



RENESAS ELECTRONICS
INDUSTRIAL BUSINESS

INDUSTRIAL SOLUTION BUSINESS UNIT

AGENDA

- Industrial Business
 - Focus Market and Position
 - Business Direction - Endpoint Intelligence
 - By Artificial Intelligence
 - By Extreme Low Power

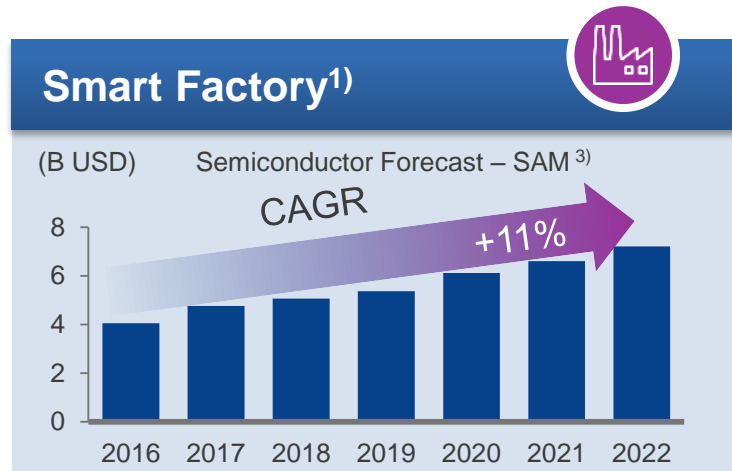
- Summary & Take Away

INDUSTRIAL BUSINESS

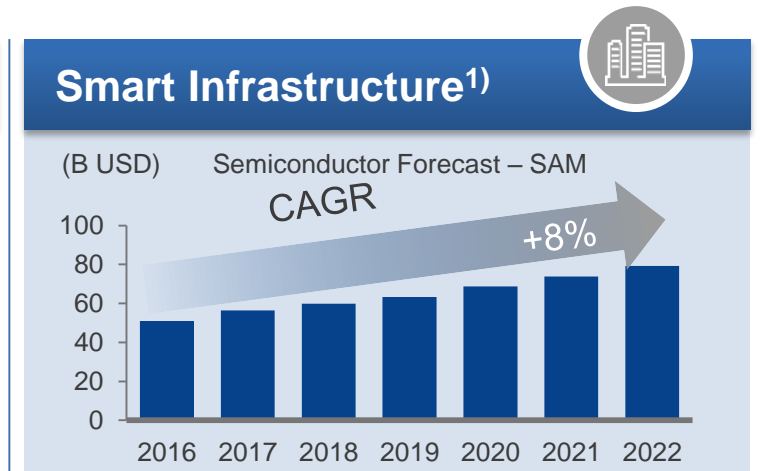
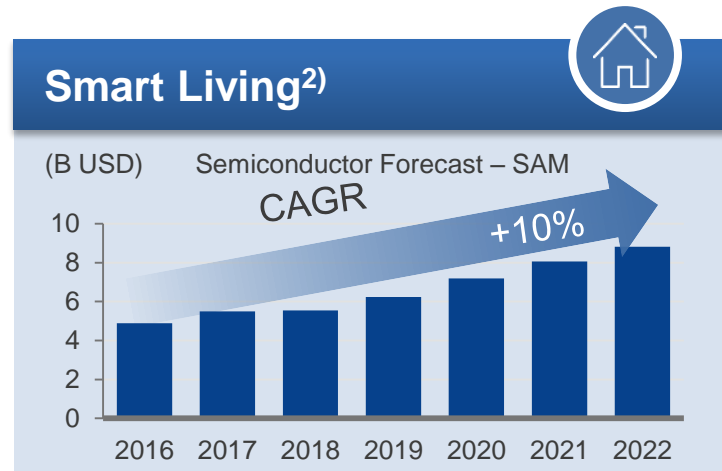


SEMICONDUCTOR MARKET FORECAST

RENESAS FOCAL SEGMENT



Smart Factory : Industrial Electronics>Automation



Smart Infrastructure : Industrial Electronics except Automation & Other Industrial

Overall CAGR in focus markets is 8,3%
(estimated by Renesas)

1) Graph created by RENESAS based on Gartner Research, Source Gartner Forecast: "Gartner Semi-conductor Forecast Database, Worldwide, 2Q18 Update". All statements in this report attributable to Gartner represent Renesas Electronics interpretation of data, research opinion or viewpoints published as part of a syndicated subscription service by Gartner, Inc., and have not been reviewed by Gartner. Each Gartner publication speaks as of its original publication date (and not as of the date of this [presentation/report]). The opinions expressed in Gartner publications are not representations of fact and are subject to change without notice.

