A blue gradient oval is centered on the page, with a blue scribble-like line looping around it. The text "Future Outlook" is written in a bold, black, sans-serif font across the middle of the oval.

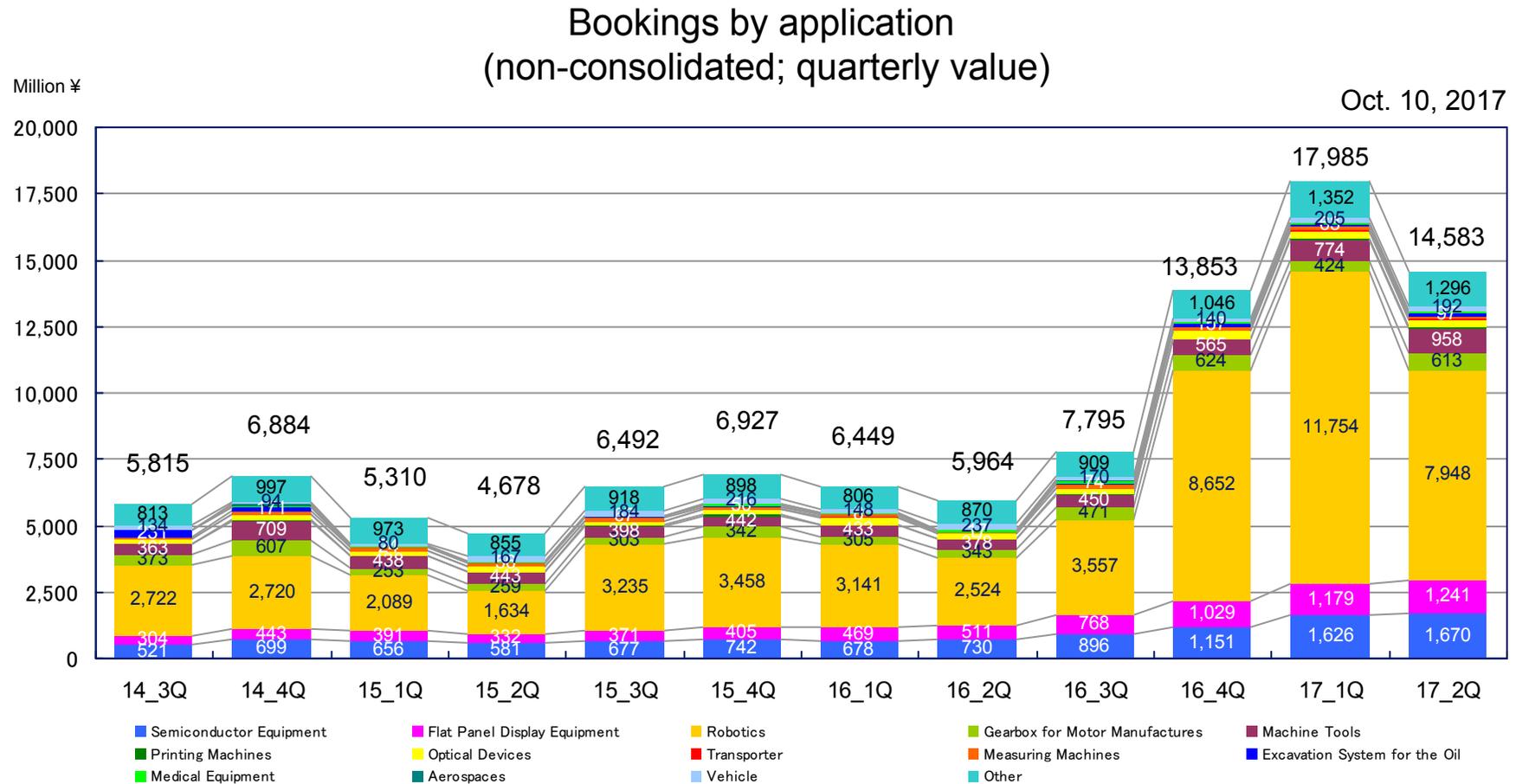
# Future Outlook

# Contents

1. Recent orders trends
2. Market trends
3. Important application trends
4. Capacity expansion
5. Expected issues have materialized
6. Long-term vision
7. Changes in the business environment
8. New products and services likely to result from technological innovation

