



## 5<sup>th</sup> IPHE H2igher Educational Rounds

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# Hydrogen and Fuel Cells related activities at DOLOMITECH

### DOLOMITECH s.r.l.

Via da Borgo, 14

38059 - Villa Agnedo (TN), Italy

[info@dolomitech.com](mailto:info@dolomitech.com)

**Paolo DELZANNO** [delzanno@dolomitech.com](mailto:delzanno@dolomitech.com)

**Alessandro GARIGLIO** [alessandro.gariglio@dolomitech.it](mailto:alessandro.gariglio@dolomitech.it)

## Company profile and mission

Foundation: 2010

Location: Trentino, Italy

Background: Dolomitech started its activity with a team of physicists and engineers with many years of personal experience into automotive field

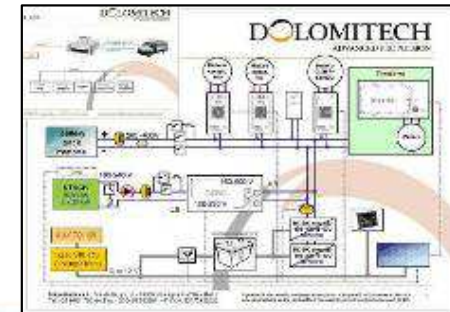
Mission:

- R&D of propulsion systems with low environmental impact
- development of advanced vehicles for niche markets
- scientific consulting and engineering services to support the implementation of alternative energy projects
- feasibility studies and assessments, design and project of plants for production and transformation of renewable energy

## Company know-how

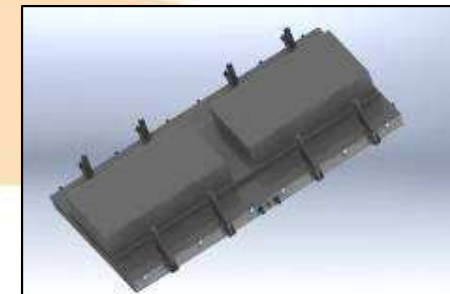
### Fuel Cell Systems analysis and development

- design of hydrogen storage systems
- design and development of auxiliary components and complete Fuel Cell Systems
- bench testing activities and data acquisition



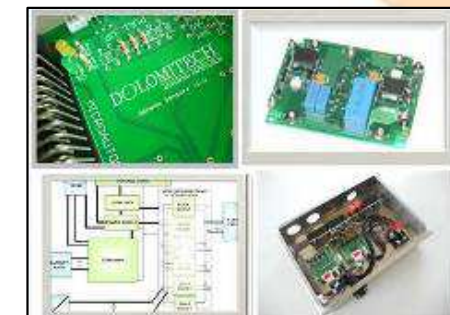
### Characterization of electrochemical converters

- study and characterization of Fuel Cell prototypes and battery package in co-design



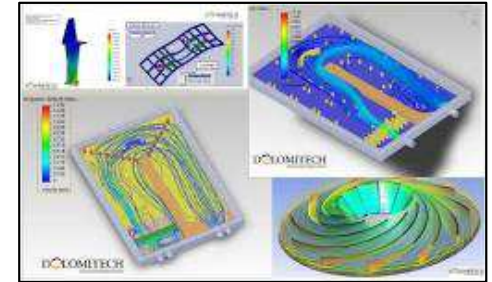
### Characterization of electronic power components

- specifications and design of power converters and electronic components



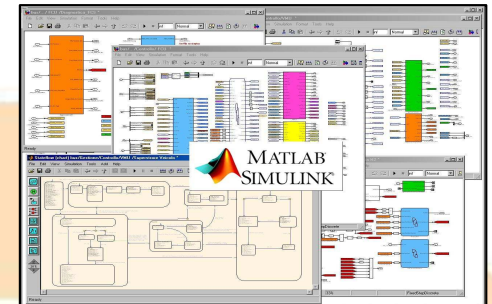
### Fluid dynamics and structural analysis

- fluid dynamic analysis of auxiliary components
- thermal analysis of heating plates
- structural calculation of vehicle body