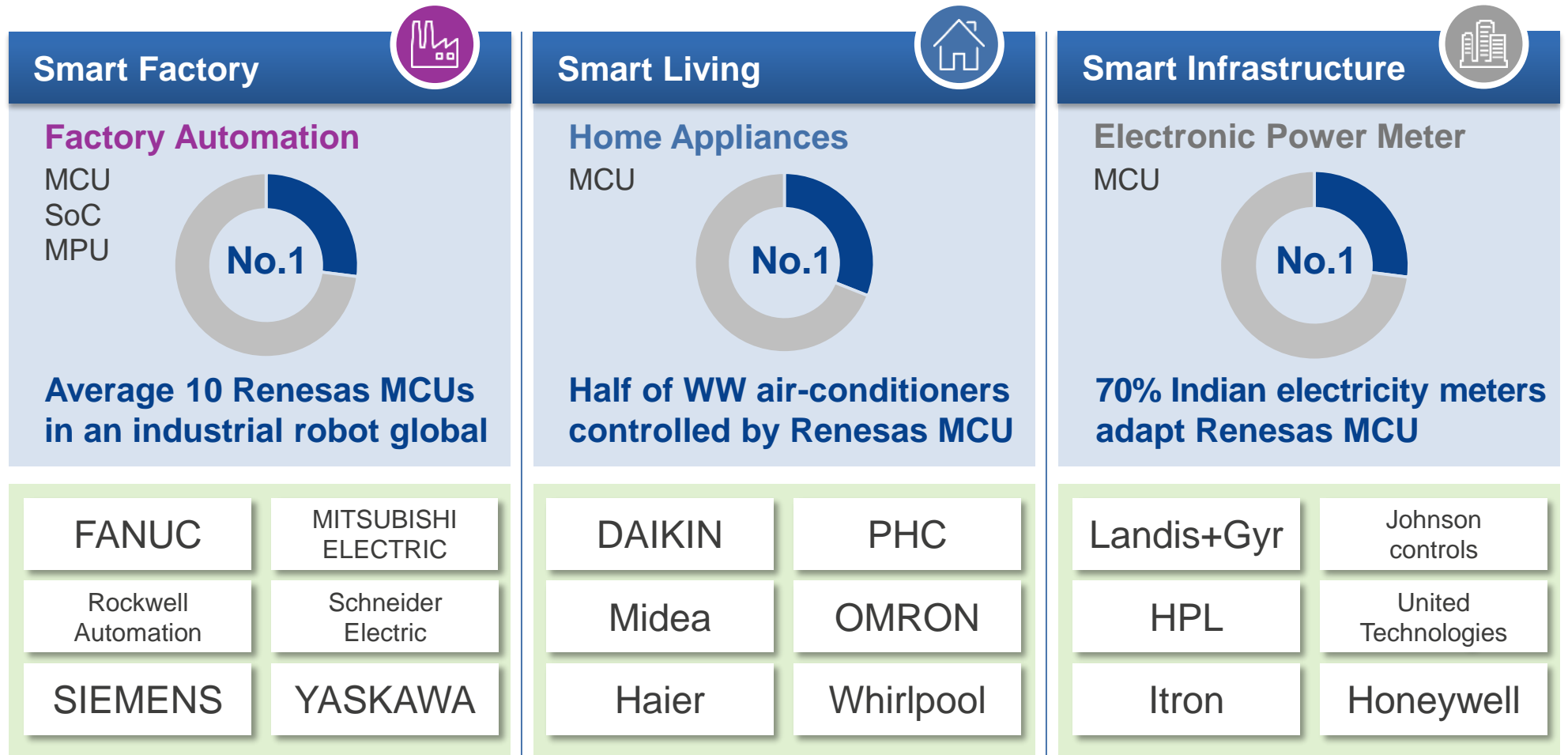
2) Fuji-Keizai "Global Home Appliance Market 2018 – Comprehensive Survey", home appliance and healthcare.

3) SAM: Total market minus DRAM, Flash, MPU and Non-optical sensor

RENESAS POSITIONING

STRONG RESULTS BY CORE COMPETENCE

**RENESAS
Position**
estimated by Renesas



ENDPOINT INTELLIGENCE

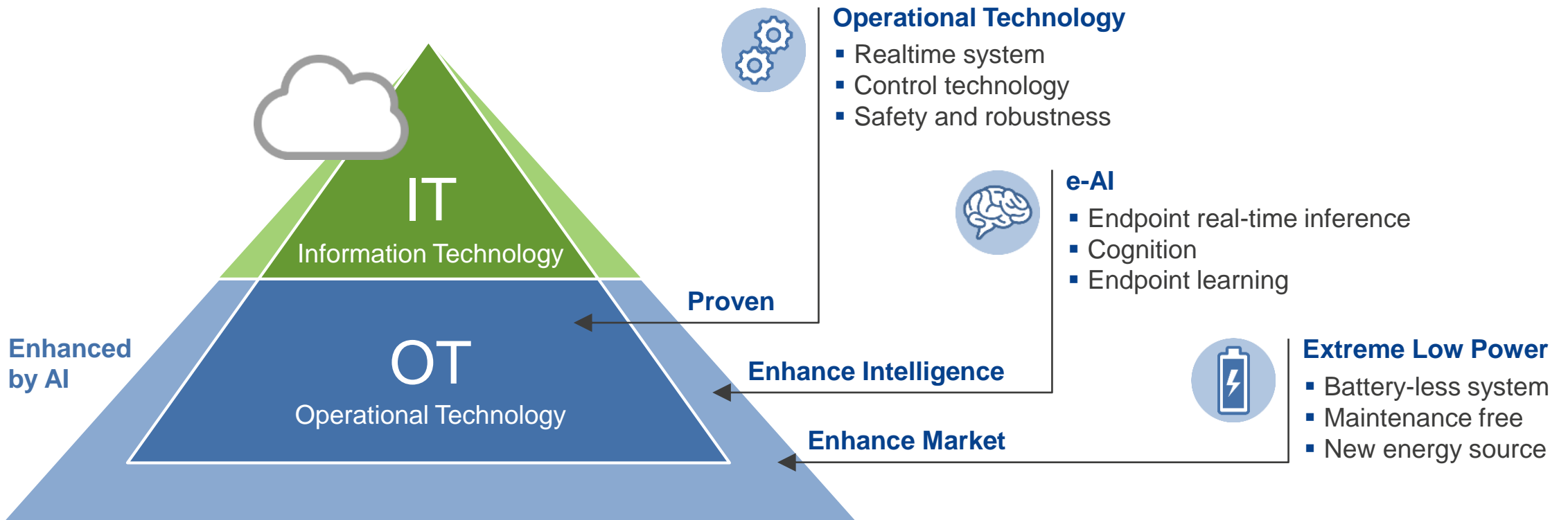


Enhance Endpoint Intelligence by e-AI
Extreme Low Power creates new markets



“ENDPOINT INTELLIGENCE”

