

AUTOMOTIVE STRATEGY



MAY 19, 2023

VIVEK BHAN

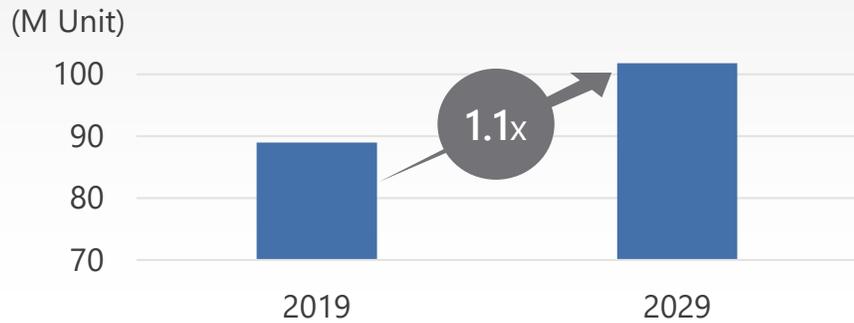
SVP, CO-GM OF HIGH PERFORMANCE COMPUTING,
ANALOG AND POWER SOLUTIONS GROUP

RENESAS ELECTRONICS CORPORATION

MARKET OUTLOOK

Content Growth continues to increase per Vehicle with autonomous, electrification and enhanced architectures

Global light vehicle production



Source : LMC Automotive Global Light Vehicle Forecast (Q1 2023)

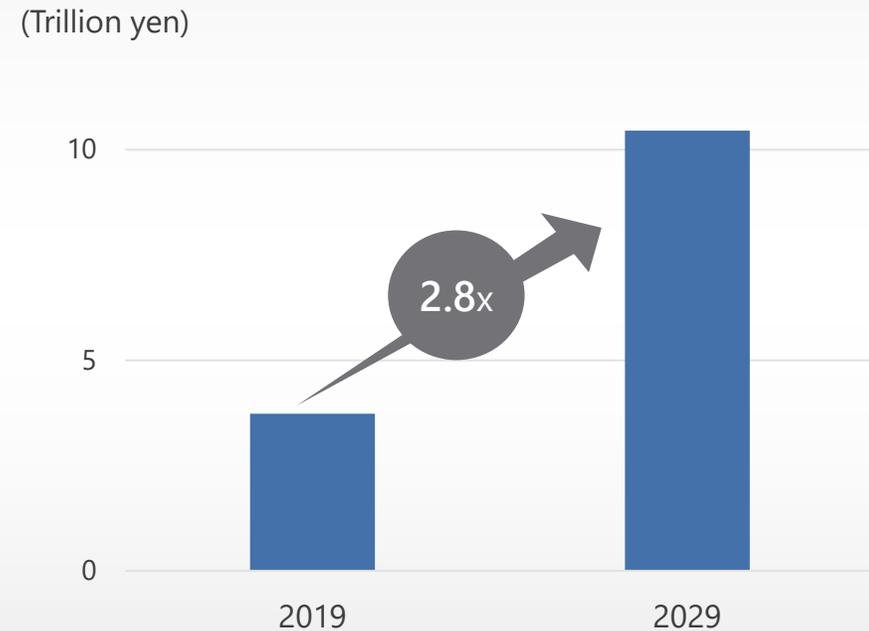
Content per vehicle



Source : TechInsights Automotive Semiconductor Demand Forecast 2020 to 2029 – January 2023