# 1. Recent orders trends

## Rapid increase in orders from January 2017



## 2. Market trends-①

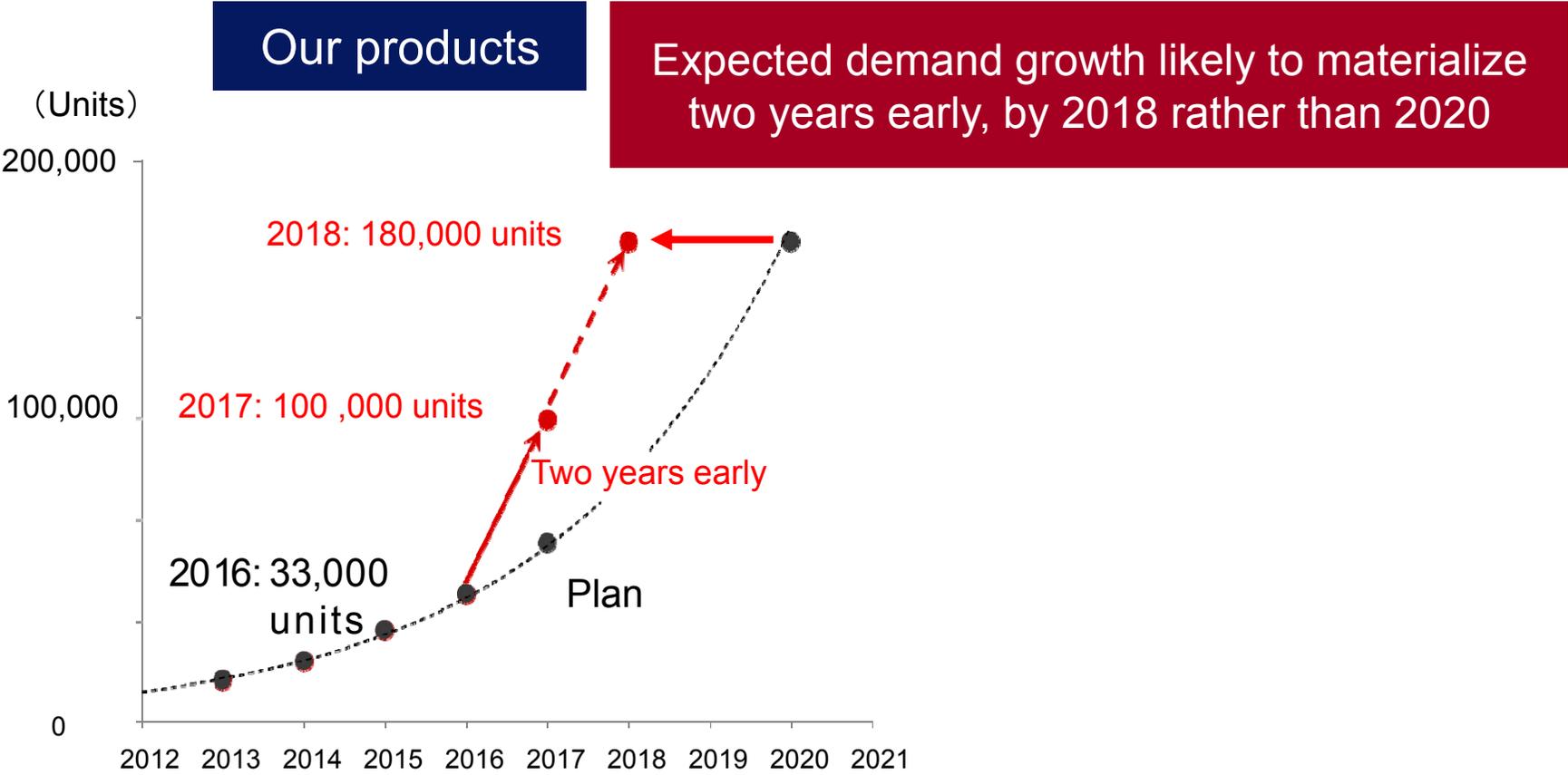
Market for industrial robots to grow 15% annually from 2018



