Novel Low-Cost and Safe Li-ion EV & Grid Battery

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Technology Overview

- High energy density EV and grid battery deploying novel housing structure which serves as safety device
- Battery concept is highly configurable targeting 100Ah+ cell demonstration
- Low cost focus through simplification and innovation projected to reach DOE targets for EV everywhere of $125/kWh at 400 Wh/L, 250 Wh/kg and 2000 W/kg by 2022

Property	VDA EV2 standard	Program target	Current status
Capacity (Ah)	60	100	107
Voltage (V)	3.6	3.6	3.7
Energy (Wh)	216	360	396
Energy Density (Wh/L)	241	402	350

Award Amount	$3.5 M
Award Timeline	3 years
Next Stage Target	In-car testing, 2016
Collaborations Sought	Partners, Growth Capital, Licensees

Current Status

1. Demonstrated to date:
   No cascading:
   that new housing material prevents cascading when subjected to abuse testing allowing high energy density and low cost
   Low cost:
   Pathway to $100/kWh in mass production
   High energy density 350 Wh/L with next gen reaching 420 Wh/L and pathway to 500
2. Next steps: Gen 2 prototype going into a Fiat 500 e in-car testing Q3’16
3. Working closely with team, suppliers and customers to ensure market acceptance, manufacturability and leverage of existing supply chains

Introduction: *not a battery company but an enabling architecture*

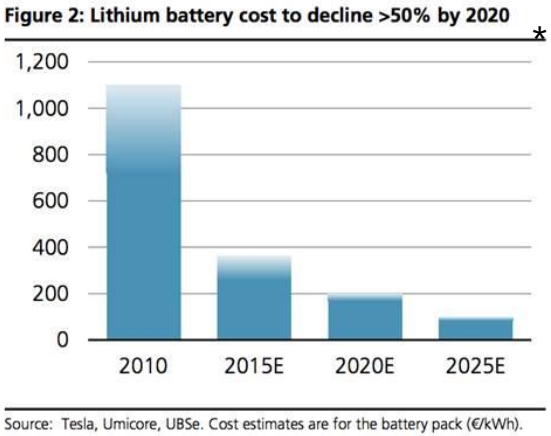
The Cadenza battery platform can deliver significantly higher energy density while achieving industry lowest cost and elimination of cascading

Cadenza will drive industry leading energy density using same dimensions

Cadenza Design Module 8.6 kWh

LG Chem UPB 4860 3.2 kWh

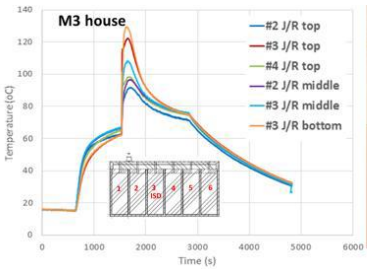
Cadenza will drive industry leading cost reductions



Cadenza cell cost roadmap to $125/kWh by 2018 is well ahead of industry projections

Forbes Magazine article, September 2, 2014 citing Tesla, Umicore, UBS

Cadenza will drive industry leading safety



Cadenza has solved thermal cascading issue for Li-ion and may through this innovation impact rapid adoption rate of Li-ion through low cost and high reliability technology platform

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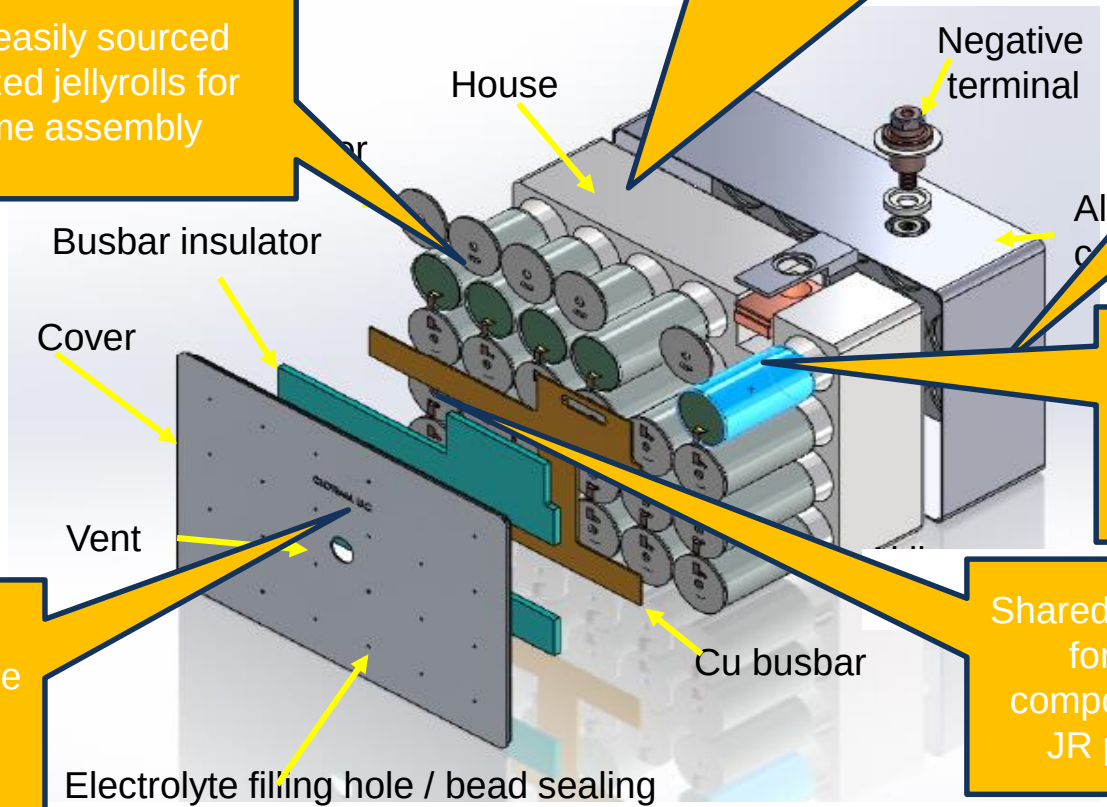
Cadenza INNOVATION

