

# STATUS MOBILE FCS @PONE WELS

ERFA MOBILITÄT WIEN 2022, NOV. 28TH

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PLASTIC OMNIUM

# Plastic Omnium - Driving A New Generation Of Mobility



2021 ECO. REVENUE  
\*  
**€9 bn**



**150** PLANTS  
**43** R&D CENTERS



**37,000** EMPLOYEES  
IN **25** COUNTRIES



**93** CUSTOMERS

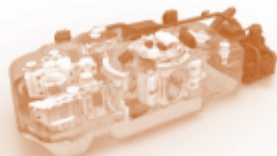


## CONNECTIVITY & FUNCTIONS INTEGRATION

### INTELLIGENT EXTERIOR SYSTEMS (IES)

Smart exterior systems improving energy performance

**#1** WORLDWIDE  
**15%** MARKET SHARE  
**21m** BUMPERS/YEAR



## CO<sub>2</sub> REDUCTION

### CLEAN ENERGY SYSTEMS (CES)

Onboard energy storage, emission reduction systems, battery systems, power electronics & electronics

**#1** WORLDWIDE  
**21%** MARKET SHARE  
**18m** TANKS/YEAR

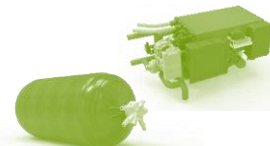


## MODULARIZATION & CUSTOMIZATION

### HBPO

Majority shareholder Development, assembly and just-in-sequence logistics of customized and ready-to- assemble modules

**#1** WORLDWIDE  
**18%** MARKET SHARE  
**5m** FEM/YEAR



## HYDROGEN SYSTEMS

### NEW ENERGIES

Design and manufacturing of high-pressure H<sub>2</sub> vessels, fuel cell stacks and fuel cell systems

Target: **€3,0 Mds**  
of eco. revenue in 2030

Target: **#1**  
WORLDWIDE  
in H<sub>2</sub> mobility in 2030



## LIGHTING

### LIGHTING

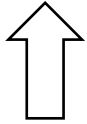
High-performance lighting solutions, greater design freedom, advanced services and driver assistance systems.

Among the **Top 10** automotive lighting suppliers

# PO New Energies FCS Capacity Ramp-up (since 2017)



Fuel Cell System  
R&D center



2017 Acquisition of



Stack module  
R&D center and  
Production site



JV  
EK-PO (60:40)