REALIZES INNOVATION IN OT CONSISTS OF THREE TECHNOLOGIES

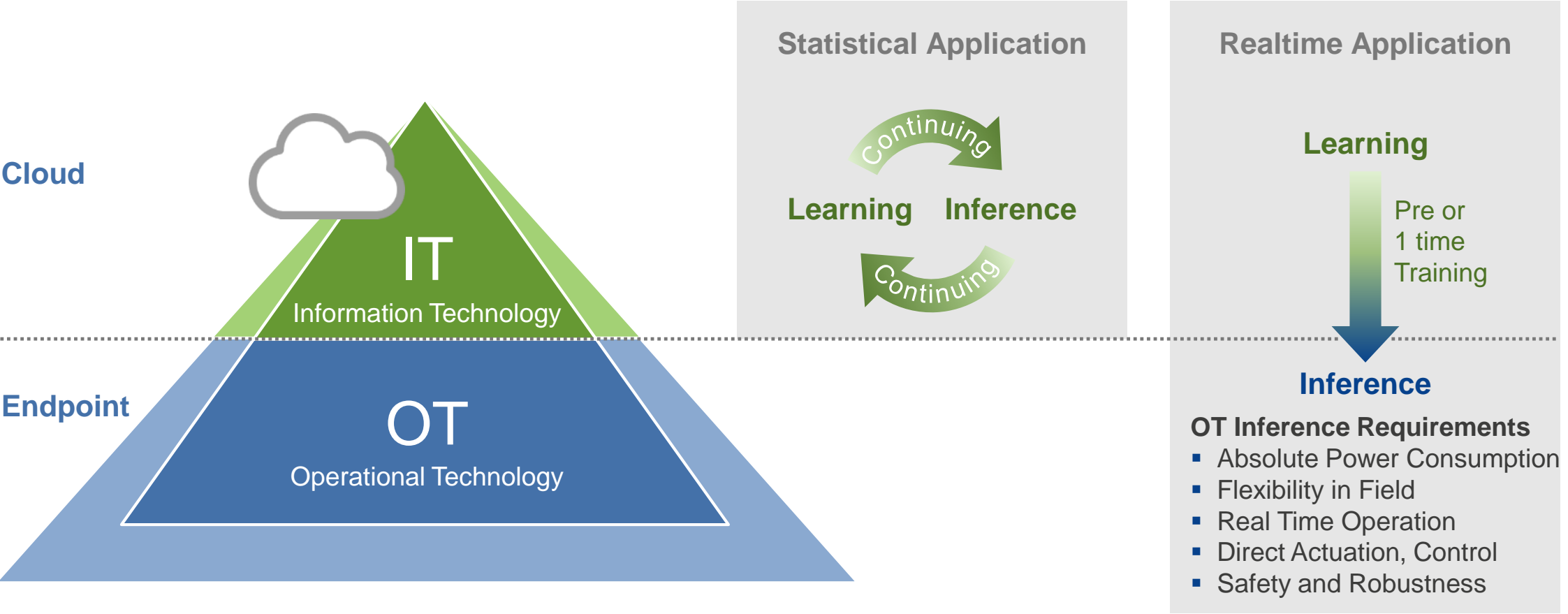


e-AI: Embedded Artificial Intelligence



TWO TYPES OF AI APPLICATIONS

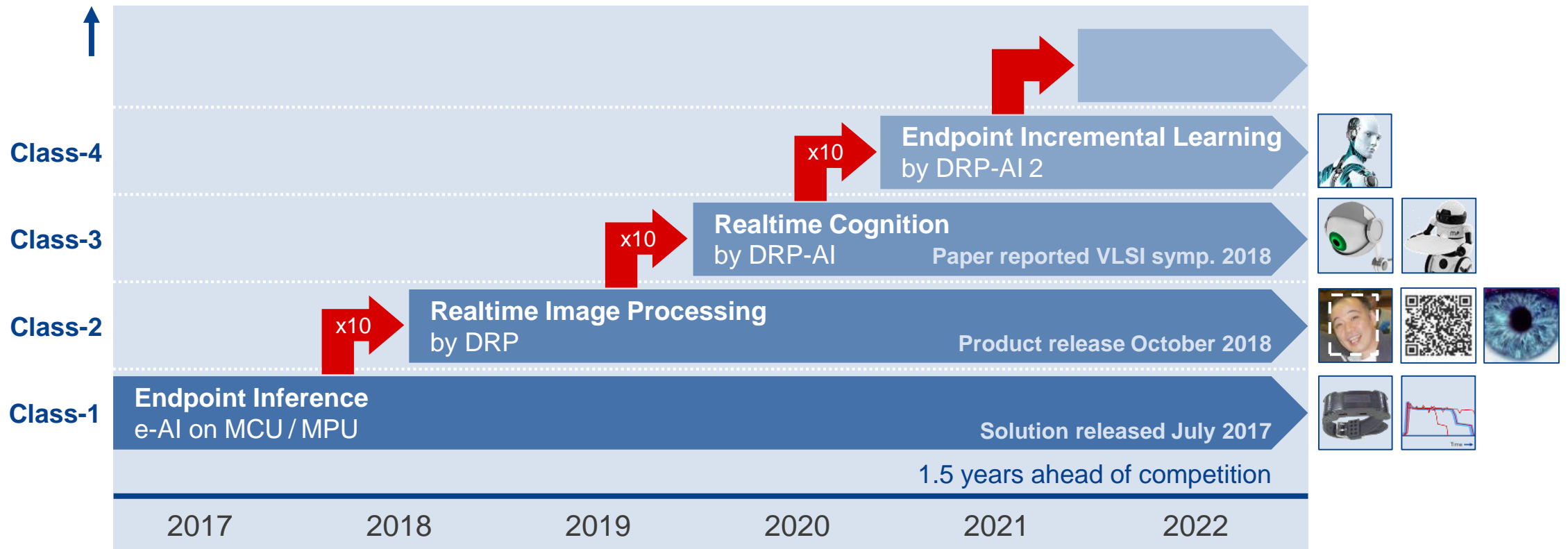
REQUIREMENTS FOR OT INFERENCE





