we use will last a few hours on a battery if used at 50% power, whihc is generally adequate, but will only last 30 minutes if the crew runs it at full power. |
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| Riverside | Commercial and residential maintenance and installation. One location. | 60" Ride on Zero Turn Mower (Mean Green)<br>48" Stand on Mower (Mean Green)<br>2 String Trimmers (Stihl)<br>3 Hand Held Blowers (Stihl)<br>2 14" Top Handle Chainsaws (Husqvarna)<br>1 12" Top Handle Chainsaw (Stihl)<br>3 Hedge trimmers (Stihl)<br>3 Handheld pruners (Infaco) (Zenport)<br>(Arvipo)<br>1 Pole pruner (Zenport)<br>1 Pole Chainsaw (Ryobi)<br>2 Backpack Sprayers (Ryobi)<br>1 Handheld Sprayer (Ryobi)<br>2 in Truck Refrigerators (Massimo from Costco)<br>14 small handheld tools<br>Sawzall, Drills, Impact guns, Blowers, Wash brushes, Etc. | 80% | Demo'd Husqvarna Robotic mower but it's not practical for commercial use because it cant handle rough terrain and acres mowed per hour is too low. Stihl backpack battery handheld blowers are ok on small properties but CFM is too low for parking lots. | Stihl backpack battery handheld blowers are ok on small properties but CFM is too low for parking lots. |
| Novato    | Residential installation and maintenance. One location.                | Blowers, trimmers, lawn mowers, skill saws, drills, saws all                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 85% |                                                                                                                                                                                                                                                            | Battery maintaining charge. Being able to charge batteries in the field.                                |

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| San Rafael | Residential installation. One location.                 | Blowers, mowers, hedge trimmers, string trimmers      | 85% | Backpack blowers -not great in rainy weather. Also quite bulky. Electric chainsaw -price too high                                  | RAIN!!!! Dirt and debris. HEAT is too much for the batteries                                                                                                                                                                                              |
| Malibu     | Residential installation and maintenance. One location. | Blowers, mower, hedge trimmer, weed whacker, chainsaw | 95% | We have electric chainsaws, but my guys prefer the gas ones. We don't really do tree trimming, so our daily tools are all electric | I was initially very happy with our Echo cordless lineup, but they do have occasional problems. That's true for gas tools as well. We have several batteries so there are always some charging. It wouldn't work with any less than 5 batteries per truck |

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| Hercules    | Commercial and residential maintenance and installation. One location. | Blowers , drills,saw, chain saws, mixers and weed eaters | Blowed, drills and saws                                                                                                         | We only use drills and saws and blower all Makita              | They will not be enough batteries in about 15 years to sustain the worlds power shortage                                                                                                                                                                                                                      |
| San Leandro | Commercial and residential installation. One location.                 | Blowers                                                  | We've converted about 60% of our blowers from gas to electric battery power. We plan to be 100% electric blower by January 1st. | We haven't tested anything other than blowers and weed eaters. | Batter life and access to charging. For blowers we're have to purchase more than one backpack battery per blower to ensure we have enough charge to make it though the work day. Many job sites don't have access for charging (at least not securely...since each backpack charger costs more than \$1,000). |

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| National Company, top 20 locations in California | Commercial maintenance and installation. Multiple locations. | blowers, line trimmers, hedge trimmers, mowers    | 2%  | Battery mowers & hand held battery pack equipment (blowers, line trimmers, etc) Run time is the biggest issues. | 1. Run Time 2. ease of battery pack replacement 3. mowing speed 4. charging ability remotely and centrally 5. cost of infrastructure upgrades to change numerous mowers and battery packs simultaneously |
| National Company top 20, locations in California | Commercial maintenance and installation. Multiple locations. | blowers, line trimmers, chainsaws, robotic mowers | 10% | There is no equipment we have tested that we are not using in one of our companies.                             | Charging is the biggest concern. The ability to have access to a charging station without using a converter in the chassis is a problem.                                                                 |

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| National Company top 20, locations in California | Commercial maintenance and installation. Multiple locations. | blowers, trimmers, line trimmers, small hand helds, nothing on the mower side | <1%      | We have tested a lot of battery equipment. Charging, availability and cost are the two main reasons. | Charging and battery loss/misplacement/theft                                 |
| National Company top 20, locations in California | Commercial maintenance and installation. Multiple locations. | chain saws mostly                                                             | maybe 5% | We have tested robotic mowers at our Lab for Husquvarna.                                             | keeping batteries charged losing batteries (leaving on ground when charging) |

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| National Company top 20, locations in California | Commercial maintenance and installation. Multiple locations. | large mowers, string trimmers, stick edgers, hedge trimmers, blowers, push mowers | less than 1% .. We are piloting products in branches | Large mowers are only used when required by a customer. The Acquisition cost, infrastructure and performance is prohibitive. Battery powered blowers are also problematic as they lack power and battery life. | Blower power and battery life especially during leaf removal. Building out branch charging infrastructure is also a challenge as it is costly and often requires rewiring the whole building to supply enough power to recharge a whole branch. |
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| Los Angeles | Commercial maintenance and installation. Multiple locations. | 1. 52" 48" 33" Mean-green equipment, Stihl blowers, Husqvarna blowers, Milwaukee. | 35% | None other than what we have purchase. | For a commercial company like us with large acreage properties, definitely the duration of the Batteries, Responsiveness from the manufacturers, lack of support from manufacturers, we have even considered filing a lawsuit using the Lemon-Law! When a large riding mower is seating in a repair shop for over two months! Very few repair shops that have training, knowledge or have support from manufacturers, equipment is less powerful. |
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| Please share the advantages, in your opinion, of using battery-powered small hand-held equipment. | List all the challenges you see when it comes to your crews using battery-powered mowers and please use specific examples about when answering. | Are there advantages to your crews using battery-powered mowers? | What are the challenges your technicians would face if they had to use only battery-powered equipment? | What challenges do you think your company would face if making the switch from gas to battery-powered equipment? |
|---------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
|                                                                                                   | charging time                                                                                                                                   |                                                                  |                                                                                                        |                                                                                                                  |
| Environmental, low noise, right thing to do                                                       |                                                                                                                                                 |                                                                  |                                                                                                        |                                                                                                                  |
| Noise reduction<br>Pollution reduction<br>Client satisfaction                                     | See #6 above                                                                                                                                    | Possibly Lighter equipment perhaps                               | See # 6 again                                                                                          | Mechanic retraining<br>Operational use and training                                                              |

