

A sleek, white Siemens Mireo Plus hybrid regional train is stopped at a modern train station platform. The train has a large, curved front window and a digital display above it showing the word "Mireo". The station has a large, arched glass and steel roof. Several people are visible on the platform, including a man in a suit and a woman in a blue jacket. The overall scene is bright and modern.

SIEMENS
Ingenuity for life

Mireo Plus – Hybrid regional train by Siemens Mobility

© Siemens Mobility GmbH 2019

[siemens.com/mireo](https://www.siemens.com/mireo)



A need to develop hybrid trains... Where does it come from ?

3000 Diesel trains

still in operation in Germany

ZERO Emission target by UK

announced in transport sector for 2040

Sweden Carbon neutral
by **2045**

further **350 Mio €**

decided for market activation program H₂ by BMVI

German Coalition

Agreement referring to hydrogen
technologies

>250 hybrid regional trains

tendered and expected to be awarded in 2019/2020 in Germany

Current situation in Europe- challenges for future generation of regional trains



Market

- Large percentage of railway lines not electrified (e.g. 40% in Germany)
- Huge demand for hybrid solutions to replace Diesel trains



Politics

- Stricter emission-regulations (air pollution, noise and CO₂)
- Public funding of development of hybrid traction systems



Resources

- Rising Diesel prices
- Fluctuating grid capacities due to renewable power generation require storage-based solutions



Market specific requirements

- A flexible system design is needed for a variety of applications
- Additional benefits compared to Diesel trains



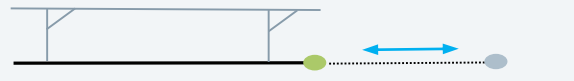
What is the right technology for hybrid trains?

Battery vs. Hydrogen

Large-scale networks



Last mile



Connection betw. OVHL networks



Suitability

Low



High

High



Low



Siemens Mobility Solution - Mireo Plus

two technologies - one train platform



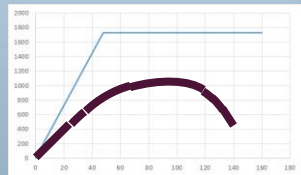
- Two new, modular power supply concepts:

- Battery-supported electric drive
- Fuel cell-supported electric drive

- Two solutions based on one train platform

- Scalable traction system

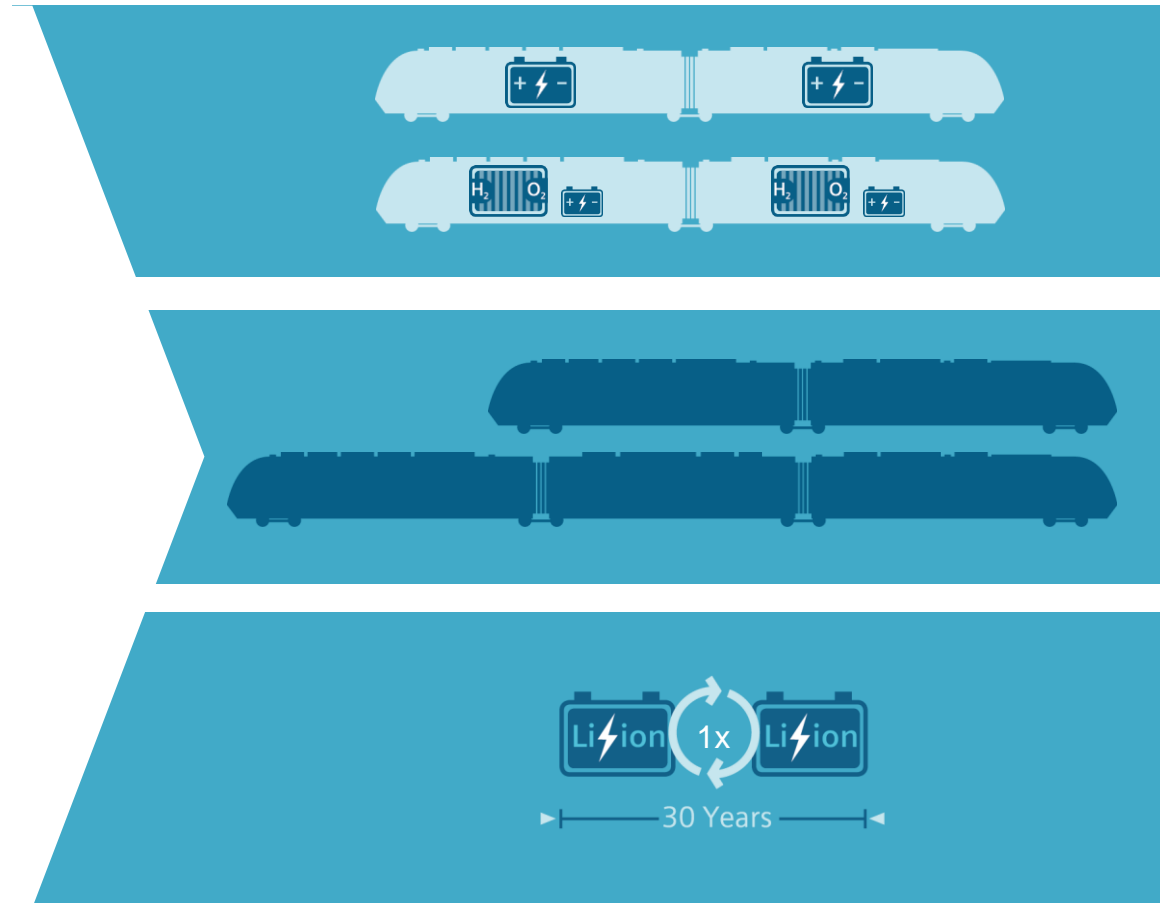
- Short and medium length configurations



