

APB company and technology overview

JUNE 17, 2021

Strictly confidential



History of APB

1998: Developed the concept of Bipolar structured batteries with polymer electrolytes

2002: Structured the new battery concept based on the ideas on Li-ion and electron

2012: Started R&D on Gel Polymer and resin current collector with Sanyo Chemical (SCI)

2018: Completed basic R&D on APB and started to develop production processes

Oct 2018: Founded APB Corporation with Keio Innovation Initiative(KII)

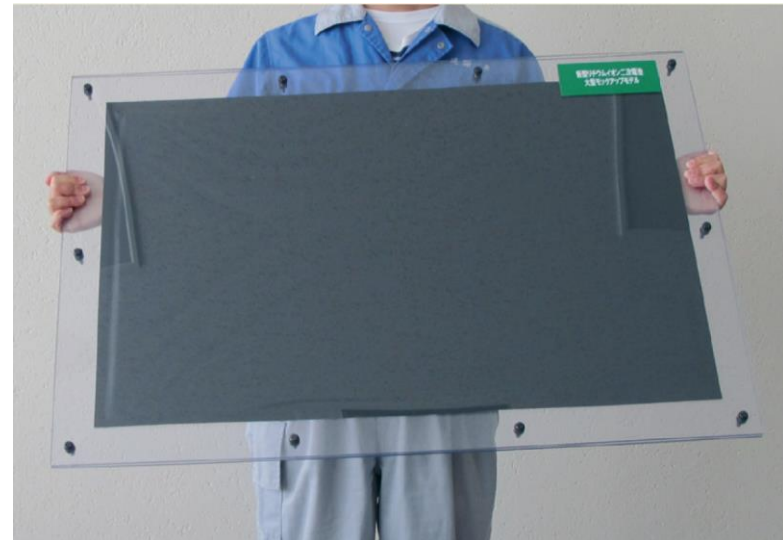
Feb 2019: Invested by SCI, the R&D partner

May 2020: APB Concluded Licensing Agreements with Nissan and Sanyo Chemical

2020: Closed JPY10Bn Financing and Acquired a mass production plant in Fukui, Japan



Left: Horie (CEO of APB), Right: Ando (CEO of SCI)

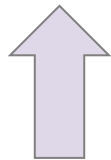


Large size battery cell sample

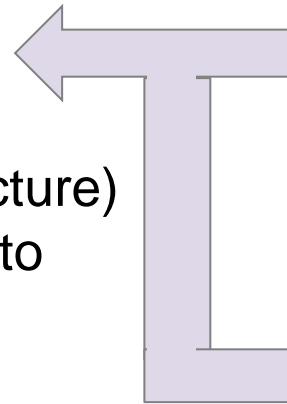
Investors and partners



All Polymer Li ion battery (bipolar structure)
(First mass production plant in Japan to start operation 2021)



Raised \$100M in 2020



Dr. Horie



**Sanyo
Chemical**

Strategic partners / Investors

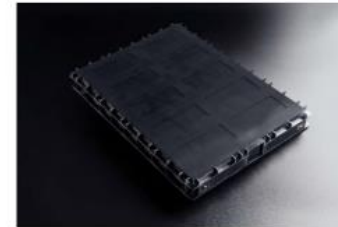


Supported by first class share holders

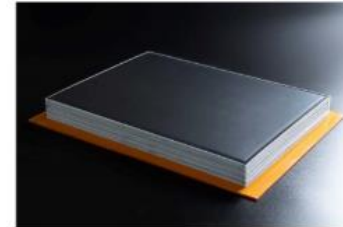
Introduction to the All Polymer Battery

Summary

- Bi-Polar, large and thick format design:
 - Increased energy density,
 - Simplified battery module at higher voltage.
- Polymer current collectors (substrate):
 - A key contributor to a high degree of safety.
- Gel Electrolyte:
 - A key innovation to dramatically improve safety
- Simplified manufacturing process
 - Lower cost at mass scale production
- Together, the foregoing innovations result in:
 - A high degree of safety:
 - a short circuit does not result in high temperatures that can result in thermal runaway or generation of volatile gases, and
 - no spillage of electrolyte.
 - A large format design for higher energy density.
 - Cost reduction



All Polymer Battery module
(Approx. 550 x 400 x 50 mm)



Inner structure
Bipolarly connects 40 battery cells in series

..... A game changer for High Capacity Storage Applications

Press Release

AUV(July 20, 2020)

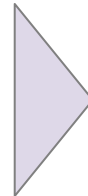
Commercialization

We started the demonstration test with AUV(Autonomous Underwater Vehicle) made by Kawasaki Heavy Industries, Ltd.