### Control HW & SW development

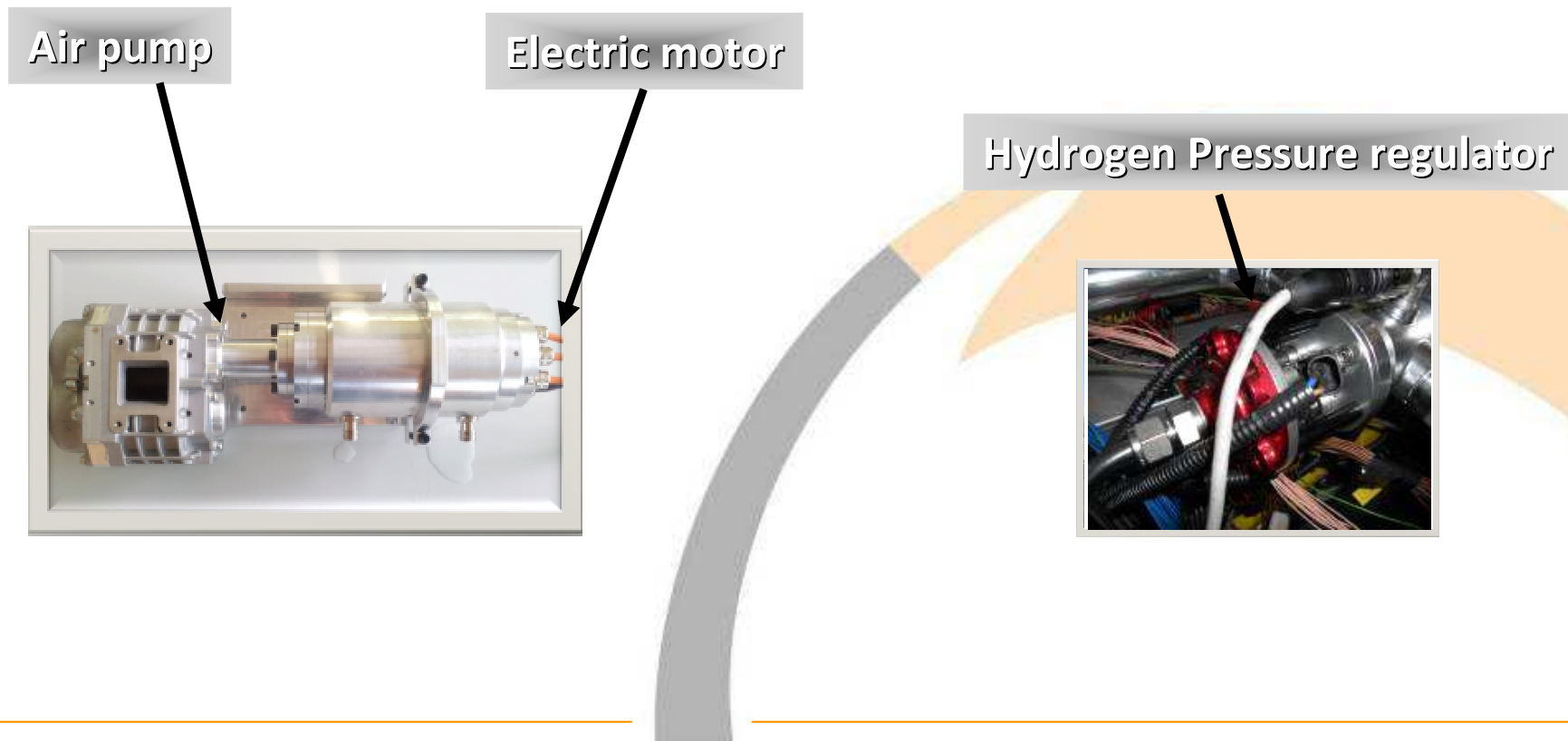
- development in Matlab/Simulink of dynamic models
- simulation of performances and vehicle behavior
- development of control algorithms vehicle code
- definition of control strategies for FCS and vehicle



