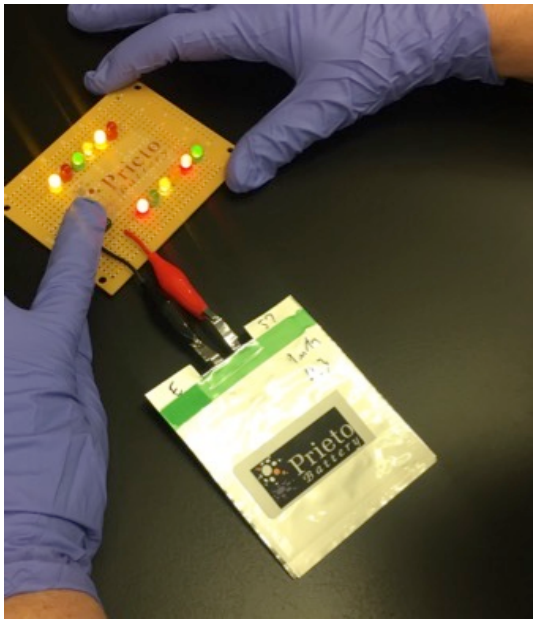
PRIETO

2022 Energy Innovations Summit
Electric Vehicles: Technology Update

November 7, 2022

Company Overview

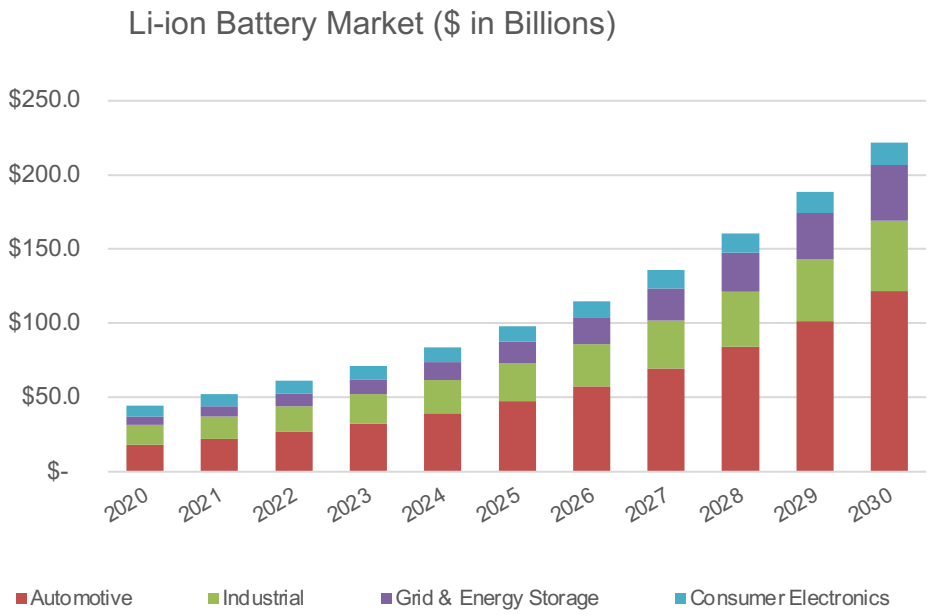
- Advanced Li-ion battery technology company
  - Commercializing proprietary solid-state 3D Li-ion batteries
  - Prototypes working
  - Robust global IP portfolio
    - 28 issued patents
    - 7 patent families
- Targeting multiple multi-billion-dollar markets
  - Electric vehicles
  - Industrial and medical products
  - Consumer products
- Strategic partnerships
  - Stanley Black & Decker for power tools and lawn equipment
- Experienced senior management team



Attractive Growing Markets

Expanding Markets

- Overall market demand for batteries is accelerating, growing at >18% per year
- Total market expected to grow from $40B in 2020 to $215B in 2030
- EV market dominates growth but all sectors growing