e-AI CAPABILITY ENHANCED BY DRP

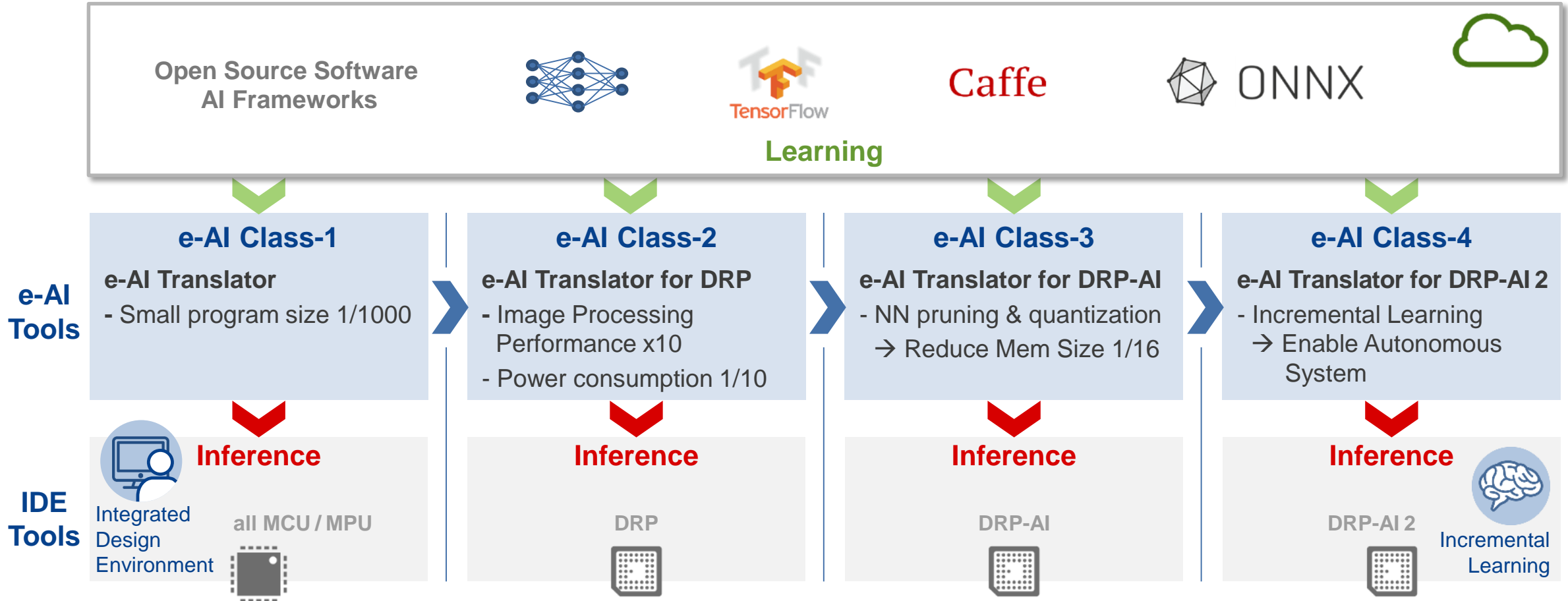
e-AI Capability



DRP: Dynamically Reconfigurable Processor

ESTABLISHED e-AI FLOW

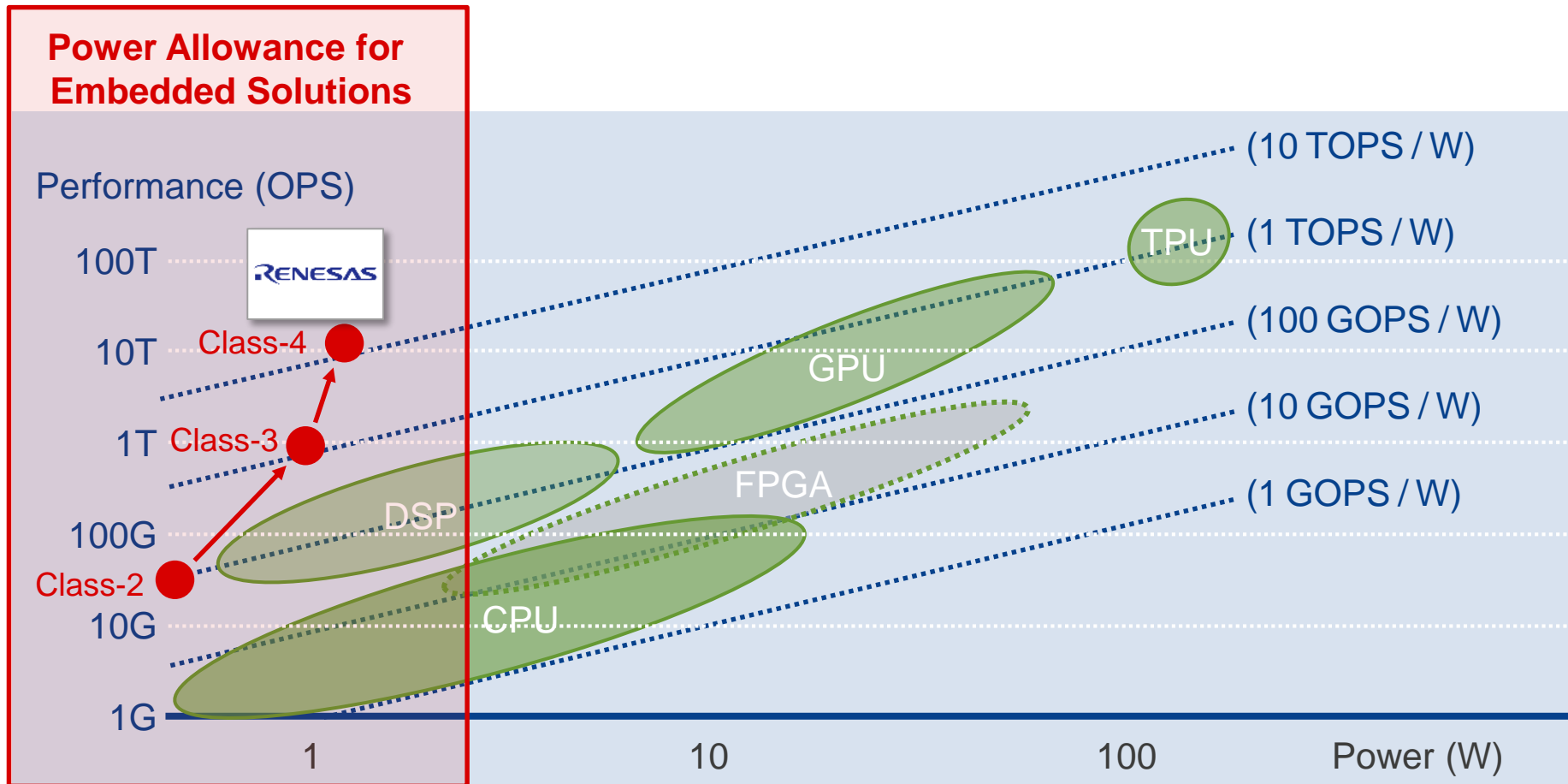
TOOLCHAIN WILL EVOLVE WITH AI ACCELERATOR “DRP”





