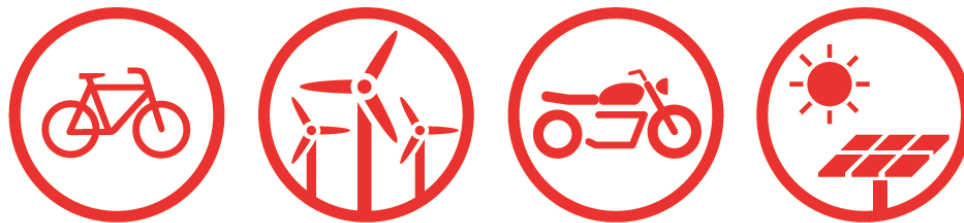


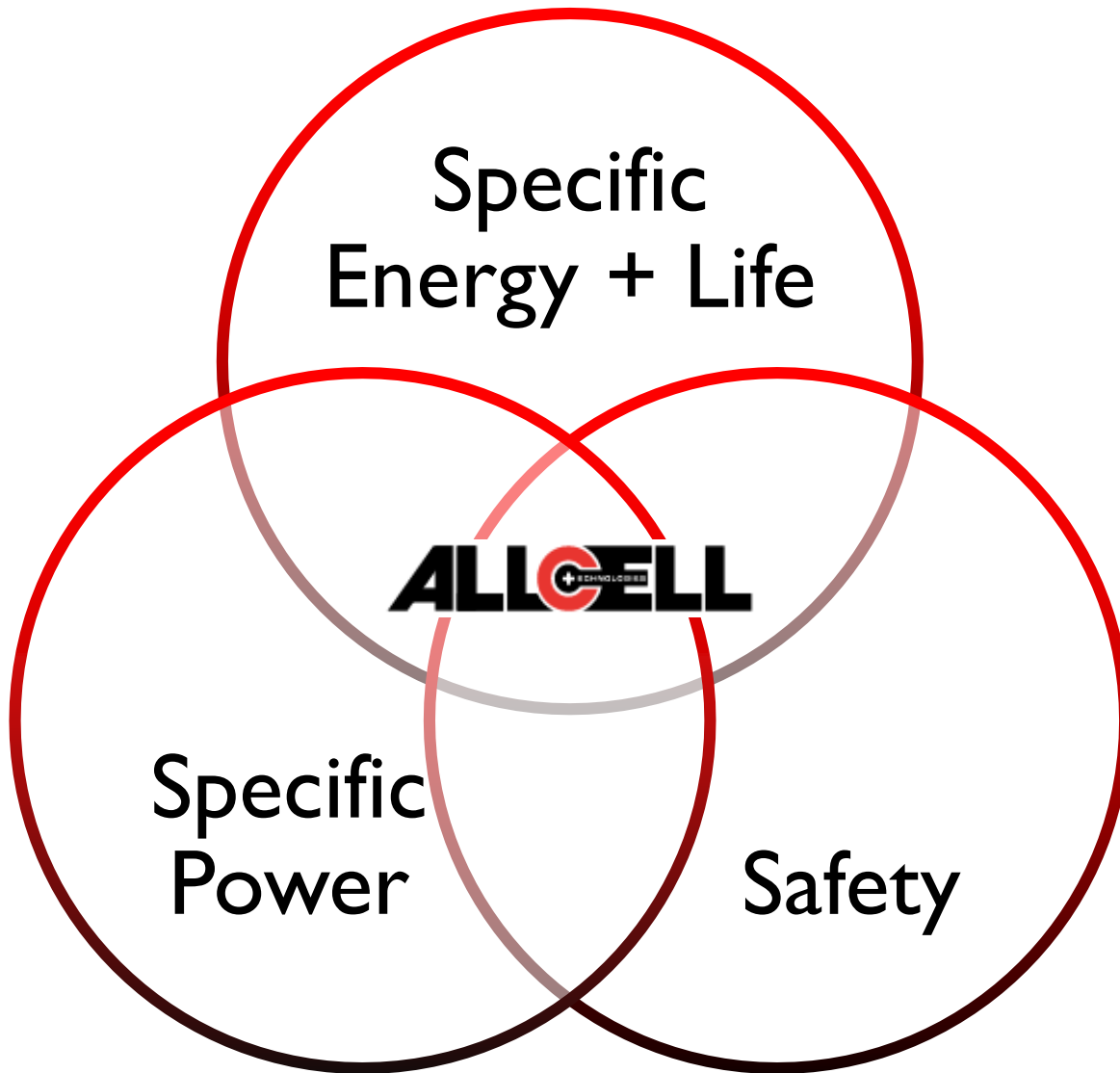
AllCell Technologies, LLC

