TOSHIBA

Toshiba IR Day 2019

Battery Division

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Toshiba Corporation

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Forward-looking Statements

- This presentation contains forward-looking statements concerning future plans, strategies, and the performance of Toshiba Group.
- These statements are not historical facts; rather, they are based on assumptions and judgments formed by the management of Toshiba Group in light of currently available information. They include items that have not been finally decided at this point and future plans that are yet to be confirmed or that require further consideration.
- Since Toshiba Group promotes business in various market environments in many countries and regions, its activities are subject to a number of risks and uncertainties that are, without limitation, related to economic conditions, worldwide mega-competition in the electronics business, customer demand, foreign currency exchange rates, tax rules, regulations, geopolitical risk, natural disasters and other factors. Toshiba therefore wishes to caution readers that actual results might differ from expectations. Please refer to the annual securities report (*Yuukashoken houkokusho*) for FY2018 and the quarterly securities report (*shihanki houkokusho*) for the second quarter of FY2019 (both issued in Japanese only) for detailed information on Toshiba Group's business risk.
- Toshiba's fiscal year (FY) runs from April 1 to March 31. All figures are consolidated totals for 12 months, unless otherwise stated.
- Results in segments have been reclassified to reflect the current organizational structure, unless otherwise stated.

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SCiB™ Characteristics and Target Areas

2019 Nobel Prize in Chemistry for Development of Lithium-ion Batteries

Congratulation to John Goodenough, Stanley Whittingham and Akira Yoshino

Koichi Mizushima, an executive fellow at Toshiba, while a researcher at Oxford University in England working with Professor John Goodenough, discovered lithium cobalt oxide (LCO), which is used for the cathode. This discovery played a central role in the development of lithium-ion battery electrodes.

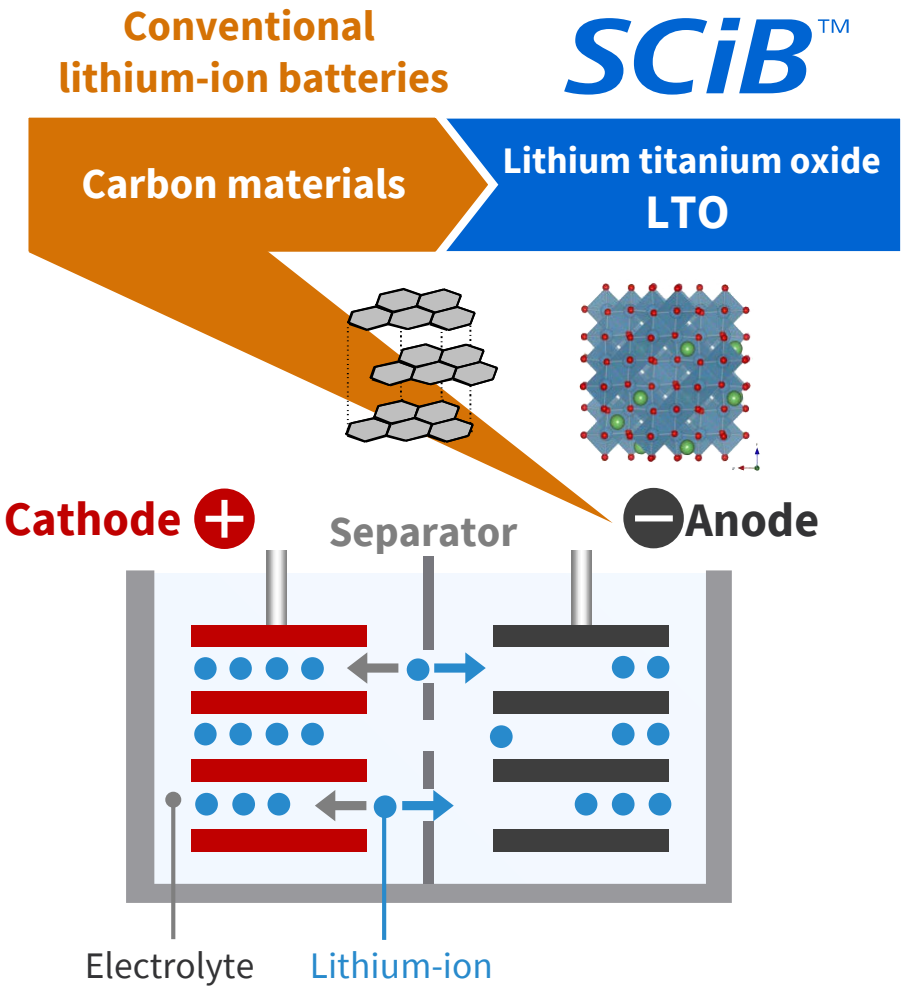
K. Mizushima & et al., Mat. Res. Bull., Vol.15, pp.783-789(1980)