UNIQUE POSITIONING OF RENESAS' e-AI

EXCELLENT PERFORMANCE AT LOWEST POWER



POSITIONING OF AI ACCELERATOR

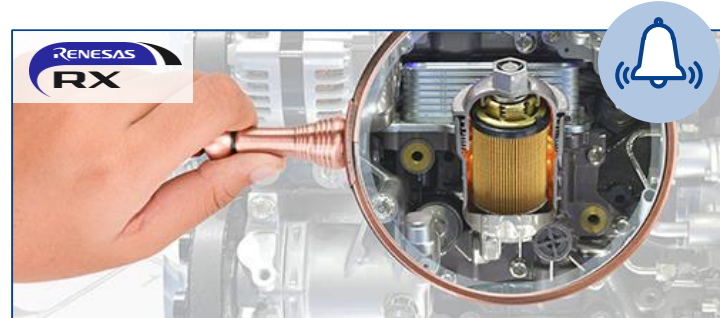


USE CASE CLASS-1: e-AI ANOMALY DETECTION FOR HUNDREDS MILLION MOTORS



Benefits:

- Improve service quality
- Avoid downtimes
- Reduce maintenance cost



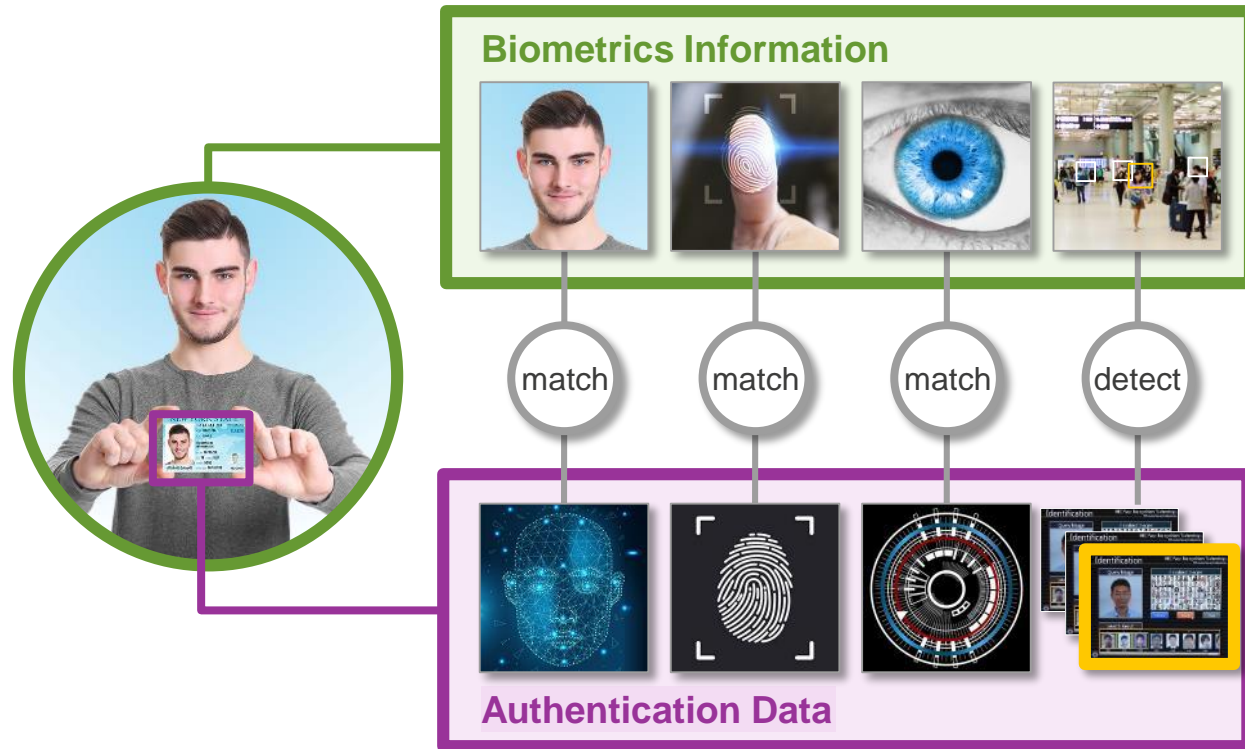
e-AI detects and pre-warns anomalies everywhere every time



▶ Renesas is shipping 200M+ motor control MCU per year.
New MCU series will enable e-AI Anomaly Detection.



USE CASE CLASS-2 / 3: MULTIMODAL E-AI BIOMETRICS AUTHENTICATION



Airport
Passport

Cashless
ID Card

Office Entry Systems
ID Card

Mobile Systems, Body-worn
Criminal Photo

▶ Smart cognitive system without cloud service.
New MPU release in October.





e-AI MARKET FORECAST



Smart Factory



Smart Living



Smart Infrastructure



e-AI MARKET GROWTH

“Integrated AI Semiconductor Revenue Forecast for IoT”