Source: IFR Report 2017

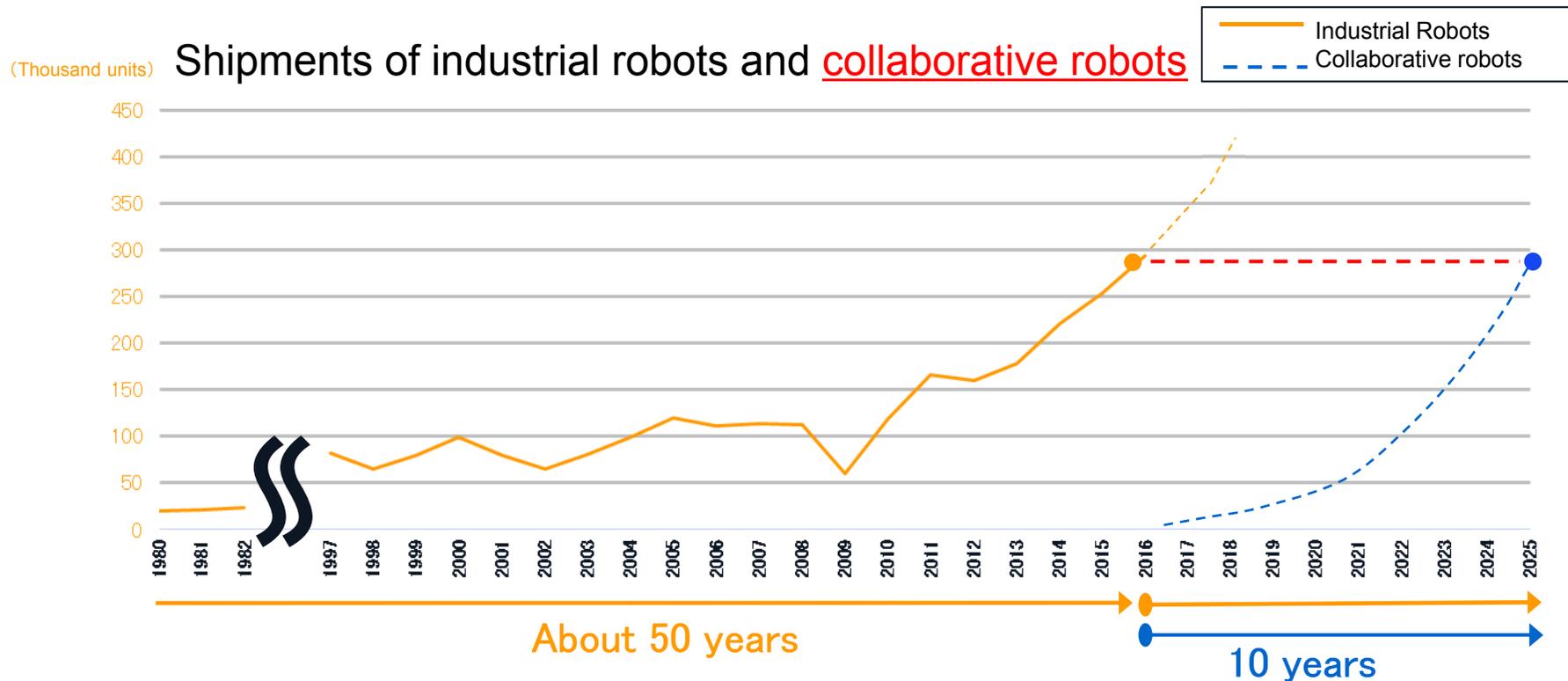
# 2. Market trends-②

## Major robot makers: Demand forecast



## 2. Market trends-③

Demand for collaborative robots to grow sharply by 2025



※HDSI, based on IFR Reports and, for the pre-1992 period, on Japan Robot Association data

Collaborative robots to grow as much in just ten years as industrial robots have in 50 years