Source: Prieto analysis of publicly available reports / forecasts

Batteries Still Not Good Enough

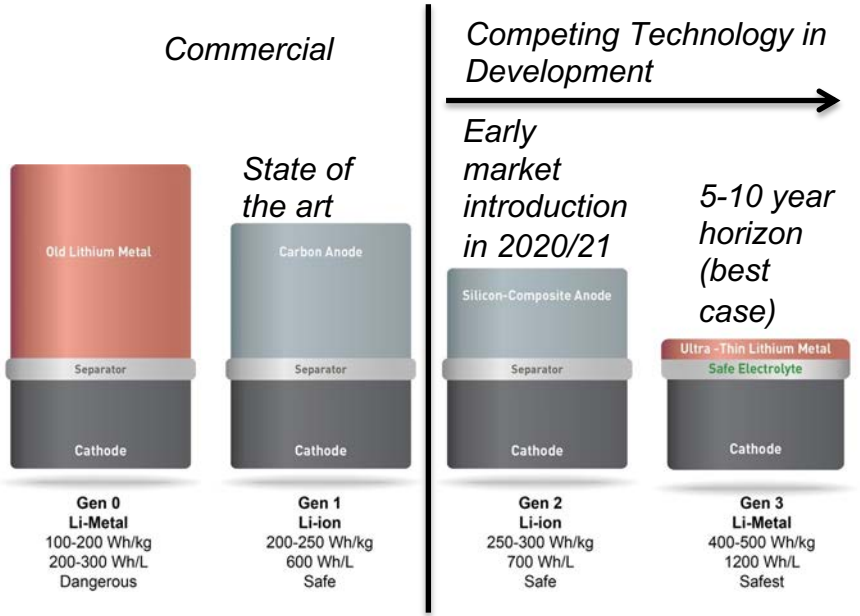
- Li-ion batteries have improved dramatically over the last 20-years
  - Increased energy densities
  - Lower cost
  - Enabling new products from cell phone, power tools to EVs
- Batteries still have significant issues – especially in EVs
  - Lack of range
  - Require fast charging
  - Expanded operating temperature range
  - Better safety to prevent fires
  - Long battery life (# of recharge cycles)

Photo Ride and Drive EVs Plug'n Drive Ontario.jpg

Conventional Li-ion Batteries Are Limited

Current Li-ion Batteries

- 2D architecture
- Energy density focus – improve anode only



Challenge

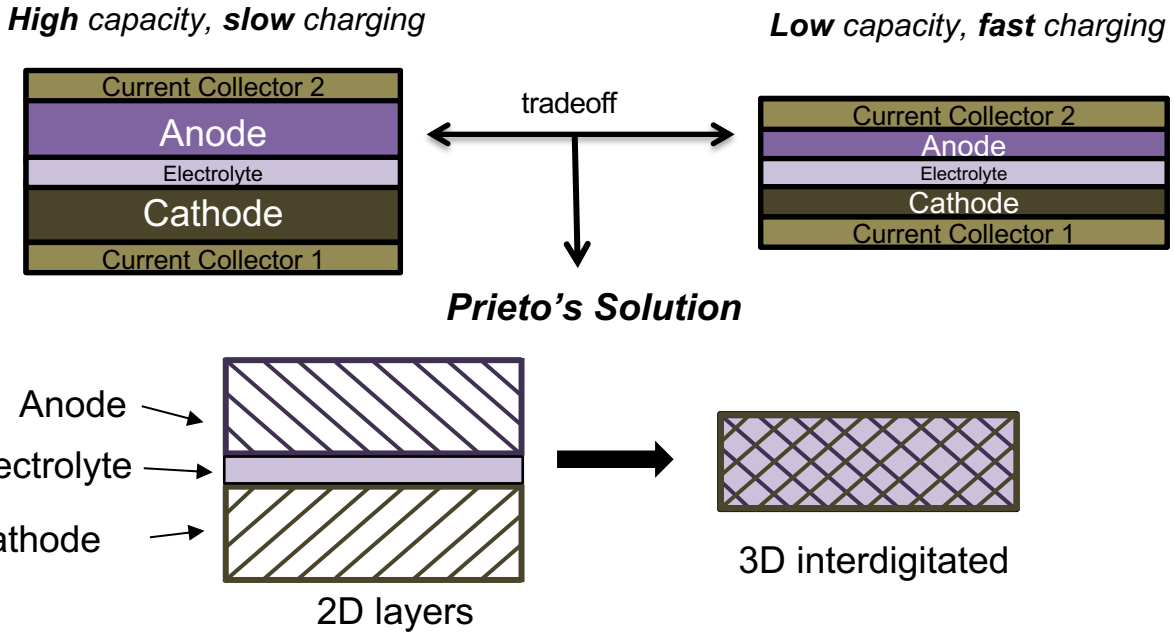
- Energy density is not the only issue with current commercial Li-ion batteries
- Other issues include:
  - Safety
  - Power density
  - Recharging time
  - Low Cost
  - Cycle or lifetime

Prieto Battery Solution

- Combine higher energy densities with higher power densities through use of new materials and 3D architecture and lower cost manufacturing

Better Batteries Require A New Architecture

Even with high-capacity anodes, the architecture is what limits the balance of power and energy density in current batteries.