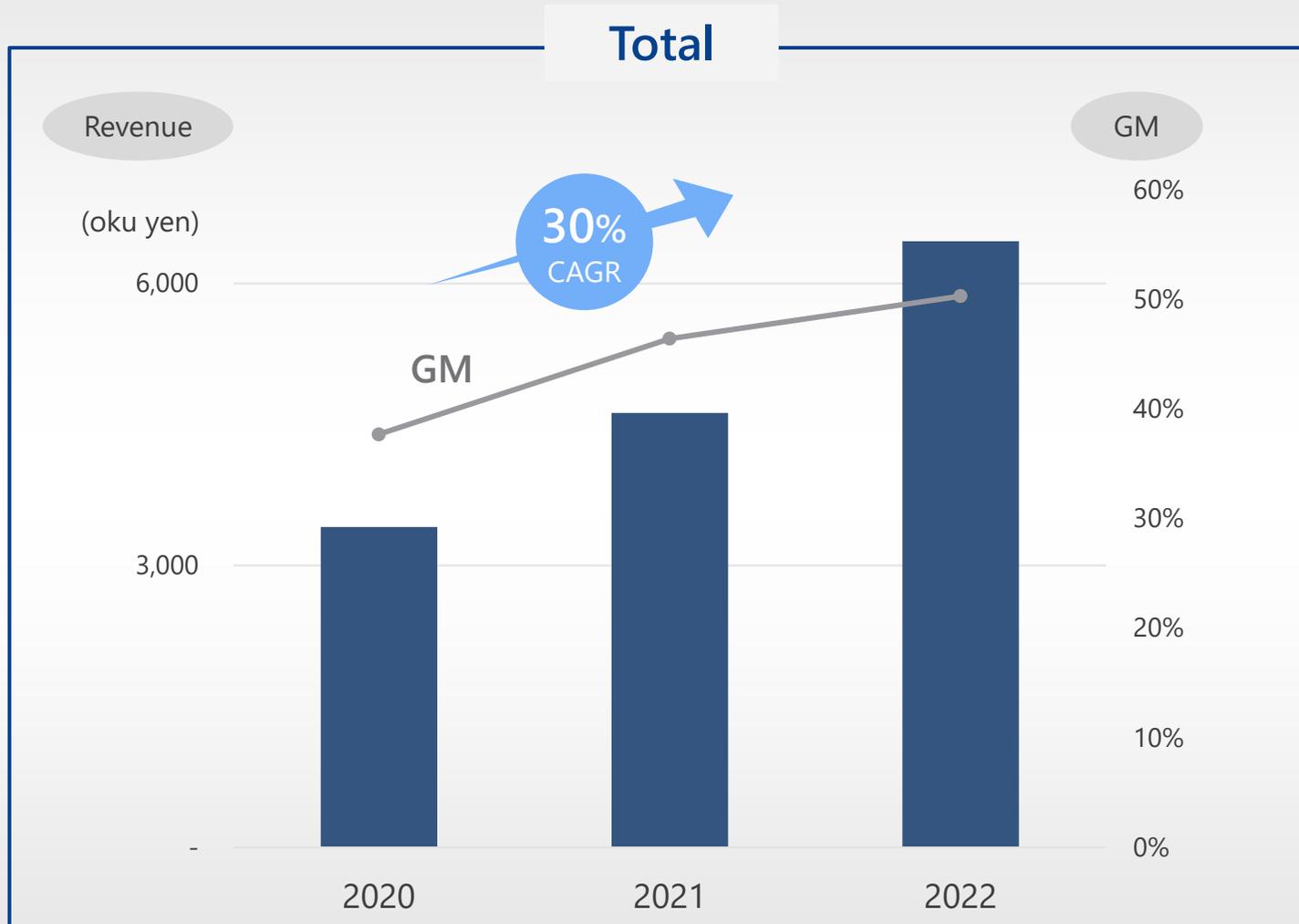


TAM of auto semiconductor

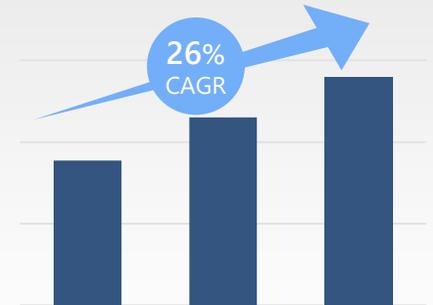


TAM is defined by Renesas FX 1USD=100JPY

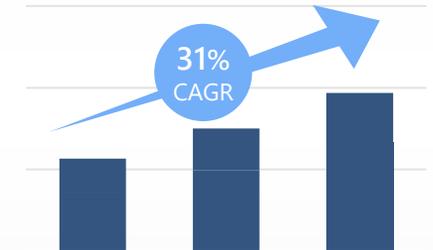
FINANCIALS AT A GLANCE



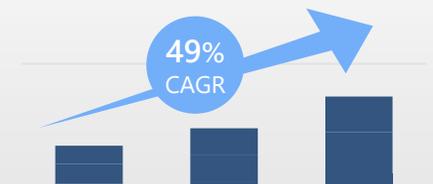
Control



Cockpit/Others



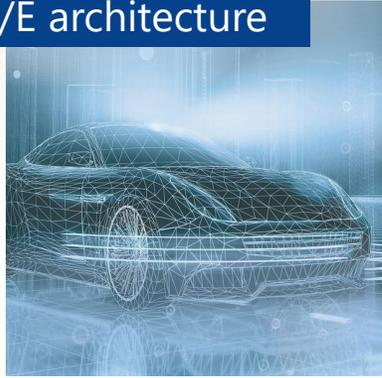
ADAS/EV/Gateway



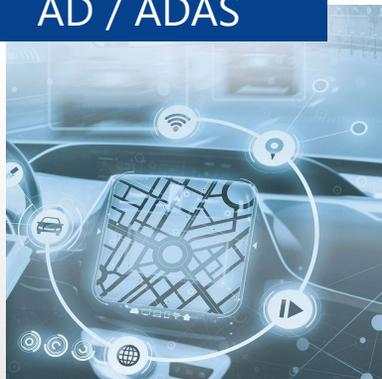
OVERVIEW OF AUTOMOTIVE BUSINESS DIRECTION