Cool by Design™

PCC Absorbs Environmental Heat

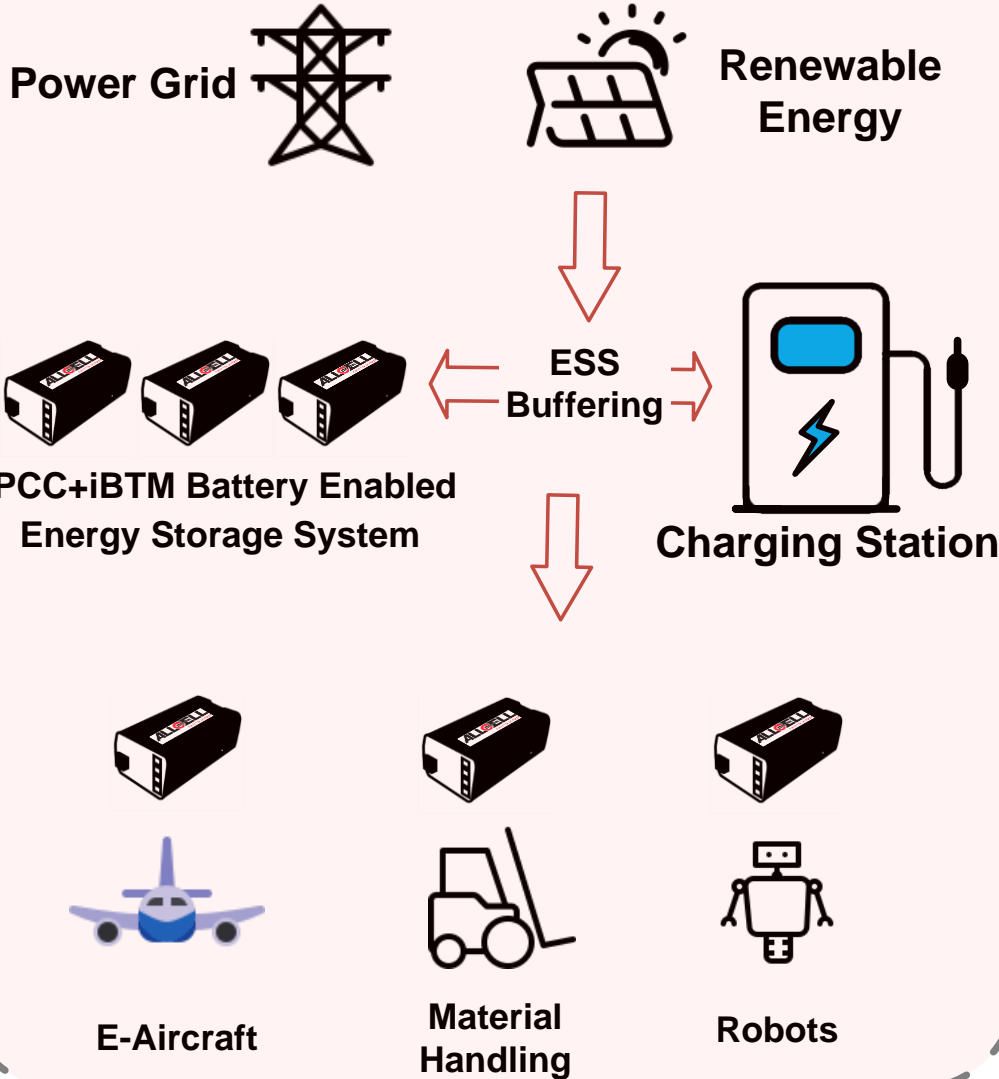


