Technical Solutions
Climate Change

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BEMAC Corporation

BEMAC VCU
Vehicle-level Control for the Next Phase of EVs

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Mar.12,2026　United Nations Conference Centre

Company Overview

Company name : **BEMAC Corporation**

(Former Uzushio Electric Co., Ltd)

Founded April 1946

Number of employees : 1,197 (as of June 2025)

Number of Group Employees: 2,264

Annual Sales : 34.4 Bil. Yen ≒ 230 Mil. USD (2024)

Consolidated Sales: 58.2 Bil. Yen ≒ 390 Mil. USD

Main office : Imabari Head Office

105 Noma -ko, Imabari City, Ehime Prefecture

Imabari Head Office / Mirai Factory

Three main businesses in BEMAC

Marine plant business

Ship Electricity

・Manufacturing of electrical equipment
・Electrical work
・Sales of equipment
・After-sales service

Industrial Plant Business

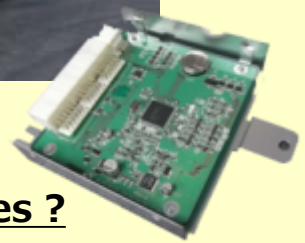
Electricity in buildings and factories

・Board manufacturing
・Electrical work
・After-sales service

EV Business

E- Trikes Electric

・Vehicle manufacturing, Electrical control system Sales



What are E- Trikes ?

・Electric versions of 3 wheelers taxi

Overview of BEMAC Electric Transportation Philippines Inc.