- As powerful as an EMU

- Keep all positive characteristics of the Mireo family (energy-saving, flexible interior, **low maintenance and life cycle costs**)

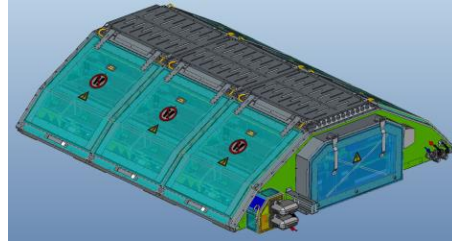
- Battery exchange: after 15 years !



Mireo Plus – Innovations are the only solution

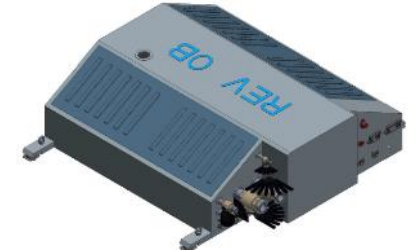
Powerful battery family

- LTO battery safe cell chemistry
- high-power charging
- 15 years life expectancy



HD8 next gen fuel cell by Ballard Power

- 50% higher power density
- Life duration: 3 times higher
- 5% Improvement in efficiency rate

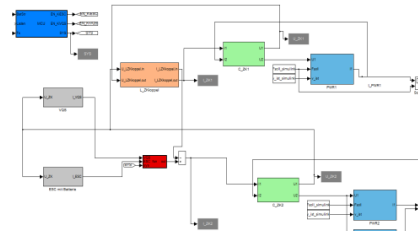


DC – DC converter

- SiC technology
(compact, lighter @ lower losses)