|                                          |    |                                                      |                                                                      |                                                                               |
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| Less fuel costs. Less engine maintenance |    | Less time spent fueling and maintaining gas engines. |                                                                      | The cost of replacing all of our equipment.                                   |
| They are handy.                          | NA | No                                                   | Having to recharge. For them to run out of energy. Not enough power. | Put us out of business if we had to replace all of our equipment. (Expensive) |
|                                          |    |                                                      |                                                                      |                                                                               |

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| <p>I believe our industry has a responsibility to be environmentally conscientious. If battery-powered small hand-held equipment helps us be more environmentally responsible, than we should pursue their use in our every day operations.</p> | <p>I have yet to personally test battery-powered mowers for extensive commercial use. I personally utilize a small battery-powered mower for my home lawn. This is a great application. I am not sure if the technology is up to speed on large battery-powered mowers for commercial use. On average, these mowers would need to be able to be used at approximately 5 to 5.5 hours per day. Cost may also be a large determining factor as well.</p> | <p>I believe our industry has a responsibility to be environmentally conscientious. If battery-powered small hand-held equipment helps us be more environmentally responsible, than we should pursue their use in our every day operations.</p> | <p>Battery charge life would be the biggest concern. Maintaining additional pieces of equipment is also a secondary concern.</p> | <p>Cost may be the largest concern here. Secondly I am concerned with the productivity of these pieces of equipment. Equipment productivity is key and even a small percentage of efficiency change may be extremely costly.</p> |
| <p>Run cleaner and less noise. Less routine maintenance required.</p>                                                                                                                                                                           | <p>Would require a big investment in Batteries, SStorage and charging infrastructure. Large mowers do not have run times necessary to make cost effective yet. No effective way yet to recycle the old batteries.</p>                                                                                                                                                                                                                                  | <p>There would be as it would require carrying less fuel. Run quieter and cleaner for enviroment.</p>                                                                                                                                           |                                                                                                                                  | <p>A lot of specialty equipment not available yet. Difficlut to carry enough batteries to work the 8 hr shift. Major expense in infrastructure to have necessary charging capacity at the yards.</p>                             |

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|                                                                                     | Battery powered equipment will require means of charging. As a company that leaves the yard each day and completes an 8-10 hour work day away from the yard, finding the means to charge equipment will be difficult and inconsistent. |                        | Battery powered equipment will require means of charging. As a company that leaves the yard each day and completes an 8-10 hour work day away from the yard, finding the means to charge equipment will be difficult and inconsistent. | Battery powered equipment will require means of charging. As a company that leaves the yard each day and completes an 8-10 hour work day away from the yard, finding the means to charge equipment will be difficult and inconsistent. |
|                                                                                     |                                                                                                                                                                                                                                        |                        |                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                        |
| Emissions                                                                           | Loss of battery    Lack of power    Lack of charge<br>Cost of battery                                                                                                                                                                  | Sound                  | Power    Cost                                                                                                                                                                                                                          | Cost                                                                                                                                                                                                                                   |
| Environmental protection and sustainable practices.<br>Light weight and easy to use | Discharge anxiety, seemingly too light weight (not professional grade).    Typically not self propelled                                                                                                                                | light weight and quiet | Bias against battery power. Inability to recharge batteries. Perceived lack of durability and power.                                                                                                                                   | initial non standardization. Cost. Durability.                                                                                                                                                                                         |

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| <p>The only advantage is for a home owner that does there yard once a week. For a company that is using there equipment six hours a day 5 days a week there is no cost or labor benefit.</p> | <p>They need to change batteries more often than they need to but fuel in the equipment. They also say that the equipment doesn't have as much torque and power so it takes longer to complete a job.</p> | <p>No</p> | <p>Having to stop in the middle of a job to change batteries, charging the batteries on-site.</p> | <p>Up front cost. Battery powered equipment for commercial use is three to four times higher than gas equipment. If you figure that most maintenance crew are three to four workers and they are each using a piece of equipment. Most pieces of equipment last 90 min. tops. That would mean that you would need three additional batteries per piece of equipment.</p> |
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| Probably less air pollution but trading for soil pollution, (How batteries are constructed, metal processing, how to safely dispose and or recycle)     | Lack of power, cost.                               | None that we have seen. Still haven't seen 31", 48" or larger rider mowers that work too well on batteries. | service technicians would lose a lot of business. Battery operated equipment, from my experience gets tossed out and replaced with new equipment instead of being repaired. | Cost, trading powerful equipment for weak powerless equipment. |
| When and where gas powered equipment is restricted, it is better than hand powered tools, or electric tools requiring and electrical source, and cords. | In this order... Injury, Theft, Complexity of use. | Minimal                                                                                                     | Safety, battery life, re-training, theft...                                                                                                                                 | Cost, repair....                                               |
| Better for the environment, and no toxic gas smell                                                                                                      | Power and longevity                                | No transportation of fuel                                                                                   | power supply                                                                                                                                                                | start up cost                                                  |