Company Name : BEMAC ELECTRIC TRANSPORTATION PHILIPPINES INCORPORATED

Established : March 2013

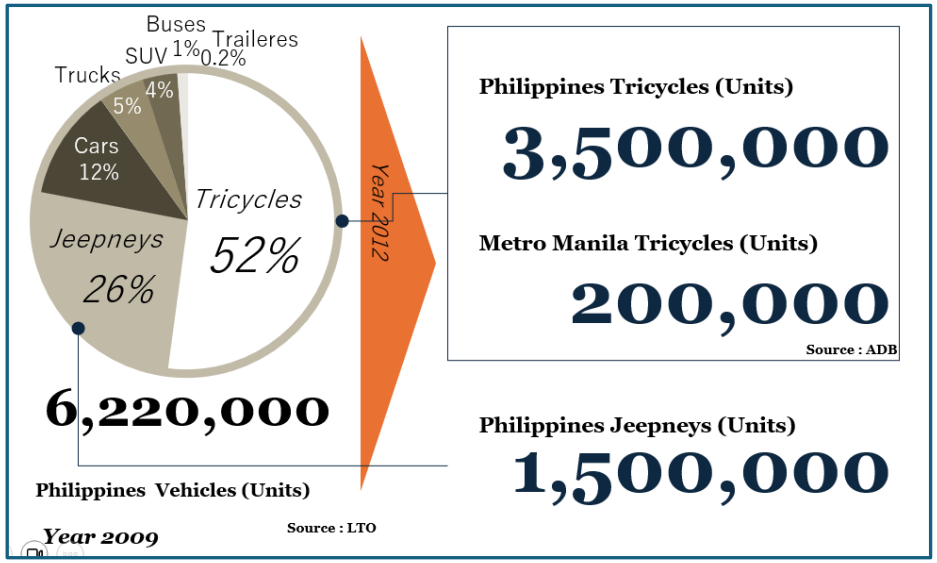
Capital : PHP660,000,000

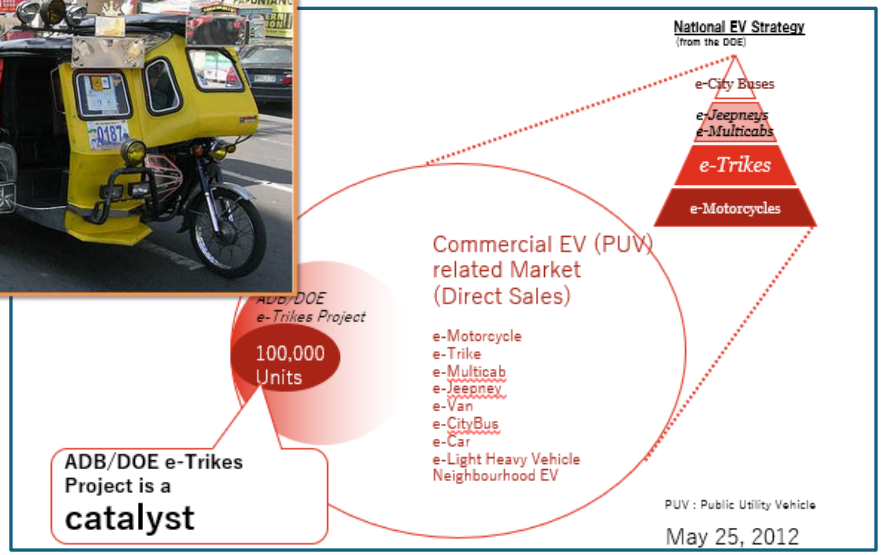
Number of employees : 44 (as of April 2025)

Main office : Block 14 Lot 8, 9th Street, Golden Mile Business Park,
Barangay Maduya, Carmona, Cavite

Business : Manufacturing, sales and after - sales service

DOE/ADB Project
-Targeted 100,000 units conversion to Electric.



