



# Why Does The World Need A Better BMS?

**The Problem:** *Existing battery management systems are extraordinarily ineffective at keeping batteries balanced.*

This has far-reaching and expensive implications for the battery and automobile industries.

## *This drives up battery cost*

To compensate for the shortcomings of passive balancing systems, EV manufacturers require battery packs that are finely tuned with extremely closely matched cells. It is difficult and expensive to make batteries that meet these stringent requirements. This drives up battery cost. We estimate that EV manufacturers pay a premium of between \$1000 and \$2000 per battery pack simply to compensate for the shortcomings and deficiencies of passive balancing systems.



## *And reduces driving range*

In any EV, driving range declines as the vehicle is driven. Loss of range is cited as one of the biggest complaints about EV performance.

Most loss of driving range is due to the cells drifting out of balance. If the out of balance problem could be solved, EVs would maintain their driving range for much longer.



## Battery life is shortened

Out-of-balance cells accelerate the battery's march towards end of life.

If BMS electronics could keep cells balanced, we estimate that the life of tier-1 batteries could be increased by about 20% and the life of tier-2 batteries could be increased by more than 50%.



## High-dollar, high-risk R&D expenditures to try to make better batteries

A key area of focus in battery R&D is to try to develop new battery technologies and new manufacturing processes that minimize variations in cell characteristics.

One of the key reasons for this area of research is to compensate for the shortcomings of existing balancing technology. Billions of dollars have been spent on this research. Those expenditures continue to this day, in part because there has been no BMS technology that is effective at keeping batteries balanced.

## These are four reasons why the world needs a better BMS

## The Solution: *True Balancing*



**True Balancing** is a breakthrough in battery management. It provides an unprecedented a level of control over the individual cells in the battery.

**True Balancing** completely eliminates or significantly mitigates all of the problems listed above. We have conducted extensive testing that validates the performance of True Balancing. Complete test results can be downloaded from [www.truebalancing.com](http://www.truebalancing.com).

### Reduce Battery Cost

True Balancing can reduce battery cost in several ways. The two most significant ways that True Balancing reduces battery cost:

1. Adding True Balancing to your BMS will increase battery capacity by 5% to 15%. By making a small, inexpensive change to the BMS electronics, your batteries can instantly have greater capacity. The cost per unit of energy in the battery will drop by 5% to 15%.
2. A tier-2 battery with True Balancing will perform similarly to a tier-1 battery with passive balancing. Getting tier-1 performance from tier-2 cells can significantly lower battery purchase price.

### Maximize Driving Range

True Balancing completely eliminates out of balance conditions for the entire life of the battery. This maximizes battery capacity which maximizes driving range. True Balancing further increases driving range because of its ability to balance the cells during discharge. This allows as much of the battery's energy as possible to be used to drive the vehicle.

## Longer Battery Life

Completely eliminating out of balance conditions also maximizes the life of the battery. Decline in SOH occurs more slowly and battery life is extended.

True Balancing can double the life of tier-2 batteries.<sup>1</sup>

## No Need to Wait for Better Battery Technology

Developing new battery technologies is very expensive (measured in billions of dollars), takes many years (often measured in decades), and is a high-risk undertaking. Most battery development efforts will never attain commercial viability. True Balancing is available now to provide improved performance to any battery pack.

## True Balancing – The Better BMS the World Has Been Waiting For

- ☑ True Balancing is available now.
- ☑ True Balancing is a low-cost technology with a high payback ratio. For an added cost of less than \$100 in a typical EV, the value added to the battery pack is measured in the thousands of dollars.
- ☑ True Balancing is tested and proven to improve battery performance. The research part of R&D is completed.
- ☑ True Balancing is designed for easy, low-cost system integration. The cost of adding True Balancing to an existing BMS is negligible compared to the cost of ramping up production of a new battery plant.
- ☑ When new battery technologies become commercially viable, True Balancing will improve their performance too.

***Unlock the Full Power of Your Battery With True Balancing***

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<sup>1</sup> Analysis of True Balancing's effect on battery life is available at [www.truebalancing.com](http://www.truebalancing.com)