Toshiba has developed an original battery, the SCiB™, that has a lithium titanium oxide (LTO) negative electrode. Its superior characteristics include safe operation, long life, high input and output, rapid charging, and low-temperature operation.

SCiB™ Characteristics

Differences Between SCiB™ and Other Lithium Batteries

Using LTO as the anode electrode allows SCiB™ to overcome the disadvantages of conventional lithium-ion batteries.



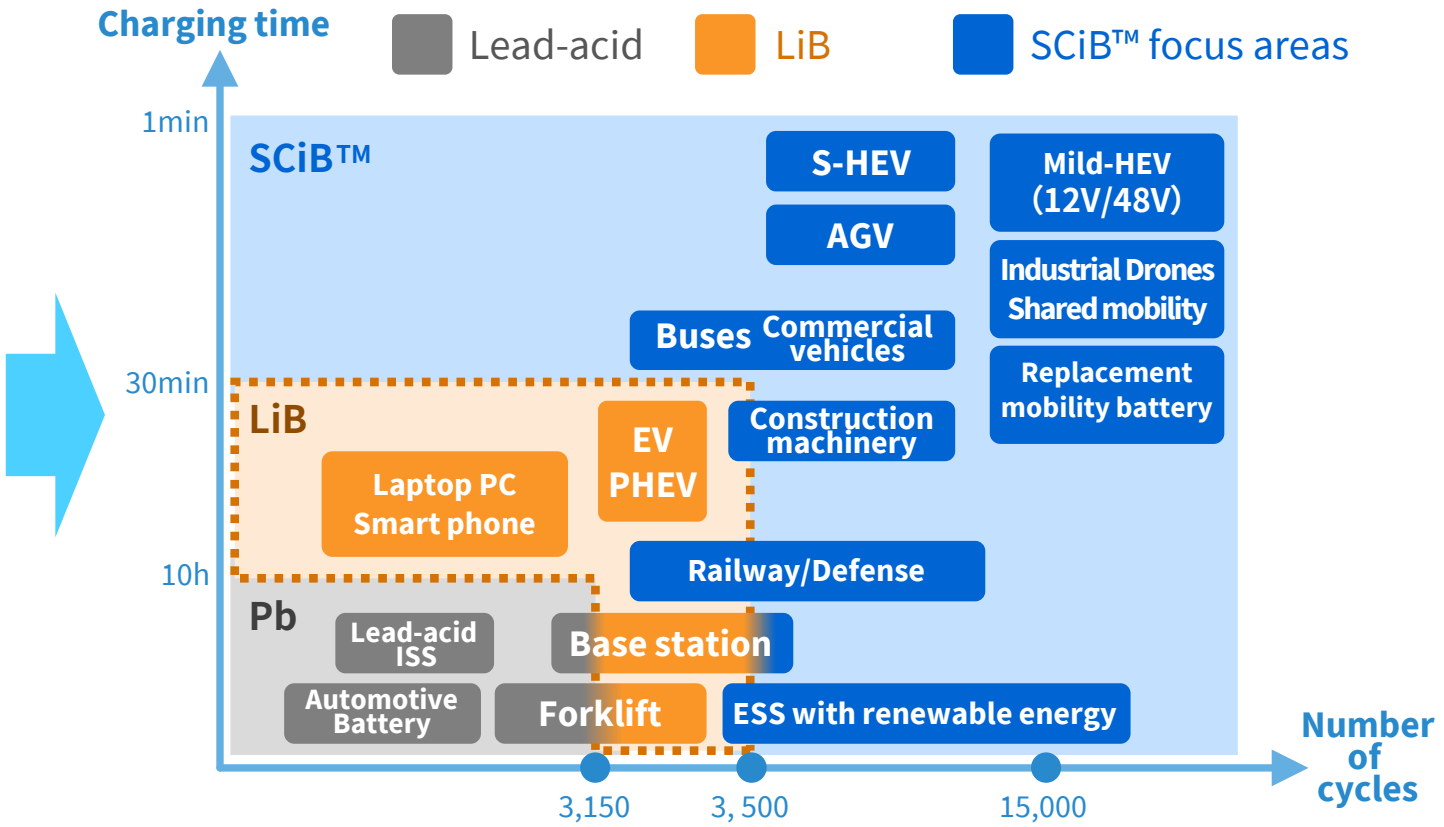
Material and Technology	Conventional lithium-ion batteries	SCiB™
Voltage	○ 3.5-3.7V	× 2.3-2.4V
Energy density	○ -500Wh/L	× 100-200Wh/L
Cycle life	× 3,000	○ >20,000
Rapid charging	× 30 min-	○ 6 min
Continuous operating temperature	× 0°C-	○ -30°C–
Safety (internal short circuit when fully charged)	× Instant discharge / ignition	○ Gradual discharge

