

ARKEMA

Arkema Offerings for Li-ion Battery Applications

Dana Swan – Business Development Manager

dana.swan@Arkema.com

Our vision is shaped by the accelerating demand
for high-performance materials



A SIGNATURE

FOR A VISION

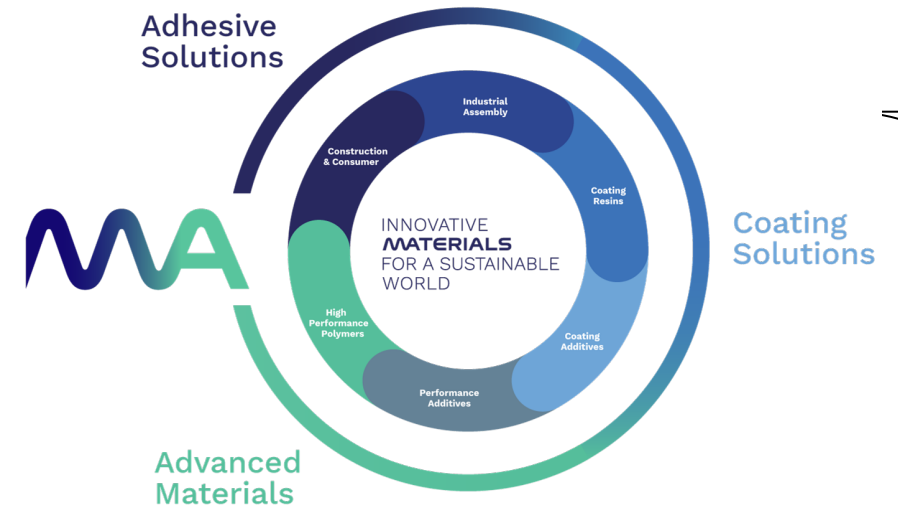
INNOVATIVE
MATERIALS
FOR A SUSTAINABLE
WORLD

“Be the Specialty Materials leader,
offering the most innovative and