PCC Value Proposition

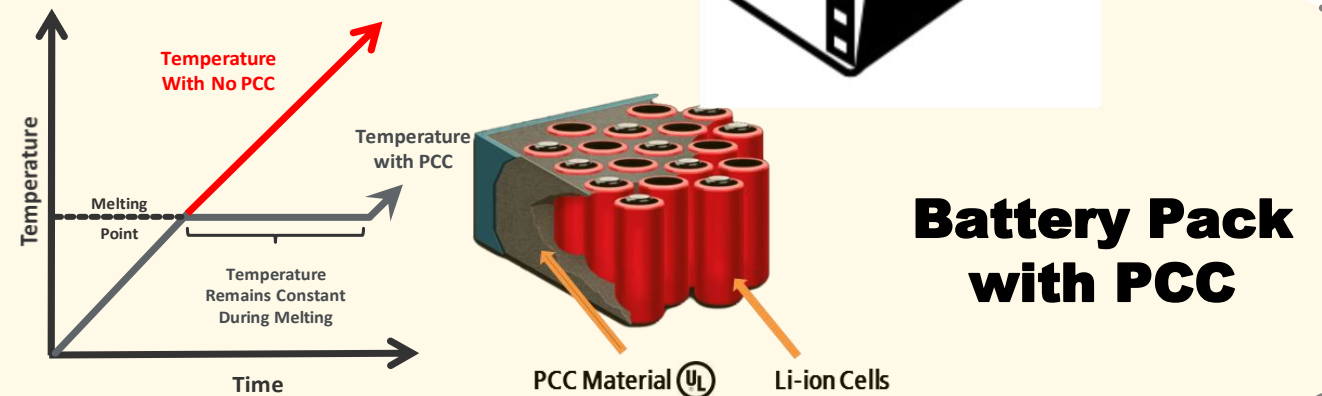
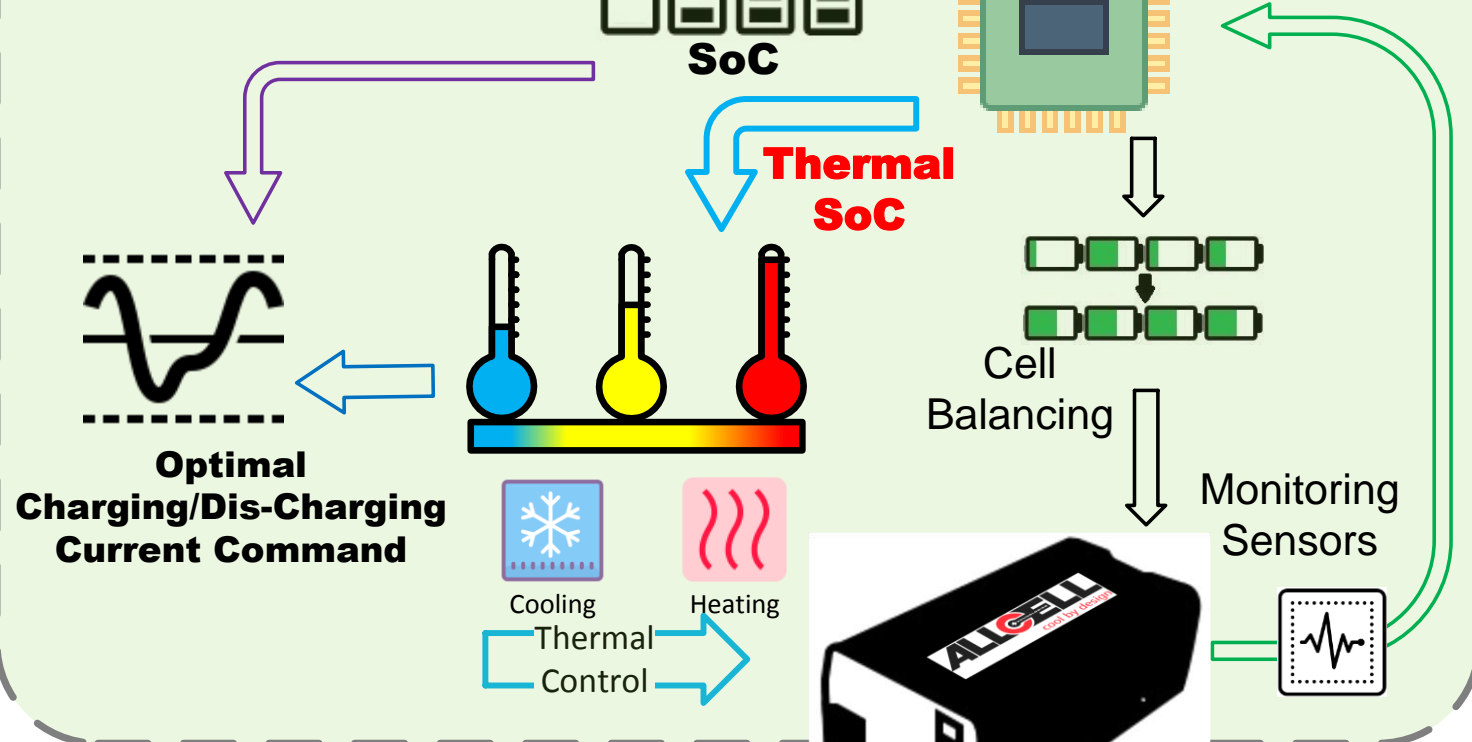