SCiB™ Target Market Segment

Focus on heavy-duty areas where SCiB™ can be useful, rather than simple energy storage applications

SCiB™ Characteristics

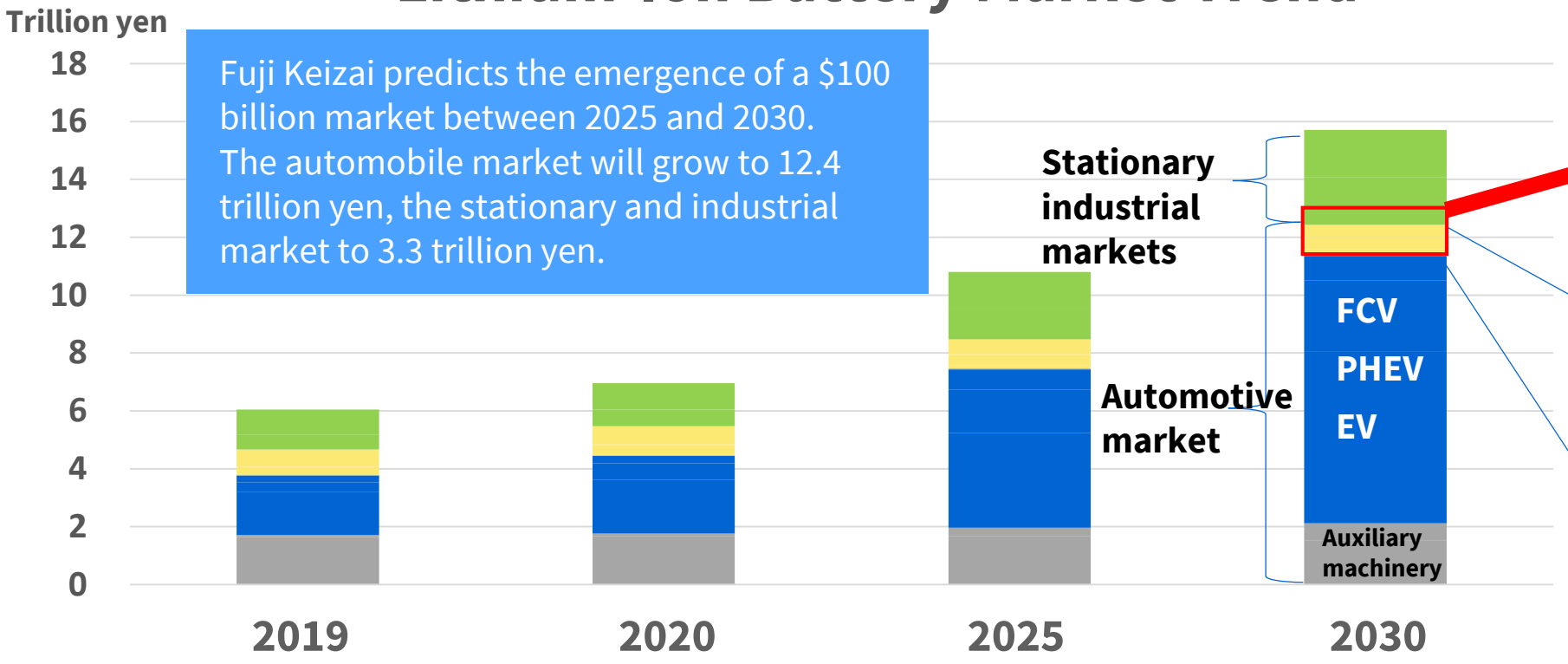
Target Markets



Secondary Battery Market Trend and SCiB™ Target Market Size

By taking advantage of SCiB™ strengths
we are looking at the top-end niche markets to reach about 1.3 trillion yen

Lithium-Ion Battery Market Trend



Target market approximately 1.3 trillion yen

■ Target area

MICRO HEV	0.2
HEV	0.4
HEV TRUCK・BUS	0.03
EV TRUCK・BUS	0.4
Total	1.0

Source: Fuji Keizai "Future Outlook of Energy, Large Scale Secondary Battery, and Materials 2018"
- Energy Devices Edition, Next Generation Environmental Automotive Field Edition -(2018: Forecast, 2019 and beyond: Forecast)

02

Progress of Business

Major Applications

Taking advantage of SCiB™ strengths to expand application

Adoption in hybrid vehicles, including light vehicles, passenger cars and heavy trucks

"About 40% of Japanese k-cars carry an SCiB™ "

■ **12V mild hybrid system**

● **Suzuki Motor Corporation**

Wagon R , HUSTLER, SWIFT, etc.

● **Nissan Motor Co., Ltd**

Dayz, Dayz Highway STAR

● **Mitsubishi Motors Corporation**

eK Wagon, eK X

■ **24V mild hybrid system**

● **Mazda Motor Corporation**

MAZDA3 SEDAN, FASTBACK

■ **Strong hybrid system**

● **Hino Motors, Ltd.**

Hino Profia Hybrid

Adoption of domestic and international public transportation

■ **European EV Bus, HV Trolley Bus**

Solaris Bus & Coach S.A.
and Van Hool, etc.

■ **Central Japan Railway Co.**

Adopted as the battery automatic driving system in the next-generation N700S Shinkansen

■ **Tokyo Metro Co., Ltd.**

Adopted in driver system combined with SCiB™

Adoption of large-scale battery energy storage system

■ **Tohoku Electric Power Co., Inc.**

Nishisendai Substation, Minami-Soma Substation

Increasing Production Capabilities

**Increase production capacity in Japan and overseas to support growth.
Strengthen production and supply system for LTO battery,
based on Suzuki Motors' strategy in India**

