



Value Proposition for Commercial & Industrial EVs

Overview

Our cell balancing technologies (True Balancing and Positive Balancing) can reduce operating costs of commercial & industrial EVs and can increase ROI significantly. They achieve this by doing the following:

- Increase operating time between battery recharges
- Maximize battery capacity
- Extend battery life
- Provide early warning of cells or modules that are going bad

Commercial & Industrial EV Market Segments

The following segments of the C&I EV market can benefit from our balancing technologies:

- Local delivery and city buses
- Long-haul delivery
- Service vehicles in warehouses, airports, etc.
- Construction
- Agriculture
- Mining
- Light-rail trains
- Marine
- Electrified aircraft (such as eVTOL)

Cost of Downtime

C&I vehicles are business assets that generate revenue for the owner of the vehicle. When a C&I vehicle is not operating, it is not generating revenue. Downtime for C&I vehicles can cost several hundred dollars per hour to tens of thousands of dollars per hour¹, depending on the specific vehicle and the industry.

Downtime for forklifts can cost:²

- Manufacturing: \$20,000 - \$22,000 per hour
- Warehousing: \$10,000 per hour
- Food processing: \$6,000 - \$9,000 per hour

Downtime for one dump truck can cost more than \$1000/hour.³

Downtime in the mining industry can be particularly expensive. If mining operations must cease while equipment is down, the cost can be \$40,000 to \$200,000 per hour.⁴

True Balancing and Positive Balancing add value to C&I EVs in four ways:

1. Maximize utilization of battery capacity
 - This lets the vehicle operate for as long as possible between battery charges
 - Longer operating time between recharging reduces the amount of downtime
 - Our technologies can increase available battery capacity by 5% to 30%⁵

¹ <https://rpmmachinery.com/the-cost-of-heavy-equipment-downtime/>

² <https://www.lillyforklifts.com/blog/how-to-calculate-the-true-cost-of-downtime>

³ <https://doranmfg.com/maximizing-uptime-in-the-mining-industry-best-practices-for-truck-maintenance/>

⁴ <https://www.linkedin.com/pulse/types-downtime-mining-industry-scheduled-n8j9c/> and <https://www.boltstress.com.au/blog/post/downtime-cost-in-a-mining-industry>

⁵ Independent tests performed by Center for Energy Research at University of California San Diego demonstrated that True Balancing increased the capacity of Tesla Model S battery modules by an average of 15.9%, with maximum increase in capacity of 36.6%. The modules were between 10 and 12 years old at the time of testing.

2. Fastest possible recharge to true 100% SOC

- Existing balancing technologies, can take hours (and in some cases days) to complete the balancing phase of a charge cycle
- With True Balancing and Positive Balancing, the balancing phase of the charge cycle is typically measured in minutes
- This gets the battery to true 100% SOC and gets the vehicle back to work as soon as possible

3. Maximize battery life

- Battery replacement in C&I EVs imposes a major cost in both CapEx and lost revenue
 - Replacement batteries can cost between \$10,000 and \$250,000
 - Replacing the battery can take two to seven days, which is significant downtime
- Our technologies can extend battery life by 20% to 40%, which extends the interval between battery replacements

4. Safety – minimize incidences of catastrophic failure or thermal runaway

- Both True Balancing and Positive Balancing can provide real-time measurements of cell impedance. This can give early warning of impending cell failure and/or thermal runaway
- Thermal runaway can lead to a battery fire which will destroy the vehicle and could also ignite surrounding buildings and equipment
- True Balancing can give early warning of common failure conditions and allow preventive maintenance to be performed before critical or catastrophic battery events occur