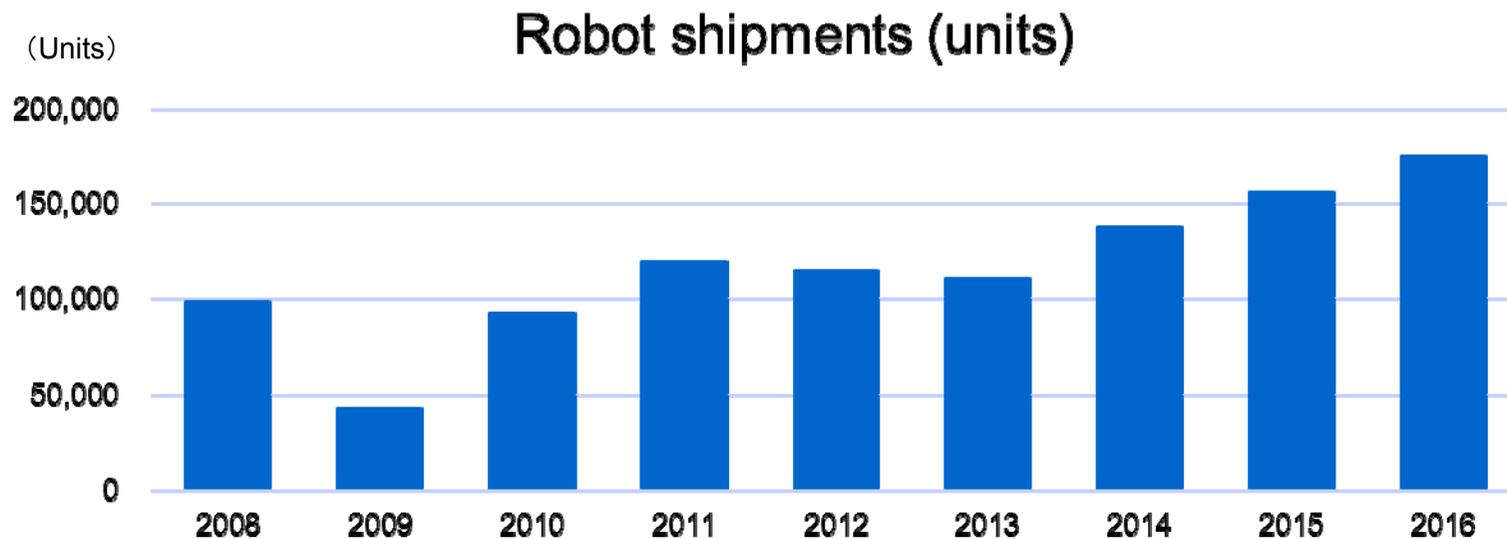
### 3. Important application trends-①

#### Industrial robots

■ Growth in demand for smartphone production

■ Growing worldwide demand for labor saving

➡ Investment in new capacity at robot makers

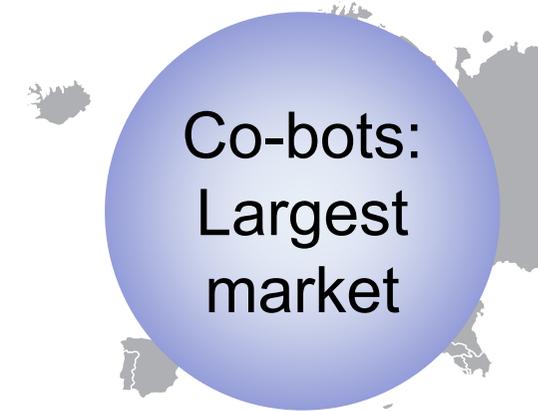


Source: Japan Robot Association

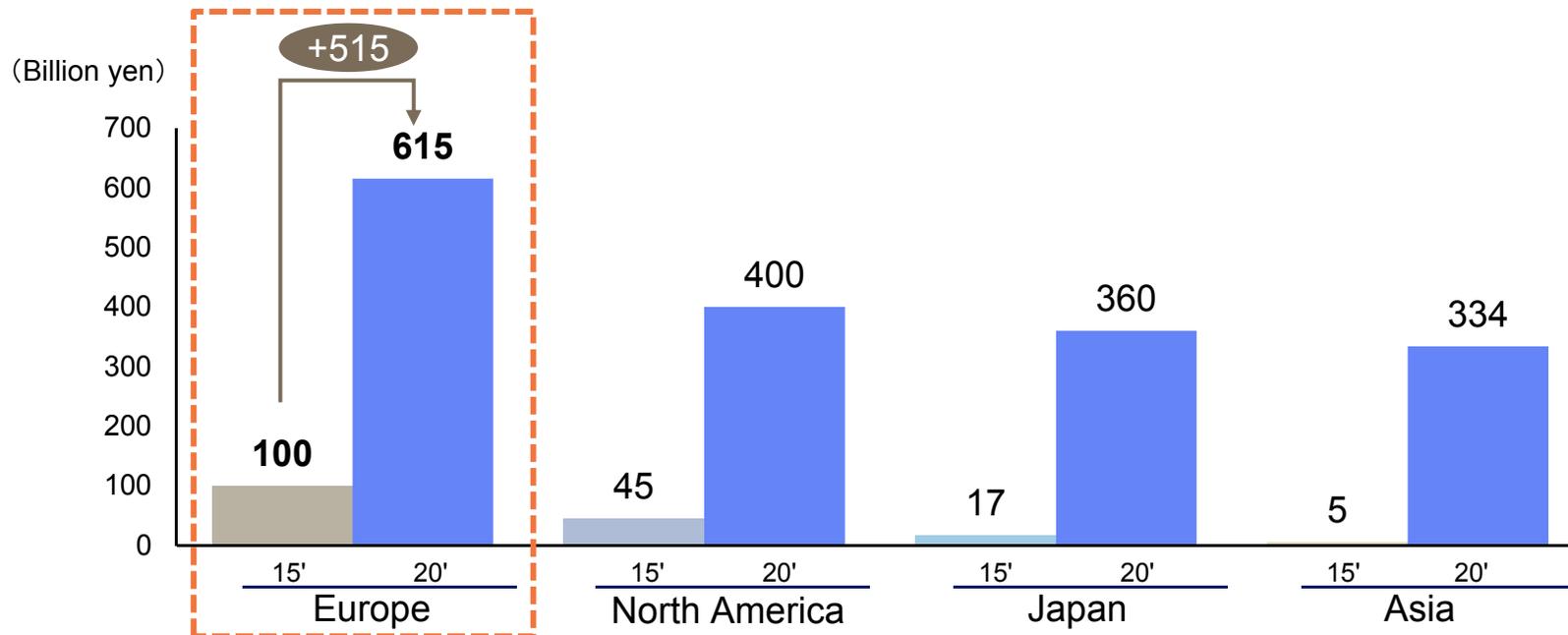
### 3. Important application trends-②

#### Collaborative robots

- Increasing use in manufacturing and in the service industries
- Set to fuel further growth



#### Co-bots: Market growth forecast

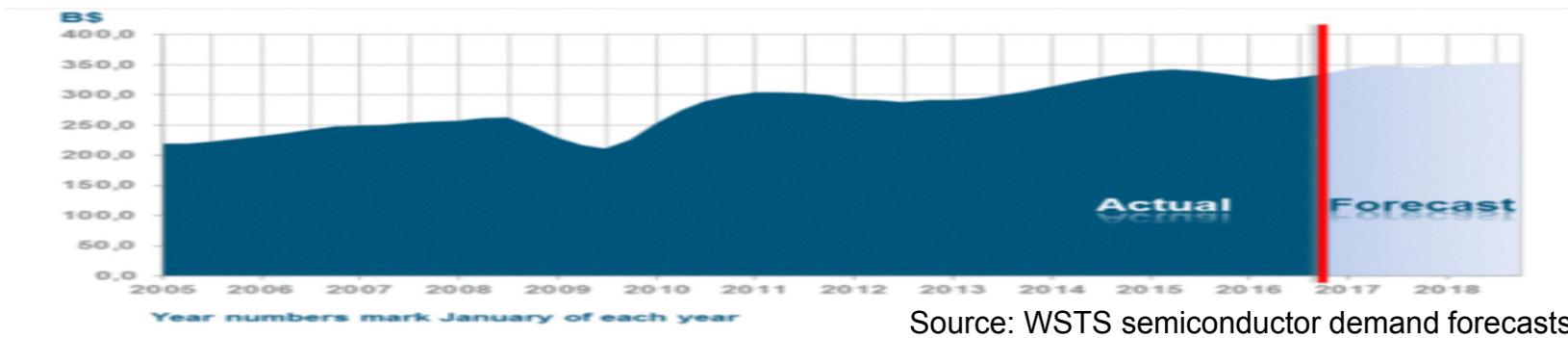


Source: Fuji Keizai "Worldwide Robot Market: Current Conditions and Future Outlook"

