



HOW TO DESIGN BATTERIES FOR THE CIRCULAR ECONOMY:

10 BEST PRACTICES FOR BUILDING BATTERIES TO LAST MULTIPLE GENERATIONS

Here at Samsar we build batteries that last a long, long time. Batteries built to live again. Batteries designed from day one for multiple generations of use.

By building a circular path for lithium batteries Samsar unlocks the full potential of lithium battery technology. Here's how:

LAST LONGER

Multi-generational batteries last longer. Circular economy design standards result in a more rugged design, that are repairable and can be serviced in the field, and batteries that age more gracefully. Batteries with a higher tolerance for vibration, extreme heat and cold, and customer abuse.

LOWER COST OF OWNERSHIP

Multi-generational batteries result in a lower total cost of ownership over the lifetime of the product. By engineering a battery that is more likely to achieve the 10-year lifespan potential of the technology the customer can unlock years of additional value.

SAMSAR

HOW TO DESIGN BATTERIES FOR THE CIRCULAR ECONOMY:

10 BEST PRACTICES FOR BUILDING BATTERIES TO LAST MULTIPLE GENERATIONS

VALUE INSTEAD OF TRASH

Multi-generational batteries create a battery core that has value instead of trash that you must pay to throw away. The lead acid battery market embraced a circular economy decades ago, and the largest lead acid battery incumbents make a significant portion of their net profit from recycling lead acid batteries. This is why Samsar will pay a core fee for every battery we sell that is returned at the end of life for upcycling – by designing a battery for multiple generations every battery has value.

LOWER COST REFURBISHED BATTERY MARKET

Multi-generational batteries allow for the creation of a lower-cost, refurbished battery market. This makes lithium-ion batteries more affordable and accessible.

U.S. BASED SUPPLY CHAIN

Multi-generational batteries support a U.S.-based lithium battery supply chain. These are batteries already in the U.S., processed at Samsar North America Battery Processing in Sugarland, Texas. No duty. No tariffs.

REDUCE E-WASTE

Multi-generational batteries reduce e-waste, diverting millions of pounds of un-recyclable material from the landfill.

The sad truth is only a very tiny percentage of lithium batteries are recyclable. Modern EV battery recycling technology collects a few metals like copper, aluminum, nickel and cobalt from the battery. But, for most drivers, when they replace their EV battery, 90% of the battery ends up in the landfill.

HOW TO DESIGN BATTERIES FOR THE CIRCULAR ECONOMY:

10 BEST PRACTICES FOR BUILDING BATTERIES TO LAST MULTIPLE GENERATIONS

Samsar has partnered with leading electric vehicle manufacturers to repurpose used EV batteries for other applications, with a portion of the profits from the resale going to the EV company. Samsar's patented re-manufacturing process captures 90 - 100% of the content of a used EV battery, providing lasting value.

In this section, we will show you how to support the circular economy by designing batteries for your application that can be easily disassembled and upcycled at end of their 1st life.

Here are Samsar's top ten design standards for building multi-generational lithium batteries:



ELIMINATE GLUE & ADHESIVES

Most lithium batteries use strong industrial adhesives to weld cells together, to connect the BMS to the battery module, and to connect the battery module to the battery case. The problem is adhesives make it nearly impossible to remove a cell, or the BMS from the battery. This makes it hard for a battery to be repaired or serviced in the field. It also makes it impossible for cells to be tested individually or repurposed for 2nd life applications. The cells are often destroyed in the disassembly process when adhesives are used. Instead of adhesives Samsar suggests mechanical connections, mechanical compression, and using easy to remove rubber polymer for heat dissipation, fire safety, and vibration resistance.

HOW TO DESIGN BATTERIES FOR THE CIRCULAR ECONOMY:

10 BEST PRACTICES FOR BUILDING BATTERIES TO LAST MULTIPLE GENERATIONS



USE MECHANICAL COMPRESSION OF THE BATTERY MODULE, PREFERABLY WITH STEEL OR ALUMINUM

Adequate compression greatly extends the life of the cells. Since electric vehicles went mainstream in the 2010s, the lithium batteries that have been powering them have lasted longer and degraded much more slowly than originally forecast. It turns out that much of the extended lifespan is due to the mechanical compression of the battery inside the metal battery case. Compression is one of the best ways to extend a battery's lifespan and ensure the cells inside can be upcycled at the end of life.