SAM: ~ \$2B

Excellent growth potential in Renesas' core competence area

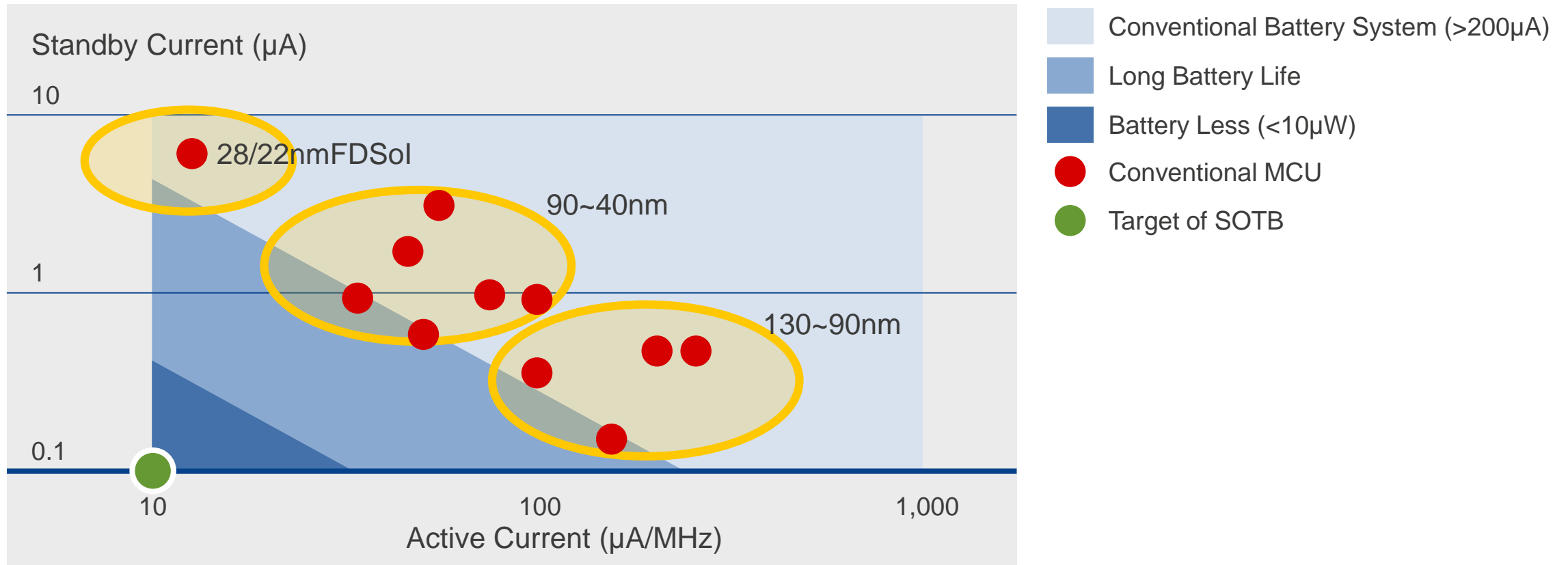
Graph created by RENESAS based on Gartner Research, Source Gartner Forecast: AI Neural Network Processing Semiconductor Revenue, Worldwide 2018, 11 January 2018 All statements in this report attributable to Gartner represent Renesas Electronics interpretation of data, research opinion or viewpoints published as part of a syndicated subscription service by Gartner, Inc., and have not been reviewed by Gartner. Each Gartner publication speaks as of its original publication date (and not as of the date of this [presentation/report]). The opinions expressed in Gartner publications are not representations of fact and are subject to change without notice.