Press release: <https://prtimes.jp/main/html/rd/p/000000005.000048479.html>



All Polymer Batteries
used
(case appearance)



AUV equipped with
All Polymer Batteries



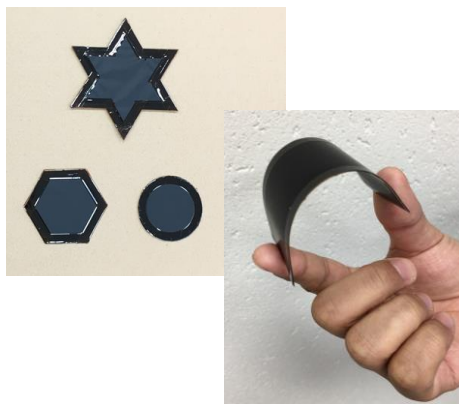
Contributes to maintenance and
inspection of submarine cables
and submarine pipelines

Characteristics of All Polymer Batteries

Bipolar structure

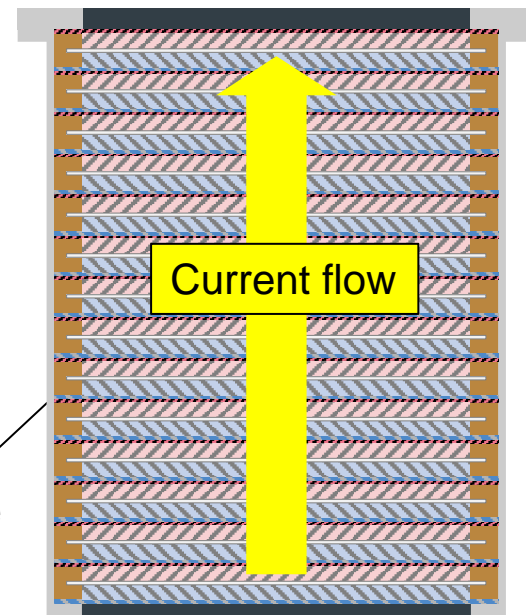
Structure

- Bipolarly stacked multi layered + large area and thickness = compact/light weighted
- Possibilities for the freedom of the shape (bended, round, star, perforated, etc.)