## Hydrogen & Fuel Cell main activities at Dolomitech

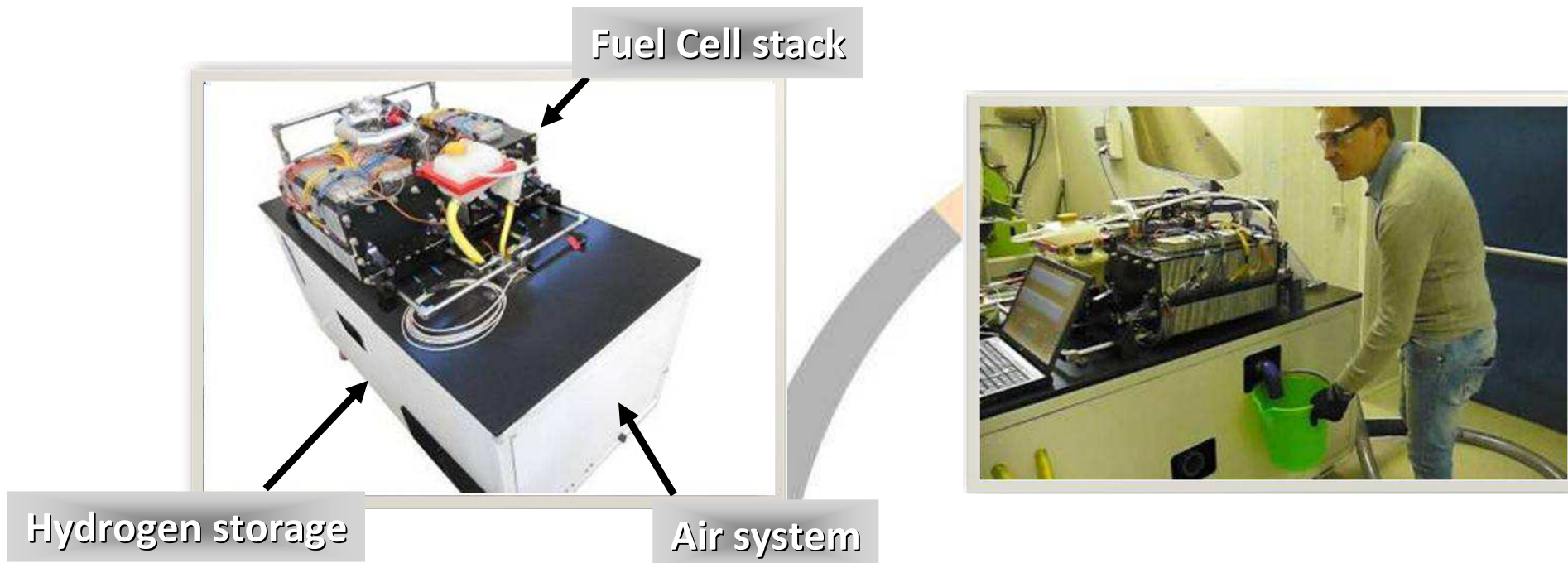
### 2011: Design and development of integrated auxiliary components

Dolomitech developed some auxiliary components for PEM Fuel Cell Systems



## 2011: Experimental FC power generator for SAPIO Group

Within the "PBI - Innovative Bus Platform" project, in collaboration with *Evotech s.r.l.*, a bench has been developed to test a "pure" 30 kW PEM Fuel Cell architecture (without battery package)



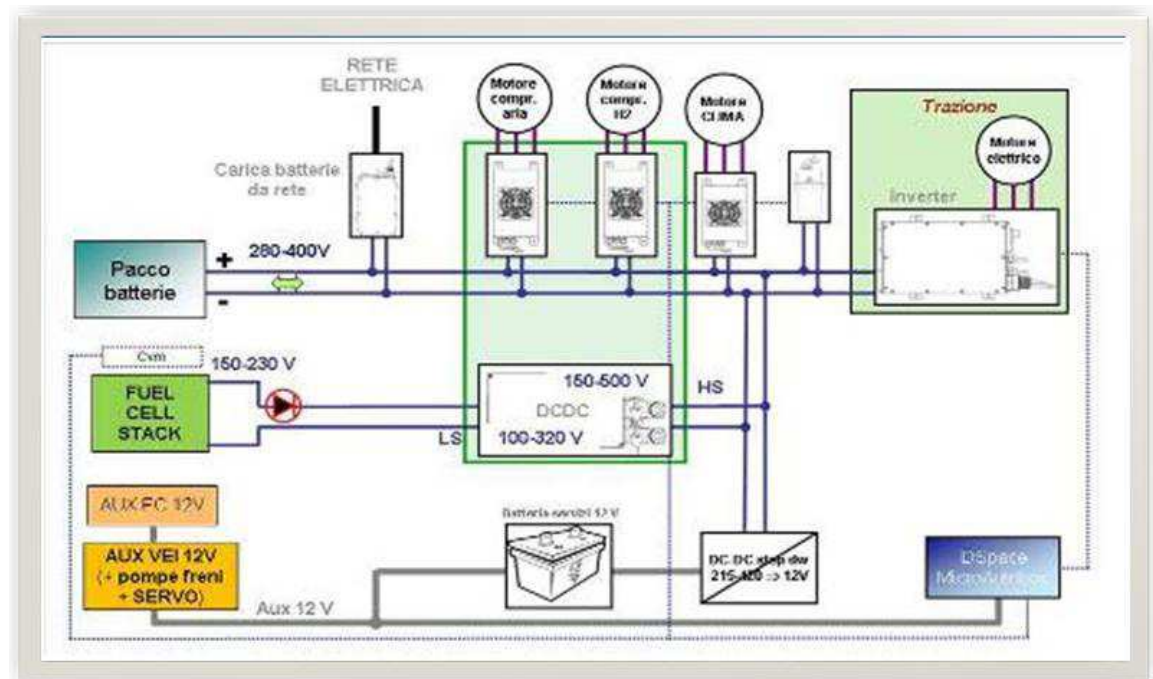
## 2012: FC-MOS (industrial operating machine)