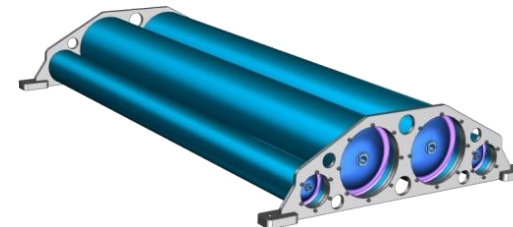
Hybrid control SW

- Optimized operation by predictive e-management
- Energy saving of ~ 5-15%



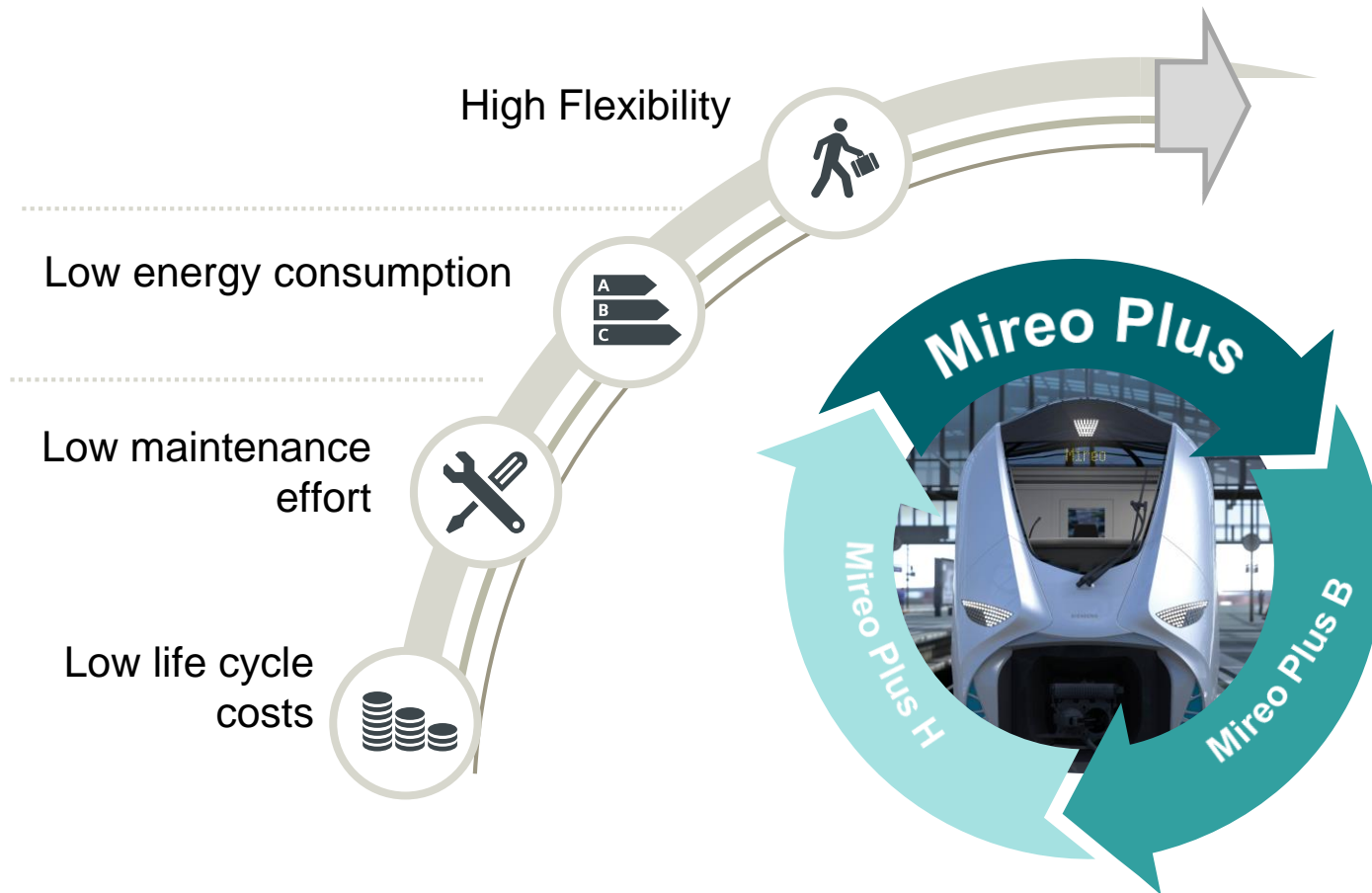
H₂ storage

- Modular concept
- +10% increase in H₂ storage



Mireo Plus –

A hybrid train presumes more than zero emissions



Specifics for B version:

- No need for Catenary
 - But can run & charge under it
 - Regular charging at 25KV, AC
- Cheaper & faster infrastructure project execution

Mireo Plus – variant matrix

High flexibility and high degree of modularization



Platform	Configuration	Performance	Track class	Max. V	Batt. Capacity						H2 Capacity							
					1	2	3	4	5	6	1	2	3	4	5	6	7	8
Mireo Plus B	2-car 120 Seats	Standard	C (<20 t)	160			80 km											
		Range	C (<20 t)	140			90 km											
		Lightweight	B (<18 t)	140	40 km													
	3 car 165 Seats	Standard	C (<20 t)	160					100 km									
		Range	C (<20 t)	140					120 km									
		Lightweight	B (<18 t)	140			60 km											
Mireo Plus H	2-car 120 Seats	Standard	C (<20 t)	160									600 km					
	3 car 165 Seats	Standard	C (<20 t)	160										1000 km				