|                                                    |                                                                                                                                                                                                                                                                   |                                                                                                         |                                                                                                  |                                                                                                                                                        |
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| Quietness of operation.                            | The battery capacity does not compare to gas-powered engines in terms of torque, longevity-of-use per job, and batteries are dependent upon availability of chargers, which require either available electrical power on the job site or a gas-powered generator. | Quietness of operation.                                                                                 | Service interruptions due to lack of power (torque) and lack of battery charge (dead batteries). | Financial strain from re-investing in different equipment.                                                                                             |
| -Less noise -Less pollutants -Lighter weight       | -Same as question 6. But I can add the power is still not too powerful which creates the need to invest more labor hours.                                                                                                                                         | Same as question 7. They like the fact that do not need to use ear plugs when using electric equipment. | No challenges, other than having a place at the yard where to recharge them.                     | If we have to go 100% all in by 2023-2024 it would be @ \$2.5M impact. Which would be a hardship                                                       |
| Meant for small nitch items like power drills only | The performance is not comparable to gas powered equipment. It may take as much as 4 times to complete tasks with powered lawn mowers and blowers and trimmers                                                                                                    | No                                                                                                      | If it were a maintenance project, we would not profit, or not win any projects to begin with.    | For my firm we would be impacted minimally since we are design build, but would still have setbacks for the times we would have to use that equipment. |

|                                                                                                      |                                                                      |                |                                              |                                                                                                 |
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| less noise, rising fuel costs, emissions                                                             |                                                                      | not using fuel | charging during shifts                       | the initial investment, blowing large areas                                                     |
| Less emissions                                                                                       | N/A                                                                  | N/A            | N/A                                          | N/A                                                                                             |
| -Instant power -Good for the environment - More quiet at customer property -Good customer impression | n/a                                                                  | n/a            | All day power not available                  | Unable to preform all tasks assigned. Also, unable to perform efficiently.                      |
| savings on gas. no exhaust fumes. healthier for our employees                                        | use time is limited requiring more batteries or quick charge portals | not sure       | not much as there is not an engine to repair | up front cost would be expensive and what would be the plan to recycle our gas driven equipment |

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| many....no gasoline needed, no neighbors yelling at the crews, not having to start a gas engine, quiet, no odors or fumes                                                                                        | The biggest will be charging batteries all the time and cost. Battery powered tool are so much more expensive. | its easier than hauling gas mowers up and down steps                                                     | not many.....its our preference now to have all battery powered equipment as soon as its feasible | the biggest is cost                                                  |
| Being able to work in municipalities that do not allow 2 stroke engines and quiet residential areas                                                                                                              | None - Currently operations are running well and favorable by clients                                          | Reducing carbon impact                                                                                   | For the crews that are assigned battery powered equipment - none.                                 | Cost, storage and charging stations                                  |
| Customers love them. They are quiet, no gas/oil mix. Less strain on employees pulling on the cords, better for the environment. Less maintenance. Employees not breathing the fumes and better for their hearing | Number of batteries and charging. Very costly                                                                  | Customers love them because they are quiet and good for the environment. Less maintenance, no fuel costs | cost, charging the batteries                                                                      | cost, charging, availability of equipment                            |
| None                                                                                                                                                                                                             | Same as above                                                                                                  | None                                                                                                     | Same as above                                                                                     | Financial burden, time loss, possible injury due to excessive weight |

|                                                     |                                                                                 |                                                                     |                                                       |                                                                                                                      |
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| Lite weight, carbon footprint                       | The juggling of recharging numerous batteries while in the field.               |                                                                     | Again charging numerous batteries while in the field. | Cost of battery equipment is expensive., logistics of charging so many batteries overnight, and during the work day. |
| Low noise, no gas fumes ,keeps customers happy.     |                                                                                 |                                                                     |                                                       |                                                                                                                      |
| Not as loud                                         | Not having the same power as gas.                                               | It would be lighter in weight                                       | Only the power the gas brings to the table.           | We would adjust and have extra batteries                                                                             |
| lightweight, no carbon build up/ easier maintenance | battery life                                                                    | absolutely, fuel costs, no carbon footprint                         | not enough power for all jobs                         | wouldn't be too hard, already familiar with what we like                                                             |
| quiet easy lighter less carbon footprint safer      | less powerful                                                                   | yes                                                                 | chain saws?                                           | all good now                                                                                                         |
| No fuel/ oil or smelling or inhaling fumes Quiet    | Small jobs ok Large not possible                                                | Small jobs Clients love the smell of cut grass with a quieter mower | Cell life Capabilities                                | Knowing cell range according to each job                                                                             |
| Less noise, Cleaner Air, Happier customers          | See#6.....and we have had a blower stolen at a commercial property parking lot. | Better for their health...auditory & respiratory.                   | See#6                                                 | Theft                                                                                                                |