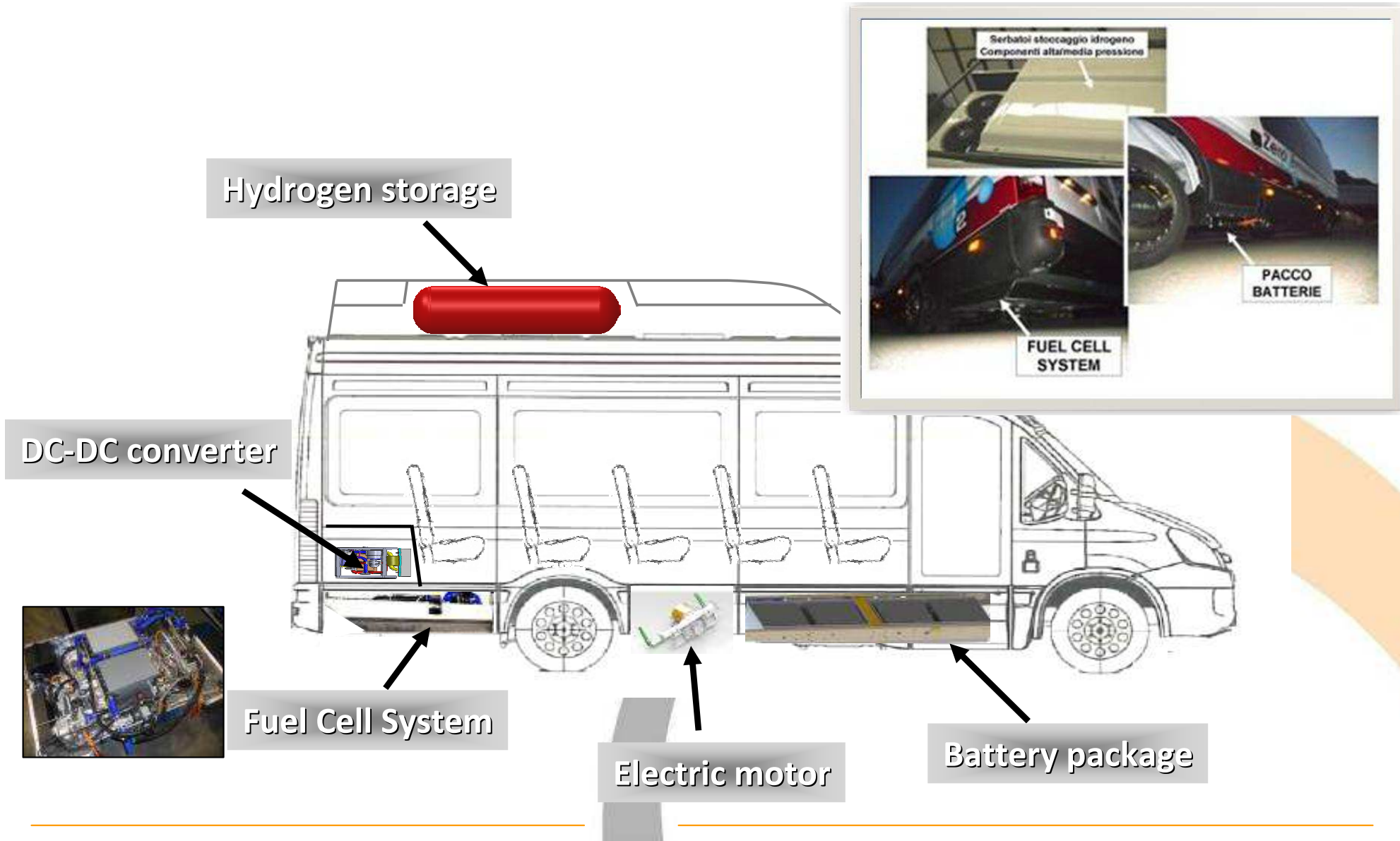
Dolomitech supplied a 10 kW PEM Fuel Cell System to be installed on industrial operating machine as “APU”



