Clean Energy Business Incubator Program
AT STONY BROOK UNIVERSITY

StorEn Technologies
ENERGY YOU CAN DEPEND ON

ENABLING THE ECONOMY OF ELECTRICITY

>>>

THE ENERGY OF THE 21ST CENTURY

LONG DURATION STORAGE

A Cost-Effective Lithium Alternative

The Lithium Paradox

Lithium Ion cannot meet all market needs!

Despite not being the ideal technology for long duration stationary applications, lithium batteries have been deployed for residential storage and grid-scale projects.

Lithium Weaknesses:

Their cost increases linearly (**no economies of scale**)
Loss of capacity over time
Limited Depth of Discharge (80%)
Fire & Explosion hazard - particularly lithium/manganese/cobalt (e.g. Tesla®)
Low recyclability of metals (~6%)

ON AVERAGE 2,700 Equivalent Full Cycle, or EFCs

VANADIUM IS BETTER FOR LONG-DURATION STORAGE!

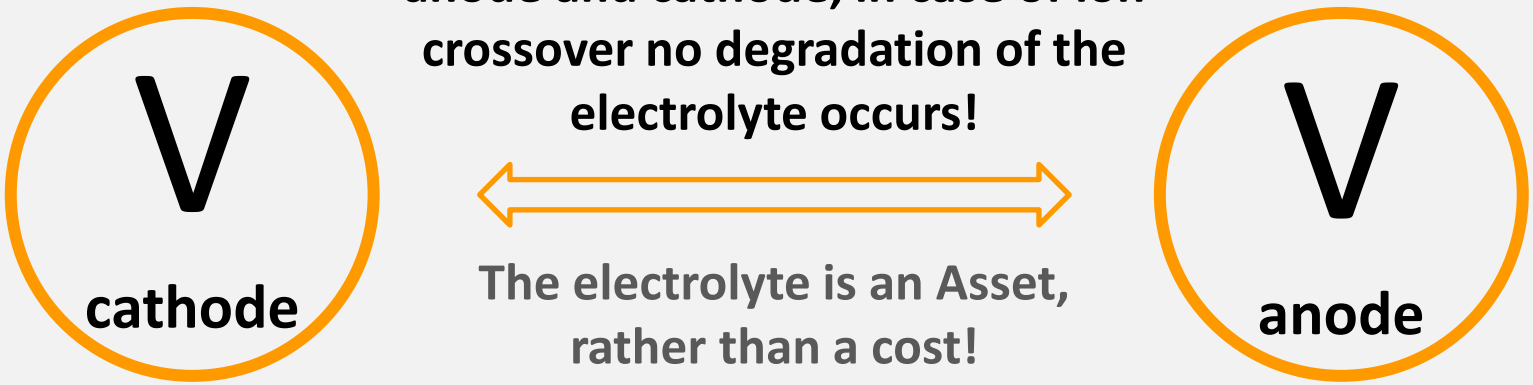
Technology: Why Vanadium Flow?

A DEMONSTRATED TECHNOLOGY WITH PROVEN FUNDAMENTALS

Vanadium Flow Batteries deliver:

- **DURABILITY** > 25 YEARS OR 20,000 CYCLES
- **100% CAPACITY @ 100% DoD** OVER LIFETIME
- **100% RECYCLABLE**
- **SCALE-UP** EASY just increase the size of tanks
- **ECONOMIES OF SCALE** FOR HIGHER C-RATE

Since we have Vanadium for both, anode and cathode, in case of ion crossover no degradation of the electrolyte occurs!



The electrolyte is an Asset, rather than a cost!