### 3. Important application trends-③

## Semiconductor manufacturing equipment

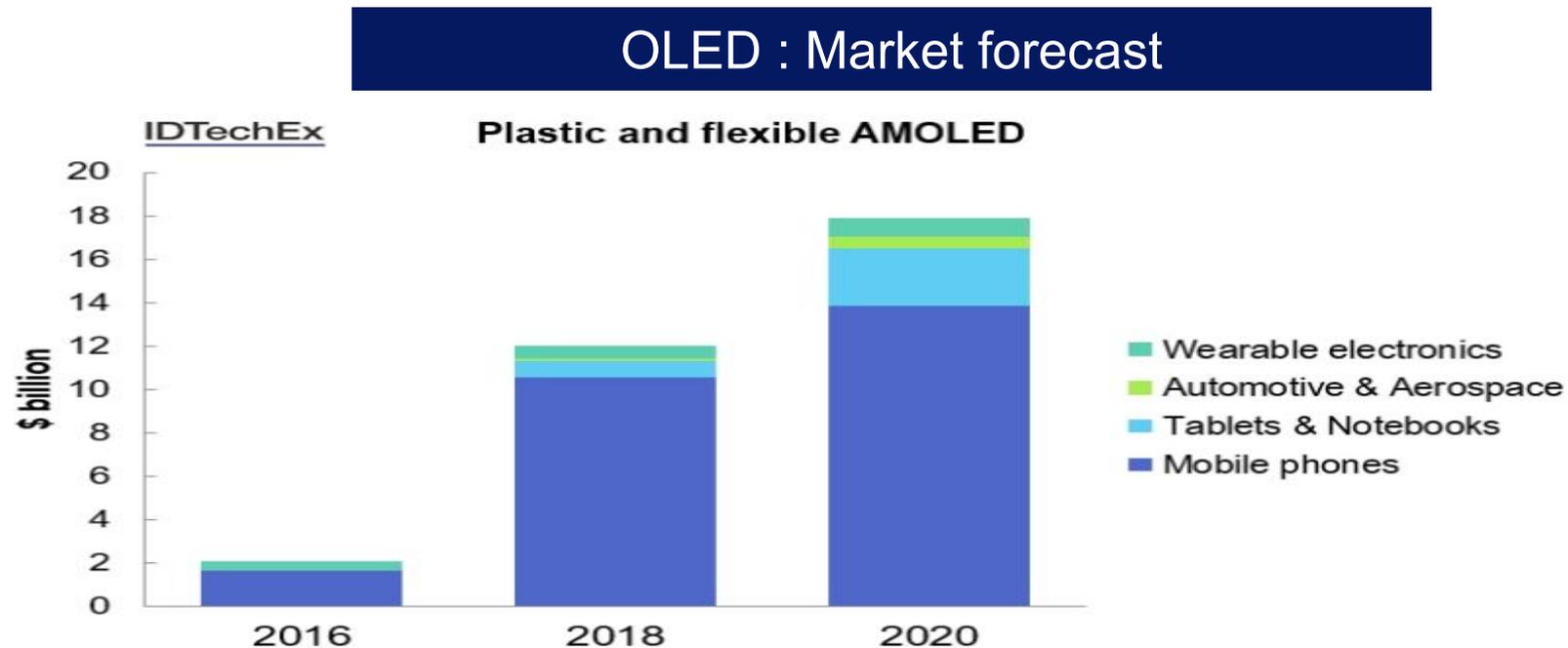
- Higher capacities and quality upgrades have spurred investment in multilayer and miniaturization technologies
- Increased demand for semiconductors for artificial intelligence and virtual reality applications
- Investment in 5G-related technologies is beginning in earnest
- Increased server demand in response to the data explosion—shift from hard drives to solid state drives



### 3. Important application trends-④

## FPD/ OLED manufacturing equipment

- Latest smartphone models use OLED
- Major Chinese smartphone makers also using OLED panels in their latest models
- In addition to Major Japanese and South Korea panel makers, and Chinese companies are investing aggressively in OLED panel factories
- Japanese panel maker starting mass production using the printing method



