From automated to autonomous

ABB Innovation & Technology Day
Bazmi Husain, CTO
Presentations given during the ABB Innovation & Technology Day 2017 includes forward-looking information and statements including statements concerning the outlook for our businesses. These statements are based on current expectations, estimates and projections about the factors that may affect our future performance, including global economic conditions, and the economic conditions of the regions and industries that are major markets for ABB Ltd. These expectations, estimates and projections are generally identifiable by statements containing words such as “expects,” “believes,” “estimates,” “targets,” “plans,” “outlook” or similar expressions.

There are numerous risks and uncertainties, many of which are beyond our control, that could cause our actual results to differ materially from the forward-looking information and statements made in this presentation and which could affect our ability to achieve any or all of our stated targets. The important factors that could cause such differences include, among others:

- business risks associated with the volatile global economic environment and political conditions
- costs associated with compliance activities
- market acceptance of new products and services
- changes in governmental regulations and currency exchange rates, and,
- such other factors as may be discussed from time to time in ABB Ltd’s filings with the U.S. Securities and Exchange Commission, including its Annual Reports on Form 20-F.

Although ABB Ltd believes that its expectations reflected in any such forward-looking statement are based upon reasonable assumptions, it can give no assurance that those expectations will be achieved.

The presentations and the related discussion may also contain or refer to non-GAAP measures of performance. Definitions of these measures and reconciliations between these measures and their US GAAP counterparts can be found in the “Financial information” documents under “Quarterly results and annual reports” on our website at http://new.abb.com/investorrelations/
ABB’s consistent contributions to industrial progress
Technology innovations pioneered by ABB

**Mechanical**
- Safety boiler control
- Power plant control
- PID control tuning

**Electrical**
- Force measurement
- Passive matrix LCD
- Electric propulsion systems

**Software**
- Electric industrial robot
- Variable-speed drives
- Electric propulsion systems

**Digitalization**
- YuMi®
- ABB Ability™
- Extended control systems
- Smart Home

**Timeline**
- 1900
- 1950
- 1980
- 2015

Writing the digital future takes ability. ABB Ability™
### Digital technologies are driving innovation in industrial markets

<table>
<thead>
<tr>
<th>Smart sensors</th>
<th>Big data</th>
<th>Cyber security</th>
<th>Virtual / augmented reality</th>
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<td>Software-defined machines</td>
<td>Connectivity</td>
<td>Cloud computing</td>
<td>Blockchain</td>
<td>Artificial Intelligence</td>
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Artificial Intelligence is a long term game changer
Automated systems move towards autonomous

Automated

Steady state control

Normal operation
Start, transients, stop

Autonomous

Complete plant lifecycle

Analyze  Act

Sense  Act  Understand

Perceive  Solve

Sense  Act  Analyze
Artificial Intelligence is key technology for the next level of industrial progress

AI: “The ability to learn or understand or to deal with new or trying situations”

Human
- Systems designed by experts
  - + Intuition
  - + Creativity
  - + Expertise
  - – Computation

Augmented
- Experts supported by algorithms

Artificial
- Knowledge learned from data
  - – Intuition
  - – Creativity
  - + Expertise
  - + Computation

Amplifying human potential

1Webster referring to intelligence
ABB partners with startups to write the future in industrial AI

ABB Technology Ventures identifies complementary startups

**Towards human level AI**
- vicarious

**To simplify AI implementation**
- bonsai

**To move safely and autonomously**
- CLEARPATH ROBOTICS

**Towards smarter buildings**
- PointGrab

Augmenting decision-making and functionality in industries and commercial buildings
Operator environments will augment human perception capabilities

AI handles information complexity allowing humans to focus on where intervention is needed
AI – a paradigm shift in ease of installation and use of robots
From programming to teaching and learning

Yesterday: **programming**

Today: **teaching**

Tomorrow: **learning**

//Defining single location in RAPID

```
CONST robtarget
rb_Location1:=[[471.90028601, -160.550088443, 259.855061587],
[0.0196845700059949, 0.999779442304461, -0.00713127900217168, 0.00165206200050307],
[-1, -1, 1, 0], [9000000000, 9000000000, 9000000000, 9000000000, 9000000000, 9000000000]];
```
Autonomous robots designed for target segments

“Data center sheriff”  “Motor crawler”  “Transformer diver”  “Plant helicopter”
Pioneering technology leadership by ABB
Writing the future of industrial progress

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<tr>
<td><img src="1900.png" alt="Image" /></td>
<td><img src="1950.png" alt="Image" /></td>
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1900 1950 1980 2015 ...
ABB is building a bridge to the future