sustainable solutions to address our
customers’ current and future challenges”

Arkema at a glance

WE ARE INNOVATION DRIVEN

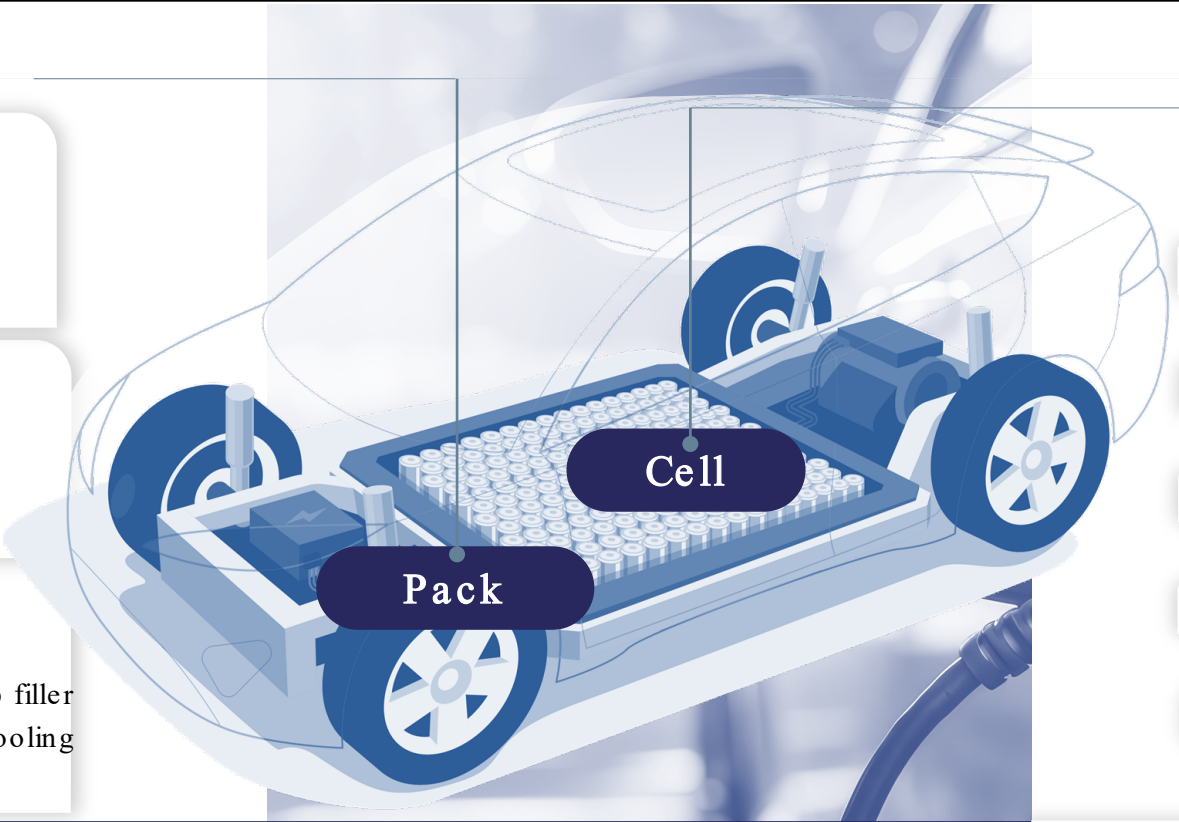
- **9.5 billion** revenue in 2023
- **21,100** talents
- Presence in **55** countries
- **17** R&D centers on 3 continents
(*Europe, Americas and Asia*)
- **1,600** researchers, **60** R&D partnerships
- **> 200** patents filed per year