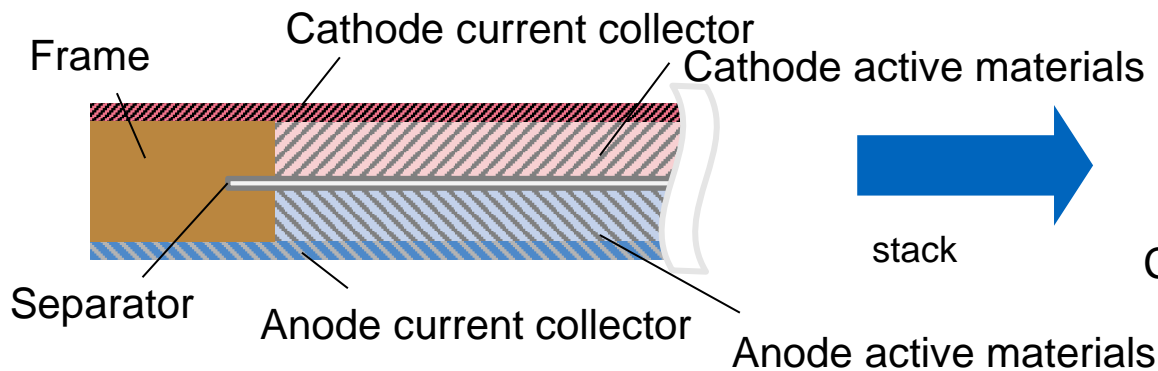


All Polymer Batteries bipolarly stacked illustrated image

Battery pack

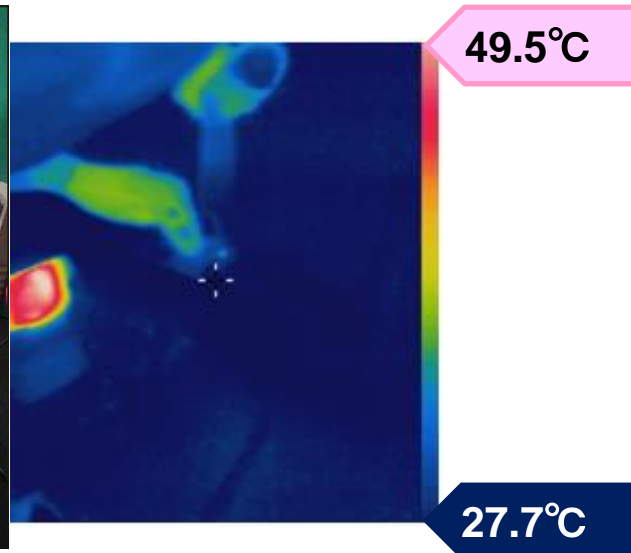
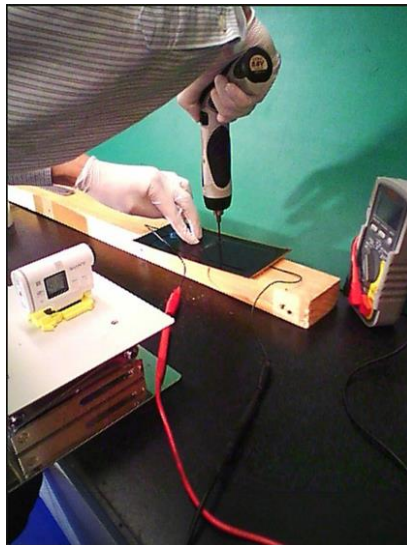


Single cell

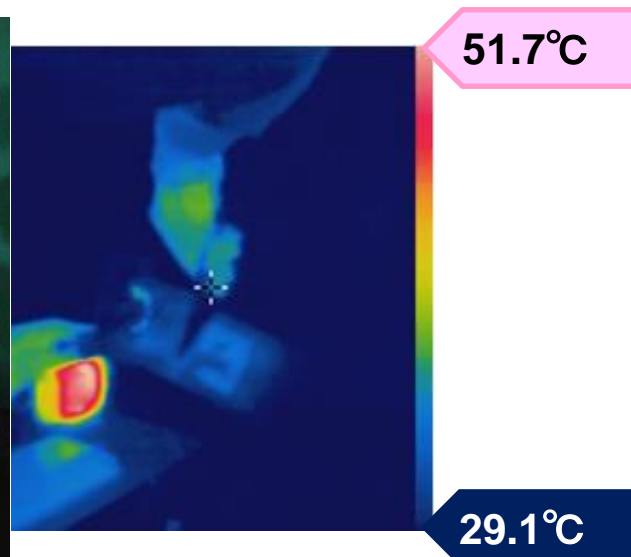
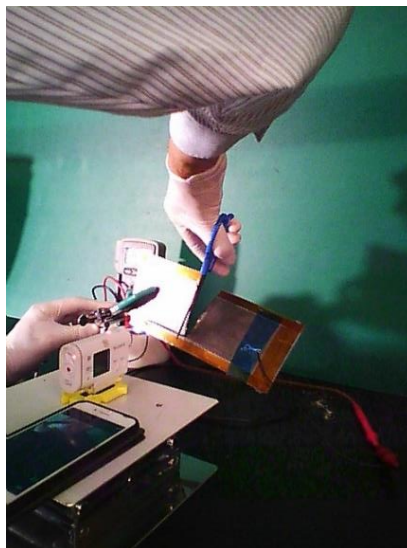