Fuel Cell System  
R&D center and  
Production site



Acquisition of  
EKAT



2020 Cooperation with  
ElringKlinger

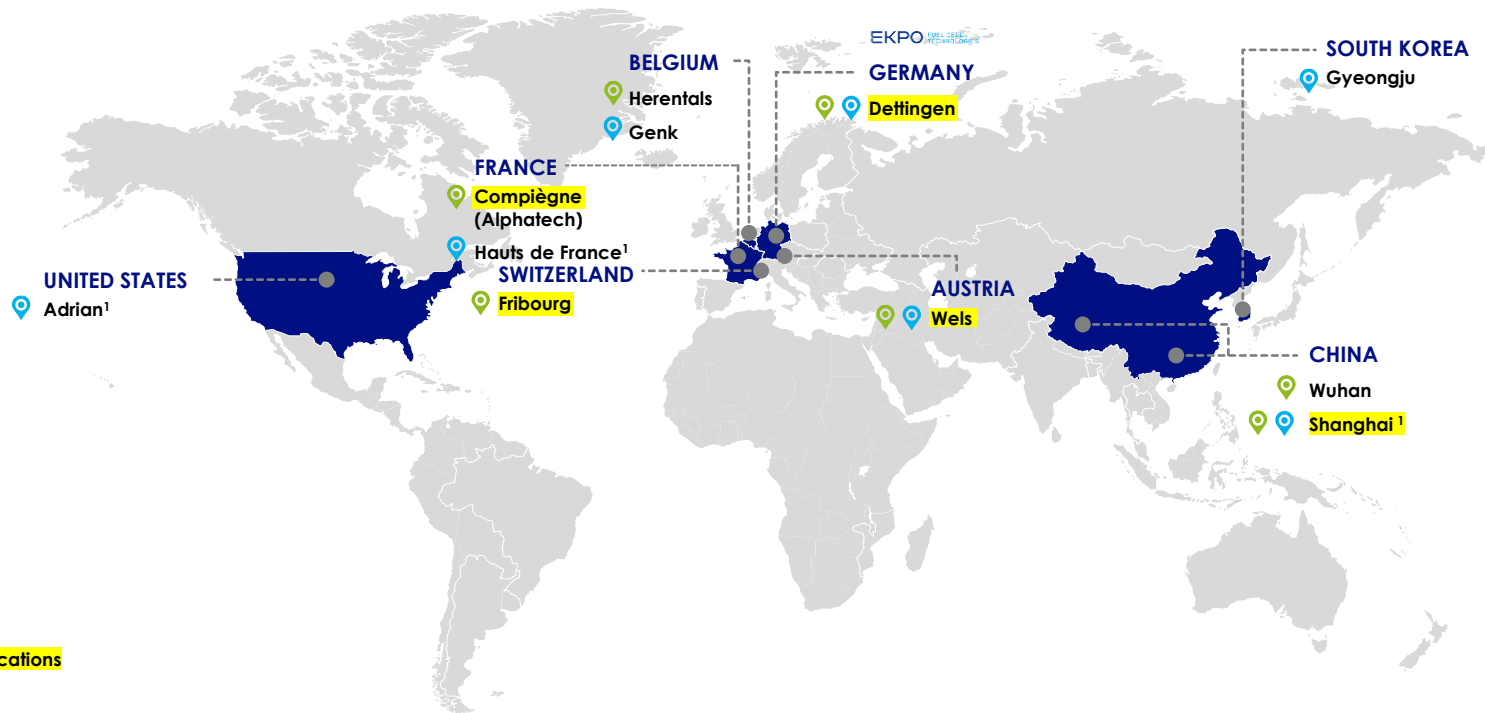


Fuel Cell System R&D



2023  
Localisation  
in Asia

# A GLOBAL PRESENCE



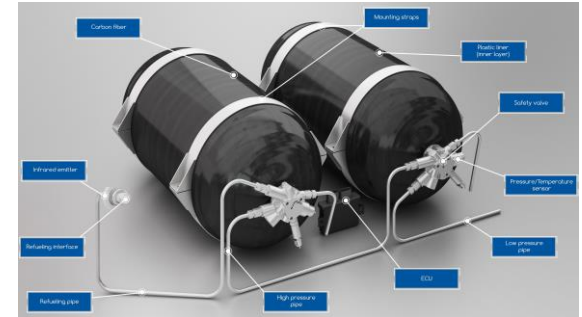
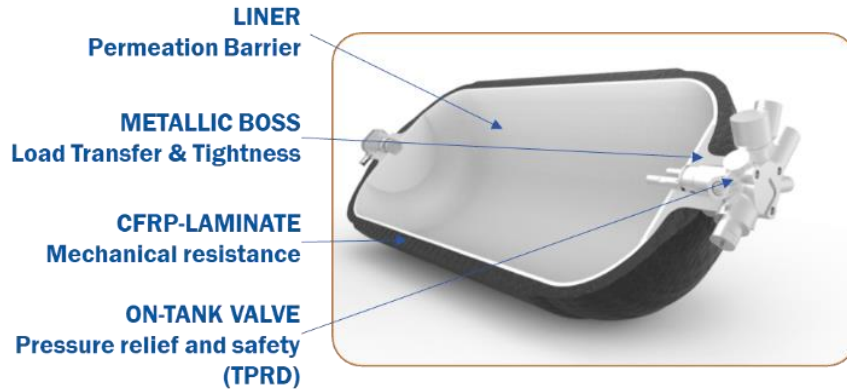
FCS Locations

**7** Plants & pilot lines

**7** R&D/test centers

**350** Employees<sup>2</sup>

# PO Hydrogen storage systems



- Multi layer structure
- On tank valve module for pressure relief
- **UNECE R134 certification for 700 bar high pressure vessel:**
  - No leakage or burst of the vessel under fire for a duration of at least 10 minutes
  - Burst pressure > 1575 bar (= 2.25 times nominal pressure)
  - Pressure cycle durability : @ 875 bar
    - no leakage before 11 000 cycles
    - no burst before 22 000 cycles