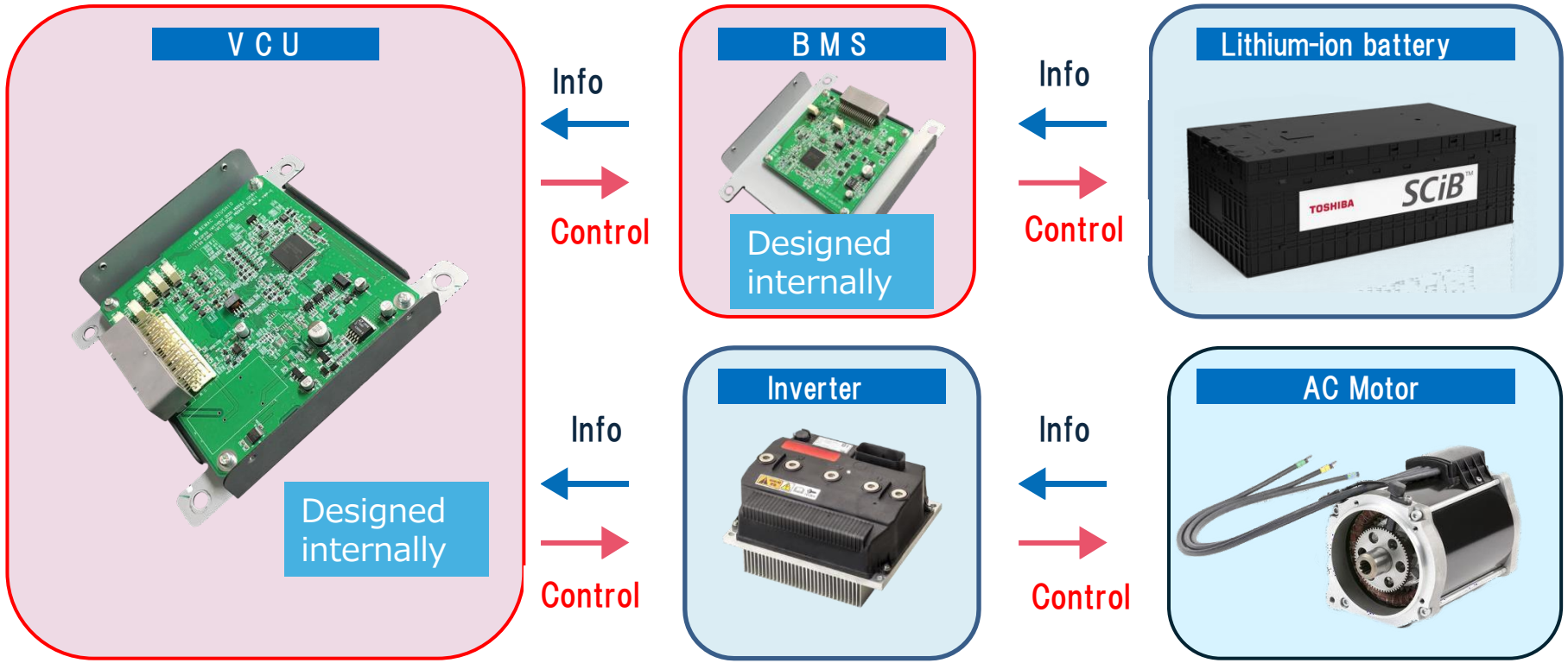


They launched a program which aimed to convert 100,000 units from existing 3.5 mil. Tricycles to Electric with the budget of 500 mil. USD in 2013.
First bidding was conducted in 2015, and BEMAC was awarded 3,000 units.
However, the succeeding bidding was all cancelled due to the transition of the Government.

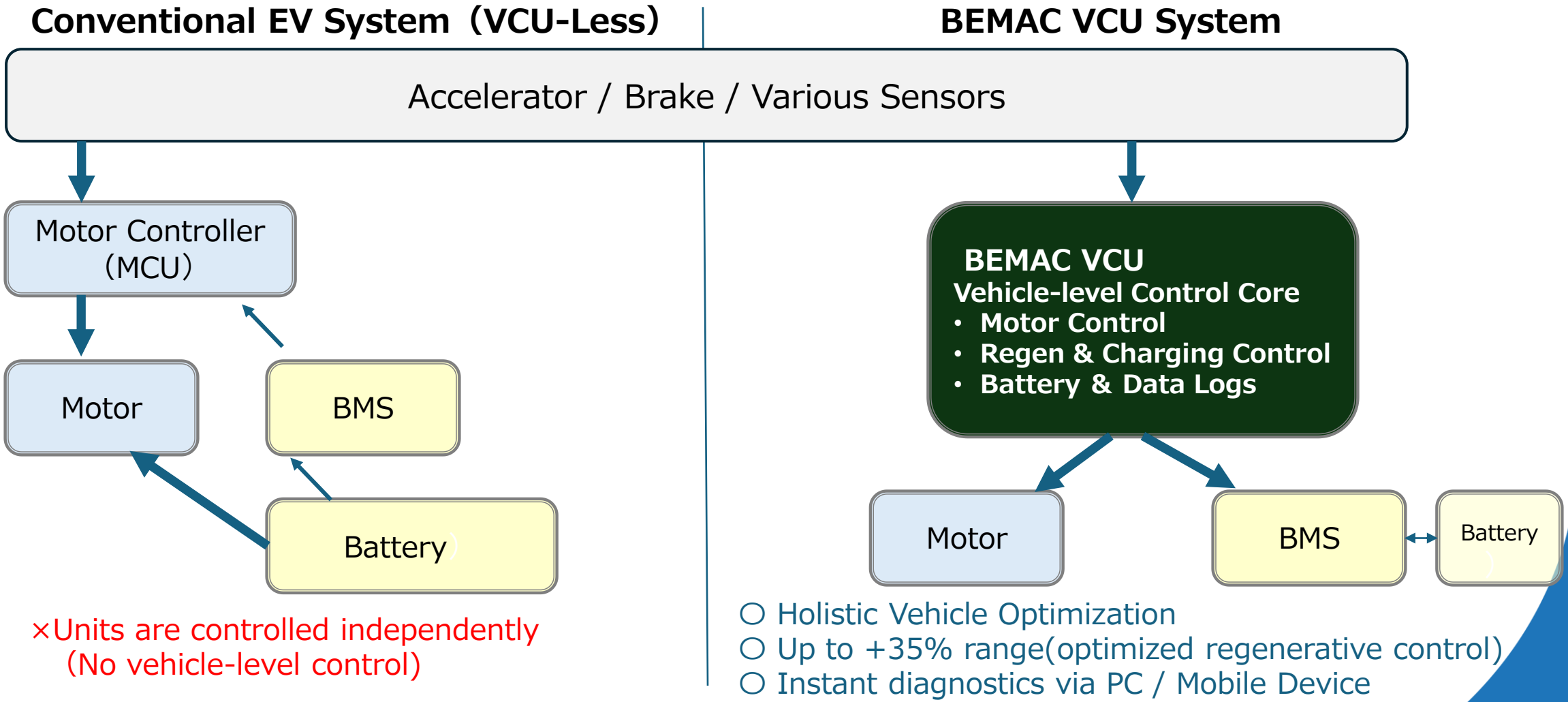
Featuring VCU(Vehicle Control Unit)

Vehicle Comprehensive Monitoring System VCU (Vehicle Control Unit)

an ECU that monitors and controls the entire vehicle by obtaining information from on-board devices such as the inverter and BMS . It has a fail-safe function that enables safe driving.