EXTREME LOW POWER – BY SOTB

SOTB – SILICON ON THIN BURIED OXIDE



EXTREME LOW POWER – BY SOTB TECHNOLOGY

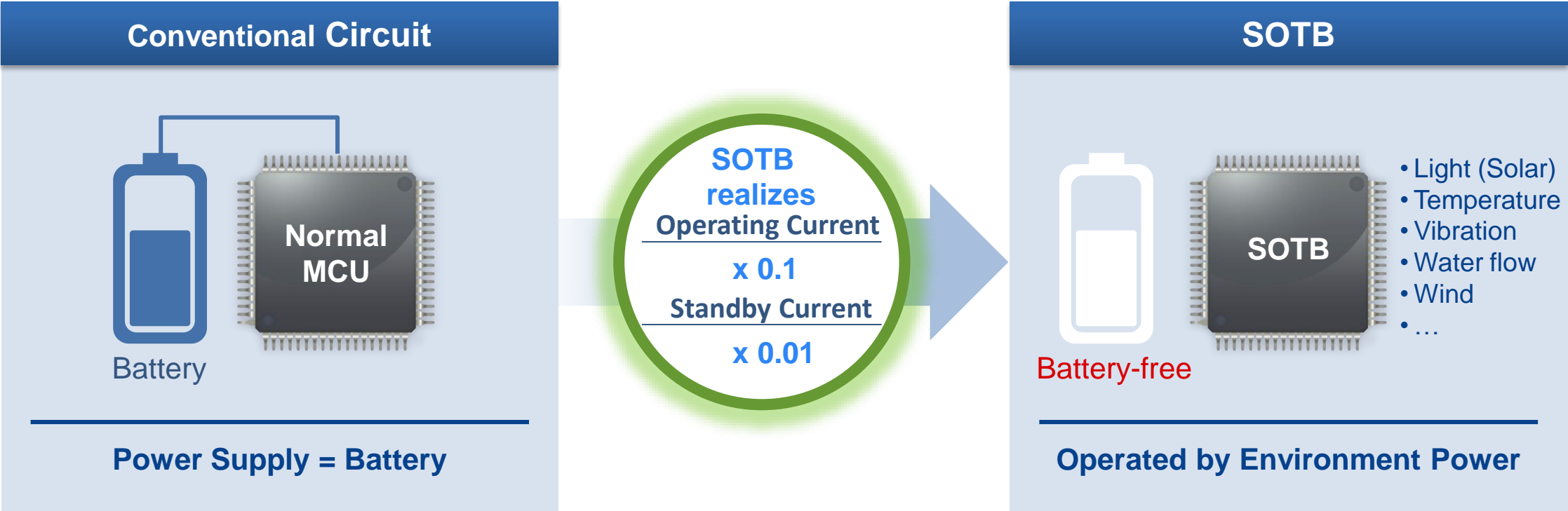


SOTB: Silicon on Thin Buried Oxide



EXTREME LOW POWER CREATE ENERGY HARVESTING MARKET

Disruptive Extreme Low Power Performance of SOTB





EXTREME LOW POWER CREATES NEW MARKET

CONNECT TO EVERYWHERE – BY SOTB TECHNOLOGY

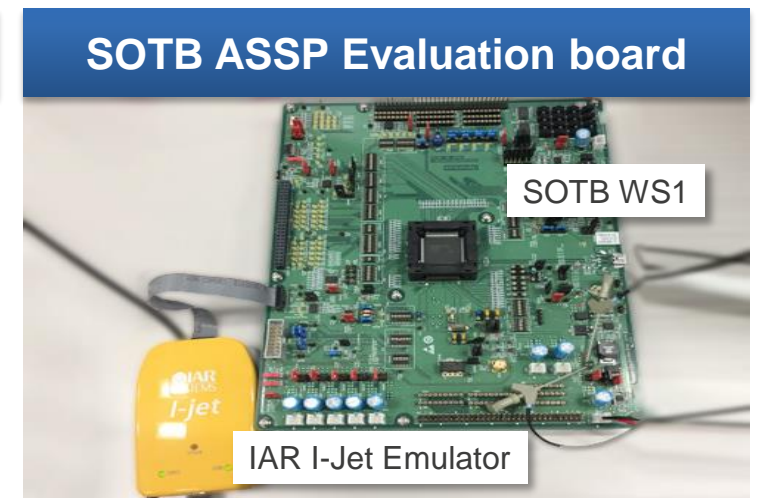
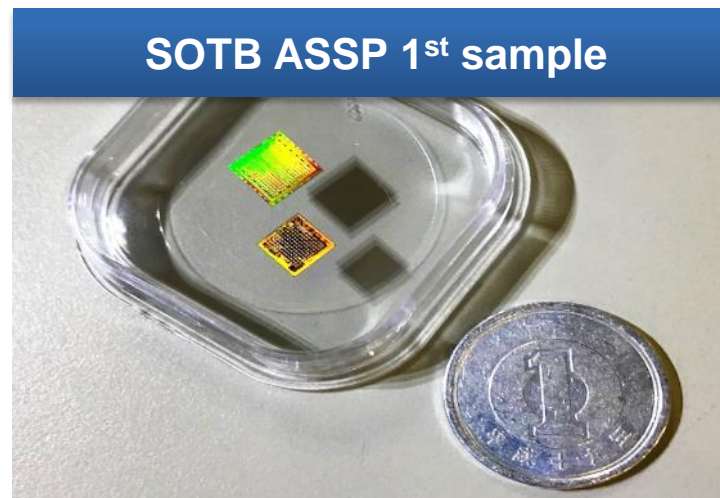
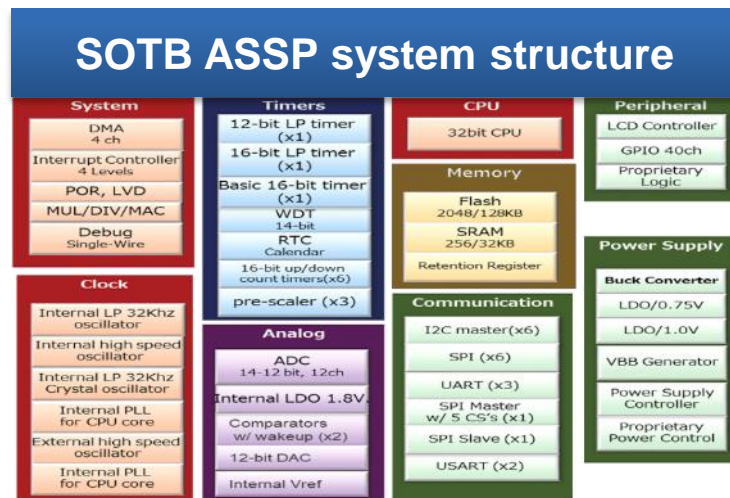


EH = Energy Harvesting RF = Radio Frequency BLE = Bluetooth Low Energy PMIC = Power Management IC



PROGRESS OF RENESAS ACTIVITIES

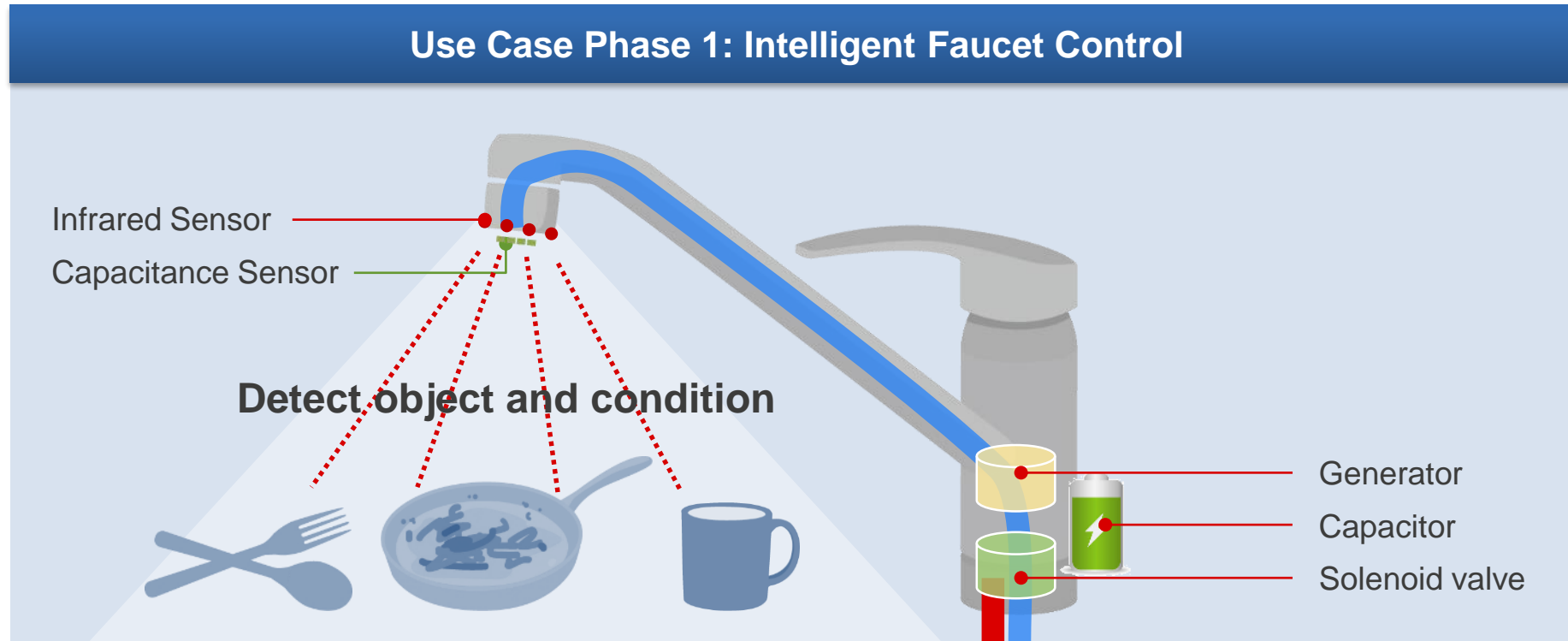
- Last spring, we got first Silicon of SOTB ASSP
- Active power and standby power are just less than the target. Continue to improve.