- PCC:
 - Prevents thermal propagation
 - Distributes and manages the temperature to improve cell life
 - Enables use of higher energy cells at a higher power through improved thermal management
 - Independently validated by:
 - Major eScooter customer validated life cycle testing
 - NREL (thermal testing and modeling)
 - UL (94-V0 certification)
 - Intertek (UN38.3)
- IP Portfolio:
 - Issued patents: 6 US, 1 EPO (France and Germany), 1 South Korea (2 new patents extend IP to ~2034)
 - Applications: 2 US, (filing in India, China, EU)

Integrated PCC + iBTM Solution



iBTM System Diagram

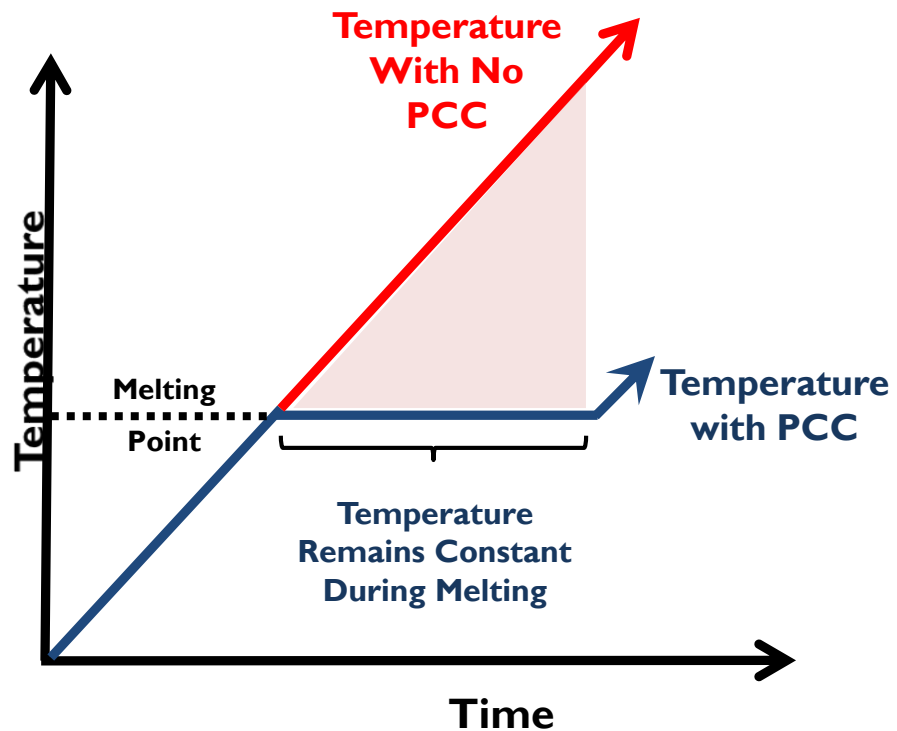


How Does AllCell's patented PCC Work?