Focus applications

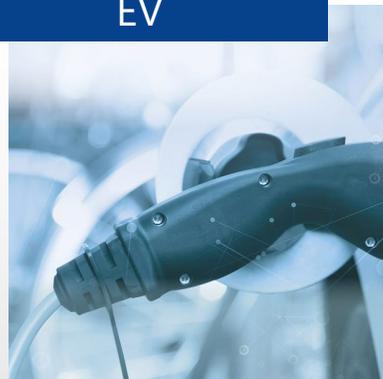
E/E architecture



AD / ADAS

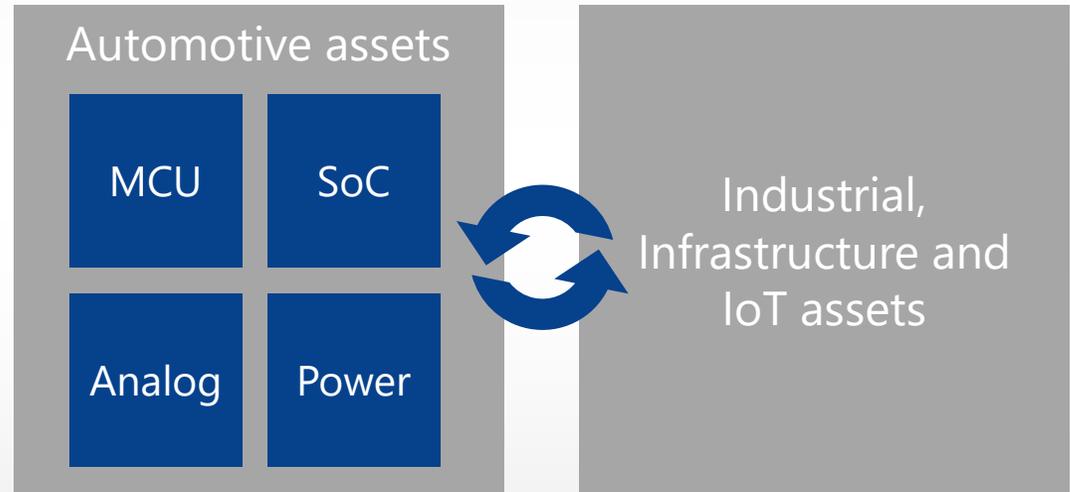


EV



Going broader

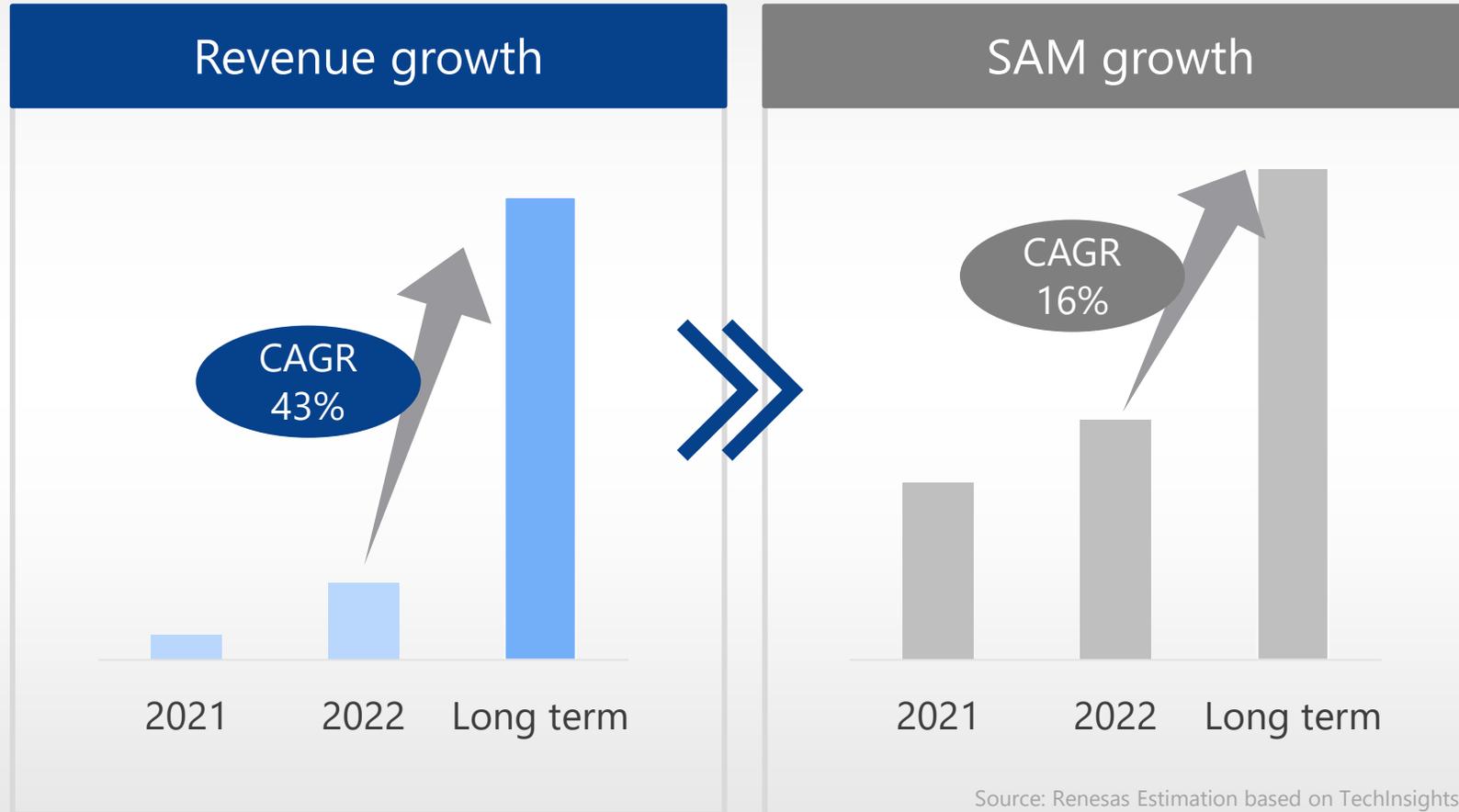
Enhance **Cross SG collaborations** to define products that can be used in both segments



E/E ARCHITECTURE

RENESAS GROWTH IN E/E ARCHITECTURE MARKET

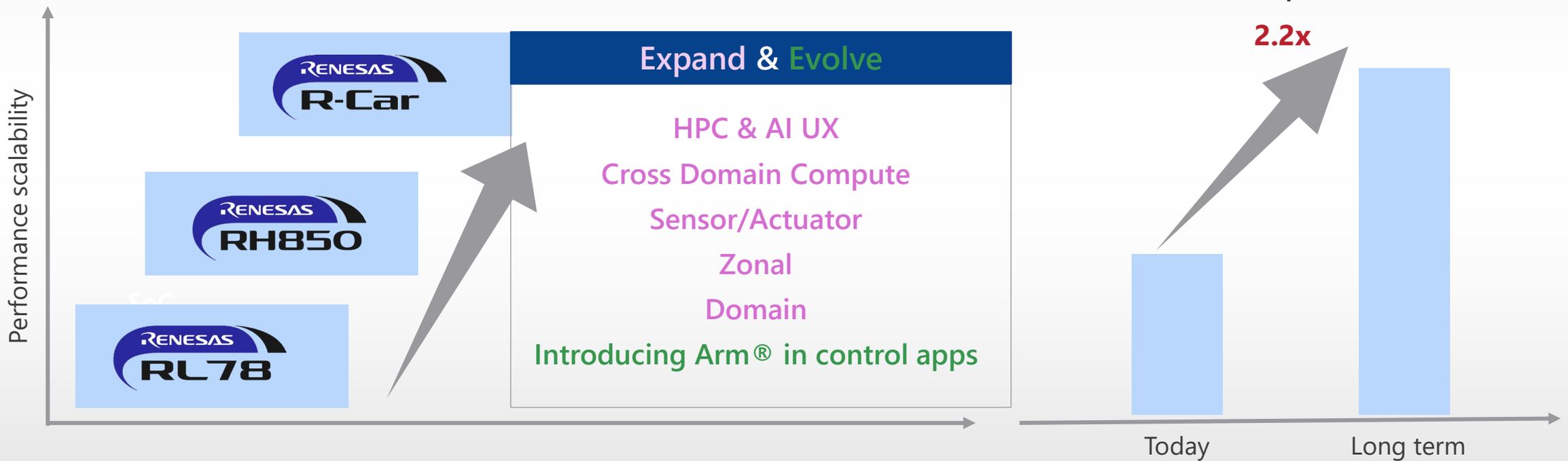
Growth expected by expanding the processor and product portfolio



ACCELERATING GROWTH IN E/E ARCHITECTURE

Investment and leadership in processors

Low power entry processing to high performance computing
Scalable HW, Reusable SW, Open, Broad ecosystem



*TechInsight_1Q23

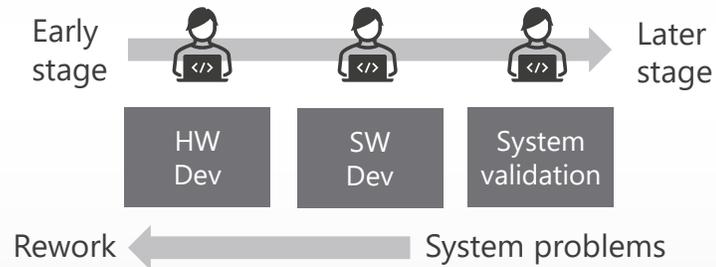
SHIFT LEFT: VIRTUAL UNIFIED ENVIRONMENT

- Virtual cloud development environment enables early SW/HW co-design
- Accelerating application development & product market introduction

Customer pain points

Real environment

- System problems are found at the later stage
- Costly and time-consuming due to rework