Why Vehicle-level Control Matters in EV Powertrains



Option 2: VCU becomes essential when EVs are operated as assets, not just a product

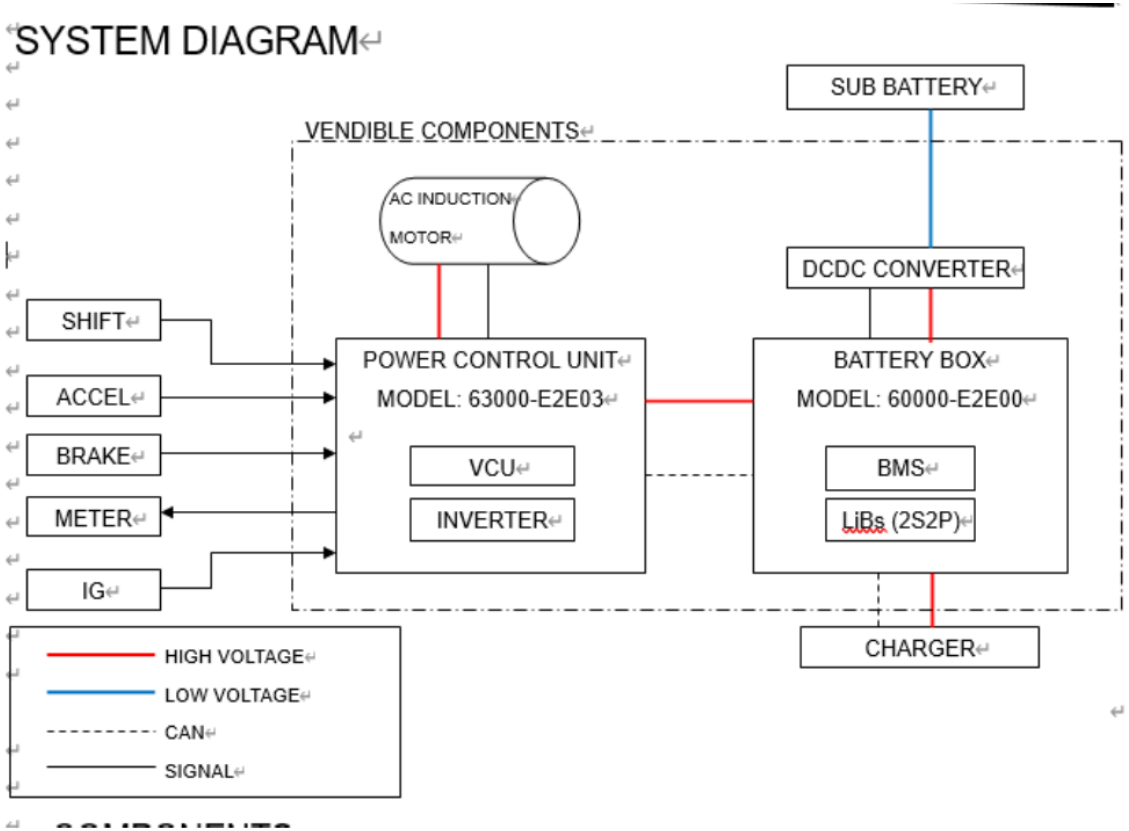
BEMAC VCU Features

■ Main functions:

- Motor control and regenerative braking
- Motor/battery protection
- Charging Control
- Diagnostics and Event Management

■ Other benefits:

- Bluetooth smartphone interface (initially Android only)
- Self-diagnosis and system monitoring can be performed from a PC...
- Supports
  - -Digital input/output (transistor/relay)
  - -Analog input/output
  - -Communication (CAN , EIA/TIA-232)
- Separation of the control board and I/O board makes customization easier