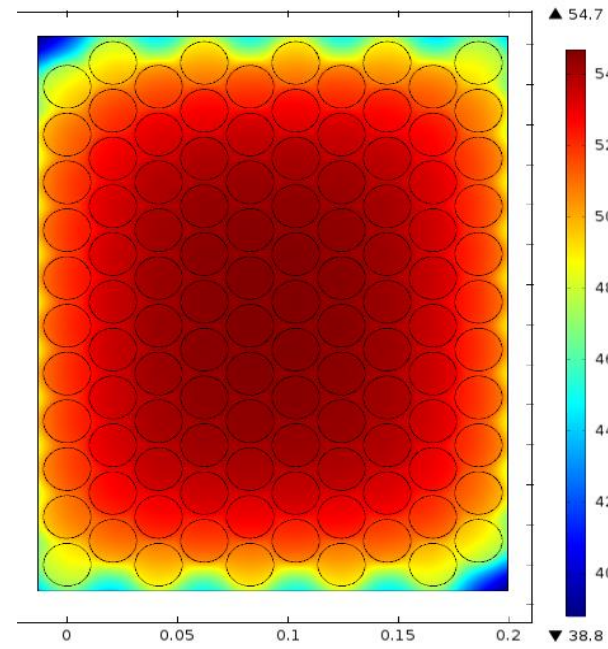
AllCells Phase Change Composite (PCC) consists of a patented and proprietary engineered graphite matrix designed for rapid heat dispersion, and an encapsulated **wax**, to provide optimum heat absorption.

Wax
absorbs heat as it melts

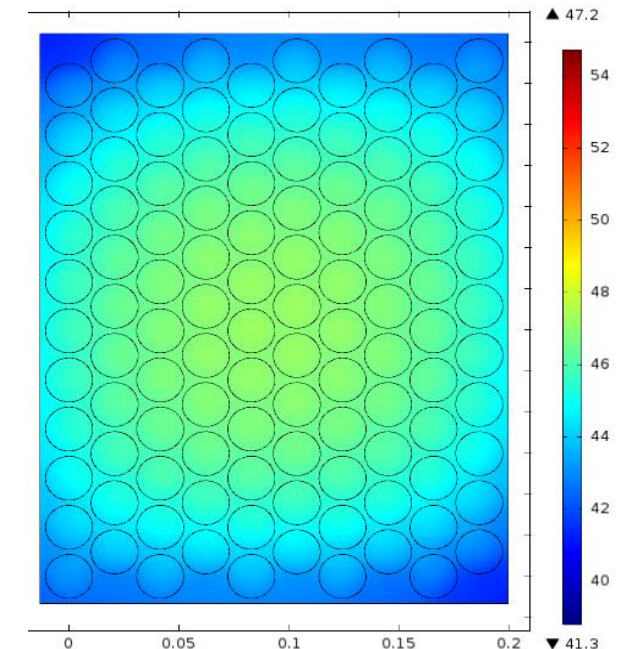
$$Q_{\text{absorbed}} = f(L_{\text{wax}}, m_{\text{wax}}, k_{\text{graphite}})$$



Graphite
distributes heat evenly – temperature gradient reduced by 50%, peak temperature reduced by 8°C