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| Quieter, no fumes                                                                                            |                                              | no fuel spills, less hand washing, keeps the noise down for everyone. workers and homeowners | Difficult to repair                                                       | batteries are expensive                                           |
| No cords, no fuel, easier to maneuver, generally ready on the spot, easier to use in any location, no cords, | Have not used                                | Have not used                                                                                | Power and longevity. Equipment and battery power is improving continually | Battery longevity to charging stations to be ready throughout day |
| Noise reduction No fuel mixtures No smell No storage of Gas                                                  | Battery charge cycles                        | No two stroke mixing No gasoline storage                                                     | No problem for us in most cases.                                          | No problem in our case.                                           |
| Less noise and tool ready to go as long as battery is charged                                                | Have not tried any so i dont have an opinion | Dont know                                                                                    | Training for breakdowns and replacement                                   | Constant replacement of batteries                                 |

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| Low maintenance, low noise, Batteries can be easily swapped out and even charge on site. No Fuel consumption, no emissions, easy to use. . | Crew is reluctant to use new technology. They tend to run everything flat out, which isn't necessary most of the time, which reduces run time per battery. The equipment and batteries have initial high expense | They are easy to use and great for small areas and have very low maintenance. | Having enough battery power to run the equipment all day. | High initial cost and ongoing high cost of battery replacement. |
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| <p>Not handling fuel or oil<br/>Less cost Quiet Faster<br/>in some cases<br/>Equipment stays cleaner</p> | <p>High initial investment</p>                                  | <p>Not handling fuel or oil<br/>Less cost per acre<br/>mowed Much Quieter<br/>No hearing protection<br/>required More acres<br/>mowed per hour<br/>Equipment stays cleaner<br/>Less operator fatigue<br/>Lower risk of theft on<br/>Mean Green 60" due to<br/>electronic access code.</p> | <p>No adequate 21"<br/>mulching mower that I<br/>know of. No adequate<br/>Backpack Blower that I<br/>know of.</p> | <p>No battery truck<br/>availability. No<br/>adequate 21" mulching<br/>mower that I know of.<br/>No adequate Backpack<br/>Blower that I know of.</p> |
| <p>No electrical cords.<br/>Ease of use. No gas or<br/>oil. Environmentally<br/>friendly</p>             | <p>Leaving batteries and<br/>chargers on site.<br/>Expense.</p> | <p>Yes! No gas or oil!<br/>Environmentally<br/>friendly.</p>                                                                                                                                                                                                                              | <p>None that come to mind</p>                                                                                     | <p>It's already happened.<br/>Did not really<br/>experience any<br/>challenges not<br/>mentioned</p>                                                 |

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| Easier for my wife/work partner to use...just ask her lol                                      | See above... RAIN, HEAT, Dirt and Debris. Also run time and battery replacement is more costly than gas tools. Can't use electric mower on wet lawn so we have to bring 2 sets of tools which is ridiculous | Quiter, better than breathing gas                                                        | They are hard on equipment and electric tools can't take the beating            | Having to bring 2 sets of tools to the job site if it's even remotely damp outside |
| No fumes, no special gas to mix and spill, lot less maintenance, only legal option in our city | Charging can be a challenge, the tools have to be protected from the weather and morning dew                                                                                                                | I'm overall very happy with the performance. I don't ever want to go back to gas powered | What technicians? You mean the mechanic I bring them to? He will have to fix it | We already faced the challenges and they were minimal                              |

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| I think some battery operated equipment is crucial and to get rid of the gas powered. I believe blowers and drills are good use of batteries. Oversize blowers with batteries and chainsaws and diggers and lawnmowers do not think it's gonna last | We don't use mowers..                                                                                                                                                                                                                                                            | It's quiet and less emissions | Everything is expensive                                                                                                                                                     | Everything is expensive                                                                                                                                                    |
| For blowers, aside from not emitting pollution, our clients have responded incredibly favorably everywhere we have implemented them.                                                                                                                | Battery life and high cost seem to be the two main drawbacks. We're a commercial company so our crews need to run blowers for many hours every day. And of course, they are expensive. For the commercial grade blowers, we're looking at about 3x the cost once fully equipped. | We haven't tested them.       | I'm not certain but I suspect there would be considerably less maintenance and repair work. A big question is how long (how many years) do the batteries hold their charge? | Being able to charge all the equipment and then the high cost of implementation. If the equipment was legally mandated then at least there would be a level playing field. |

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| much more environmentally friendly, much less noise                                               | 1. run time (need 8 hours per day) 2. ease of battery replacement (battery packs) to change on the fly 3. blade tip speed 4. overall mowing speed 5. ease of charging 6. fast charging (IE: Level 2) | clients sometimes specifically request electrics/noise reduction                                                                    | run times, recharging, the number of battery packs required to get through a typical business day, infrastructure costs.. Not enough ability to charge 50 to 100 devices simultaneously            | infrastructure costs/loss of productivite due to charging and battery pack switch outs / costs of switching product                                                                             |
| customers love the noise level especially working around HOA's and school zones, lower fuel costs | We currently run a few Husqvarna Auto Mowers on large properties, municipalities and private land. Very efficient and reduces need for multiple crews.                                               | finding labor right now is a big concern for our operation. Anything we can do to reduce the need for labor is viewed as a positive | Carrying chargers, finding charging sources, additional weight of batteries. We have piloted a few Husqvarna/Stihl solutions both requirre supplemental charging to get through a full day of use. | We will most certainly perform a cost analysis between battery and fuel applications. Cost safety (chainsaw bar speed - need to test trimmer chaps and chainsaw chaps that prevent cut through) |