Arkema materials in the World of Batteries

“Outside the cell”

- Electrical insulation**
 - PA11 coating for busbars
 - UV-curing acrylics coating
 - PI films (esp. for 800V)
- Assembly**
 - Structural & hotmelt adhesives for cell-to-cell/module
 - Sealing & gasketing solutions
- Thermal management system**
 - PA11 & PA12 for cooling circuit
 - Thermally conductive adhesive & gap filler
 - Fluorinated booster for immersion cooling liquid



“Inside the cell”

- Anode**
 - Waterborne acrylic based binders & additives for Hi Si
 - PVDF binders
- Electrolyte**
 - Ultra-pure electrolyte salts
 - Ionic liquids
- Separator**
 - PVDF and acrylic coatings
- Cathode**
 - CNT; PVDF binders
 - Acrylic primer
- Process**
 - PI tapes



Towards more sustainable & safer batteries

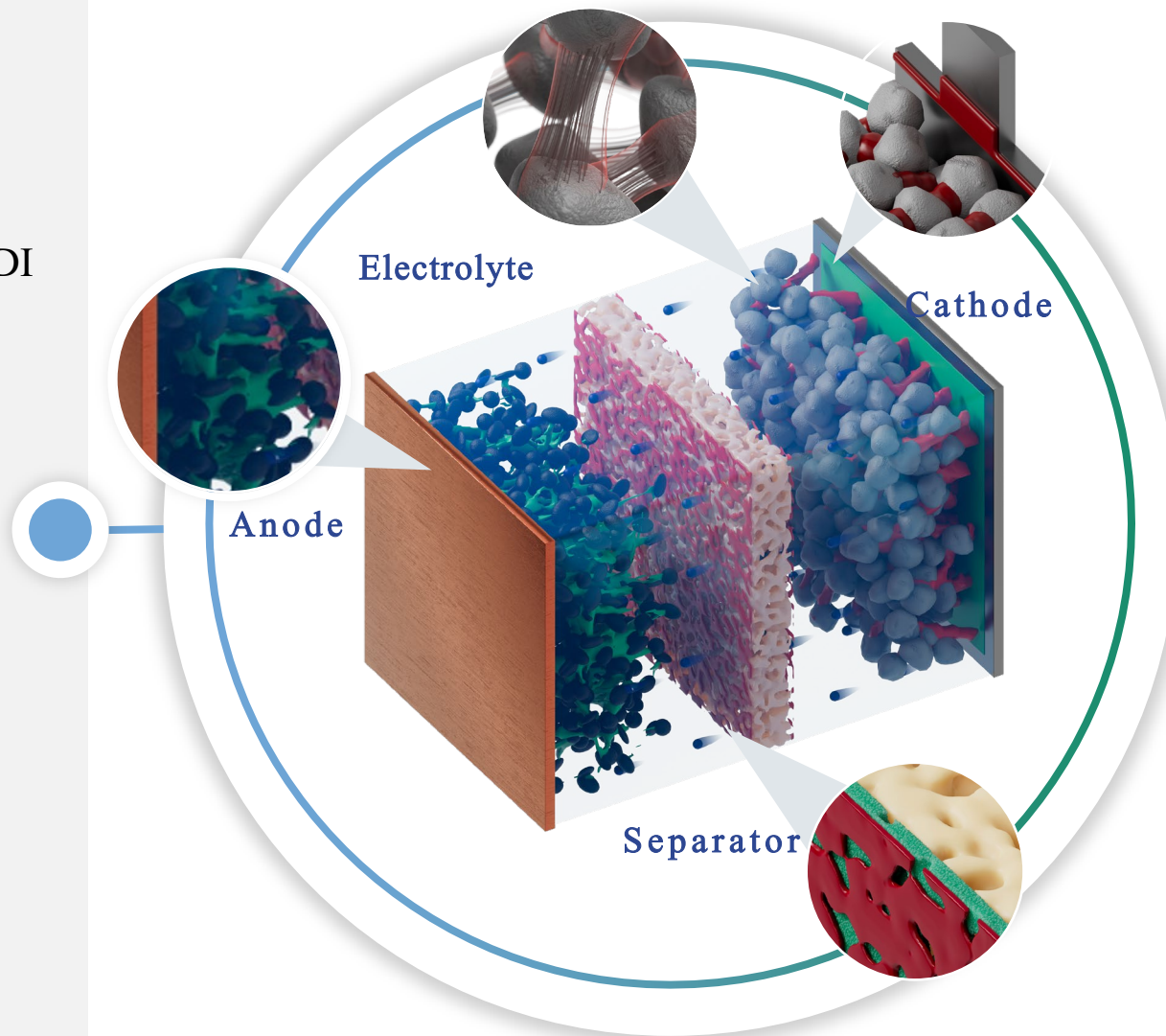
One Arkema ● Adhesive Solutions ● Advanced Materials ● Coating Solutions

- Safety**
Intumescent (fire) & protection powder coating (pack)
Ionic Liquid; BFP foil bonding
- Specialty surfactants, acrylic additives** for more efficient lithium mining and recycling
- Bio-based (PA11) and bio-attributed (PVDF) materials** to lower carbon footprint of EV
- Hydrogen peroxide** for recycling
- Bonding & debonding adhesives** for servicing and recycling (under development)
- Lower energy intensive, solvent free applications/solutions** (UV, powder)