Significantly higher reliability in catastrophic event not cause temperature rise in being drilled or cut by scissors

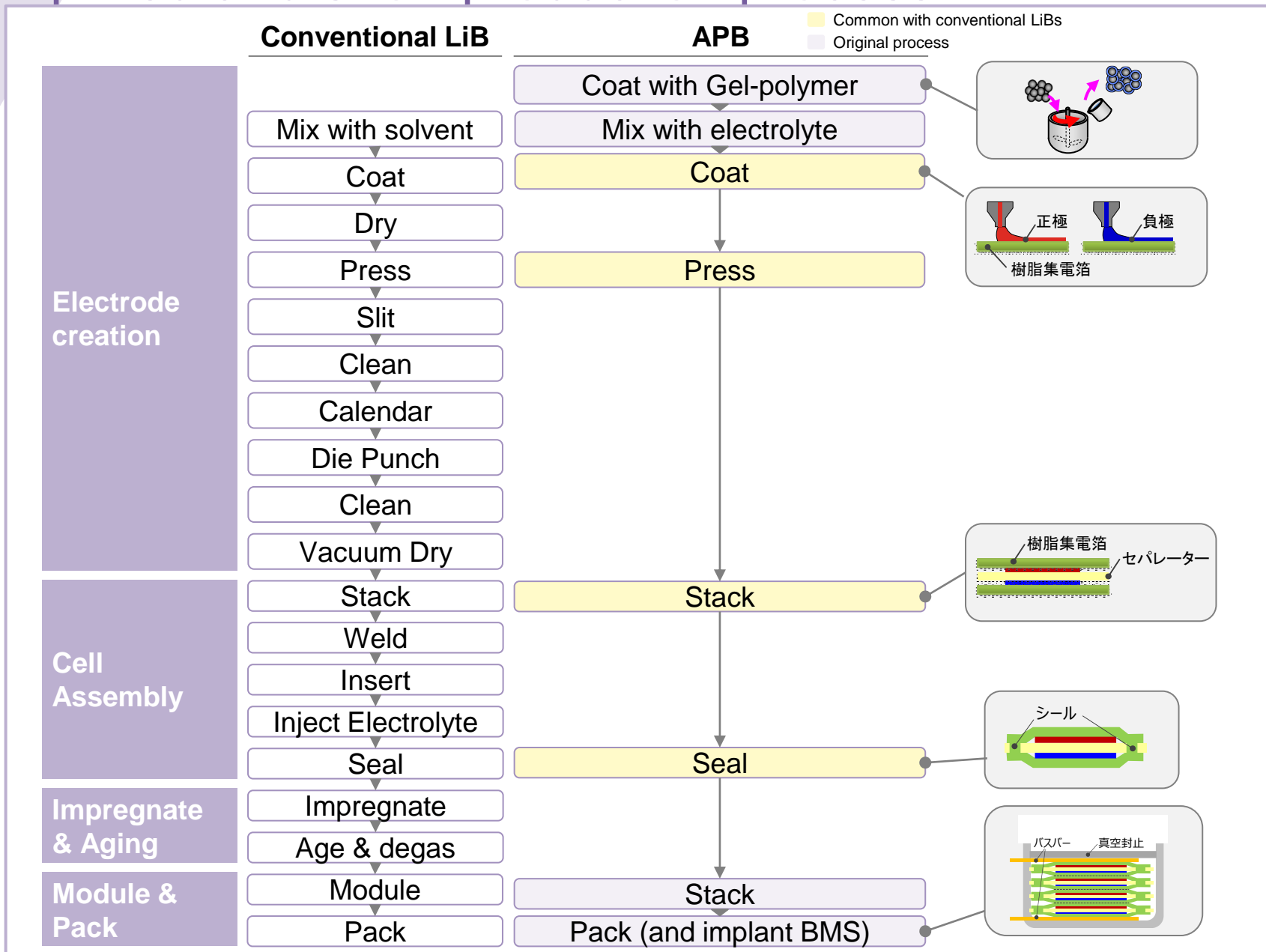
Drilling



Cutting with
scissors


















Simplified and short production process



Comparison

Specifications/Performance

Criteria	Conventional LiB	All Polymer Battery	Solid-state battery
Energy density	 <ul style="list-style-type: none"> Estimated max: 300 Wh/L Major products are only 100-200Wh/L 	 <ul style="list-style-type: none"> Estimated max: 560Wh/L Short-term improvement expected 	 <ul style="list-style-type: none"> 1st generation: 450Wh/L (2025 target) 2nd generation: 800Wh/L (2030 target)
Output	 <ul style="list-style-type: none"> High discharge-charge performance 	 <ul style="list-style-type: none"> Balance of energy density and output performance is adjustable through electrode thickness 	 <ul style="list-style-type: none"> High output with high ion-conducting performance
Durability	 <ul style="list-style-type: none"> High durability (max: tens of thousands cycles, 15+ years) Sudden death risk 	 <ul style="list-style-type: none"> 3,000+ cycles with 90% capacity High durability with the usage of hard carbon for anode active materials 	 <ul style="list-style-type: none"> Low risk of dry-up with solid state electrolytes
Safety	 <ul style="list-style-type: none"> High risk of short circuit and accompanying fire Required to limit energy density to secure safety 	 <ul style="list-style-type: none"> Low risk of fire/explosion even with high energy density 	 <ul style="list-style-type: none"> Fire risk still exists with metal current collectors Risk of hydrogen sulfide gas
Cost	 <ul style="list-style-type: none"> Complicated process has limitation on cost reduction 	 <ul style="list-style-type: none"> Low cost thanks to high yield production process and scale merit Limited number of parts required 	 <ul style="list-style-type: none"> No business plan for large scale battery systems yet

In the short run, APB focuses on 3 major applications as target market



Grid

Grid specific cells optimized for multi-hour duty and immediate charge discharge performance