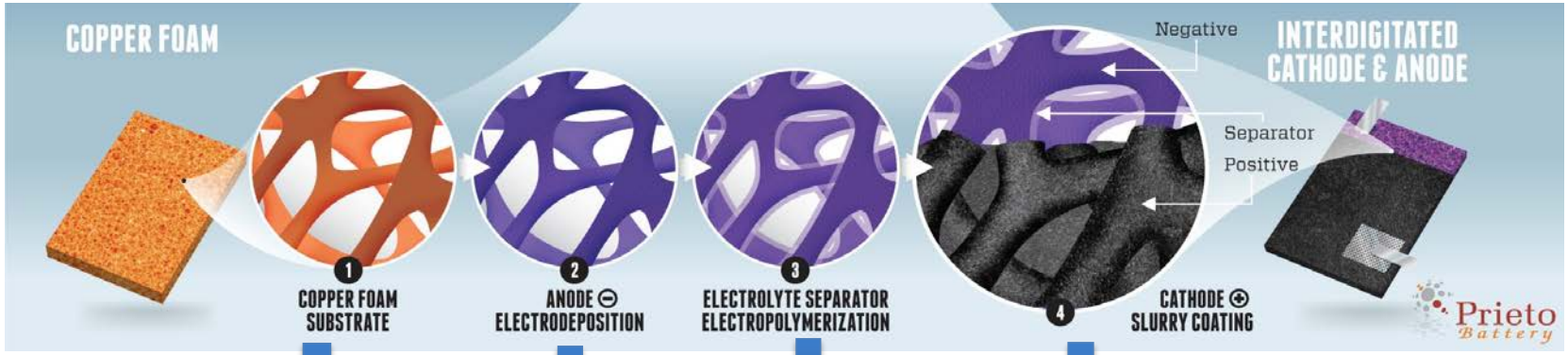
Prieto's 3D architecture provides ***high*** capacity, ***fast*** charging, and is safer

Strategic Approach – Development/Mfg

Prieto strategy was to start with large scale manufacturing ***first***, then work backwards:

- What manufacturing process would enable low cost and high volume?
  - Water based electroplating
- Based on lithium chemistry, what are the key compounds to use in each component?
  - Copper antimony anode
  - Polymer electrolyte
  - Commercially available cathodes

Prieto Approach: 3D Architecture & Mfg



High electrode surface area
+
Shorter ion diffusion path
=
Up to 5X power density

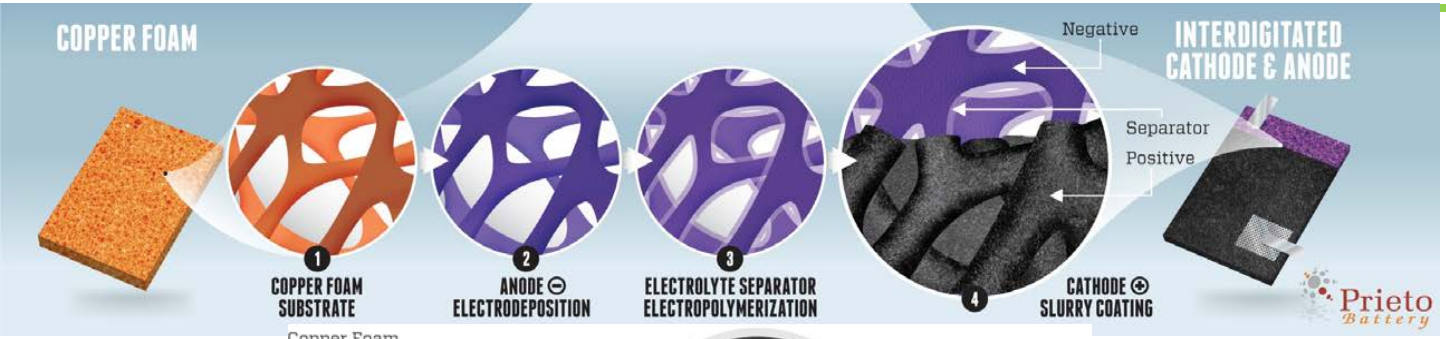
Intermetallic anode
=
3X increase in volumetric energy capacity
+
Safer