Improving performances inside the cell

Electrolyte

Ultra -pure LiFSI electrolyte salts, LiTDI additives and Ionic liquids



Anode

Waterborne acrylic based binders & additives for Hi Si
PVDF binders

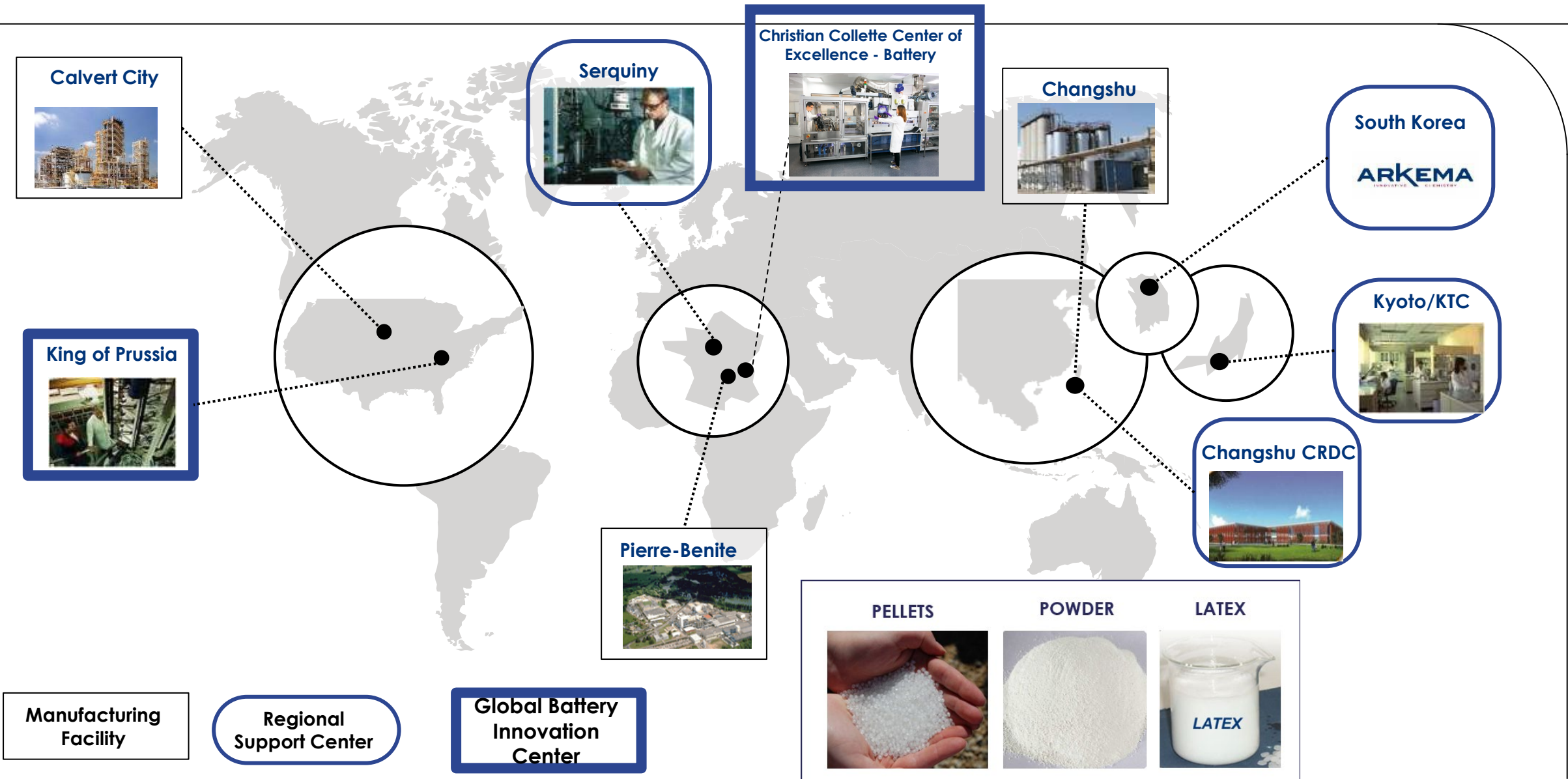
Cathode

PVDF binders, edge coating solution, MWCNT as a conductive additive and waterborne acrylic for primer coating of current collectors