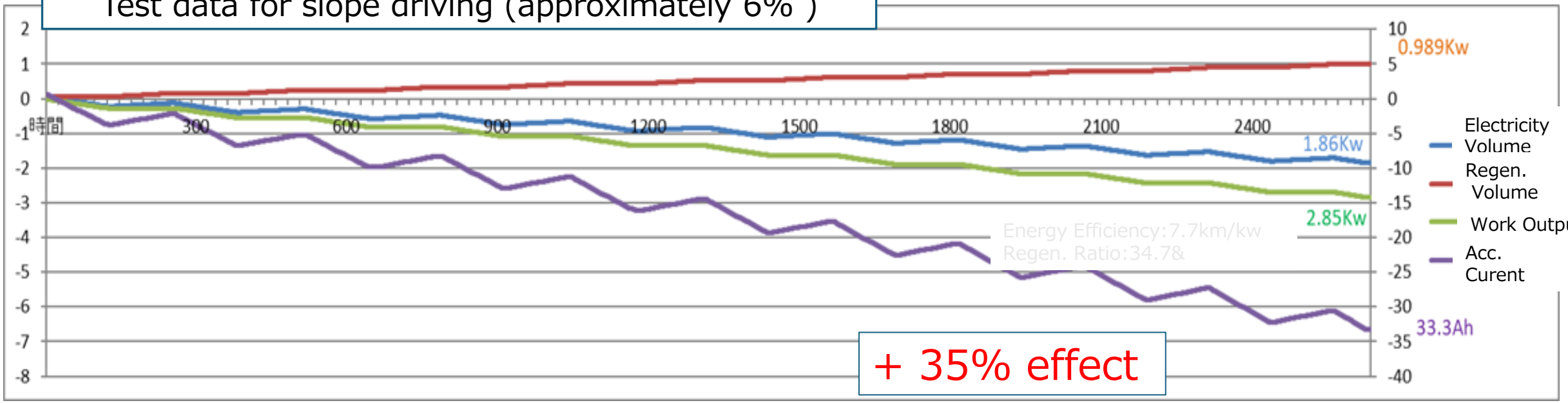


・VCU is BEMAC 's proprietary technology
・Designed as an integrated control unit that The VCU centrally manages the Battery, BMS, Inverter, and Motor.
- The existence, role, and value are clearly stated, and optimization based on collaboration functions can be provided.

BEMAC VCU Features

-Regenerative braking control increases driving distance

Test data for slope driving (approximately 6%)



+ 35% effect

Regenerative braking control increases driving distance by up to 35%

- An additional 1.4% improvement was observed even on flat terrain

BEMAC VCU Features

-Motor/battery protection – multi-layer safety design for reliability

classification	Main detection items	Control and Effect
Motor/inverter protection	·Overcurrent/low voltage/high voltage - Motor temperature abnormality - Inverter temperature abnormality (board/device/capacitor)	- Meter display when abnormality is detected - Automatically limits power output or stops driving
Battery Protection	- Over-discharge/over-charge/low voltage abnormality - Temperature abnormalities (when driving or charging) - Cell/module balance abnormality - Current/voltage sensor abnormality	-Warning or stop depending on the abnormality level - Ensures cell life and safety
safety design	·Fail-safe architecture with isolated CAN networks	- Maintains safe operation even during communication abnormalities
Control Policy	- Overcurrent, overvoltage, sensor abnormality: Immediate stop Minor abnormality: Warning message is displayed and driving continues	- Designed to ensure safety while maintaining operational efficiency

Multi-layer monitoring of both the motor and battery ensures safety, reliability, and extended lifespan.