■ Expanding Kashiwazaki Operations

Increasing production for future business expansion

■ New factory in Yokohama

New factory under construction

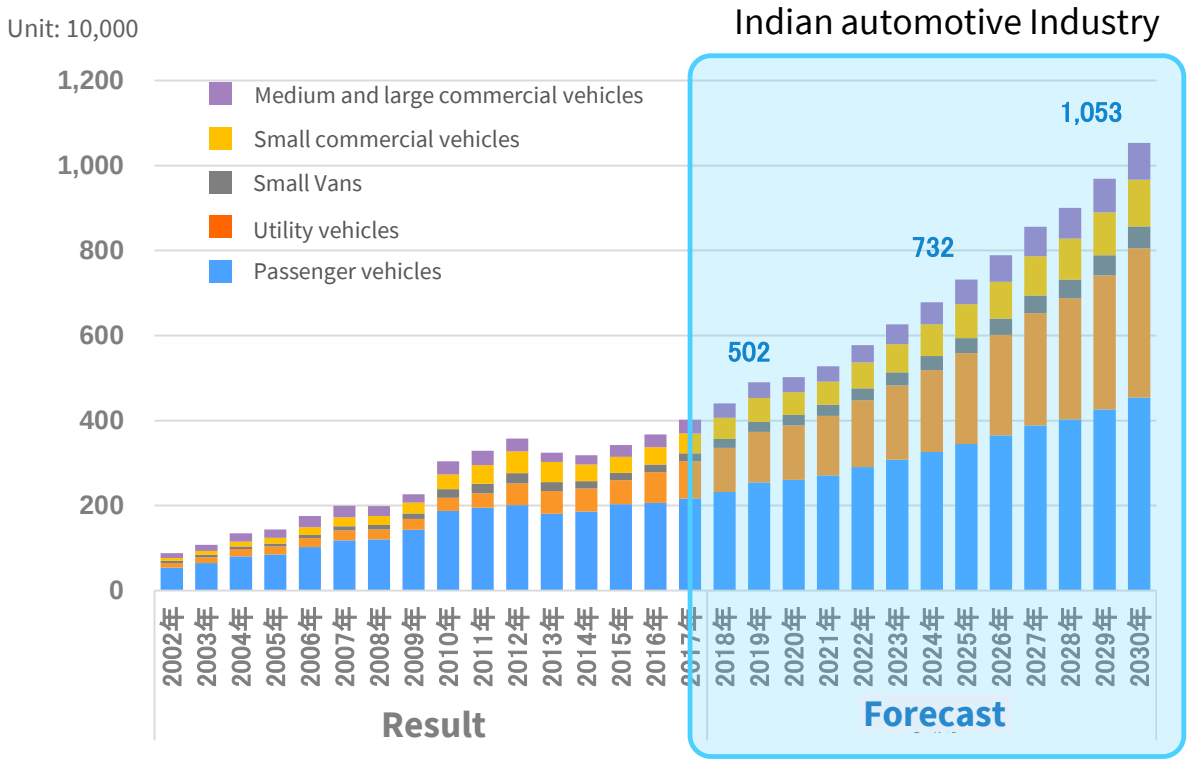
Rendering of new factory

As of 2019/11

■ New factory in India

Joint venture with DENSO and Suzuki Motors in Gujarat, India to manufacture automotive LTO battery. Factory building was completed in Oct. 2019. Ramping up production facilities to start mass production in 2020

**Suzuki : announced that they are targeting a 50% share
Indian automobile market : 10 million vehicles by 2030**



Source:：FOURIN Forecast of Indian automotive Industry 2030 and Electrification Trend

Strategic Alliances

Promoting strategic alliances with battery and material manufacturers

Collaboration with Nichicon to manufacture a small LTO battery

Samsung adopted a small LTO battery which made using SCiB™ technology for the Galaxy Note10 and Note10+ stylus pen.

Joint venture with Titan Kogyo

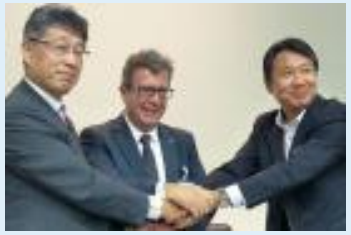
TBM Ltd. was established in October 2019 with Titan Kogyo, Ltd.
Aim is to ensure a stable supply of lithium titanium oxide for SCiB™.

Collaboration with Clarios Co.