## 2013: Fuel Cell Dominant (FCD) Minibus

Dolomitech developed the hybrid “Fuel Cell Dominant” (FCD) Minibus with a 50 kW Nuvera PEM Fuel Cell Generator





Specifications and technical data:

- Vehicle Platform: Iveco Daily (7 mt.)
- Weight (full load): 5600 kg, cat. M3
- Seats: 16 + driver, B class
- Hybrid architecture (Fuel Cell + batteries)
- Electric motor: 3 phases asynchronous (80 kW<sub>max</sub>)
- Fuel Cell: PEM automotive (50 kW<sub>max</sub>)
- Batteries: Lithium-ion
- H<sub>2</sub> storage: 350 bar, vol. 300 lt., H<sub>2</sub> capacity 7 kg
- Electric air conditioning
- “Plug-in” functionalities
- Braking system with kinetic energy recovery
- FCS working at low temperature

Performances:

- Max speed: 80 km/h (limited)
- Acceleration 0-50 km/h: 6,6 s
- Max slope: 20%
- Refueling time: < 10 min
- Range: 250 km



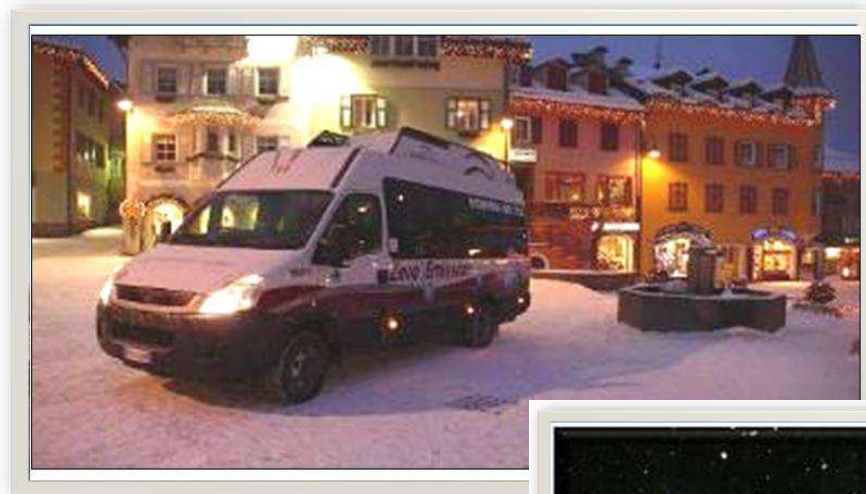
Fuel Cell Dominant Minibus has a FC Generator working at low temperature and it is suitable for mountain roads