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| Environmental footprint, leaning out supplies such as gas and fuel cans. Opening space in the trailer. Less risk to employee exposure, operating costs. | Charging and battery weight. Power, culture, mindset that battery is just as good/powerful. | same advantages as handhelds | none, we are relying on quality and less on technicians | culture and charging                                                                                                               |
| quieter lighter                                                                                                                                         | we do not use mowers                                                                        | n/a                          | power outages on storm resotration work                 | power outage would be the largest costs to make a large switch what do you do with all of the gas powered equipment we already own |

|                                                                                                                                        |                                                                                                                                                                                                                                                                                                                              |                                      |                                                                                              |                                                                                                                                                                                                                                                                 |
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| Cost per KWH is lower, charging using customers electricity, time savings vs purchasing gasoline and filing machines and mixing fuels. | Durability of the machines, the batteries are so heavy the frame has to be light. Mowing slopes, they are so heavy they don't hold hills. Lack of repair expertise locally. Parts are difficult to acquire and take a long time to get. Battery life in heavy cutting conditions and longer mow times due to double cutting. | customer perception. Noise reduction | We outsource to dealers and find that they are not trained or knowledgeable about technology | Infrastructure cost to support charging. Much higher acquisition cost and long ROI. Slower operations with some products like blowers and large mowers resulting in increased man hours which will erode margins is not addressed with customer cost increases. |
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| Cleaner, lighter, no fumes, less noise, less fire-risk, fuel-savings. | For a commercial company like us with large acreage properties, definitely the duration of the Batteries, Responsiveness from the manufacturers, lack of support from manufacturers, we have even considered filing a lawsuit using the Lemon-Law! When a large riding mower is seating in a repair shop for over two months! Very few repair shops that have training, knowledge or have support from manufacturers. | Cleaner, lighter, no fumes, less noise, less fire-risk, fuel-savings. | We don't have knowledge of how to repair in the field and we are stuck with work not completed if a mower breaks down, charging time is too long, additional space would be needed for spare equipment that translates to additional expenses for transportation, logistics, risk and storage. | Cost, financing, pricing of new electric equipment is out of this world! Compared with gas-powered equipment, we don't have enough training/knowledge of longevity, we don't enough support from manufacturers. |
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| <p><b>If air board regulators required a switch from gas-powered equipment to battery-power equipment, what impact do you think it would have on your operations? (Please share any specific examples about the challenges it would pose to getting the work done if your equipment needed to be 100% battery operated.)</b></p> | <p><b>Any other comments you want to share about the possible impacts of a shift from gas-powered equipment to battery-powered equipment?</b></p> |  |  |
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| <p>major impact financially</p>                                                                                                                                                                                                                                                                                                  |                                                                                                                                                   |  |  |
| <p>I'd welcome it for our industry and especially our environment</p>                                                                                                                                                                                                                                                            |                                                                                                                                                   |  |  |
| <p>It would have to be phased in over a period of years with input from manufacturers collaborating with commercial contractors</p>                                                                                                                                                                                              | <p>Possible tax incentives would be helpful</p>                                                                                                   |  |  |

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| Having to keep the equipment charged all day while doing our clients and our commercial properties. |  |
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| <p>Answering this is a bit difficult. I can only assume that challenges would include product availability, ongoing maintenance of the equipment, and understanding the productivity of the machines working efficiency. This could make a large impact on the day-to-day operations during the initial equipment conversion schedule.</p> |                                                                                                                                                                                                            |
|                                                                                                                                                                                                                                                                                                                                            | <p>I believe there would be a major blow to efficiency and result in more manhours used for same tasks. This would obviously result in higher labor costs at a time when we can not find enough labor.</p> |

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| <p>Battery powered equipment will require means of charging. As a company that leaves the yard each day and completes an 8-10 hour work day away from the yard, finding the means to charge equipment will be difficult and inconsistent. Additionally, all of our current assets which have been purchased over many years, would be unusable requiring the need to purchase all new equipment during a time of uncertainty and struggle amidst a pandemic.</p> |                                                                         |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                         |
| Higher job cost                                                                                                                                                                                                                                                                                                                                                                                                                                                  | N/A                                                                     |
| Loss of productivity (perceived under performance of battery powered equipment). Discharge anxiety                                                                                                                                                                                                                                                                                                                                                               | Incentives may work to assist transition - think tax credits, subsidies |

|                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                               |
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| <p>Less Productivity, the crews wont be able to spend as much time in the field. They will have to spend more time in the mornings and afternoons in the shop either charging the batteries or having to gather them up to take with them.</p> | <p>The green industry is a vital resource to CA. Rather it is for for home owners, parks office buildings, golf courses, fire breaks and weed abatement. Companies would need to find additional labor so they can get get the jobs done in the same amount of time as if they were using gas powered equipment. At the moment finding landscape labor if very difficult.</p> |
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| Slows everything down, would need to raise prices. | Probably a balance needs to be addressed, perhaps it makes sense for a home owner who mows their lawn the size of a postage stamp to use battery operated equipment, but contractors who need to come in, get the job done as efficiently as possible need reliable and powerful equipment, not battery operated toys. |
| Cost.... repair                                    | No                                                                                                                                                                                                                                                                                                                     |
| slower completion time                             | Better for the environment, and I would have no problem converting to battery                                                                                                                                                                                                                                          |

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| Higher service costs.                                                                                                                                                                                   | Battery manufacture or production pollutes the environment as well.                                                                                                |
| How would our vendors be able to handle all the orders? And with the chip shortage/ battery material minerals situation. And not enough truckers to deliver goods from ports.... Too quick a timeframe. | If cities want us to switch to 100% electric in short period of time, they should subsidize part of this investment.                                               |
| Loss of revenues on each pricey, as much as 5-10% if that equipment was needed on my particular project.                                                                                                | This would effect maintenance only operations substantially, and design build appx. 5-10% of lost revenues of that equipment was needed on the particular project. |