Distributed environments on premise

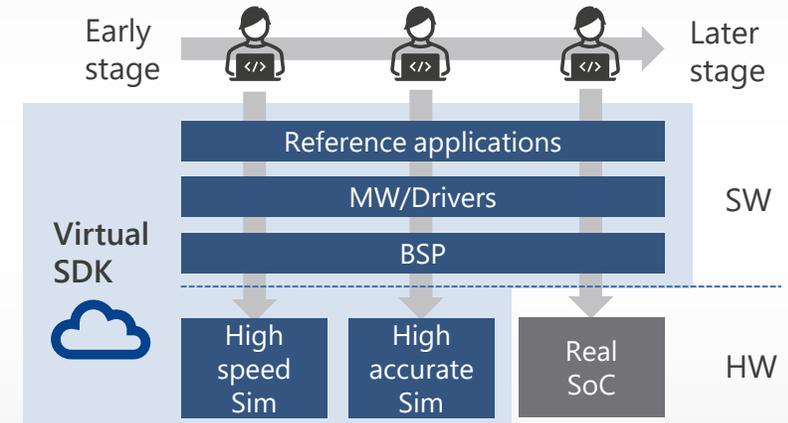
Cloud expertise

- Need knowledge to build cloud environment

Renesas solution

Virtual SDK for cloud environment

- SW-first approach with multi-abstract simulators



Single unified environment on cloud

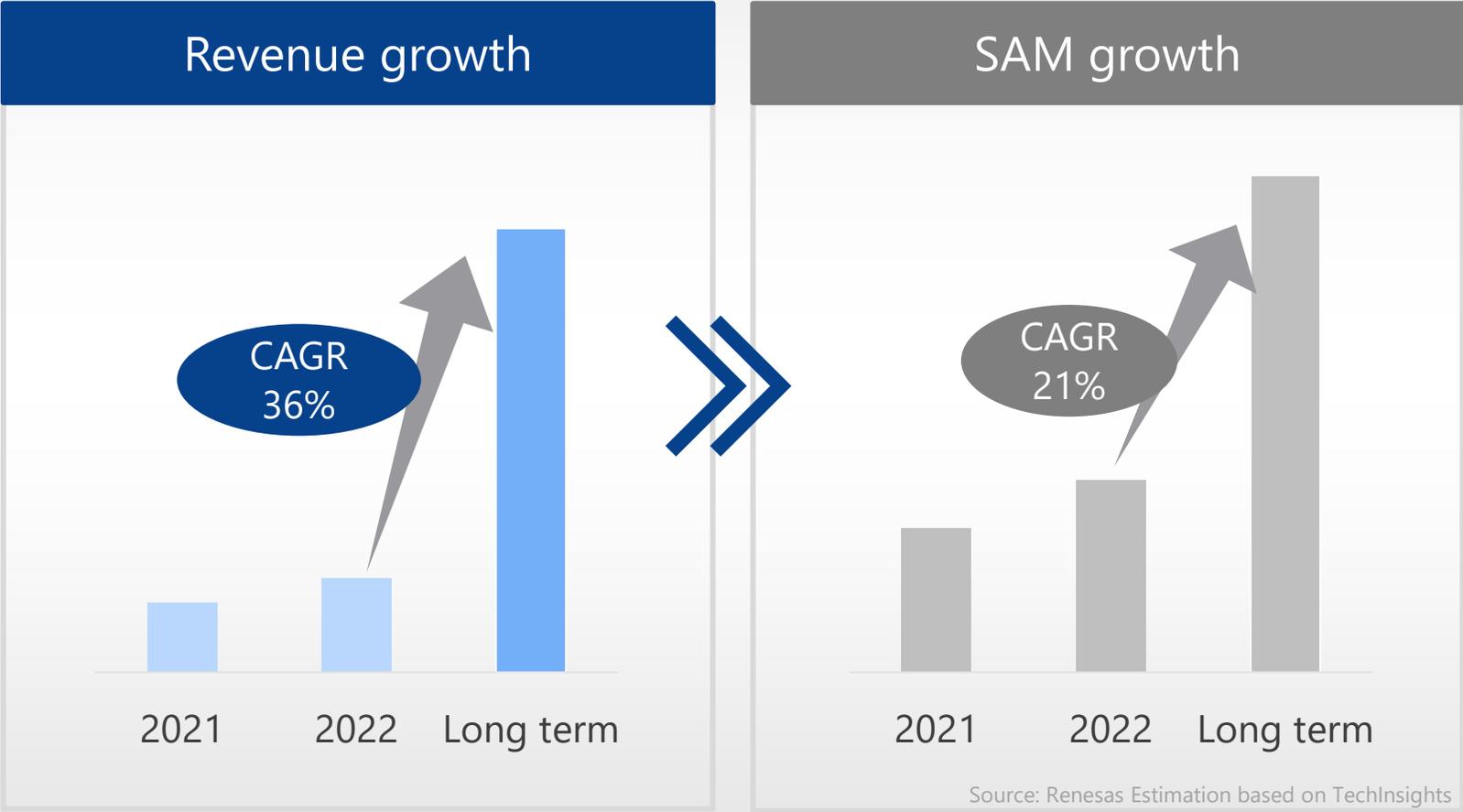
Cloud environment configurator