# HIGH PRESSURE VESSELS PRODUCTION LINE



**LINER  
MANUFACTURING**



**BOSS ASSEMBLY**



**WINDING**

Filament winding  
Curing  
Fire coating & Proof testing



**FINISHING**

Shock absorber assembly  
OTV/EP assembly & N2 inerting  
Gas leak test



**SYSTEM ASSEMBLY**

# EKPO Stack Portfolio



**NM5evo**  
max. 335 Cells  
76kW @2.5bar  
max. 380A  
**3.6 kW/l**

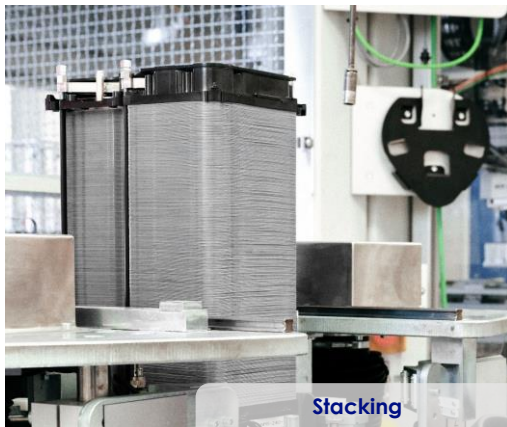
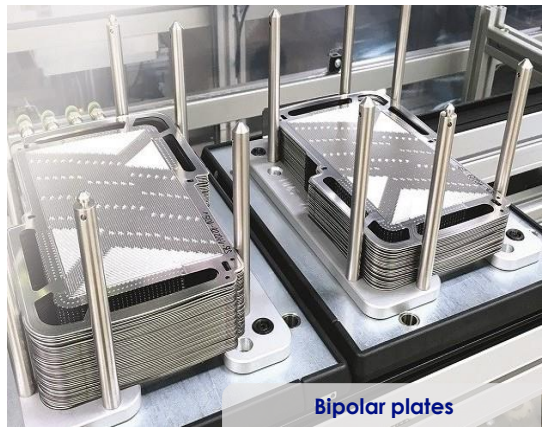


**NM12**  
max. 359 Cells  
123kW @2.5bar  
max. 570 A  
**4.2 kW/l**



**NM12-TWIN**  
2x299 Cells  
205kW @2.5bar  
max. 570 A  
**4.0 kW/l**

# EKPO – FUEL CELL STACK ASSEMBLY LINE



## PRE PROCESS

Membranes & bipolar plates  
manufacturing  
Plastic component  
injection molding



## PRE ASSEMBLY

Cell assembly  
End plate & media  
module assembly



## STACK ASSEMBLY











Automated cells  
stacking & stack  
compression

## FINISHING

End of Line Testing



# FCM Product Range & Key Characteristics

<p><b>Target Application</b></p>	 <p>Truck, Bus, LDV, Genset, ...</p>	 <p>LDV</p>	 <p>Heavy Duty Truck, LDV, ...</p>
<p><b>FCM Platform</b></p> <p>Power BOL (EOL) kW          HV / LV System Voltage V          Lifetime (Target) h          Efficiency @ rated Power %          L/W/H mm          Weight kg          Operating Temp. °C</p>	<p><b>FCM50</b></p>  <p>50 (43)          450 &amp; 850 / 24V          20.000          47 (max 56)          1000/700/330          230          -25 to +45</p>	<p><b>FCM65/80 (-100)</b></p>  <p>65/80 (tbd)          tbd          8.000          Tbd          Tbd          Tbd          -30 to +45</p>	<p><b>FCM150</b></p>  <p>164 (150) kW          850 / 24V          25.000          48 (max 60 excl DCDC)          1020 x 700 x 680 mm          &lt;350          -30 to +45</p>
<p><b>FC Stack</b></p>	 <p><b>2x NM5evo</b>          215 Cells          2x28kW @1.3bar          max. 250 A</p>	 <p><b>NM5evo</b>          335 Cells          76kW @2.5bar          max. 380A</p>  <p><b>NM12</b>          359 Cells          123kW @2.5bar          max. 570 A</p>	 <p><b>NM12-TWIN</b>          2x299 Cells          205kW @2.5bar          max. 570 A</p>