Source: IDTechEX

## 4. Capacity expansion-①

### Expanding capacity for HarmonicDrive®; new land acquisition for expansion

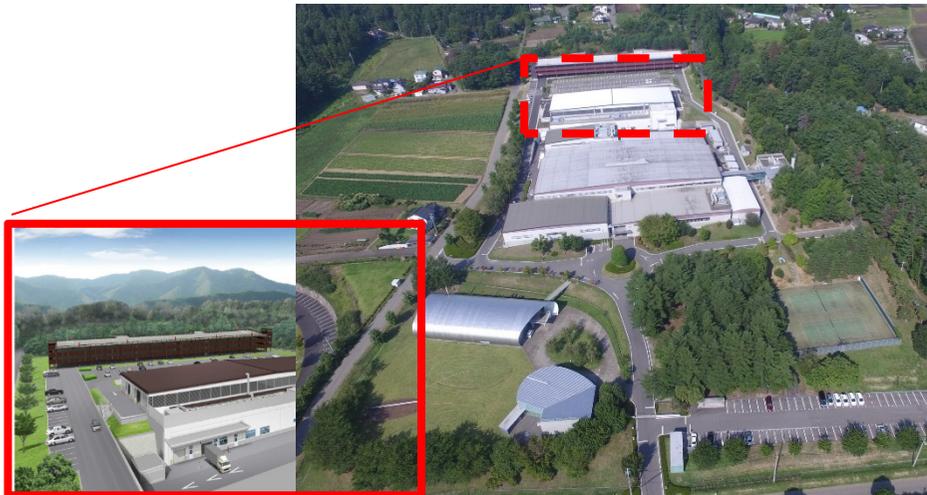
- New lines at the first Hotaka factory
- Expansion of existing capacity (adding a second shift, boosting productivity)
- Land acquired for a second Hotaka factory, to become a production base of the same stature as the No. 1 factory

The Hotaka No.1 Factory  
(Azumino City, Nagano)

Factory land  
area about  
20,000 *tsubo*

The Hotaka No.2 Factory  
(Azumino City, Nagano)

Factory land  
area about  
15,000 *tsubo*



Source: Google Earth

- New line equipment investment: ¥1.5bn
- Production increase from March 2017
- (to 85,000 units/month, from 50,000 units/month)

- Incremental investment
- Output to rise to 100,000/month by March 2021

## 4. Capacity expansion-②

Main component (cross roller bearing) capacity expansion, new factory construction

New factory—artist's conception  
(Matsumoto City, Nagano)



- Construction of new factory structures to start in December 2017
- Cross roller bearing **monthly capacity** to rise to **150,000 units** by March 2023

# 4. Capacity expansion-③

## HDLLC/HDAG: Proposed factory site



### 【HDLLC】

Plans to buy a factory site near Beverly, MA  
(New plant conceptualization)

### 【HDAG】

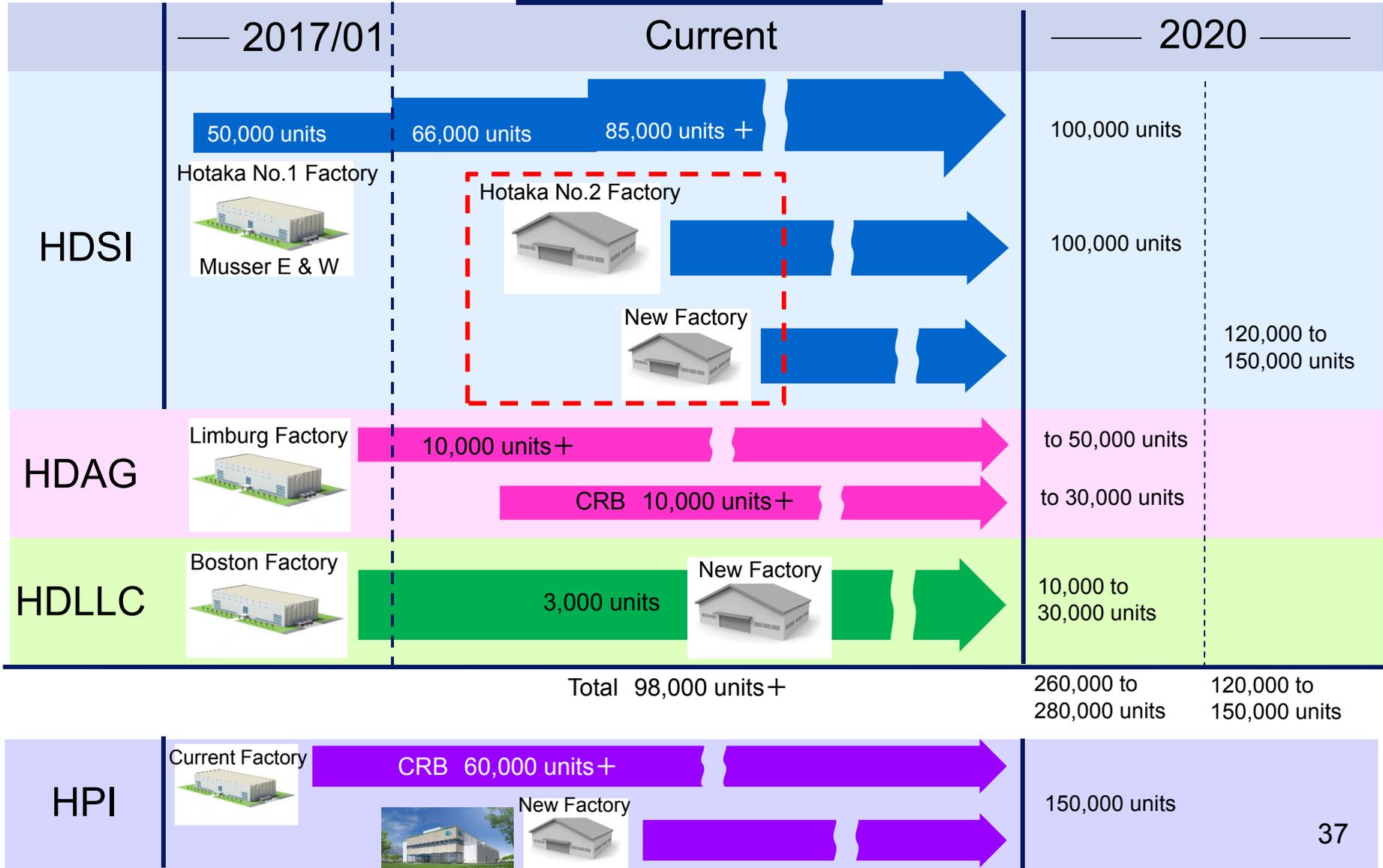
Expansion possible next to the existing plant