Product merit: Novel cell architecture levering mature supply chain enables product launch in 2017 supported by demos in 2016



Lessons Learned: On the road to offering a step- change in cost and performance through three main areas of technology focus:

Cylindrical Jelly Rolls

- Longer and wider jelly rolls compared to those in 18650 cells
- These larger jelly rolls leads to significant packaging advantages (higher Wh/L)
- Lowest cost and highest yield manufacturing process
- Mature manufacturing with easily accessible mass production tools
- Use of all state-of-the-art chemistries, power or energy

Novel Housing Material

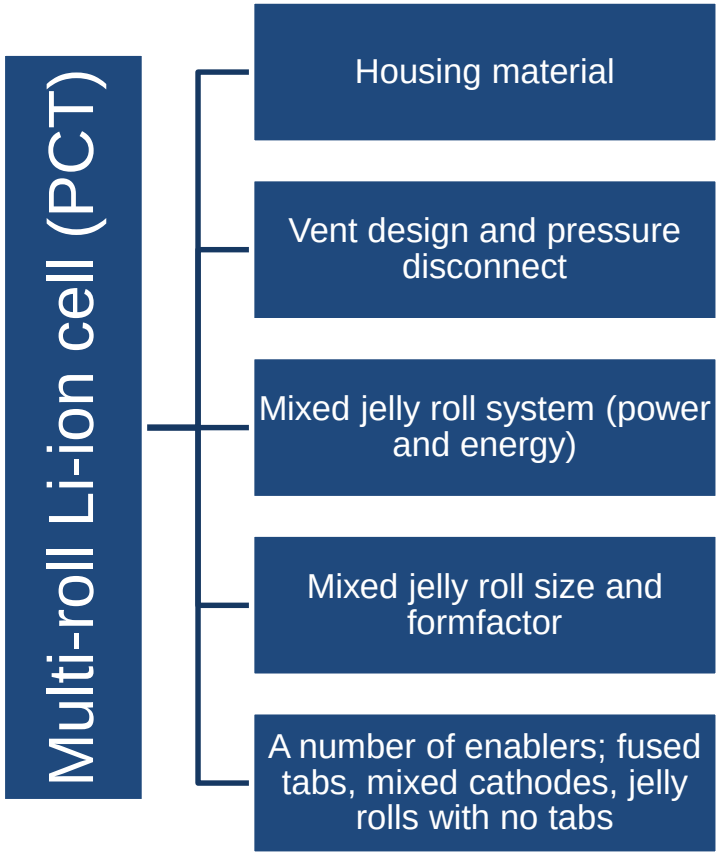
- Thermally isolating housing enables a closely packed jelly roll configuration without cascading failure
- Thermal isolation is sufficient to allow large jelly rolls up to 6Ah with no roll-to-roll runaway (both NMC and NCA has been demonstrated safe, Panasonic has 3.1Ah rolls)
- Novel patented and non-combustible ceramic fiber material formulations with high levels of fire retardant

Large Prismatic Cell

- Configuration allows open jelly roll structure with shared atmosphere
- Non-expanding cells and no cascading results in space effective and low cost module designs
- Uses entire jelly roll capacity distribution with no need for sorting
- Large format size allow easily incorporated low pressure vent and pressure disconnect designs in a space effective way
- Jelly rolls reconfigurable arrays can optimize battery pack to format and capacity
- Enables low profile packs

Product merit:

Cadenza's IP focus is on open jelly structure with enabling components and materials protected through global patent portfolio



- Base WO2014059348A2
  - Entered national stage filings US, JP, China, EP, Korea, India, Mexico
  - First filed 10/2012 (provisional)
- Multiple provisional applications with development partners
- IP Strategy entails expansion with continuation-in-part and divisional portfolio from base
- Goal is to leverage development partners existing portfolios for Li-ion field

Partnerships:

Cadenza Innovation has formed a highly collaborative global partner network to enable fast commercialization

- **Collaboration partners**
  - FCA (Fiat Chrysler) – vehicle integration
  - Alcoa – metal components
  - Karotech – metal component design and fast prototyping
  - Morgan Thermal Ceramics – housing material
  - ABB – grid system integration
  - NREL and Impact Design (MIT) – thermal and mechanical modeling
  - Multiple US and Asia supply chain sources

- **Government contracts to establish essential research projects, provide funding and provide technology validation**
  - States of CT, MA and NY
  - DOE/ARPA-E and NYSERDA
    - and an active member of NYBEST

Summary:

Cadenza Innovation is in multiple discussions with very large global battery manufacturers for partnership, investments and licensing, and is seeking initial investment to step-up its activities to enable these opportunities.

- The technology platform has the potential of becoming the next standard for the global industry.

- New stealth-mode CT-based venture offering technology/cost/safety breakthroughs
    - Energy density: immediate 2x uplift with a roadmap that always stays ahead due to architecture solution
    - Costs: cutting costs in half with near-term roadmap to reach $100/kWh BOM
    - Safety: solved thermal cascading with reduced weight, volume and cost
- Applicable and leading-edge for global grid energy storage and electric transport (EV, PHEV, start-stop, aviation) as these markets accelerate
- Potentially the core building block for military applications as DoD is focusing on reducing battery footprint, increasing safety and energy density, reducing cost as well as eliminating all lead-based systems