TECHNOLOGY WORKSHOPS 2017.

December 2017
STRATEGY NUMBER ONE > NEXT CONTINUES THE SUCCESSFUL BUSINESS DEVELOPMENT AND CHARTS THE COURSE FOR AN INNOVATIVE FUTURE.

Strategy Number ONE

- BMW i
- EfficientDynamics
- Services

NUMBER ONE > NEXT

- Electrification as the new normal
- Autonomous driving
- Digitalization
AS A DRIVING FORCE OF INNOVATION, iNEXT WILL SET NEW STANDARDS FOR THE MOBILITY OF THE FUTURE.

VISIONARY MOBILITY

BMW iNEXT
Driving force of innovation.

- iNEXT accelerates emotions
- iNEXT simplifies driving
- iNEXT improves experiences
- iNext fosters networking

- Highly automated / autonomous driving
- Artificial intelligence
- Connectivity
- E-Mobility/ Lightweight construction
- Design / Interior of the future

Strategic cooperation
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DRIVE TECHNOLOGY
In global markets with differing legislative, infrastructure and customer demands, flexibility is key.

- NEV legislation
- License plate lottery
- Massive market regulation
- Focus on BEVs

- ZEV legislation
- Low fuel prices
- BEV focus on US West and East Coast

- Challenging CO₂ requirements
- Customers reluctant as regards xEV
- Very heterogeneous legislation, depending on country

RoW:
- Challenging infrastructure for EVs
- Heterogeneous customer demands
OUR R&D ACTIVITIES ENSURE OUR TECHNOLOGICAL LEAD IN E-MOBILITY.

- **Gen 5 modular kit**
  - PHEV & BEV scalable from UKL to GKL

- **Performance leader**
  - HEAT XL 300 kW

- **Agile development methods**
  - faster & more efficient

- **Cost leader**
  - for BEV

- **Technology project on battery technology**
  - Product expertise for cells

- **Variants**
  - HEAT, CCU, HVS flat battery, cell formats

- **Charging**
  - Qualification 800 V, 300 kW

- **New business segments**
  - Stationary batteries

- **Field data analysis**
  - Early fault detection (diagnosis)

- **Ensuring supply of commodities and production capacities**

- **Ensuring lead in innovation**
  - Patent initiative
FLEXIBLE MIX OF DIFFERENT DRIVE SYSTEMS THANKS TO THE PREPARATION OF VEHICLE ARCHITECTURES AND QUALIFICATION OF PLANTS TO HANDLE BOTH E-DRIVES AND COMBUSTION ENGINES.

BEV
- Suitable for large volumes
- Emotional
- Range up to 700 km (WLTP)

Plug-in hybrid
- Power PHEV (>> 100 kw)
- Range up to 100 km (WLTP)

Combustion engine
- 48 V
- Leading in terms of CO₂ and other emissions
THANKS TO THE ELECTRIFICATION OF ARCHITECTURES AND THE SCALABLE E-MODULE, THE BMW GROUP HAS THE FULL ABILITY TO ACT.

<table>
<thead>
<tr>
<th>RWD architecture (CLAR WE)</th>
<th>BEV</th>
<th>Power PHEV / PHEV</th>
<th>Efficient Dynamics NEXT</th>
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</table>

- **BEV**
- **Power PHEV / PHEV**
- **Efficient Dynamics NEXT**

**Electrification module** (5th generation)
THE BMW GROUP’S ELECTRIFIED MODEL RANGE IS ON TARGET WHEN IT COMES ON LINE-UP AND SALES.

PURE ELECTRIC
- BMW i3 60 Ah
- BMW i3 94 Ah
- LCI BMW i3 & i3s**

PLUG-IN HYBRIDS
- BMW i8
- BMW xDrive40e iPerformance
- BMW 530Le iPerformance*

MINI
- MINI Cooper S E Countryman ALL4

* Only available in China
** LCI: Life Cycle Impulse
*** Launch date not yet confirmed

200,000 electrified vehicles sold.

Sales BMW i, BMW iPerformance and electrified MINI vehicles per target 09/17 2017

- BMW 225xe iPerformance
- BMW X5 xDrive40e iPerformance
- BMW iX3 BEV
- BMW iNEXT
- BMW i8 Roadster
- MINI Vision Dynamics***
- BMW 530Le iPerformance*
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AUTONOMOUS DRIVING & ARTIFICIAL INTELLIGENCE
FIRST AUTOMATED DRIVING IDEAS CONTINUOUSLY DEVELOPED – STARTING MORE THAN TEN YEARS AGO.

<table>
<thead>
<tr>
<th>BMW Track Trainer (2006).</th>
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<tr>
<td>Emergency stop assistant (2009).</td>
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<tr>
<td>Highly automated driving on the motorway (Gen1: 2011; Gen2: 2014)</td>
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<tr>
<td>Highly automated driving at the limits of vehicle dynamics (2014).</td>
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<tr>
<td>Fully automated remote valet parking (2015).</td>
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<tr>
<td>Highly automated driving Munich to Geneva (2016).</td>
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<tr>
<td>Test fleet up and running (2017).</td>
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</table>
HIGH COMPLEXITY OF AUTONOMOUS DRIVING.

- **Driver**
  - No assistance (L 0)
  - Assistance (L 1)
  - Semi-automated (L 2)

- **Feet off**
  - Assistance (L 1)
  - Semi-automated (L 2)

- **Hands off**
  - Semi-automated (L 2)
  - Fully automated (L 4)
  - Autonomous (L 5)

- **Eyes off**
  - Fully automated (L 4)
  - Autonomous (L 5)

- **Attention off**
  - Autonomous (L 5)

- **Passenger**
  - Autonomous (L 5)

- **Transfer of responsibility**
  - Individual
  - Transfer of responsibility
SENSOR FUSION, ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING MAKE TARGET-ORIENTED ENVIRONMENT MODELS POSSIBLE.

On-Board

- Perception, Sensor fusion
- Plan Execution, Motion Control

ARTIFICIAL INTELLIGENCE

- Scene Understanding
- Mission and Trajectory Planning

Off-Board

- Labeling of Training Data
- Evolution Through Training
- Simulation and Sign-off

FLEET DATA

BACKEND

MODEL UPDATE
TECHNOLOGY DEVELOPMENT OF AUTONOMOUS DRIVING: VARIOUS PLAYERS CONSOLIDATE INTO 14 TECH STACKS AND FORM NETWORKS.
NEW SOLUTIONS FOR INTERIORS THROUGH DIGITALIZATION AND AUTONOMOUS DRIVING.

- Living environment seamless integrated
- Operation intelligent, personalized and intuitive
- Retreat with new ways of communication
- Room for new usecases
THANK YOU FOR YOUR ATTENTION.