BEMAC VCU Features

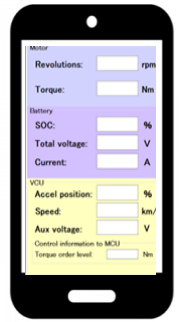
-Diagnostics and event management – operational visibility and rapid troubleshooting

Serial connection

VCU self-diagnosis abnormality detection → notification → analysis

On-site support (Bluetooth)

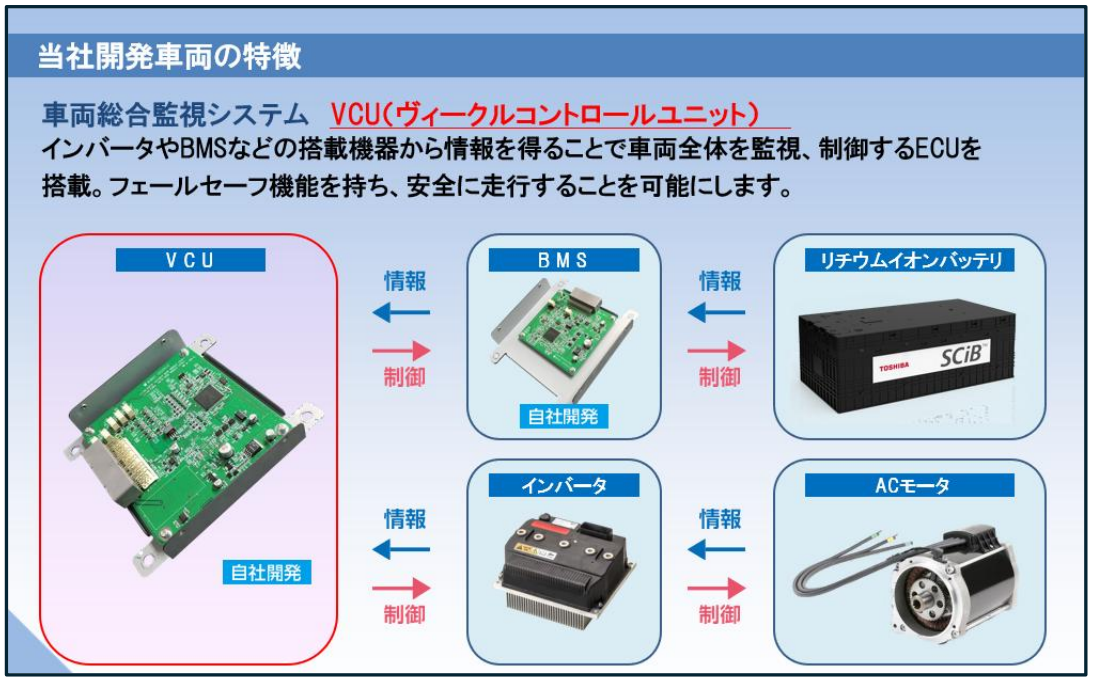
Serial connection



Operable locally or offline / Enables real-time monitoring and data logging

Immediate problem identification	Automatically identify the location of an abnormality and immediately display the cause
Reduced downtime	On-site self-diagnosis reduces recovery time
Reduced maintenance costs	No dedicated device required, diagnosis possible via PC or smartphone
Maintenance efficiency	Accumulating historical data to predict failure trends
Fleet Optimization	Remote monitoring possible with telematics integration

Utilization of key EV technologies



1. Electrification of industrial monorails:
Launched in June 2025

2.Supply of components for E- rickshaw for India

3. Golf cart conversion business:
Under feasibility study

Components, mainly controllers, developed for E-trikes to other applications and promote their widespread use.

Application Example : Industrial Monorail

< E-trike >

- Adjust power and speed by operating the accelerator and brake

The following controls are used to resolve the influence of factors such as inclination and load changes:

①Inclination sensor
②Motor rotation speed vs. speed

<Industrial monorail>

- One-touch constant-speed operation (forward/reverse, low-speed/high-power modes)

Configuration block diagram

Control panel (start / stop, forward / reverse)

Inclination sensor | Motor RPM / Speed Feedback

BEMAC VCU

- Speed / torque control
- Incline compensation
- Load compensation: Motor RPM / Speed analysis
- Regenerative Brake Control
- Electromagnetic Brake Control
- Obstacle detection interface
- Telematics (optional)

Drive motor / drive module

Three Core Values provided by BEMAC VCU

1. High operational efficiency: Maximized energy utilization through integrated controll
2. Safety and reliability: multi-layer monitoring and fail-safe design
3. Data-enabled Fleet management

BEMAC VCU provides the optimal solution that combines safety, efficiency, and reliability as the core control unit for next-generation mobility.

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Thank you very much