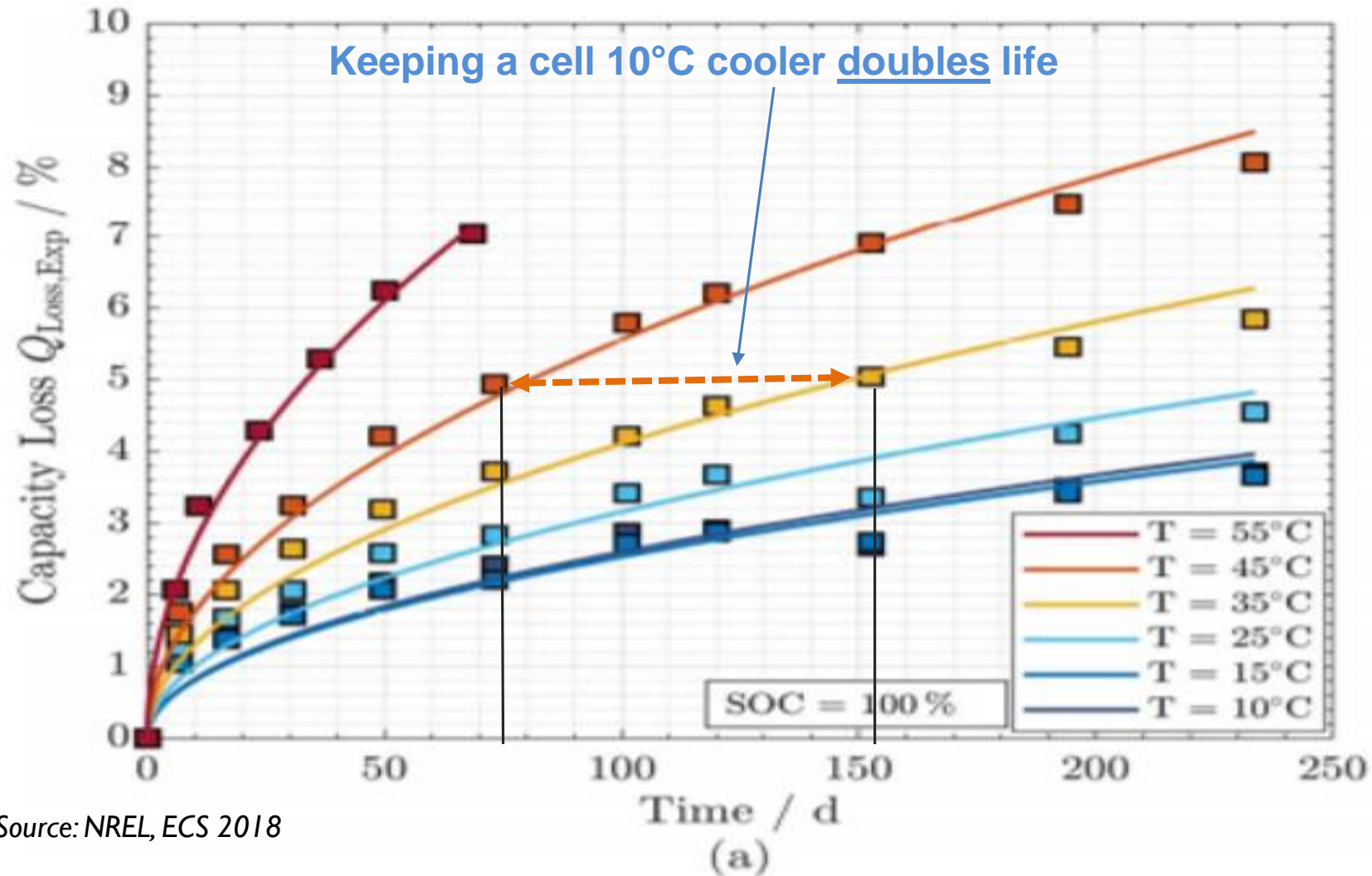
Pack temperature with no thermal management



