100% Renewables
Climate Protection as Business Case in Rail
ELECTRICITY SUPPLY OF RAILWAY TRACTION AND RENEWABLE POWER GENERATION IN AUSTRIA ARE CLOSELY LINKED

1919
Large-scale electrification of railway lines starts

1920s
ÖBB's first own hydropower stations

1930
Electric traction from Salzburg to Bregenz

2018
4800 km of railway lines, 73% electrified
Climate protection strategy

1. **ELECTRIFICATION**
   - TODAY 73%

2. **ALTERNATIVE DRIVES**
   - BATTERY
   - E-HYBRID
   - ...

3. **CLIMATE-FRIENDLY ROAD MOBILITY**
   - BUSSES
   - E-MOBILITY
   - RAIL & DRIVE
   - ...

4. **RENEWABLE ENERGY**
   - HYDRO
   - PV
   - WIND

5. **ENERGY EFFICIENCY**
   - BUILDINGS
   - DRIVING STYLE
   - AUTOMATION
   - ...

6. **MODAL SHIFT**
Total use of traction current in 2017: 1894 GWh, 92% Renewable
RENEWABLE TRACTION ENERGY PRODUCTION AND CERTIFIED AUSTRIAN RENEWABLES FROM MARKET

- Energy and industry
- Transport
- Buildings
- Agriculture
- Other

29%
RAILWAY TRANSPORT IS EFFICIENT AND CLIMATE-FRIENDLY

**MODAL SPLIT**
in Austria

- Passenger transport
  - CAR 77.7%
  - BUS 10.2%
  - RAIL 12.1%
- Freight transport
  - ROAD 97.5%
  - SHIP 3.0%
  - RAIL 31.5%

**ENERGY DEMAND**
of transport (rail, road, water)

- RAIL 2.3%
- ROAD 97.5%
- SHIP 0.2%

**EMISSIONS**
of passenger and freight transport

- PASSENGER
  - CAR
  - RAIL
  - TRUCK

- FREIGHT
  - RAILWAY

- in g_CO2-eq/passenger-km and g_CO2-eq/tonne-km resp.

- Security for train operation
- Control and balance traction current grid

- **TRACTION ENERGY AT STABLE, ATTRACTIVE PRICES**
- **SUSTAINABLE TRANSPORT**
Vision for the Future

- Power-to-mobility
  - Relief of public grid
  - Reduction of losses
- Healthy energy mix
- Savings through long term investments
- Security of supply
Will it work out?

**STRENGTHS:**
- High-performance grid
- Experience

**OPPORTUNITIES:**
- Awareness of customers
- Commitment of policy makers

**WEAKNESSES:**
- 16,7-Hz components are more expensive

**THREATS:**
- Not (yet) economically feasible
- Public funding restricted
Conclusion

Business case 100% renewables in rail: Technically feasible, economic obstacles!

EU STRATEGY TO SUPPORT CLEAN AND AFFORDABLE ENERGY FOR RAILWAYS

- Balance prices and true costs of rail and road
- R&D and technology to market
- Level-playing-field for funding