Mobility

High energy and power mobility cells for EVs and other mobility applications

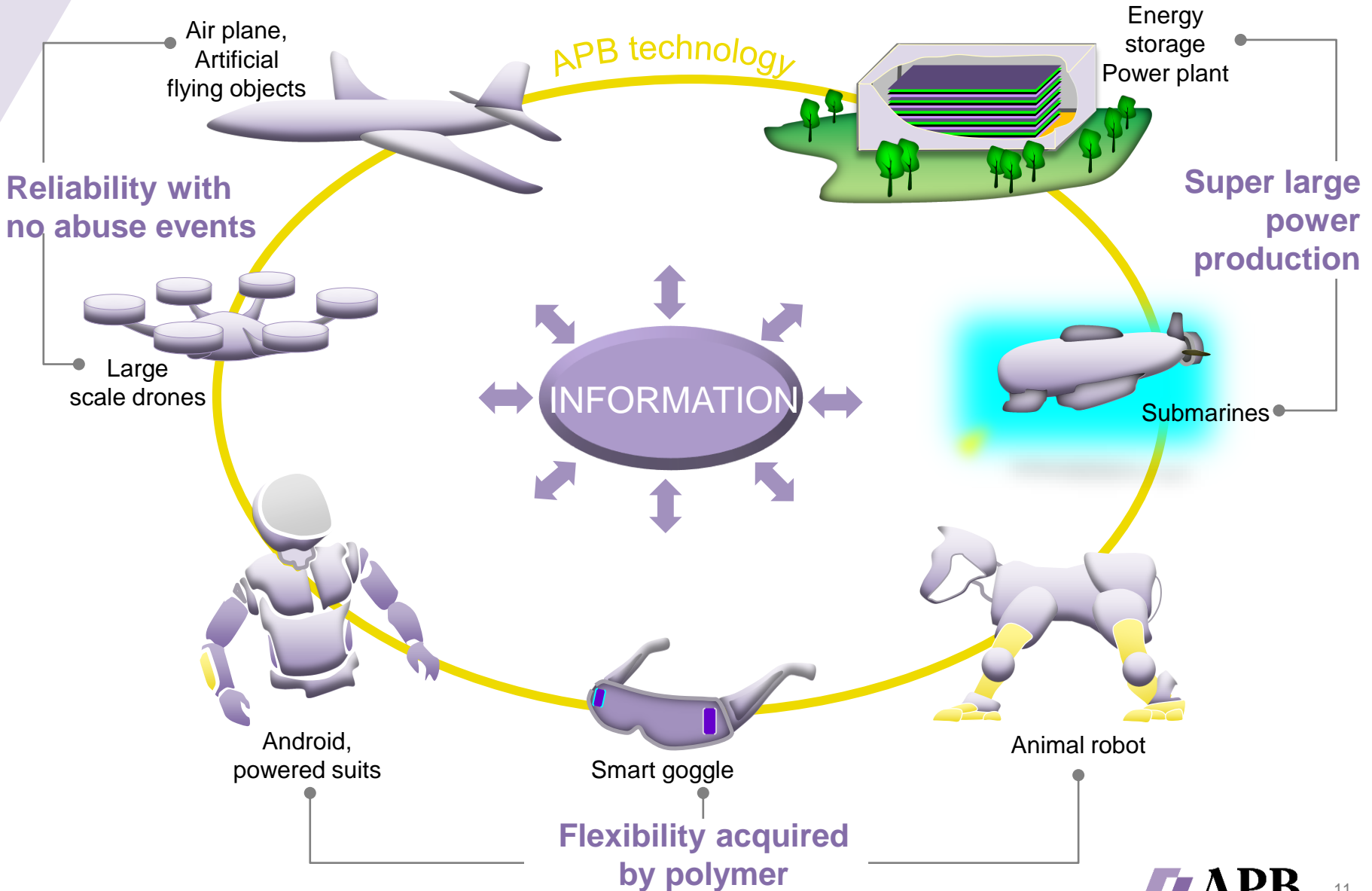


Custom designs

Wide application for electronic devices and other specific applications

Our Battery is applicable to airplane or any other applications require high reliability

Any imaginable future artifacts could be realistic and materialized with All Polymer Batteries



APB Corporation

Business Prospect & Production Plan

Production Plan(First Step Plan@Fukui Center Takefu Plant in Japan

	FY2020	FY2021	FY2022	FY2023
	3Q 4Q	1Q 2Q 3Q 4Q	1Q 2Q 3Q 4Q	1Q 2Q 3Q 4Q
Installing Equipment	→			
Trial Run		→		
In-House Product Testing		→		
Production Start			→	

Business Prospect

APB is not only a battery manufacturer. In order to build the social infrastructure rooted in each region of the world, we will establish a global position by partnering with entrepreneurs and investors around the world who share our vision and have the noble business sense and the future strategy.

What we want