Cool pack temperature with AllCell PCC

Impact of Higher Temperatures on Cell Life

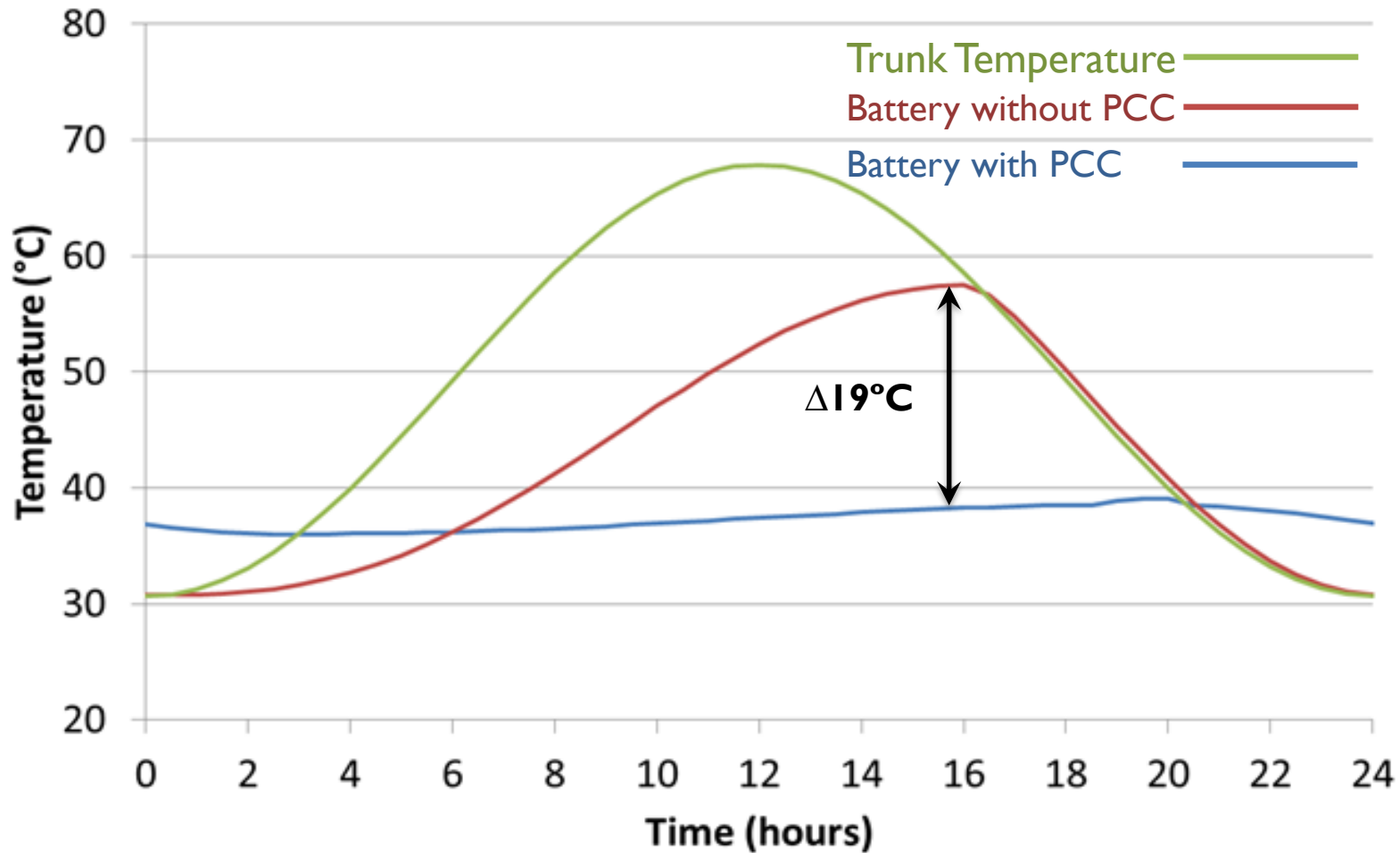
Calendar aging of Li-Ion cells at different temperatures



Source: NREL, ECS 2018

PCC Shields Batteries from Hot Environments

Comparison of two battery packs in a hot trunk (Phoenix)



- AllCell PCC reduced the peak temperature by 19°C (33%)
- Temperature was maintained below 40°C for the duration of the test avoiding temperatures at which accelerated cell degradation can occur (typically surface temps of $>50^{\circ}\text{C}$ can result in accelerated aging of the cell)

Contact Information

info@allcelltech.com

AllCell Technologies LLC
2321 West 41st Street
Chicago, IL 60609 USA
www.allcelltech.com