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| take longer in some cases, especially large turf areas the initial investment, charging stations We would need to raise prices initially at least.                                                                                            |                                                                                                                                                                                                                                                                  |
|                                                                                                                                                                                                                                               | I would love to see the shift to battery operated tools within the landscaping industry.                                                                                                                                                                         |
| This would be a large investment during challenging economic times. It would be devastating to our ability to perform the work that is needed. Battery powered equipment has not caught up to gas powered yet in reliability and portability. | No                                                                                                                                                                                                                                                               |
| The cost would be considerable. Work production would slow down a percentage because the battery powered equipment is not quite on par with our gas fueled tools                                                                              | I love the idea if it helps the environment. What would help us out to transition to battery equipment would be an incentive program via a trade in program of our existing equipment. Also discounts on new equipment to make the change financially equitable. |

|                                                                                                                                         |                                                                                           |
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| again the biggest is charging batteries constantly and being able to pass on the costs                                                  | It needs to happen I just wish batteries held a charge longer                             |
| Currently using propane for large mowers (36" to 60") reducing the use of gas. Slowly intergrading battery powered equipment into fleet | Longer life of batteries, charging while in the field and power of equipment              |
| cost, charging, availability of equipment and some applications really would work better with gas powered equipment                     | MSE Landscape Professionals has committed to be fully battery operated by the end of 2022 |
| Financially not able, business loss                                                                                                     | Hope this does not happen until technology makes it worth it                              |

|                                                                                                                                                          |                                                                                                                                      |
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| Added expense of purchasing all new equipment, expense of purchasing additional batteries for big properties, not sure how good a job those machines do. |                                                                                                                                      |
|                                                                                                                                                          |                                                                                                                                      |
| I think jobs make get done slower.                                                                                                                       |                                                                                                                                      |
| jobs would take longer to complete, less profit or would have to charge more. How much higher can rates go for the market to still bare?                 |                                                                                                                                      |
| i would do it                                                                                                                                            | i like the battery powered                                                                                                           |
| Know cell power so you know limitations                                                                                                                  |                                                                                                                                      |
| The equipment is expensive & we would have to ramp up a more efficient system for charging.                                                              | We have been gradually transitioning since last year & welcome the change. Most of our client service areas have banned gas blowers. |

|                                                                                                                                                                                                                                                                                       |                                                                                                                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| chain saw is the only gas tool we use for landscape maintenance                                                                                                                                                                                                                       | Battery powered is a great option compared to gas, but its an investment and a mindset                                                |
| Finding the proper equipment to cost ratio. Having the larger equipment operate for the length of time required to finish job/project and be ready to continue to next site. Cost of investment to complete tool lists for workforce and how to justify increase into cost to clients | What are options on working with battery power equipment if battery equipment is not available or ready for commercial implementation |
| No problem for us.                                                                                                                                                                                                                                                                    | Where possible we are committed to this conversion.                                                                                   |
| Retraining of crews about care and storing                                                                                                                                                                                                                                            |                                                                                                                                       |

|                                                                                                                             |                                                                                                                                                                                            |
|-----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 80% of the equipment I currently use is battery powered, so the impact on my company would be less than on other companies. | I bought a lot of my equipment using a rebate program from AQMD which reduced the initial investment costs significantly, and was one of the main reasons I transitioned to battery power. |
|-----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                                                                             |                                                                                                                                                          |
|---------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| No battery truck availability. No adequate 21" mulching mower. No adequate Backpack Blower. | If it was mandated, we would increase contract prices to cover the increased labor, but overall, the current equipment we are operating is saving labor. |
| I do not see any challenges                                                                 | Needs to happen.                                                                                                                                         |

|                                |                                                                                                     |
|--------------------------------|-----------------------------------------------------------------------------------------------------|
| Rain and Heat and battery life | Price is ridiculously high for a small maintenance company. Would need a covered truck when raining |
| None                           | As long as the technology improves, we'll be fine                                                   |

|                                                                                                                                                                                                                                 |                                                                                                                                                        |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                 | Some gas powered engines are more efficient now and burn cleaner. An impact for the environment or earths is less than mining and processing batteries |
| I think it would ultimately come down to the cost. Commercial grade electric battery powered equipment is very expensive. It's unclear how receptive our clients would be to having us pass these significant costs on to them. | It would be great if there were rebates and incentives to facilitate the transition.                                                                   |

|                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| stated in earlier answers                                                                                                                                                                                                                                                                             | NA                                                                                                                                                                                                                                                                                                           |
| <p>Supply Chain is a major concern at the moment and getting any equipment is a challenge including battery equipment. We do not see this changing for quite some time. We also receive off highway tax credits for gas powered equipment including wood chippers, chainsaws and hand-held tools.</p> | <p>The infrastructure to support battery powered equipment is a concern for the operation. Charging stations are not readily available in our work areas. Noise reduction is a positive. Safety standards for PPE (i.e. chaps) must be reviewed and understood by the operation prior to a full rollout.</p> |

|                                                                                                                                                                                                                                      |                                                                                                                                                                                                                           |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cost, availability of parts, supply chain                                                                                                                                                                                            |                                                                                                                                                                                                                           |
| Finding equipment. We just ordered chainsaws and there is a battery shortage so the saws came with batteries being back ordered. The costs to switch over completely disposal of gas powered equipment that is in perfect condition. | I feel they have their place to help the environment but it can't be a drop dead date. Should adapt slowly and get more testing in field to see how will hold up. What do you do with batteries that life has expired on. |