## PAT & TT: first customers of FCD Minibuses

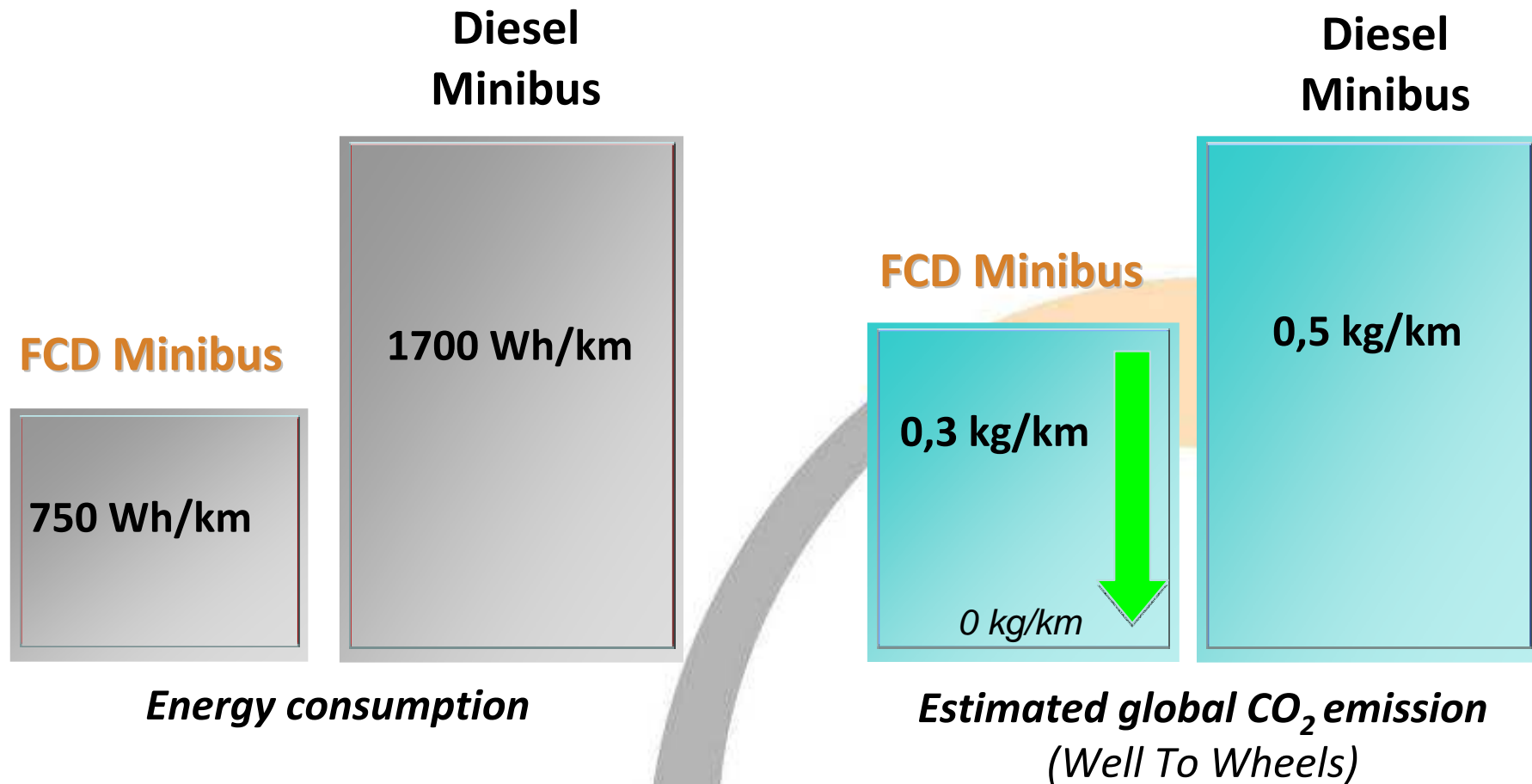
- Provincia Autonoma di Trento (PAT) launched the “Hydrogen Project for a sustainable mobility”.
- Trentino Trasporti (TT) in 2013 acquired two FCD minibuses from Dolomitech and developed with Linde Gas an hydrogen fueling station in “Val di Fiemme”.



The minibus have been used as shuttles for the transport of the industry “media” for the first time during the 2013 Nordic World Ski Championships in Val di Fiemme. Then minibuses have been used on suburban lines along Val di Fiemme, Val di Fassa and Dolomites passes.



## Comparison FCD Minibus and diesel Minibus



## Possible future developments at Dolomitech

### Hybrid Fuel Cell Bus urban/suburban

- Platform: 9.5 m.;
- Passengers: 18 seated + 40 standing;
- Weight (fully loaded): 14 tons;
- Battery: Lithium Ion;
- Hybrid architecture (Fuel Cell + batteries);
- Electric motor: 3 phase asynchronous AC ( $kW_{max}$  140);
- Type of Fuel Cell: PEM ( $120 kW_{max}$ );
- H2 storage: carbon fiber @ 350 bar.



### Hybrid Fuel Cell vehicles

- Power (Fuel Cell + batteries): 100 kW;
- Passengers: 5;
- Max speed : 140Km/h;
- Acceleration 0-100 km/h: <12 s;
- H2 storage: carbon fiber @ 350-700 bar;
- Range (urban): 200 km.



## Marine applications

### Generation of electric power for propulsion

The Fuel Cell Generator on board is used for propulsion.



### Generation of electric power for auxiliary systems

The Fuel Cell Generator is used only to cover the needs of auxiliary power, excluding the propulsion.



## Heavy industry applications

Transformation of the conventional diesel-hydraulic propulsion of a operating machine into Fuel Cell powered Generator.



**Thank you for your attention!**

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Cel. 3357235001  
[delzanno@dolomitech.com](mailto:delzanno@dolomitech.com)

**Alessandro GARIGLIO**

[alessandro.gariglio@dolomitech.it](mailto:alessandro.gariglio@dolomitech.it)