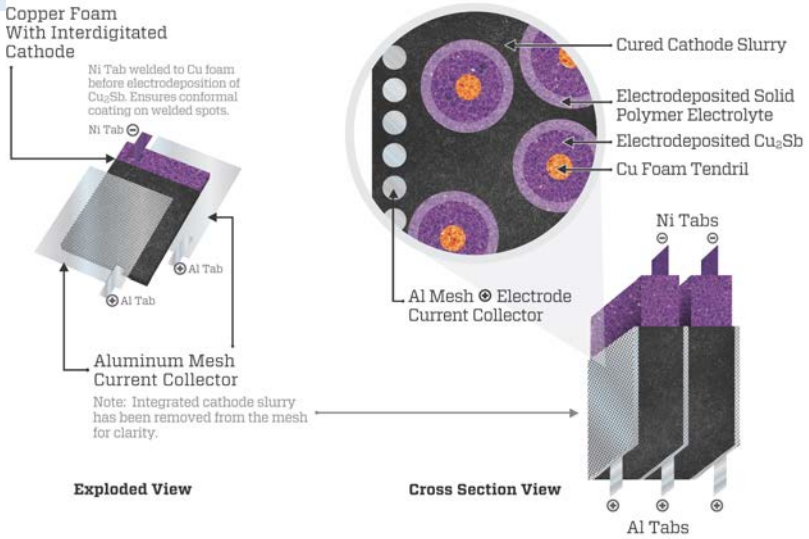
Solid polymer electrolyte
=
non-flammable batteries
+
Increased lifecycles

Standard industry available cathode materials
=
Customizable cell voltage & capacity

H_2O
WATER BASED PROCESS
Electroplating
=
Low cost & Scalable

Cell Assembly



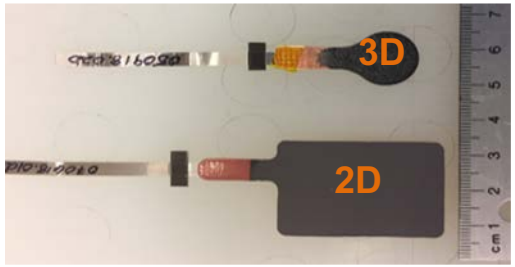


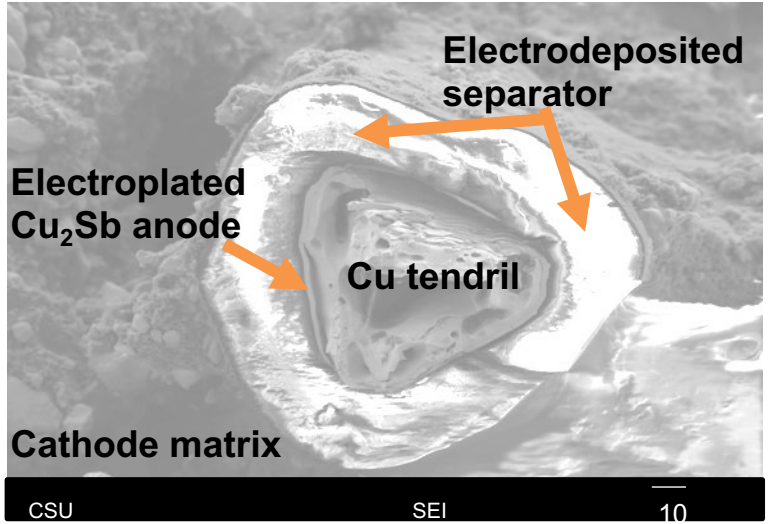
The manufacturing method is inexpensive, fast, and environmentally friendly. Quality control is built into each step.

3D solid-state Full Cell Successfully Validated

Technology Update

- Achieved 300+ cycles
- Operating at temperatures from - 30 °C to 120 °C
- The 3D cell stores the **same** amount of energy as the 2D cell in a much smaller footprint
- 5X the power density
- Solid polymer electrolyte safer – eliminates flammable liquid electrolyte
- Charge in less than 10 minutes





Manufacturing Proven at Lab Scale

- Electroplating – standard low-cost commercial process
  - Water based
  - Recycled water – limited waste
  - Used extensively in semi-conductor industry

Representative commercial electroplating line

- 70% of manufacturing process will be drop-in to existing battery manufacturing
  - Slitting
  - Calendaring
  - Welding
  - Etc.