# 4. Capacity expansion-④

## Roadmap

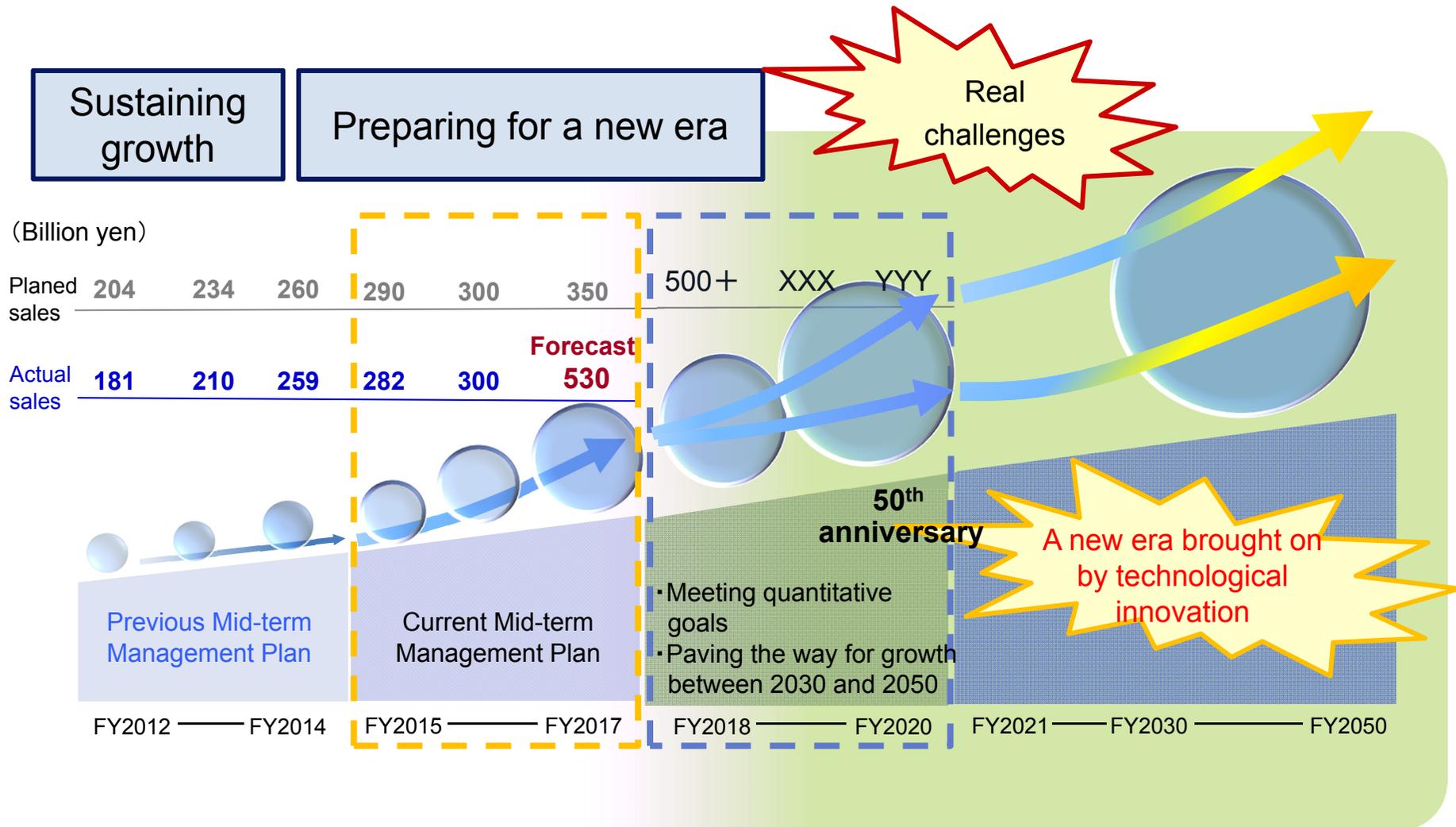
(Monthly units)