- Automatically build cloud environment

AD/ADAS

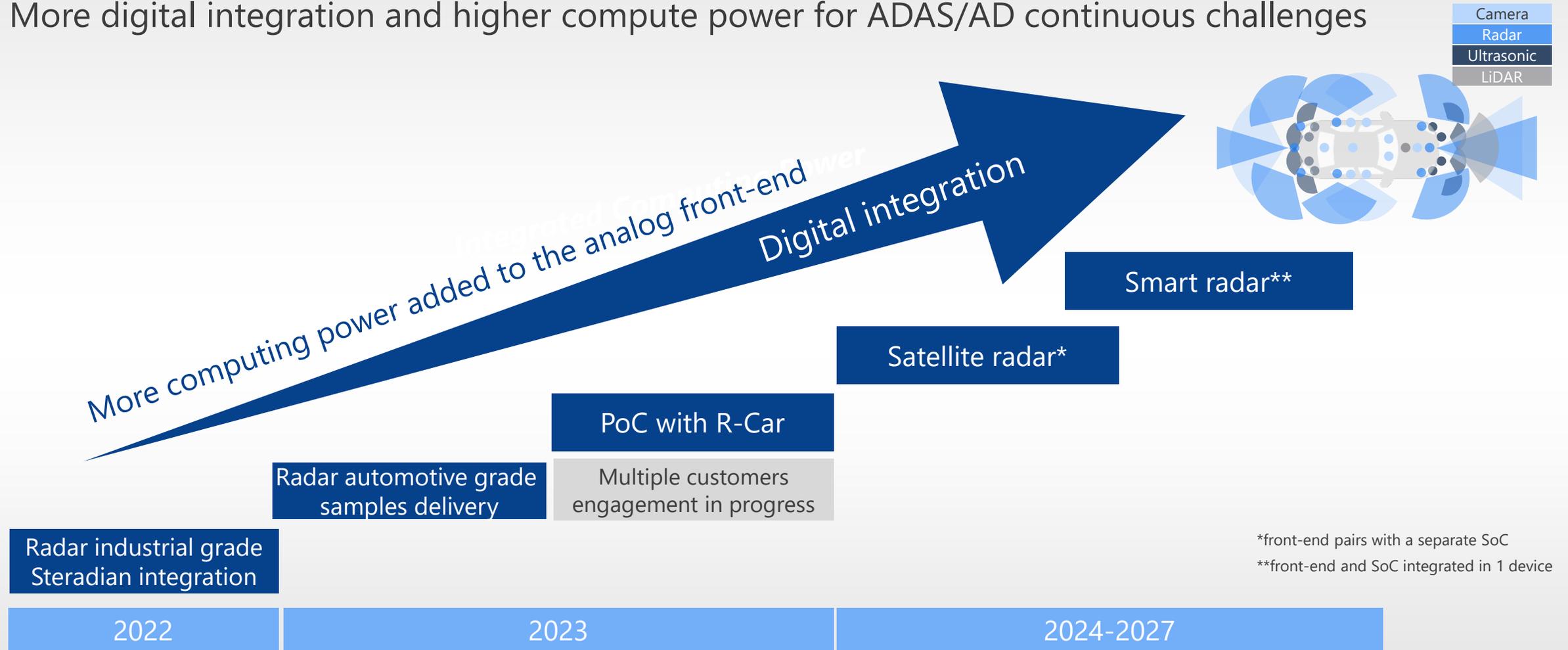
RENESAS GROWTH IN AD/ADAS MARKET

Revenue increase expected by strengthening high-performance compute, sensors, and product portfolio



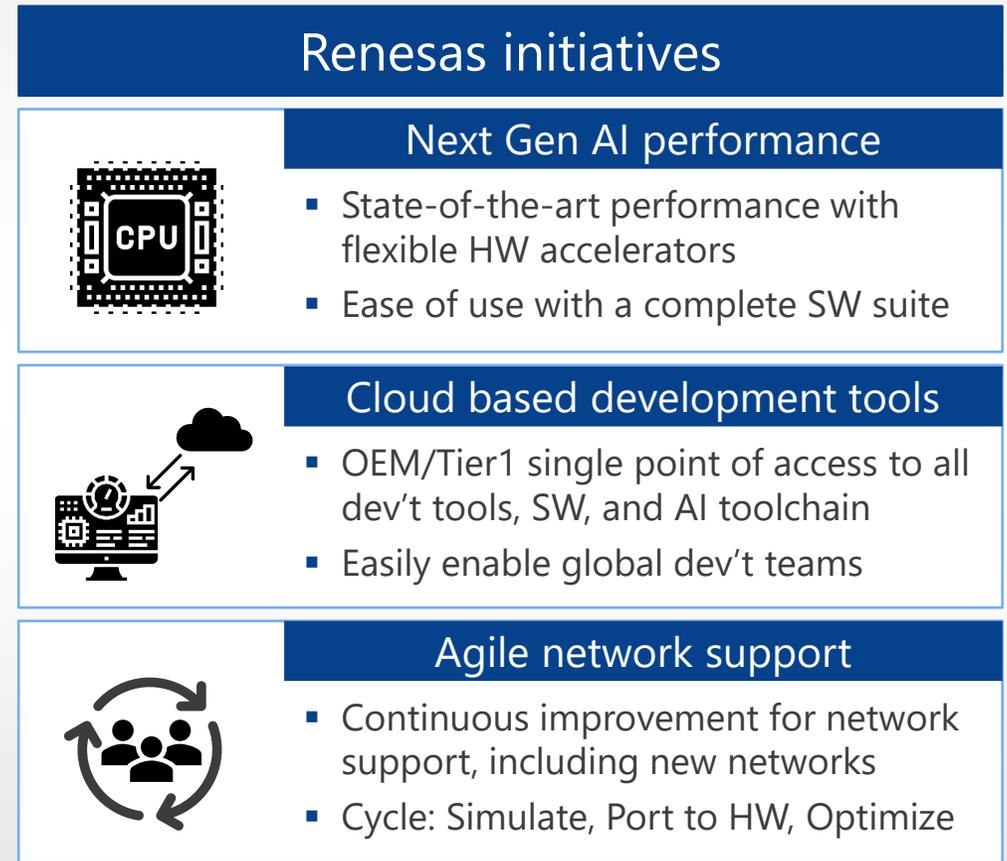
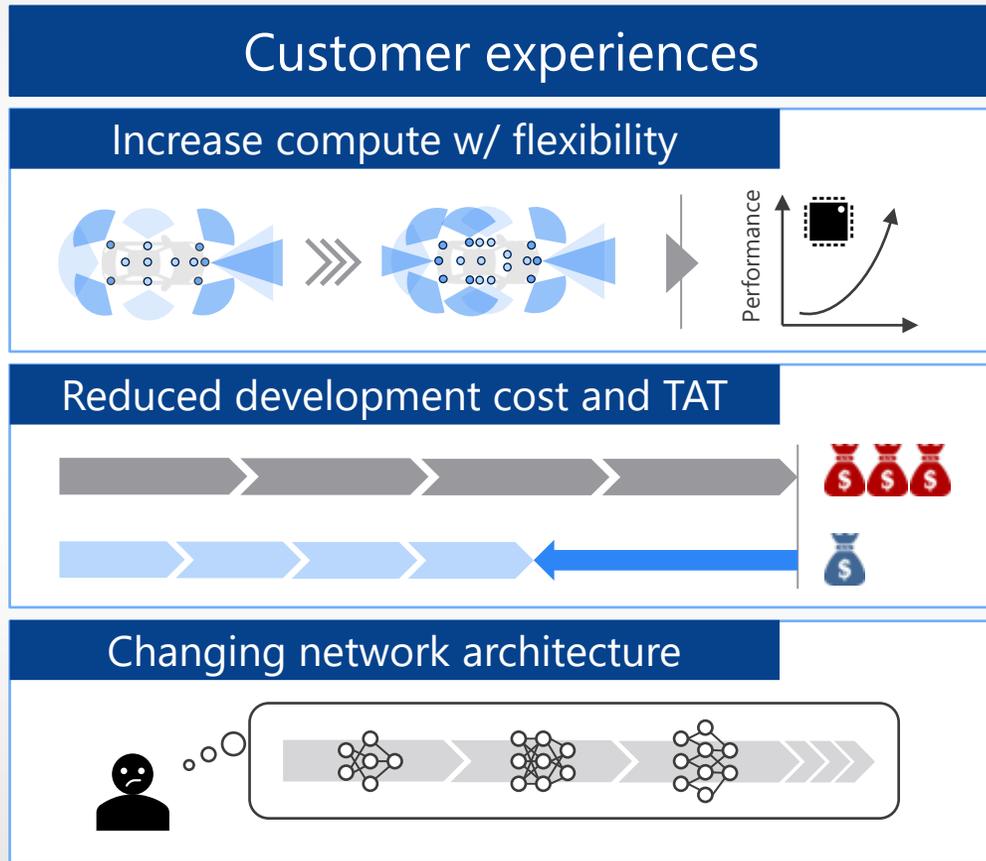
ADVANCING RADAR SOLUTIONS WITH SUPERIOR DIGITAL ASSETS