Existing battery manufacturing equipment

Intellectual Property Strategy

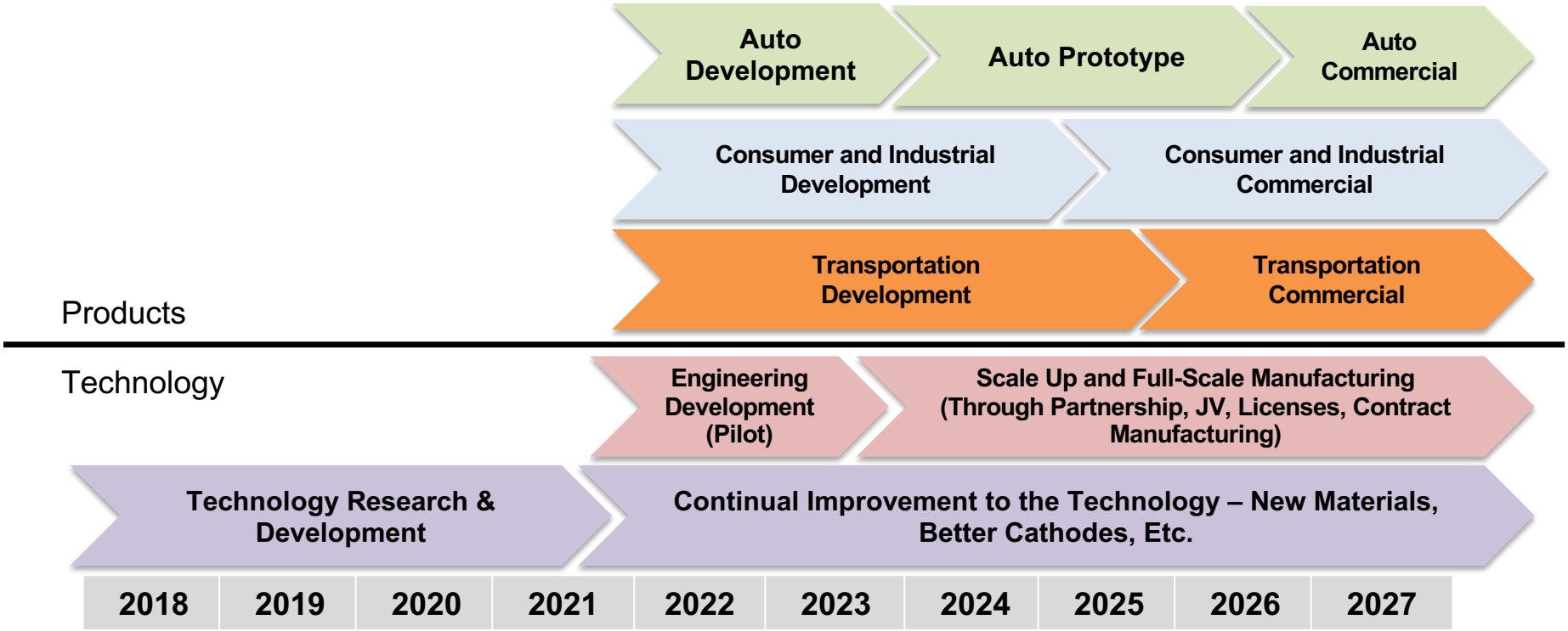
Own and Control the Critical IP for Economic Commercial Production of Advanced Li-ion solid-state Batteries