We are looking for strategic partners with whom we can build a long-term relationship, either through joint development of batteries or through funding etc.

APB Completed Construction of the 1st Plant of All Polymer Battery in Fukui, Japan

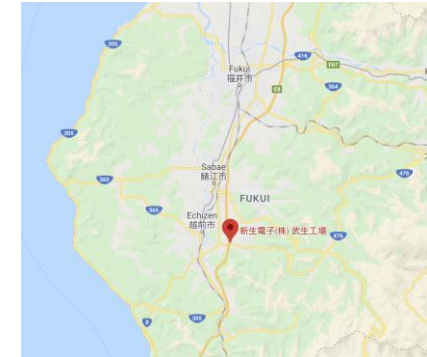
APB Fukui Center Takefu Plant

Location : Shodencho, Echizen City, Fukui

Total floor space : Approx.23,733 m²

Building area : Approx. 8,628 m²

Start of operation : 2021





APB develops its battery business in 3 phases to build capacity for 1/3 of world battery demand in 2030


GWh in Fukui
 Validate APB technology in mass production


30GWh in 2026
 Introduce APB for various applications

500+ GWh in 2030
 Offer capacity of 1/3rd of world battery demand

-  **Capacity (GWh/year)**

-  **Investment (Oku JPY)**

-  **Timing**

-  **Target application**

0.1 – 3 (starting with smaller capacity))

100

2021-24

- Large ESS solutions

30

1000

2026

- Grid
- EV
- Family house

500+

10000+

2030

- All applications
- Potential license out and partnering