▶ Public launch at  **electronica** 2018 November 2018 in Munich.
inside tomorrow



NEW SOLUTION



Control







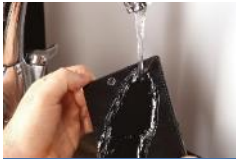









-  ON / OFF
-  Temperature
-  Water Flow

▶ Extreme Low-power with SOTB enables Endpoint Intelligence.

APPLICATION USE CASE EXAMPLES

EXTREME LOW POWER – MARKET GROWTH POTENTIAL

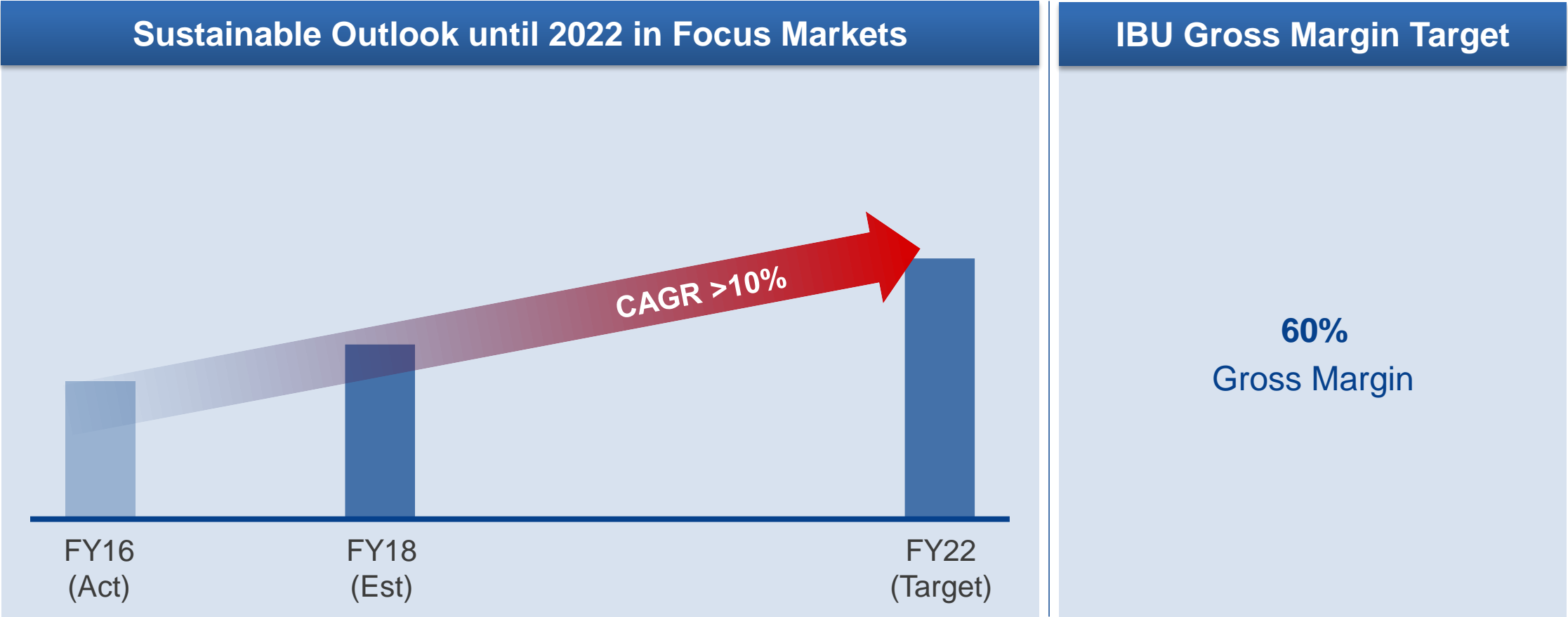
ELP Applications

<p>Medical / Healthcare</p>  <p>Fitness Wearable</p>  <p>Capsule Device</p>  <p>Portable Device</p>  <p>Smart Watch</p> <p>Implantable Device</p> <p>Equipped Device</p>	<p>City</p>  <p>Smart Agriculture</p>  <p>Transportation</p>  <p>Commercial and Public Facility</p>  <p>Aquatic Product</p> <p>Stockbreeding</p>	<p>Infrastructure</p>  <p>Urban Environment Monitoring</p>  <p>Natural Environment Monitoring</p>  <p>Home/Office Security</p>  <p>Infrastructure Monitoring</p>	<p>Industrial Automation</p>  <p>Equipment Monitor</p>  <p>Worker Monitor</p> <p>Smart Tags</p>
<p>Energy Management</p>  <p>Controller</p>  <p>Lighting</p>  <p>Meter</p>		<p>Gadget / Home Devices / ...</p>  <p>Gadget</p>  <p>Home Device</p> <p>Other Prototype</p> <p>Sports & Outdoor Device</p>	

SUMMARY & TAKE AWAY



INDUSTRIAL BUSINESS OUTLOOK



TAKE AWAY

Core Competence
in OT

Differentiating
Innovation by
e-AI and SOTB

High Profitable
Growth

Leader of
Endpoint Intelligence



Renesas – Endpoint Intelligence