Started collaboration in January 2019. Mass production of LTO battery to start in 2020

Joint development with CBMM*

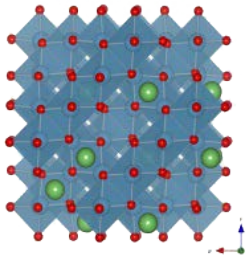
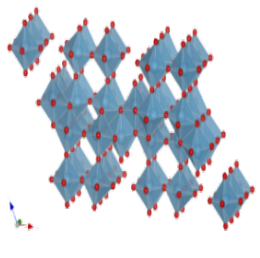
Joint development of next-generation niobium titanium oxide battery with CBMM* & Sojitz



＊CBMM: Companhia Brasileira de Metalurgia e Mineração (Brazil)

Develop Next-Generation SCiB™ Battery

By bringing the unique properties of niobium, a metallic element, to the electrode, increase energy density more than 1.5 times

	Lithium titanium oxide	Niobium titanium oxide
Cathode	LTO	NTO
Crystal structure	spinel	monoclinic
		
Weight capacity* (mAh/g)	170	387
Volume capacity* (mAh/cm³)	580	1680
Potential (V vs. Li)	1.55	1.6

* Theoretical capacity

Materials and Technology	SCiB™
Voltage	✕ 2.3-2.4V
Energy density	✕ 100-200Wh/L
Cycle life	○ >20,000
Rapid charging	○ 6min
Continuous operating temperature	○ -30°C-
Safety (internal short circuit when fully charged)	○ Gradual discharge

improve

Taking advantage of SCiB™ strengths to increase capacity

49Ah cell sample from Toshiba Research Institute

- Volumetric energy density: 350Wh/L (111mm×194mm×14.5mm)

Source: :Toshiba Review

Collaboration with System Division

Promote sales growth by developing and leveraging new system applications

Railway Systems

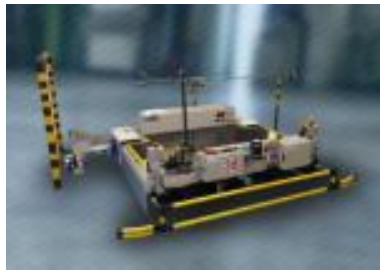
Adopted in automatic driving system for N700S series Shinkansen

Adopted in propulsion system for Tokyo Metro Marunouchi Line that combines PMSM *1 and SiC with SCiB™

Adopted in the propulsion systems of European hybrid locomotive that combine SCiB™ and PMSM *1

Developed SCiB™ module for rolling stock that meets the RAMS*2 standard safe level SIL4

Industrial Systems



Mazda manufacturing plant adopted SCiB™ for AGV system

Kinden Corporation adopted SCiB™ for self-propelled snow removal robot

VPP/Stationary battery

Adopted in smart resilience and VPP construction

Tokyo Electric Power Company is demonstrating SCiB™ for direct current power supply

Adopted for regenerative power storage device for Okinawa monorail

※1 PMSM(Permanent Magnet Synchronous Motor)
※2 RAMS(Reliability, Availability, Maintainability, Safety) International railway standards

03

Promoting New Businesses Initiatives

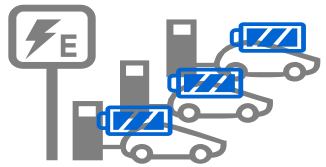
Battery for MaaS

Toward realization of a highly mobile society (MaaS), create value that expands the battery business