USE MECHANICAL CONNECTIONS FOR CELLS

Cells with mechanical connections (imagine a nut and bolt) last longer than welded connections. The battery is also more resistant to vibration, cells charge more evenly due to the uniform surface area which results in a longer lifespan, and it is easier to disassemble the battery at end of the 1st application. .



USE BATTERY CASES WHERE THE LID CAN BE REMOVED

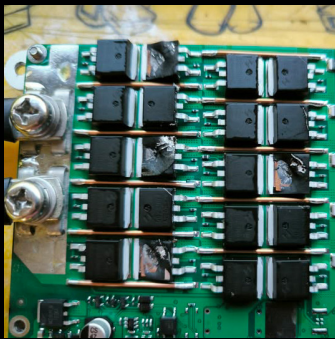
This allows for repairing a battery in the field without needing to ship it back to the factory. Use a silicone gasket around the lid to achieve an IP 67 waterproof and dustproof seal.

HOW TO DESIGN BATTERIES FOR THE CIRCULAR ECONOMY:

10 BEST PRACTICES FOR BUILDING BATTERIES TO LAST MULTIPLE GENERATIONS

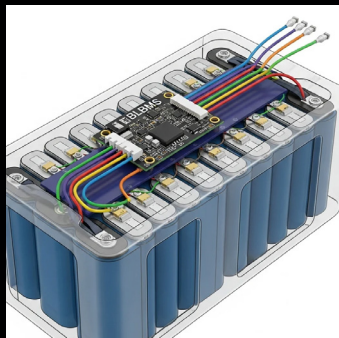
USE RUBBER POLYMER DIP FOR BATTERY MODULES

There's lots of different rubber polymer out there. Our favorite dissipates heat, is fireproof, eliminates vibration, protects battery connections, makes the battery module waterproof, and provides oxygen suppression which prevents thermal runaway. Use a polymer that can be easily peeled off at end of life (non-adhesive).



USE LARGER MOSFETS

Most BMS's have mosfets that are sized exactly to the max specifications of the battery. The problem, however, is that most batteries are subject to use where the max specifications are tested regularly – such as golf cart batteries or RV batteries running air conditioning – applications where lots of amps are required at one time. When a BMS fails it is most often a mosfet that melted from too many amps running through too small of a surface area. By making the mosfets bigger the BMS becomes more durable and the battery lasts longer. This also increases safety by reducing internal heating and fire risk.



MAKE IT POSSIBLE TO REPLACE THE BMS

The majority (>80%) of lithium batteries that fail is due to a BMS failure. This is because a BMS is subject to extremes – it is built to protect the battery from short circuits, overcharging, over discharging, and overheating. As a result, the BMS is subject to abuse and is the component most likely to fail in a lithium battery. Make the BMS easy to replace by making the lid of the battery case removable, by not gluing the BMS to the battery module, and by making it possible to unplug a BMS and install a new one with minimal tools.

HOW TO DESIGN BATTERIES FOR THE CIRCULAR ECONOMY:

10 BEST PRACTICES FOR BUILDING BATTERIES TO LAST MULTIPLE GENERATIONS

USE WIRING CONNECTIONS THAT ALLOW FOR REPLACING THE BMS

When a BMS is installed in a battery, wires are commonly soldered on, resulting in damage when the BMS is removed. By using plug and play wiring like Anderson plugs, you allow for the BMS to be easily removed and replaced when needed.

USE A SOFTWARE BMS THAT CAN BE MANUALLY UPGRADED BY CANbus

Software code ages and degrades with time. Wildly enough, this code degradation is caused by cosmic rays bombarding the hardware – Radiolab does a deep dive on this phenomenon in their episode called Bit Flip which we highly recommend. The takeaway is that software BMS can age over time or need an update due to changing software protocols in the application or connecting components. By allowing for software upgrades the BMS utility can be extended, and batteries do not need to be replaced when a new model of product is released. Samsar recommends that every battery over 2 KWhs has CANbus ethernet connectivity. This allows a BMS that has failed to be recovered manually, whereas a connection via Bluetooth only may be lost when the BMS fails.