Materials | Architecture | Manufacturing Processes

- 28 Patents Issued
- 7 Patent Families
- Other Patents Pending

USA
EU
China
India
Korea
Japan

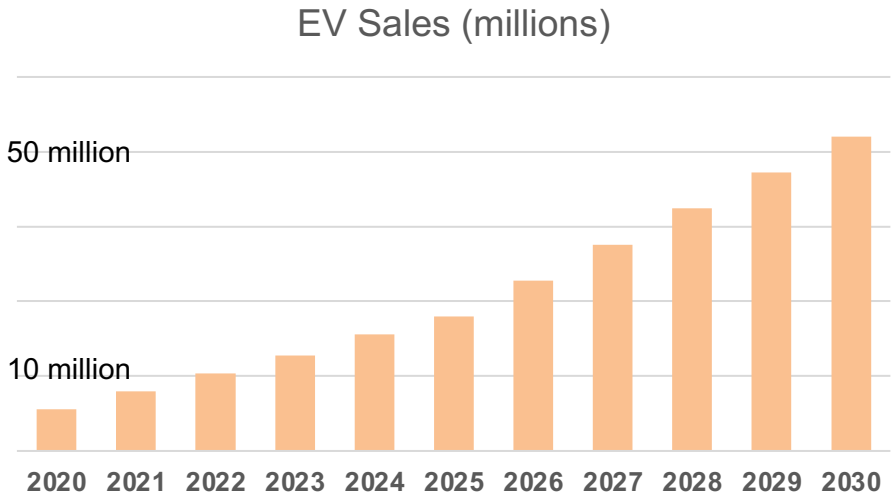
Growth Plan – Product Roadmap



EV Market - $100+B Opportunity by 2030

Opportunities

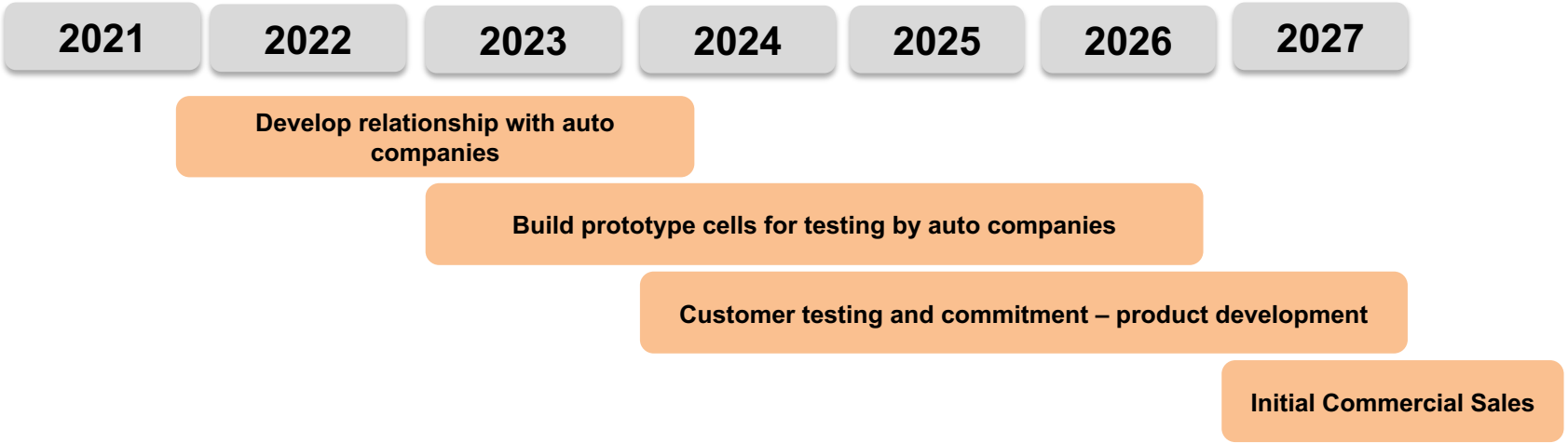
- EV sales are expected to accelerate over the next 10-years
  - Forecasts range from 15% to 30% of all Global sales will be BEV
  - VW expects 70 BEVs by 2025
- Total Market for Li-Ion batteries will exceed $100B by 2030
- To achieve forecasts batteries must improve:
  - Higher energy density to extend range
  - Faster charging
  - Safer
  - Operate in colder weather
  - Lower cost
  - Better cycle life



Prieto batteries will enable auto manufacturers to achieve these targets by addressing all the current short-comings of BEVs

EV Market – Commercial Plan

- Company goal is to be the battery technology of choice for the automotive industry
- Goals in 2021 - 2022 will to be develop relationships with auto companies and to get our batteries into their product testing and development process
- Commercial sales are expected by 2025
- Strategic partnership with Hercules Electric Vehicles for electric pickup trucks



Experienced Senior Management

Michael Rosenberg, CEO

- Experienced Cleantech Executive
- CEO, Novinda Holdings, Inc. – Sold to Environmental Energy Services
- CEO, OPX Biotechnologies, Inc. – Sold to Cargill
- Ballard Power Systems – 10 years of executive roles at leading fuel cell company

Amy Prieto, Ph.D., Founder and CTO

- Founded Prieto Battery, Inc. in 2009
- Invented the 3-D Li-ion battery architecture
- Presidential Early Career Awardee for Scientists and Engineers (PECASE, an honor she received from President Barack Obama)
- ExxonMobil solid-state Chemistry Faculty Fellow
- L'Oréal USA for Women in Science Fellows

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