|                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
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| <p>We have not fully studied the impact as we are testing and collecting data now. What we have learned so far is that large mowers, will be 3 times more expensive to acquire, last about the same number of years as gasoline, every branch will need to invest 15 to 30k to build out charging infrastructure and operations performance in man hours will take longer.</p> | <p>The technology is still young and is developing rapidly. At some point the manufactures will solve the production issues with large mowers and blowers and as sales ramp up cost should go down. This will take a long time to level out so the ROI is going to be challenging for some time. While lost of folks are talking about autonomous there is not a commercial product available today. When this technology matures and hits the market it will solve for some of the large mower issues and change the industry signifcantly.</p> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                      |                                                                                                                                                                                                                                                                                                                                                        |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Not possible probably 7 to 10 years. | The idea is great, homeowners as the end-users are a no-brainer, however the commercial landscape service industry lacks support and comprehensive training, education, outreach to smaller dealers, repair-shops, availability of parts and how-to's and most importantly the planning of a cost-effective, smooth transition with planned longevity. |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

# Appendix C

# Blowing Force Comparison EGO EB6500 VS ECHO PB-2520

# Blower Performance Parameters

- The following parameters are indicators of a blower's ability to do work
  - Air Velocity (Speed) – Speed of the blower air in mph – How fast debris can be moved, which is a factor in time on the job.
  - Air Flow (Rate) – The volumetric rate of the blower in  $\text{ft}^3/\text{min}$  – How much volume of debris can be moved at a given speed, which is a factor of time on the job.
  - Force Measurement – The force of the blower in Newtons (N) – How much mass of debris can be moved, which is a factor of time on the job.
  - Run-time – The time a blower runs in minutes (before refueling or changing batteries)
- For landscapers, time is money so if the amount of work is less than more time is spent on the job which means less jobs per day

# Blower Performance Parameters

- CARB includes these parameters when comparing the subject blowers in the ISOR
  - “Staff compared leaf blowers that can move similar amounts of leaves based on air flows stated in equipment specifications. The SORE equipment considered moves air at 453 ft<sup>3</sup>/min, while the ZEE ranges from 250 to 500 ft<sup>3</sup>/min. The blower force of the SORE blower is 15.8 Newtons. The zero-emissions leaf blower has a blowing force of 21 Newtons
  - Despite a plan to conduct ZEE durability testing, CARB conducted no technology feasibility comparisons. CARB based comparisons solely on marketing data which may not reflect the equipment performance beyond a snapshot in time or may have inaccurately depicted equivalence in performance and run time

# Blower Performance Parameters

- Conclusions

- While the CARB noted performance values are confirmed by industry testing, the performance of the ZEE blower in all three performance metrics degrades from the moment the blower is started until the battery dies. The ZEE battery lasts just 18 minutes in the “turbo” mode, the mode that reflects the maximum performance values noted in the marketing info, while the gas-powered blower maintains its performance in all three metrics for the full 1-hour test (the equivalent of 1-tank of fuel or approximately one pint of fuel).
- CARB SORE2020 models average blower use at 1.15 hours/use (per day), and that on average each landscaper that uses a blower owns 2.17 blowers. According to CARB SORE2020, the average landscaper who operates a blower(s) uses them 2.5 hours/use (per day). In the low performance mode (24min/battery) the landscaper would require (7) 5 Ahr batteries (or charges) a day just for blowers. In the high performance mode (18min/battery), the mode by which the maximum air-flow and force are measured, the landscaper would require (9) 5-A-hr batteries (or charges) a day just for blowers. In HD commercial applications the performance stated in CARB’s ISOR is not sufficient and in fact no battery powered blowers of this size exist on the market today.

