MOBILITY FOR A SUSTAINABLE WORLD
THE TRAIN OF THE FUTURE

Dr. Urs Bikle, Zurich, 28.09.2016
AGENDA

1. Introduction

2. Trends and Technologies in R&D for Rolling Stock

3. Profile of Potential Partners
INTRODUCTION

Stadler Rail in a nutshell

- Founded in 1942
- 7000 employees worldwide
- Sales volume of around 2 B€ / yr; strong growth since year 2000 (factor 20)
- Privately owned; headquarters in Bussnang, Switzerland

The speaker

- Urs Bikle, Head of Engineering at Stadler Rail in Bussnang (CH)
- Dipl. El.-Ing. ETH, PhD in bearingless electrical machines
- 6 yrs at ABB El. Machines (Switzerland, France, Sweden)
- 12 yrs at Bombardier Transportation Locomotives
- 2 yrs at DB Schenker Rail (today DB Cargo)
- Last 2 years at Stadler Rail

Stadler Rail – Passionate about trains
# INTRODUCTION – STADLER RAIL PRODUCTS

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<tr>
<th>SEGMENTS</th>
<th>MODULAR CONCEPTS</th>
<th>TAILOR-MADE CONCEPTS</th>
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<td>URBAN</td>
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<tr>
<td>LRV</td>
<td>Tram ≤80 km/h</td>
<td>Adhesion vehicles</td>
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<td>Tram Train ≤100 km/h</td>
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<tr>
<td>Metro</td>
<td>Metro ≤100 km/h</td>
<td>Adhesion and rack vehicles</td>
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<thead>
<tr>
<th>RAILWAY VEHICLES</th>
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<tr>
<td>DMU</td>
<td>Regional rail ≤140 km/h</td>
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<tr>
<td>EMU</td>
<td>Regional rail ≤160 km/h</td>
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<td></td>
<td>Intercity ≤200 km/h</td>
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<tr>
<td></td>
<td>High-speed ≤250 km/h</td>
<td>Not in Scope</td>
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<td></td>
<td>Very high-speed &gt;250 km/h</td>
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<tr>
<td>Locomotives</td>
<td>Mainline locomotives diesel/dual/electric</td>
<td>Not in Scope</td>
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<td>Shunters/special purpose vehicles</td>
<td>Not in Scope</td>
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<tr>
<td>Coaches</td>
<td>Passenger coaches and sleepers</td>
<td>Not in Scope</td>
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<td>Freight wagons</td>
<td>Not in Scope</td>
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GLOBAL MEGATRENDS
WITH HIGH INFLUENCE ON RAILWAYS

Urbanisation and Individualisation
  - Limited space in growing mega cities
  - How to ensure individual space and privacy
  - Personalised guidance from door to door

Mobility and Logistics
  - Cargo bundling

Demographic development
  - Access to mobility and vehicles
  - High comfort

Scarcity of energy and resources
  - Best in class: Energy per (transport kilometer*speed)

Intelligent Products and Infrastructure
  - Best in class: Safety per transport hour
  - Production Lead times, IoT, intelligent use of data
R&D OUTLOOK
STADLER’S VIEW ON ROLLING STOCK 2030

Increasing automation of trains
- Today’s status
  - Number of automated lines low
  - Block bound rail infrastructure
- R&D topics:
  - Safe obstacle detection
  - Train position detection in tunnels; moving blocks
  - Safe train to wayside communication

Energy efficient operation
- Today’s status
  - Best in class of public transportation in terms of green label
- R&D topics:
  - Integration condition knowledge into train & route control
  - Network-wide load balancing
  - Light weight materials
Increasing comfort

- Today’s status
  - Main line traffic with continuous low floor rare
  - Noise and pressure tightness acceptable, but not perfect

- R&D topics:
  - Space saving passive technologies for noise reduction
  - Non train borne pressure condition prediction systems
R&D OUTLOOK
STADLER’S VIEW ON ROLLING STOCK 2030

Alternative energy sources

– Today’s status
  – Electrification of railway lines in Western Europe 53%, North America: 1-2%
  – Operation on non electrified lines with diesel trains
– R&D topics:
  – Alternative energy and traction concepts fit for railway purposes complying with
    – the extension of the network and the long range traffic
    – the demanding railway requirements (fire safety, shock/vibrations etc)
    – the duty cycles and lifetime
R&D OUTLOOK
STADLER’S VIEW ON ROLLING STOCK 2030

Further potential R&D topics

− Intraday adaptability of vehicles’ interior
  − seat / seat pitch / comfort arrangement adaptable

− Windows with integrated functions
  − amplifier, darkening, structural contribution, …

− Life Cycle Cost optimisation
  − IoT usage;
  − reusable materials

− New urban models
  − one stop model for each individual
R&D COOPERATION
PROFILE OF POTENTIAL PARTNERS

- SMEs, Global Corporations or Universities
- Experienced and strong in industrialisation of inventions
- Strong network to «manufacturing» companies
- Strong in dealing with 3-4 decade obsolescence topics
- Knowledge of railway requirements

The future of mobility is RAILWAYS
THANKS FOR YOUR ATTENTION