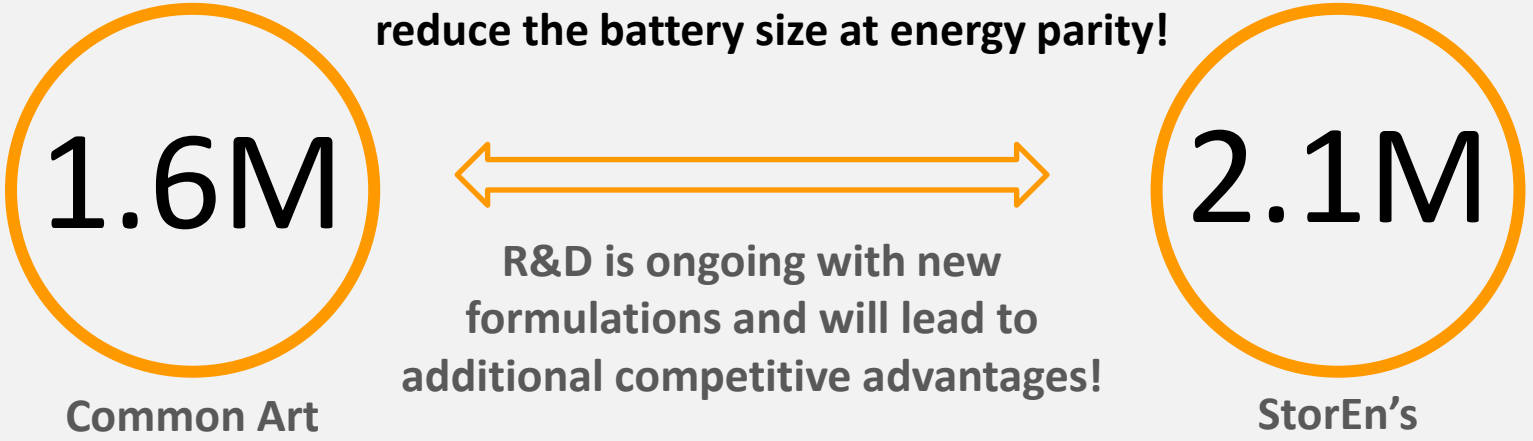
It is Only the Beginning

AT THE BEGINNING OF ITS DEVELOPMENT CYCLE

Tech Improvement & Cost Reduction from:

- **+ POWER DENSITY** > stack cost reduction
- **+ ENERGY DENSITY** > size reduction
- **COMPONENTS** > higher performance
- **VOLUME MANUFACTURING** > economies of scale
- **COMPONENTS' COST** > new advanced materials

StorEn's own electrolyte formulation led to a 30% increase in molarity over common art – this will reduce the battery size at energy parity!