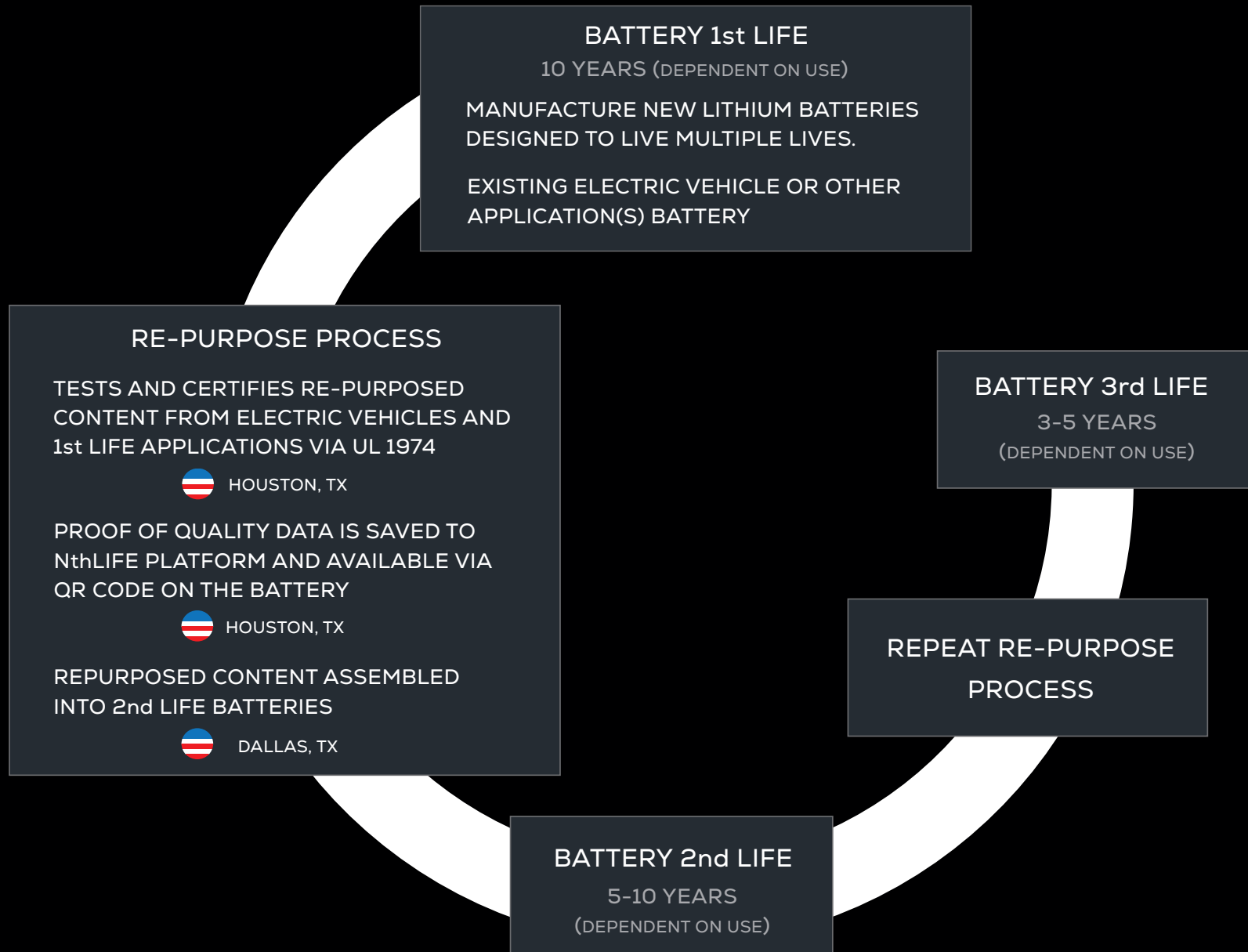
USE SAMSAR'S NthLIFE BATTERY PASSPORT

By tracking the manufacturing data, certification and testing data, and lifecycle use, Samsar's NthLife technology allows for quality tracking throughout multiple generations of the product. Customers can scan a QR code on the battery case to see where their battery was made, what components are inside, and the testing and certification information. The result is higher quality products, built to last, with transparency and trust.



