

# Addressing the Technical Challenges

A Whole System Perspective

UIC RailAdapt Beijing 18/06/2017



# A Whole System Challenge





#### Crucial Role of Rail in Addressing these Systemic Challenges

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## **Reduce Systems' Needs**



#### **HESOP** Reversible Substations

- 99 % of braking energy returned to power grid
- or re-used in station equipment
- Up to 40% energy savings
- Reduce tunnel and in-station ventilation



#### **Permanent Magnetic Motors**

- 15% energy savings vs asynchronous motors
- 40% lighter, contributes to train mass savings
- Dirt reduction by 15%, noise by 4%
- No cooling water consumption: self-ventilated design

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#### Energy recovery, mass reduction, reduced or no ventilation

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# Adapt to Non-continuous Electrification



Catenary-less Trams Three feeding systems 3rd Rail, Static Recharge, SuperCapa

Aptis Electricity-fuelled mobility On the road Dual charging modes **Coradia iLint** Hydrogen Fuel Cell Regional Train

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#### And reduce environmental impacts of urban transport

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# Adapt to Non-continuous Electrification





#### Prima H3 Shunting Locomotive

- Hybrid Diesel Battery
- Bimode Diesel Electric
- Diesel consumption down 50% to full autonomy
- Emissions down by over 50% to emission-free
- Max speed 100 km/h
- Traction force 240 kN

#### Prima H4 Shunting and Mainline Locomotive

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- Hybrid Diesel Battery
- Bimode Diesel Electric
- Diesel consumption down 50%
- Emissions down by over 50%
- Driving speed 120 km/h
- Traction force 300 kN

Increase flexibility and reduce environmental impact of

#### freight and shunting operations

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# Adapt to Changing Environmental Conditions



- Sizing and protection of electric and electronic equipment
- Sand protection
- Thermal isolation reinforcement
- AC reinforcement and air-flow management
- Condensation protection

Adapting to a world ~2°C hotter by 2050

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## Resilience to slow-onset environmental changes



#### Heatwave events across NSW actual and projections



Source: heatwaves climate change impact snapshot

Design to withstand outside  $T^{\circ} > 40^{\circ}C$ ,  $>50^{\circ}C$  in degraded mode

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# **Resilience to Increasing Intensity of Climatic Events**

### Australia Tram System Project



20% AEP\* flood depth CBD (1 in 5 year event)



1% AEP\* flood depth CBD (1 in 100 year event)

#### **Climate Change Risk Assessment and Mitigation Measures**

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# Optimize System Resilience: Real-time Condition M&D



#### Train, Track, Catenary and whole System detection of intrusions and theft

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# Optimize System Resilience and Safety: Traffic Optimization

#### Optimet

Metro Connectivity and real-time information for Passengers



Real time information about traffic conditions and service interruption



Live estimation of journey times



Urban life information through social media



Multimodal mobility advisory overlay



Coordinate all public transport modes from rail to road



Alternative mobility solutions rapidly offered in case of incidents



Predicting with data analysis and operational optimisation

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## Sustainability and Innovation: at the core of Alstom's DNA



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