Common Art

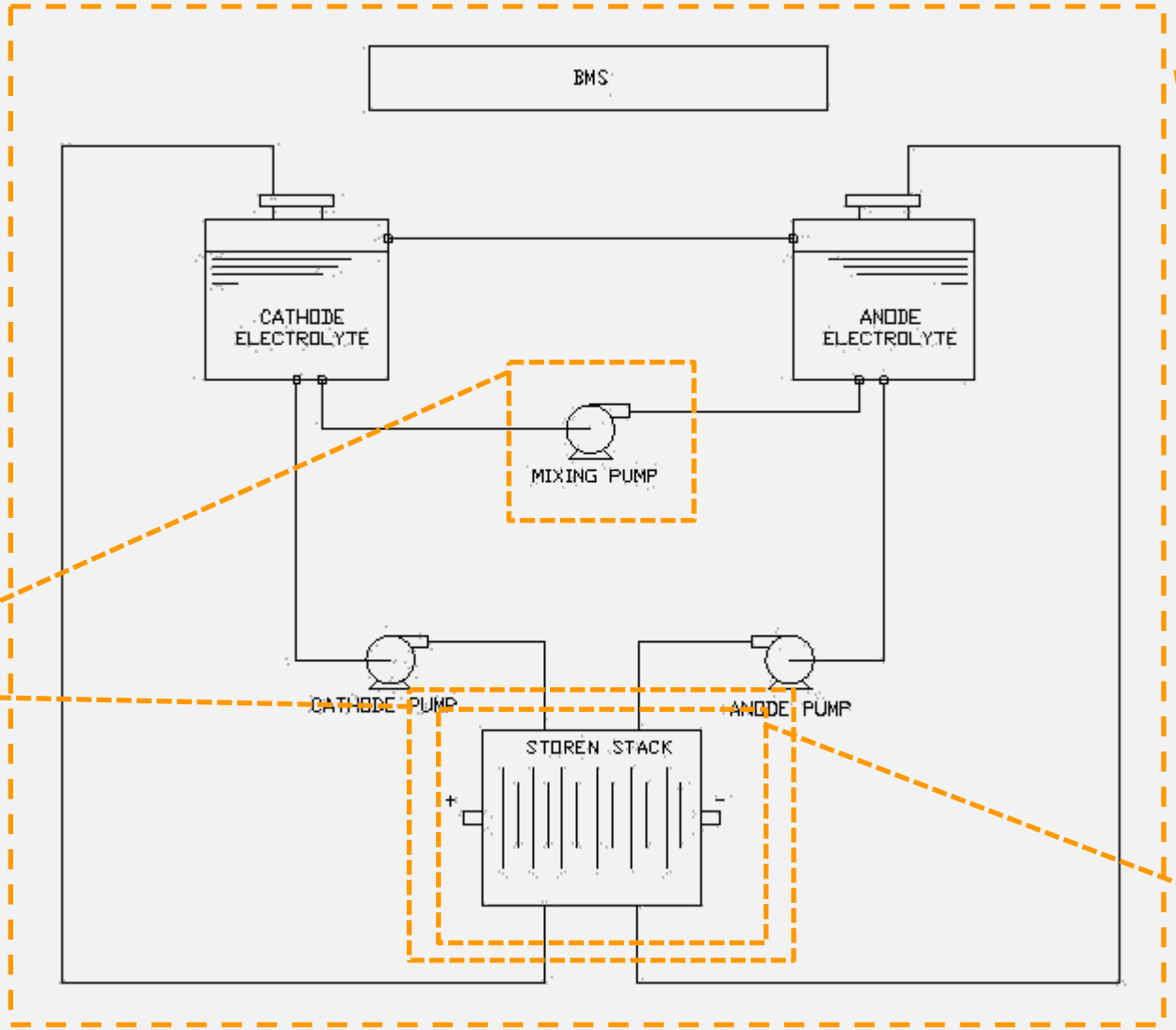
R&D is ongoing with new formulations and will lead to additional competitive advantages!

StorEn's

Our IP – A Comprehensive Focus

EQUILEVELS™ Tanks
Electrolyte Rebalancing System

RESAFE™ Stack
Leak Control System



THERMASTABLE™ Battery Design
Enhanced Round-trip Efficiency

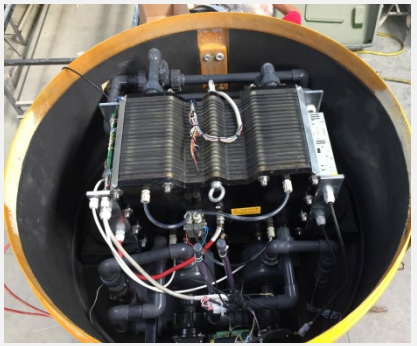
MULTIGRID™ Stack
Enhanced Power Density

Know-how:

- Electrolyte Formulation & Process
- Electrode Nano-Coating (HiPower)

StorEn's Next Gen Vanadium Flow Batteries

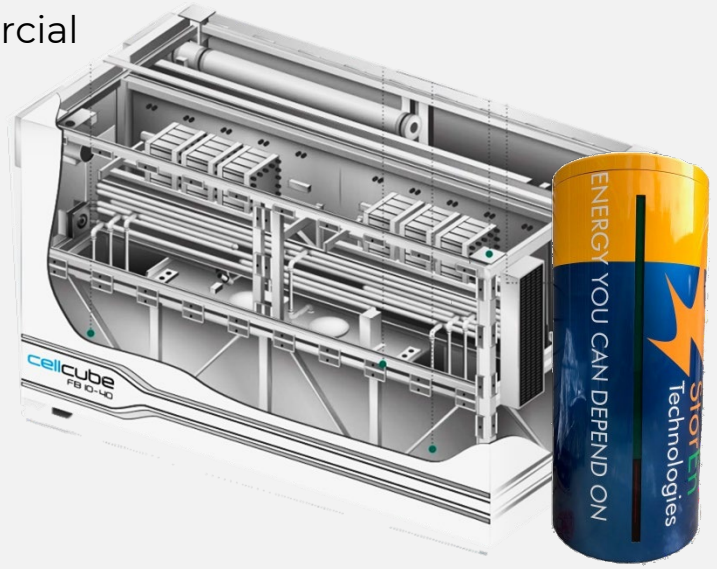
- **World Leading Performance**
- 50% Higher Power Density over Common Art
- Lowest $0.04 cost/cycle (*)
- Lowest TCOs