More digital integration and higher compute power for ADAS/AD continuous challenges



TRANSFORMING ADAS/AD WITH AI INVESTMENT

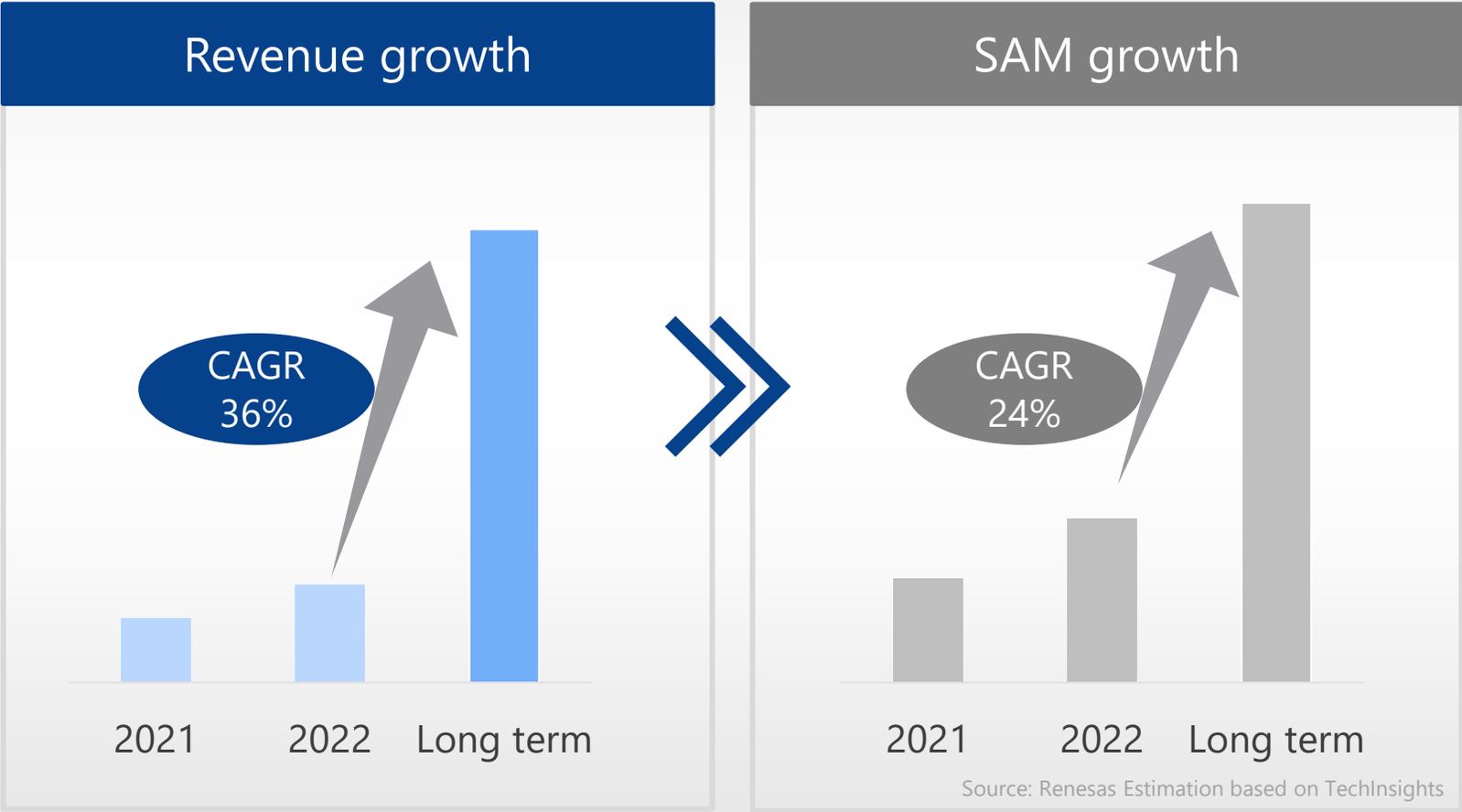
- Enhance high performance compute
- Improve development environment to simplify customer journey.



EV

RENESAS GROWTH IN EV MARKET

Accelerate market growth by investment in optimized systems as well as power solutions



OPTIMIZED APPLICATIONS SOLUTIONS FOR EV

Turnkey solutions to meet the demand of emerging EV manufacturers.

New players in EV field

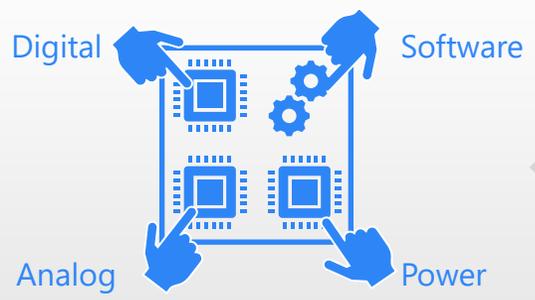


Emerging markets Emerging OEMs

Key buying factors

- Turnkey solutions
- Lower development cost
- Faster time to market

System solutions



Digital Software
Analog Power

Customer benefit

- System-level optimized
- Turnkey solution

Optimized solutions for EV

EV inverter reference solution	EV inverter model & SW	BMS model & SW
Battery management	FuSa for EV inverter	Motor generator system
12/48V DCDC converter	Monitoring function extension (motor)	Inverter for 2/3 wheeler traction motor
EV inverter reference solution w/ IPS	48V auxiliary inverter	Wireless BMS