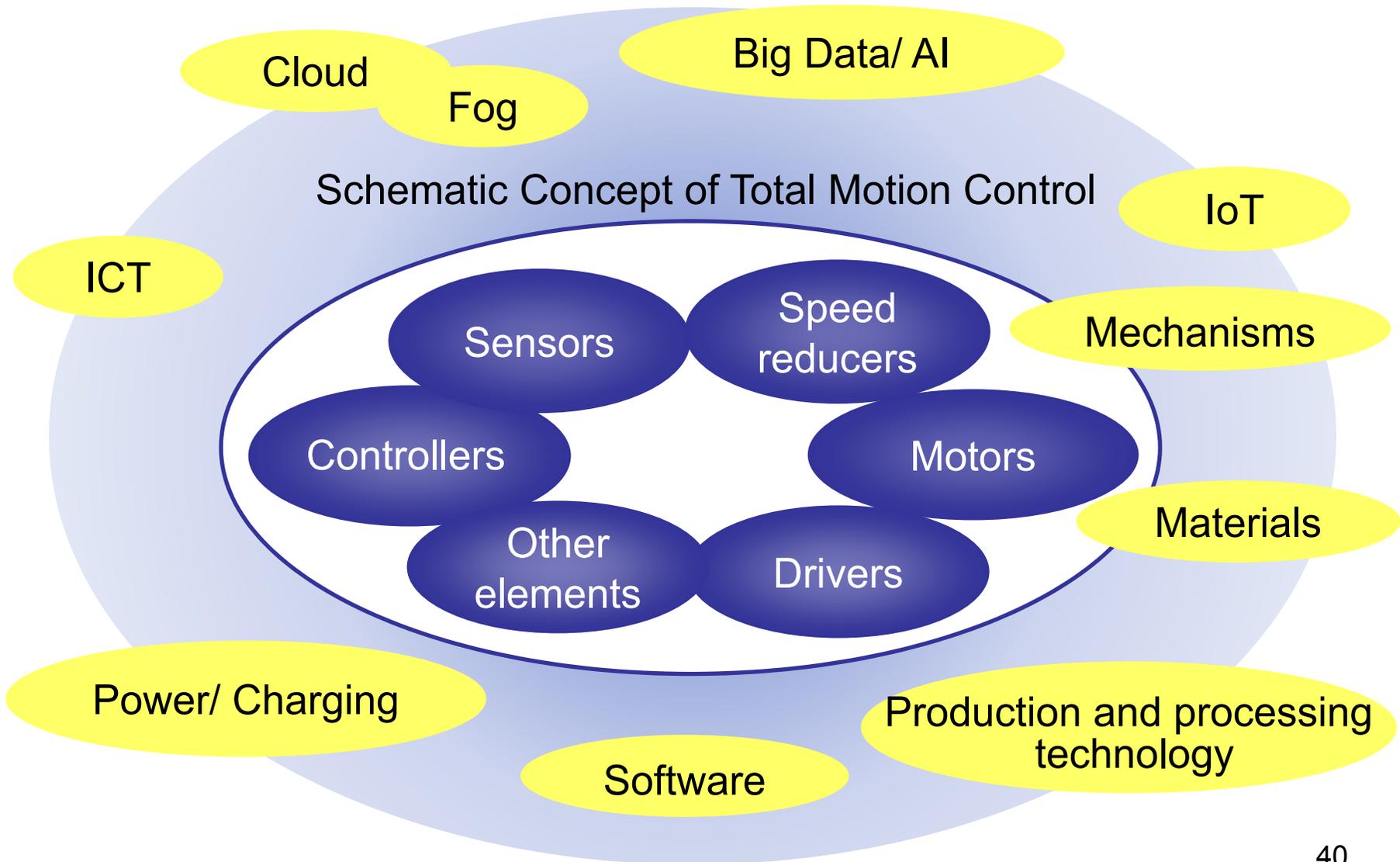
## 5. Expected issues have materialized

- ◇ Expand production capacity
  - ⇐ [The second Hotaka plant](#)
- ◆ Don't count on current record high sales – it's short term.  
Be aware there always involves a certain fluctuating factors – in SEMI, FPD/OLED even Industrial Robot as well.
- ◆ Serious competition has developed
  - ⇐ [Competitors have moved into Nagano](#)
  - ⇐ [A surge among Chinese manufacturers](#)
- ◆ Can not depend solely on long term relationship based upon mutual trust built on our experiences and QCDS.
- ◆ Can these risks be absorbed simply through scale expansion?
- ◇ Continuous effort to diversify applications (medical equipment, food industry, pharmaceuticals etc.)  
Diligent work in R&D; New gear mechanism, New Materials,  
New production method

# 6. Long-term vision (the next medium-term business plan)



# 7. Changes in the business environment



The performance targets and other numerical data presented herein are forecasts based on information available to the HDS Group at the time this material was prepared, and are subject to the influence of uncertainties including those in the economic and competitive environment. Actual performance may therefore differ materially from the forecasts given in this material.

**Harmonic Drive Systems Inc.**

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