- **Proprietary IP**
- IP-enabled Design for Smaller Batteries
- Our Integrated Product Design Vs. a System Design

- **Financially-viable Batteries**
- In Residential and Small Commercial
- Telecom Towers

40kWh Vs. 30kWh
Product Vs. Systems
Elimination of "the air"
>
Lesser Volume &
Smaller Footprint



(*) < ARPA-E 2018 DAYS $0.05 target

Vanadium Vs. Lithium: Cost & Durations

COST/KWH OF LITHIUM IS LOWER THAN VANADIUM UP TO 3 TO 4 HOURS

2 hrs. 4 hrs. 6 hrs. 8 hrs.

Residential Storage – Lithium Vs. StorEn

TESLA POWERWALL TESLA HOME BATTERY

Energy you can depend on

$562 ($533 in May 2018)	**Cost/kWh**	$600
10 yrs. @ 70% Capacity	**Duration/Decay**	25 yrs. or 15K Cycles @ 100%
$0.15	**Cost/Cycle @ 100%**	$0.04 (*)
$0.18	**Cost/Cycle @ 85%**	No decay in capacity
~6%	**Recyclability**	100% Recyclable/Reusable
89%	**R. Trip Efficiency**	82% (**) Vs. 76% Common Art
2	**# Units Required (27kWh)**	1
Yes, Outdoor only	**Fire/Explosion Hazard**	No, Indoor and Outdoor

(*) < ARPA-E 2018 DAYS $0.05 target)
(**) with THERMASTABLE™

Telecom Towers Back-Up Application

LEAD ACID		Energy you can depend on
Average: $270	**Cost/kWh**	$600 (present cost)
Average: 3 yrs.	**Duration/Decay**	25 yrs. or 15K Cycles @ 100%
8 packs	**Replacement**	nil
High cost of disposal	**Recyclability**	100% Recyclable/reusable
Temperature-controlled	**Installation**	Underground with Thermastable™

Over 120K Towers (*) in the US – Growing Globally at 15.53% CAGR (**)

Estimated > 40K US Annual Replacements p.a. or $720M

Operators Saving Over Lifetime > $1,000/kWh or $30K/battery

(*) www.wirelessestimator.com

(**) Mondor Intelligence

Clean Energy Impact

- One StorEn's 5/30kWh Battery
- Residential Use cycling once per day
- @ 100% Depth of Discharge

EMISSIONS

WILL SPARE 154 METRIC TONS OF CO_2 OVER THE LIFECYCLE

Calculator: www.epa.org

82% of vanadium comes from the "reprocessing of waste"

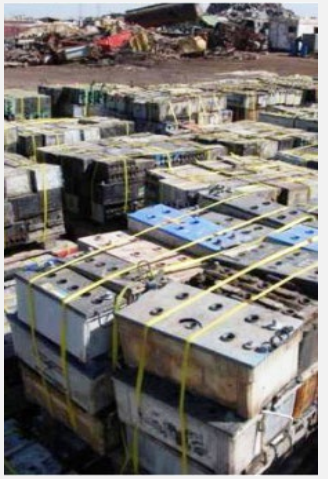
- A single Energy Module Over its Lifecycle

DISPOSAL

WILL AVOID THE LANDFILL OF 8 LEAD ACID BATTERY PACKS

or

3 LITHIUM ION BATTERY PACKS



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