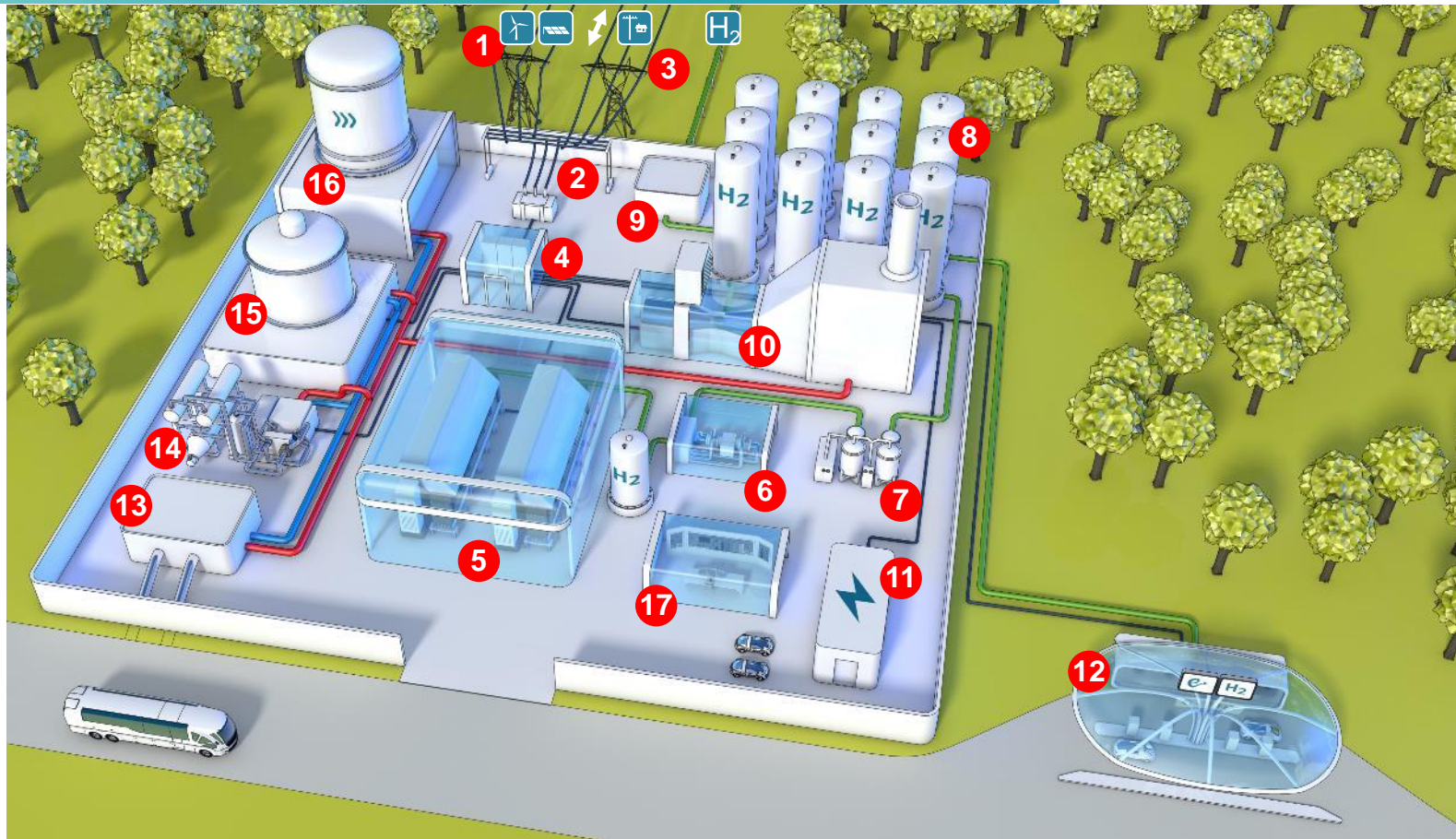
Desiro Cityjet Eco

ÖBB and Siemens Mobility



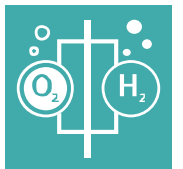
- Commissioning & testing operations
- In operation by the end of 2019.
- Site visit from October 2019.

H₂ Generation out of renewable energy – Siemens Green Hydrogen Power Project



1. Wind and Photovoltaic
2. Grid connection and transformer
3. Connection to local grid
4. Medium voltage switch gear
5. Electrolyseur
6. Compressor
7. DEOXO plant
8. Hydrogen storage
9. Connection to H₂-grid
10. H₂ gas turbine
11. Battery
12. Filling station for H₂- & E-cars
13. Transmission station for district heating
14. High temperature heat pump
15. Electric heating boiler
16. Hot water storage
17. Control center

— Electricity
— Hot water
— Cold water reverse flow H₂



Gdje smo mi u toj priči ?
Od ideje do realizacije...



Potencijalni projekti:

- **SPLIT > Zračna luka - Trajektna luka**
- **ZAGREB > Grad - Zračna luka**
- **Dionica M604 (Lička pruga/Oštarije-Split)**
- **Dionica M606/607 (Knin-Zadar/Šibenik)**

Tko sudjeluje:

- **Lokalna, županijska i državna vlast**
- **HŽ Infrastruktura i Putnički prijevoz**
- **Projektanti**
- **Pot. Investitori/ koncesionari**

Otvorene teme:

- **Financiranje (EU fondovi, Koncesija...)**
- **Izrada projektne dokumentacije**
- **Izgradnja punionica H₂**
- **Povezivanje na postojeću / novu mrežu**
- **Upravljanje voznim parkom**
- **Upravljanje infrastrukturom za punjenje**

Contact



Jochen Steinbauer

Director Platform & business development alt. drive systems for regional trains

Werner von Siemens Street 67
91052 Erlangen, Germany

Cell: +49 173 7160103

E-mail: Jochen.Steinbauer@siemens.com

Bruno Gabud

Heinzelova 70a
10000 Zagreb, Hrvatska

Cell: +385 91 6105625

E-mail: bruno.gabud@siemens.com