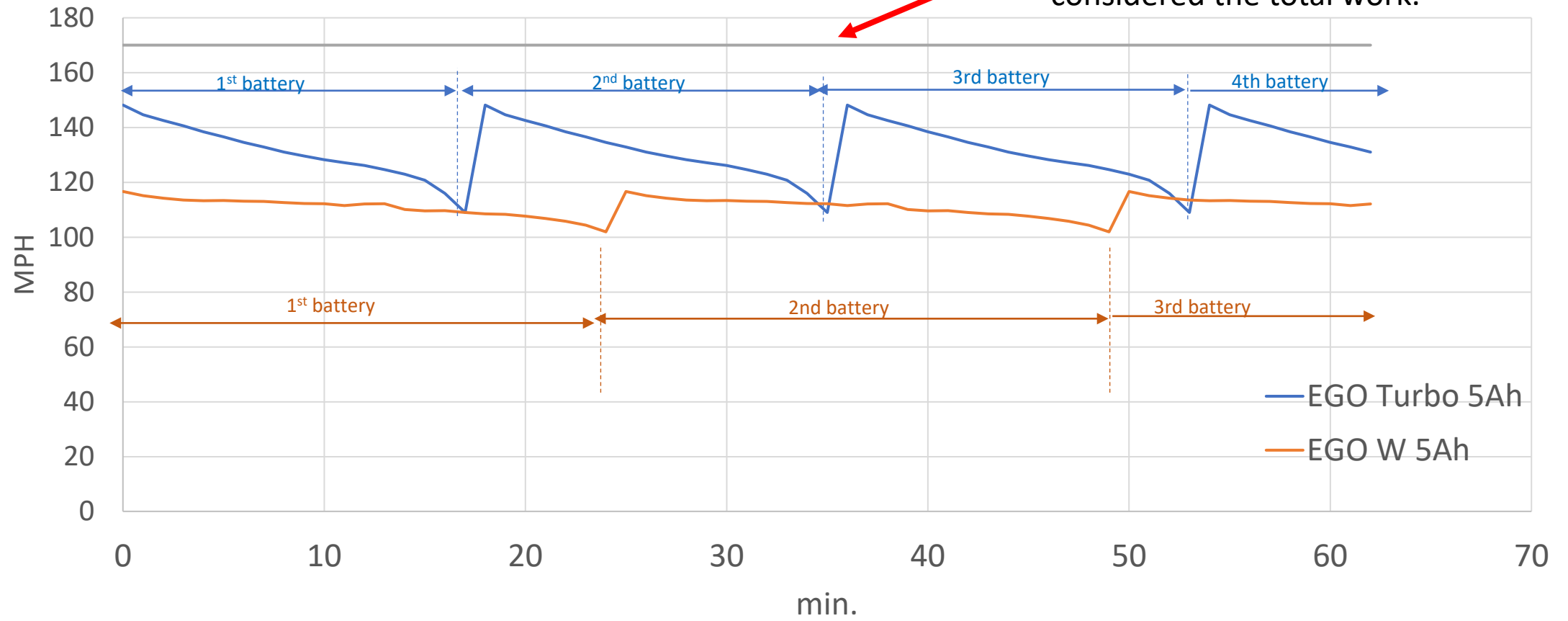
# Blower Performance Parameters

- Conclusions

- Battery performance starts to degrade after 300 charges. Most battery makers state a goal of 85% capacity at about 300 charges. Battery capacity continues to degrade until it must be replaced. CARB models 210 starts/year (days). CARB models the median age of leaf blowers as 5 years. As a result, replacing batteries at 500 hours, landscapers would need to replace 7-9 batteries at least 2 times (3 sets of batteries) in order to achieve the median blower age.
- Battery costs for a typical handheld blower may be \$150 for 2.5 Ahr to 250 for a 5 Ahr – In the CONSERVATIVE case, no “turbo” used, total battery cost \$250 x 5 (machines come with one battery to start, 5 extra batteries needed) + \$250 x 7 x 2 = \$4750+ over the life of the blowers. The cost of Fuel and oil over this time is far less.

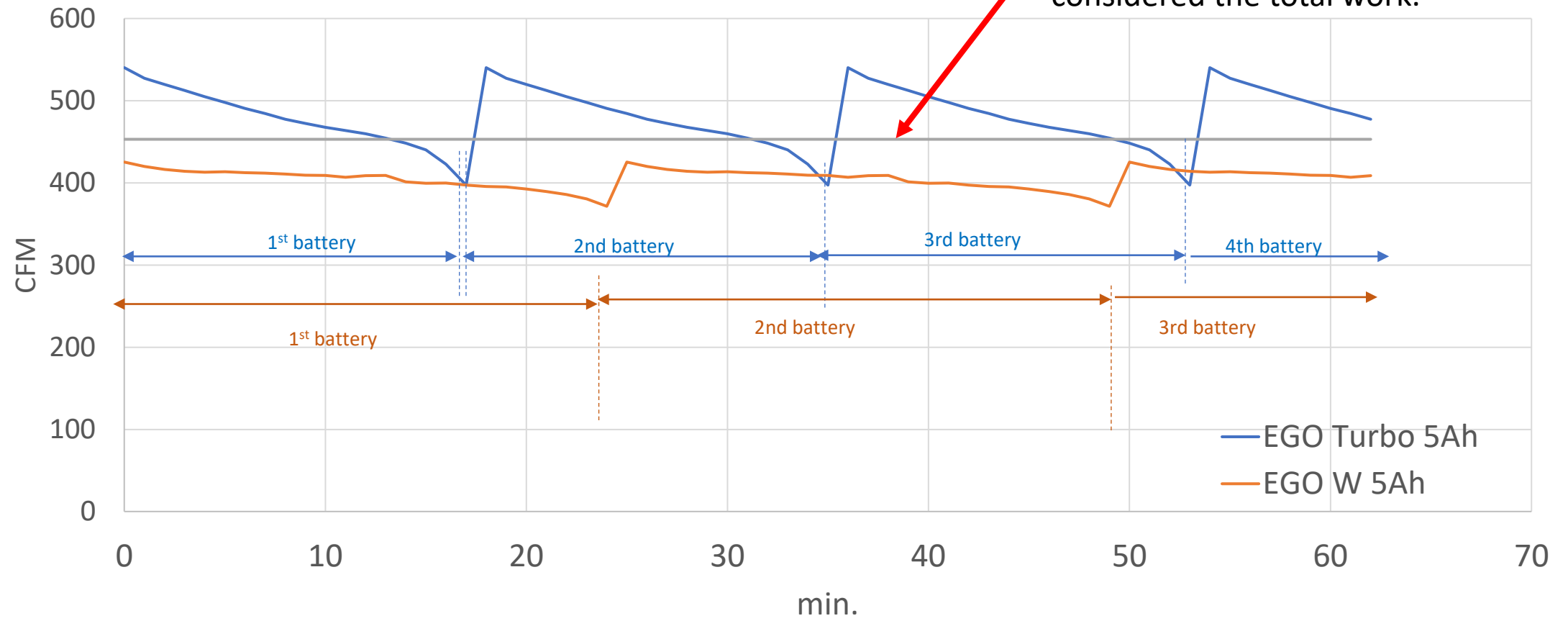
# Air Velocity (speed)

PB-2520 (gray) Performance for for 1-tank. Area under line is considered the total work.



# Air Volume

PB-2520 (gray) Performance for for 1-tank. Area under line is considered the total work.



# Blower Force