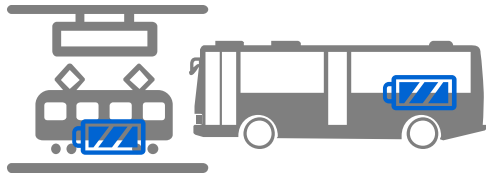
Value Change

Mobility as a Service: MaaS

●Increased vehicle ownership by service providers

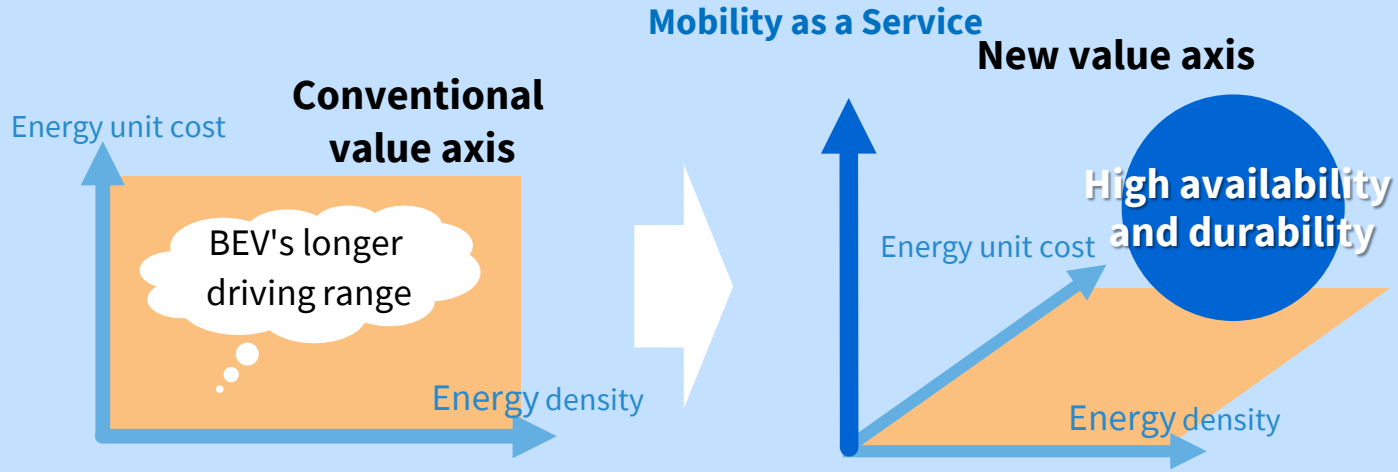


Ride Sharing



Public transport
(Buses,Trains, etc.)

Performance required for batteries



●**High availability combined with ultra-fast charging**

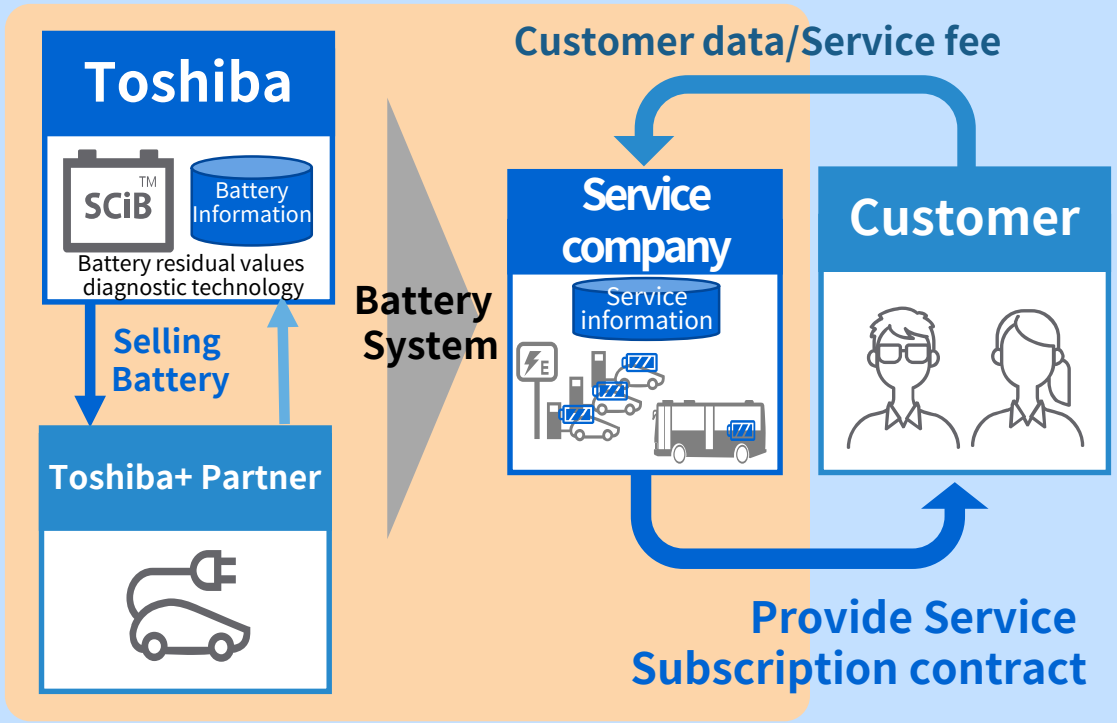
●**long-term stable usage based high durability**