SAMSAR

A CIRCULAR ECONOMY





ELECTRIFY YOUR PROJECT,
•
SAVE WORKING CAPITAL,
•
IMPROVE CASH FLOW, AND
•
OPTIMIZE YOUR SUPPLY CHAIN

WITH DUTY-FREE, PLANET FRIENDLY, LITHIUM BATTERIES ASSEMBLED IN THE USA

CONTACT US

info@samsarresources.com

+1 (914) 809-9908

[BOOK A MEETING](#)

[REQUEST A QUOTE](#)

CORPORATE OFFICE

3 EAST 80TH STREET NEW YORK NY 10075

NORTH AMERICAN BATTERY PROCESSING

12510 WEST AIRPORT BLVD SUITE C02 SUGAR LAND TX 77478



PARTNER WITH SAMSAR TO REDUCE YOUR TRADE POLICY EXPOSURE

HERE IS WHY:

Superior performance. 2x the run time, 2x the power, 5x the charging speed of traditional batteries.



Extended lifespan. Lasts 10x longer than traditional batteries. Backed by a 10 year warranty.



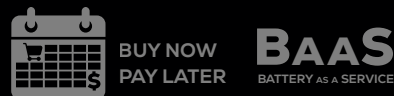
Quality guaranteed with history and performance data
available via Samsar's NthLife platform.



American made and duty free. US based assembly reduces trade policy uncertainty, shortens
your supply chain, and improves cash flow.



Cash & Working Capital. Financing & leasing options improve cash flow and reduce
CapEx spend, helping your company grow.



Planet friendly. Batteries are repurposed and upcycled at end of life to help people and the planet.



EXPLORE HOW SAMSAR CAN HELP YOUR COMPANY SHORTEN SUPPLY CHAINS, CONSERVE CASH, AND PROVIDE

GET THE POWER YOU NEED NOW WITHOUT THE UPFRONT COSTS. GROW YOUR BUSINESS, CONSERVE YOUR CASH AND WORKING CAPITAL, AND ENSURE YOUR BATTERIES WILL BE FULLY RECYCLED AT END OF LIFE. SAMSAR OFFERS BUY NOW PAY LATER AND BATTERY AS A SERVICE (BAAS) LEASING PLANS.

LEASING AND FINANCING:



BUY NOW
PAY LATER

With a Buy Now Pay Later plan, your company owns the batteries – though you can work with Samsar on a buy back program when the batteries reach end of life. Choose this option for applications where the expected use life is more than five years.

- Minimum annual volume commitment of 500 units
- One, two, and five year financing terms
- Conserves cash while building balance sheet value over time
- Positive P&L impact – product depreciates over the 10 year warranty term

BAAS

BATTERY AS A SERVICE

With a BaaS plan, Samsar owns the battery, but replacement and recycling are built into your leasing plan. Choose this option for mobility and high use applications where batteries age quickly or for rapidly scaling companies who need to grow without deploying additional working capital.

- Lease energy storage for the lifetime of your application
- Replacement and recycling of end of life batteries built into the leasing program
- Conserves cash and capital, allowing for rapid scaling of your business

THE SAMSAR STORY

THE EXECUTIVES



STEVE HELLMAN

MANAGING PARTNER – MOBILITY IMPACT PARTNERS

FOUNDER – SAMSAR RESOURCES

Samsar was born from a simple question – how can we best make use of the tsunami of used electric vehicle batteries? Lithium recycling has shown to recover only a small fraction of the value of a battery, and why recycle a battery that still retains 80% or more of its capacity? There must be a better way. That way is Samsar – based on the concept of Samsara, the cycle of birth, death, and rebirth. Samsar captures up to 95% of the value of a used EV battery, enabling all kinds of new applications, and helping keep batteries out of the landfill.



GUILLERMO GARCIA

CHIEF EXECUTIVE OFFICER – SAMSAR RESOURCES

The concept of repurposing lithium batteries for second life applications has so many advantages – it makes those applications more affordable; the used batteries are already in the US which means our customers pay no tariffs; and the repurposing process is much more sustainable and captures more value than recycling. What makes Samsar's process unique is that every one of our batteries is engineered to be easily disassembled, allowing for continuous reuse. The result – more affordable batteries, built in the USA duty free, tested and certified for quality.

SAMSAR



KENT O'HARA

FORMER PRESIDENT OF NISSAN ENERGY

BOARD MEMBER – SAMSAR RESOURCES

At Nissan I helped bring the Nissan Leaf, one of the most popular electric vehicles of all time to America's roads. As the president of Nissan Energy I saw how hungry the world was for sustainable energy storage and knew that in a few years there was going to be millions of EV batteries that would be headed for recycling. I knew there must be a way to match the need for power with the growing supply. Samsar is the solution – affordable – sustainable – and built here, in the USA.