# PO FCM USP

**EKPO stack** – vertical integration

**Highest power density** (volume & weight)

**PO control software and system controller**

DC/DC integration competences

Simple vehicle integration (black box & standard interface)

Safety function integration

Customer support & automotive experience

PO's industrialization expertise



# PONE Wels FCM Engineering & Production



## Vehicle Engineering

Fuel Cell System  
Requirements & Safety  
Vehicle Integration



## FCM Engineering

BOP Components  
Specification & Testing  
FCCU Software Developm.  
Compliance Eng. &  
Product Certification



## FCM Production

Product Assembly  
End-of-Line Testing



## Customer Support

Service &  
Maintenance  
Remote Monitoring



# FCM Status & Outlook

## Engineering



Wels (AT)  
Fribourg (CH)  
Compiègne (FR)  
Dettingen (DE)  
Shanghai (CN)

## Production



2023: Pilot Production  
line 1800 u/a  
2027: Mass Production  
>10.000u/a  
(capacity)

## Application



Gensets, Rail, Marine, ...



- **Objectives:** 16 FC Trucks (26t/44t) end-customer demonstration including HRS.
- **Results:** >2 mio km day-to-day driving of FC trucks providing data base for EU business case.

Coordination, dissemination, analysis

elementenergy  
an E.ON Group company

Hydrogen Europe

RU

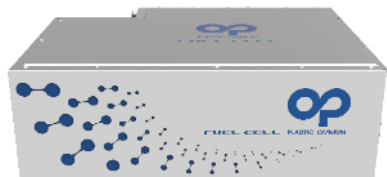
sphera

H

	Fuel cell supplier	HRS provider	Truck manufacturer	Shipper
				<p>Final customers</p> <p>Shippers</p>

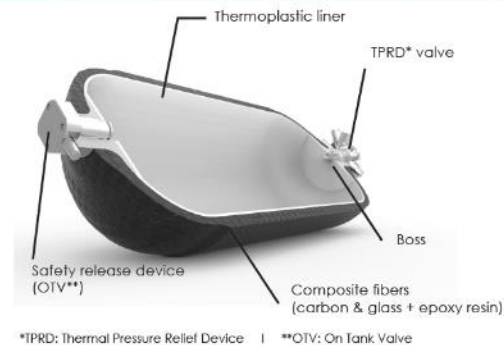
## VDL Prototype Truck 44to

2x FCM50 (A-Sample), 40kg/350bar H<sub>2</sub> Tank System, 210kWh Battery



## Fuel Cell Module FCM50

- Power: 50kW, 520 - 850V
- Stack: 2x NM5evo (EKPO)
- Low-Pressure Cathode
- Integrated DC-DC
- L/W/H: 1000 x 700x 330 mm
- Weight: 230 kg
- H2 Consumption: 0,9 g/s
- Efficiency (peak): 56%
- Durability: 20.000h (target)