Promote New Business Through Services

Promote leasing business for battery packs and systems

Taking advantage of SCiB™ strengths

Switch from sell out to service business



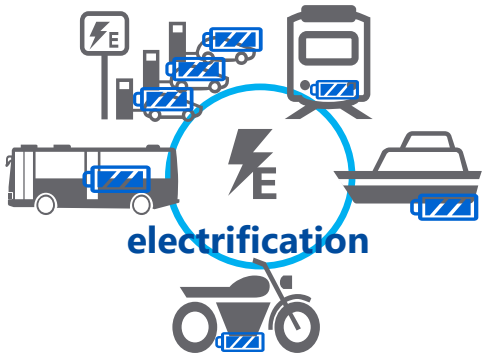
Aiming to create new value through open innovation

SCiB™ is suitable for reuse

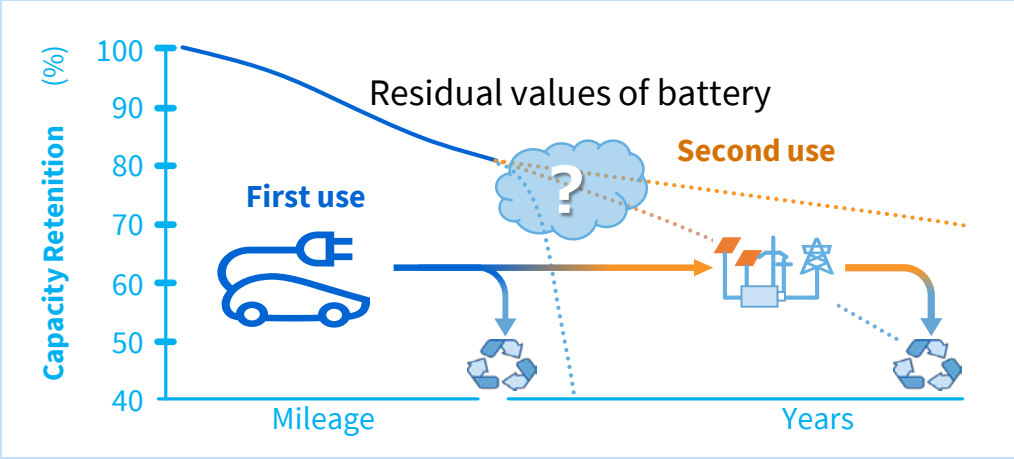
Long life characteristic contributes to lower environmental impacts

Increased battery use and environmental considerations

- Battery production will reach 1000GWh equivalent in 2030
- In a few years later, 5 million tons of battery waste is discharged every year



Reuse model to conserve resources and reduce waste



Key point:

Battery residual value diagnostic technology

SCiB™

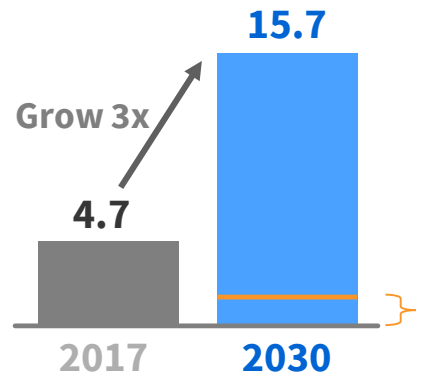
Battery Division Next Plan

By taking advantage of SCiB™ strengths in growth markets, aiming for a business scale of 400 billion yen in 2030

Market environment and main focus fields

Rechargeable battery market※

Growth market



Win share in markets that value the SCiB's strengths

400 billion yen

100 billion yen

2030

※Source: Fuji Keizai "Future Outlook of Energy, Large Scale Secondary Battery, and Materials 2018" - Energy Devices Edition, Next Generation Environmental Automotive Field Edition -

Committed to People,
Committed to the Future.

TOSHIBA