...more solutions coming soon

COMPREHENSIVE PRODUCT PORTFOLIO FOR EV

Innovative technology enabling highest range, highest power efficiency

Inverter

State of the art IGBT/SiC enabling more range

On-Board charger

Advanced GDU providing lower power losses and faster charging

DC/DC

Total solutions provide higher efficiency

BMS/wBMS

Leading edge HW Systems and SW algorithms

Pack SOH (%)	Pack SOC (%)
69	84

Best in class lifetime accuracy

MCU + PMIC + Sensing

MCU PMIC Sensors

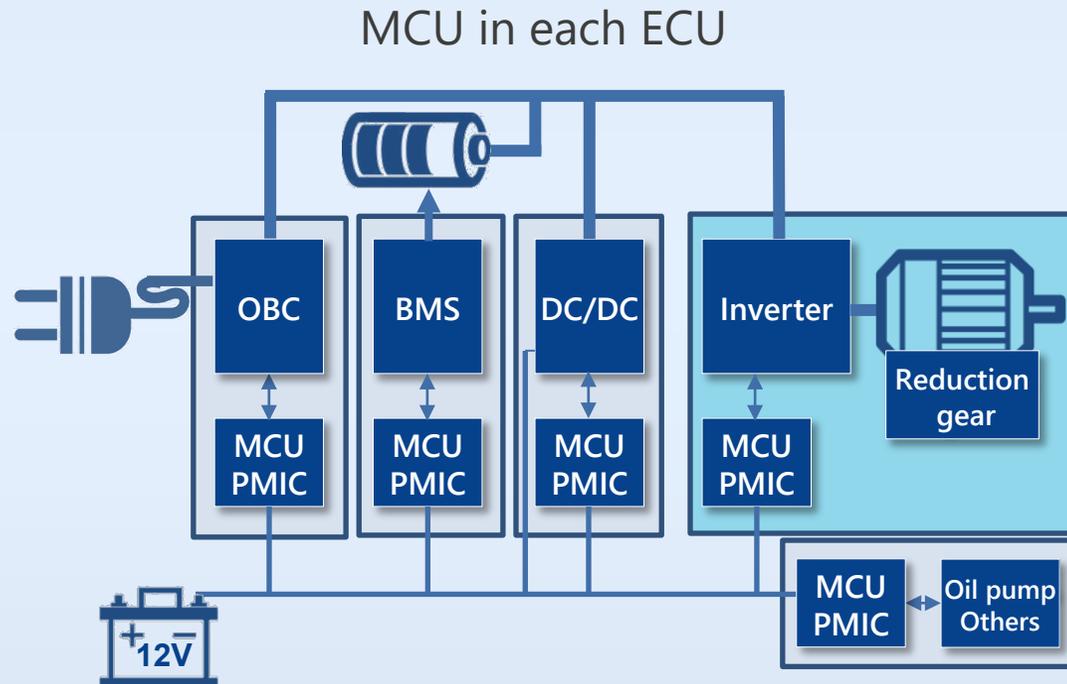
Scalable portfolio for any sub-system

BMS: Battery Management System | wBMS: Wireless Battery Management System | PMIC: Power Management IC | BLE: Bluetooth Low Energy | IPD: Intelligent Power Device | MCU: Micro Controller Unit

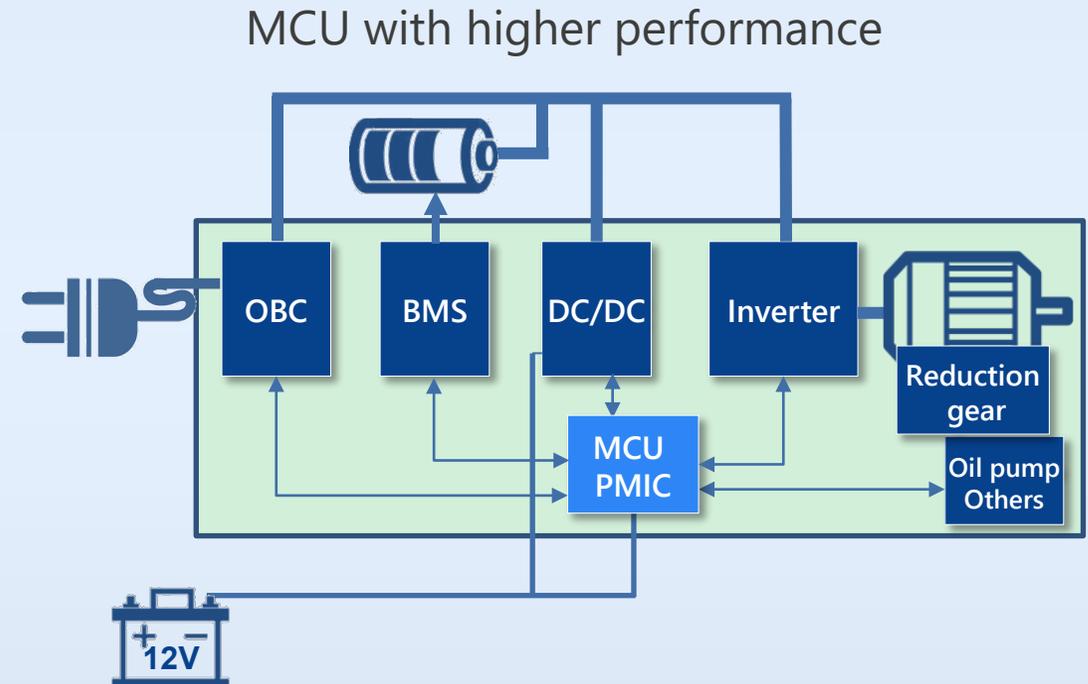
ADDRESSING MULTIPLE EV SYSTEM TREND : X-IN-1

Leveraging MCU vast lineup, wide analog & power portfolio and system-level knowledge to address different system configurations.