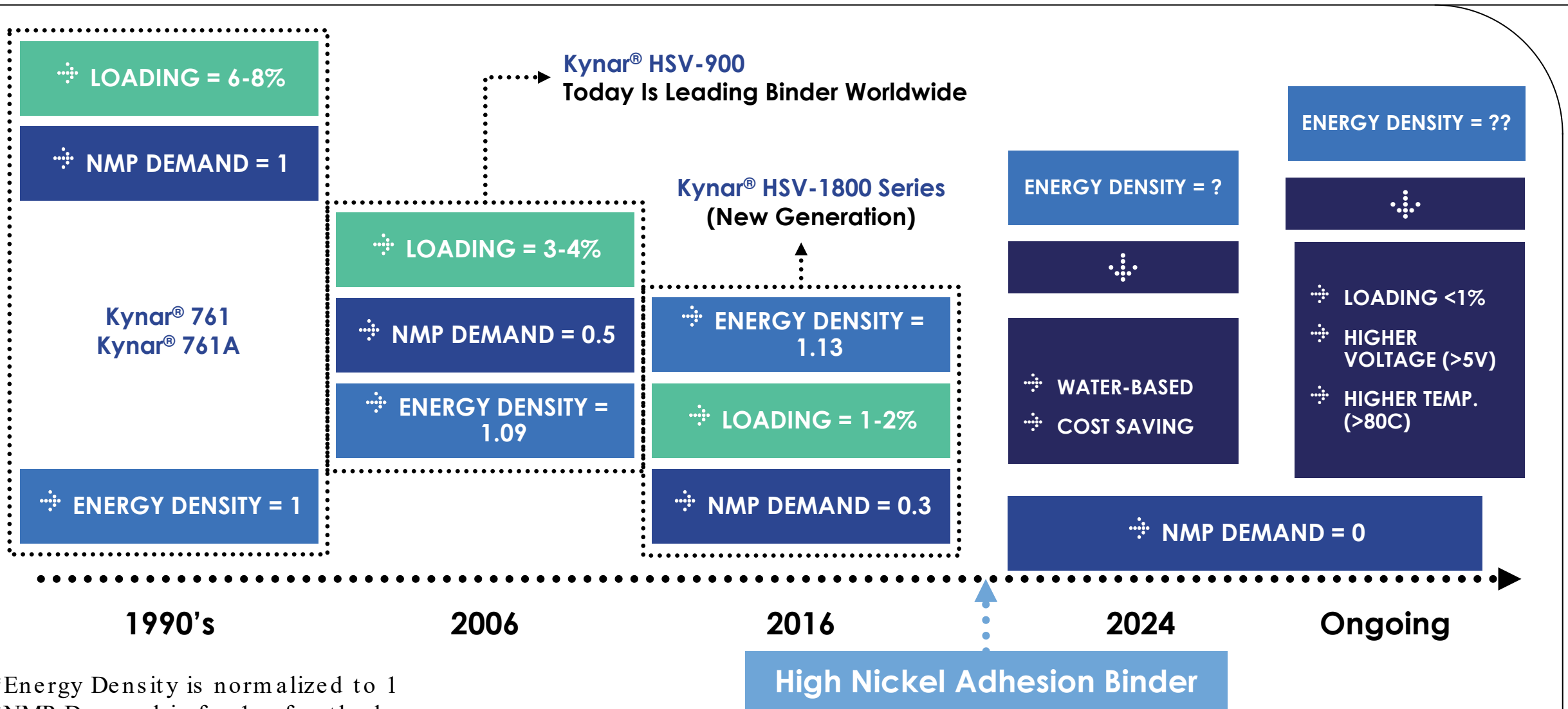
Separator

PVDF adhesive layer and acrylic based binders

KYNAR® PVDF GLOBAL FOOTPRINT



EVOLUTION OF KYNAR® BINDERS



*Energy Density is normalized to 1
 *NMP Demand is for 1g of cathode

KYNAR® PVDF BROAD PRODUCT PORTFOLIO = a toolbox for customers

Key fine-tuning parameters...

- Molecular weight
- Crystallinity
- Copolymer content
- Functionalization

For tailor-made properties of Kynar PVDF

- Adhesion
- Flexibility
- Electrolyte uptake (swelling)
- Dissolution speed
- Phase separation speed

Main commercial Kynar® battery grades