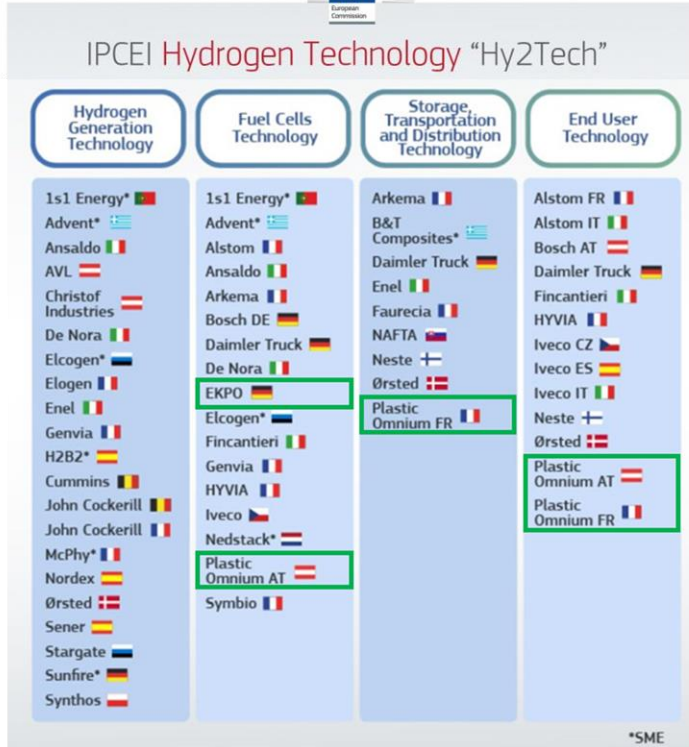
## Hydrogen Storage System HPV-S-7-350

- 7x Vessel Type IV
- System H2 Weight: 39,8kg
- Vessel Working Pressure: 350bar
- System Gravimetric Efficiency: 3.16%
- L/W/D: 3120/2330/1460
- System Weight: 1258kg
- Refueling Time: ca. 10min
- Vessel Certification EC79
- Certified Operating Temperature -40 to +85°C



# IPCEI Hy2Tech

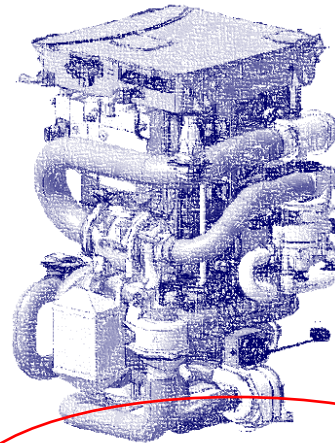
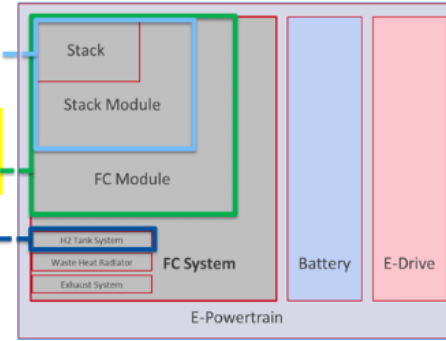
Hy2Tech: €5.4 billion public investment which will unlock €8.8 billion private investment



IPCEI EKPO  
Germany

IPCEI PO Wels  
Austria

IPCEI PO  
France

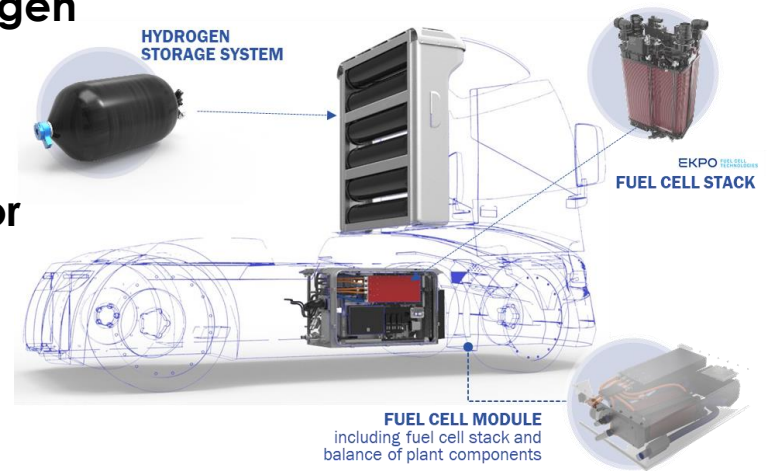


- Development of FCM150 for heavy-duty applications
- Innovations on components, control strategy & cost reduction
- High volume production process development
- Lead customer vehicle integration & test



# Summary & Outlook

- **PO Wels** is operating in an **industrial network of leading automotive suppliers** and fuel cell technology providers
- PO is targeting a **one stop shop offer of hydrogen technologies** for the electric mobility market
- PO Wels is focusing on FCM product development and production and is **looking for cooperation for its European value chain**







PLASTIC OMNIUM

## Contacts

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