Independent multiple ECUs



Integrated ECU functions in E-Axle



X-in-1: different system aggregation to shrink motor size

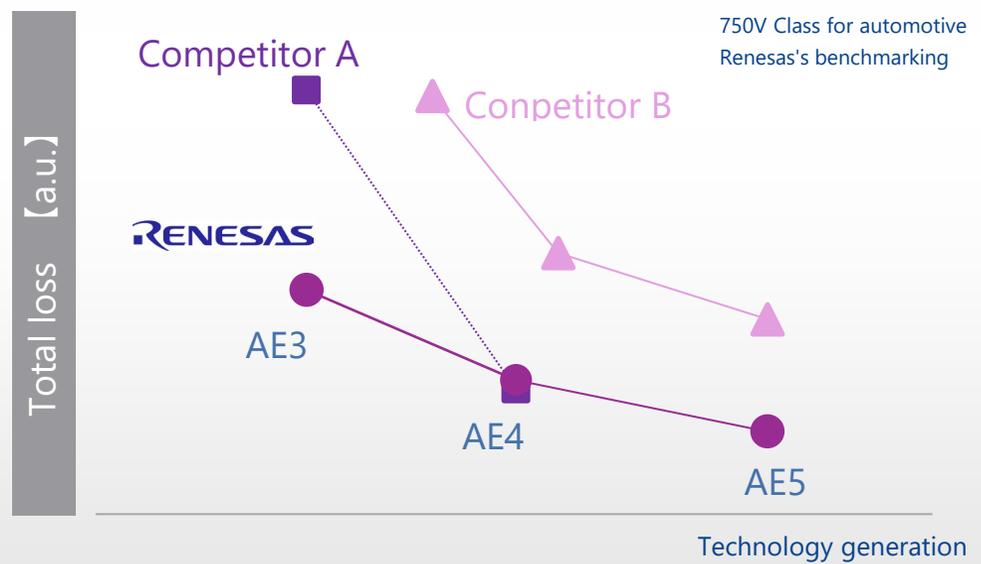
POWER: STRATEGY ACCELERATION

- Accelerate investment for capacity
- New technologies for enhanced efficiency and performance

300mm IGBT

- Next-gen IGBT (AE5) development on track
 - K6 300mm Fab on track (Mass production 2025)
 - Started sampling from 2022

Efficiency performance Trend



SiC

- New investment for in-house fab (Mass production 2025)
 - Best in class performance for EV inverter
 - Automotive qualified (Working sample 3Q/2023)

Product line up

Voltage ratings (V)

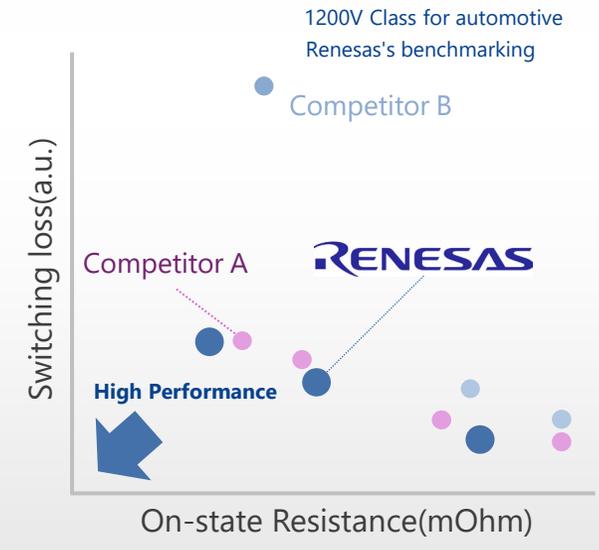
650-750	1,200	1,700 -
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On-state resistance (mOhm)

15	10-500	1,000 -
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Focus applications

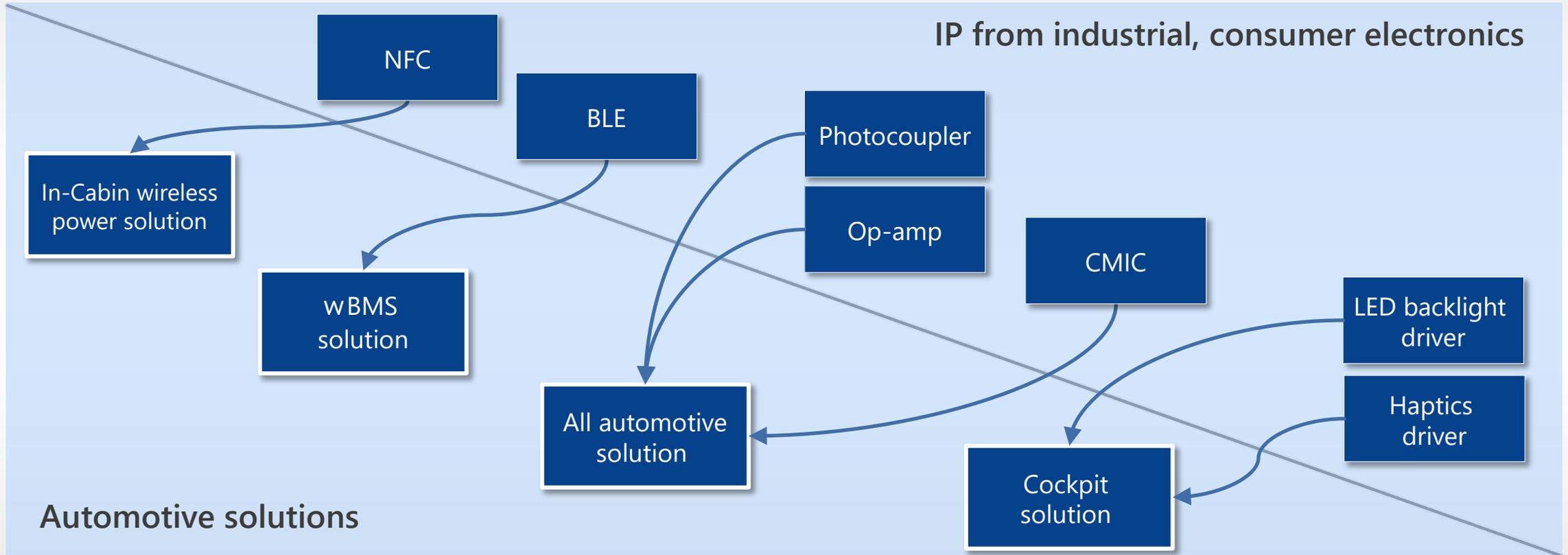
Efficiency performance



CROSS-SELL/CONNECTIVITY OPPORTUNITY MAXIMIZING RENESAS GROWTH

LEVERAGING ASSETS FROM NON-AUTO TO AUTO

Using IP from industrial and consumer electronics to create new business and growth



CONNECTED TECHNOLOGY FROM NON-AUTO TO AUTO

By auto-qualifying connectivity ICs more applications can be addressed



SUMMARY



Investing in high performance compute

Introduction of Arm based MCU processors

Enhance software, AI and infrastructure

Expand power devices portfolio and invest in manufacturing

Leverage non-auto technology and IP assets to auto



THANK YOU

(FORWARD-LOOKING STATEMENTS)

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