FUEL CELLS AND HYDROGEN
JOINT UNDERTAKING

Research activities for transport applications: MEAs, components, stacks and subsystems, HRS

Pietro Caloprisco

PRD 2018

15 November 2018

Agenda

PROGRAMME REVIEW DAYS 2018
FUEL CELLS AND HYDROGEN JOINT UNDERTAKING
14 - 15 NOVEMBER, BRUSSELS

	TRIALS AND DEPLOYMENT OF FUEL CELL APPLICATION - TRANSPORT	NEXT GENERATION OF PRODUCTS - TRANSPORT	TRIALS AND DEPLOYMENT OF FUEL CELL APPLICATION - ENERGY	NEXT GENERATION OF PRODUCTS - ENERGY	HYDROGEN FOR SECTORIAL INTEGRATION	SUPPORT FOR MARKET UPTAKE
09:00 - 09:20 09:20 - 09:40	H2ME HAWL HYFIVE HYLIFT-EUROPE HYTRANSIT JIVE SWARM H2ME 2	AUTO-STACK CORE COBRA COSMHYC DIGIMAN Fit-4-AMandA H2REF HYCARUS INLINE INN-BALANCE INSPIRE MARANDA NANO-CAT SMARTCAT VOLUMETRIQ COMPASS Giantleap	ALKAMMONIA AUTORE CH2P CLEARGEN DEMO D2SERVICE DEMCOPEM-2MW DEMOSOFC ENE.FIELD ONSITE PACE PEMBEYOND POWER-UP STAGE-SOFC	Cell3Ditor DIAMOND ENDURANCE FLUIDCELL HEALTH-CODE HEATSTACK INSIGHT MATISSE NELLHI PROSOFC qSOFC SCORED 2:0 SECOND ACT SOSLeM INNO-SOFC	BIONICO BIOROBURplus Demo4Grid DON QUICHOTE Eco ELECTRA ELY4OFF ELYntegration GrInHy H2Future HELMETH HPEM2GAS HyBalance HYDROSOL-PLANT HyGrid INSIDE MEGASTACK PECDEMO PECSYS QualyGridS SElySOs SOPHIA BIG HIT MEMPHYS	HYACINTH HYCORA HyLAW HYPACTOR HySEA HYTECHCYCLING KNOWHY NET-Tools SOCTESOA
09:40 - 10:00 10:00 - 10:20						
10:20 - 10:40 10:40 - 11:00						

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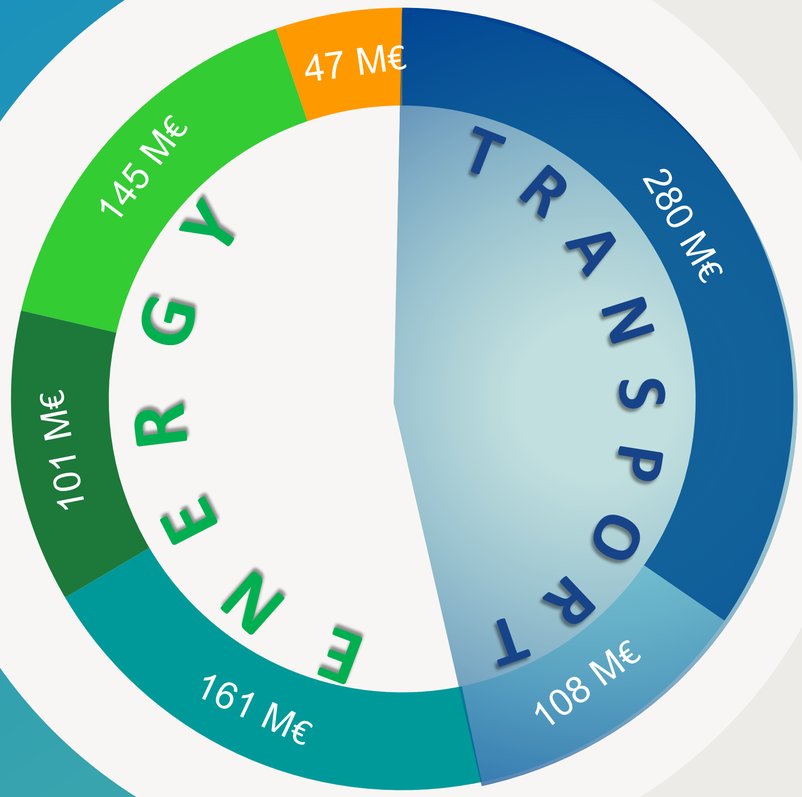
Next Generation of products - Transport

Related FCH JU objectives

Reduce fuel cell system costs for transport applications while increasing lifetime

Reduce use of critical raw materials



Transport - Total

42 %

388 M€

60 Projects

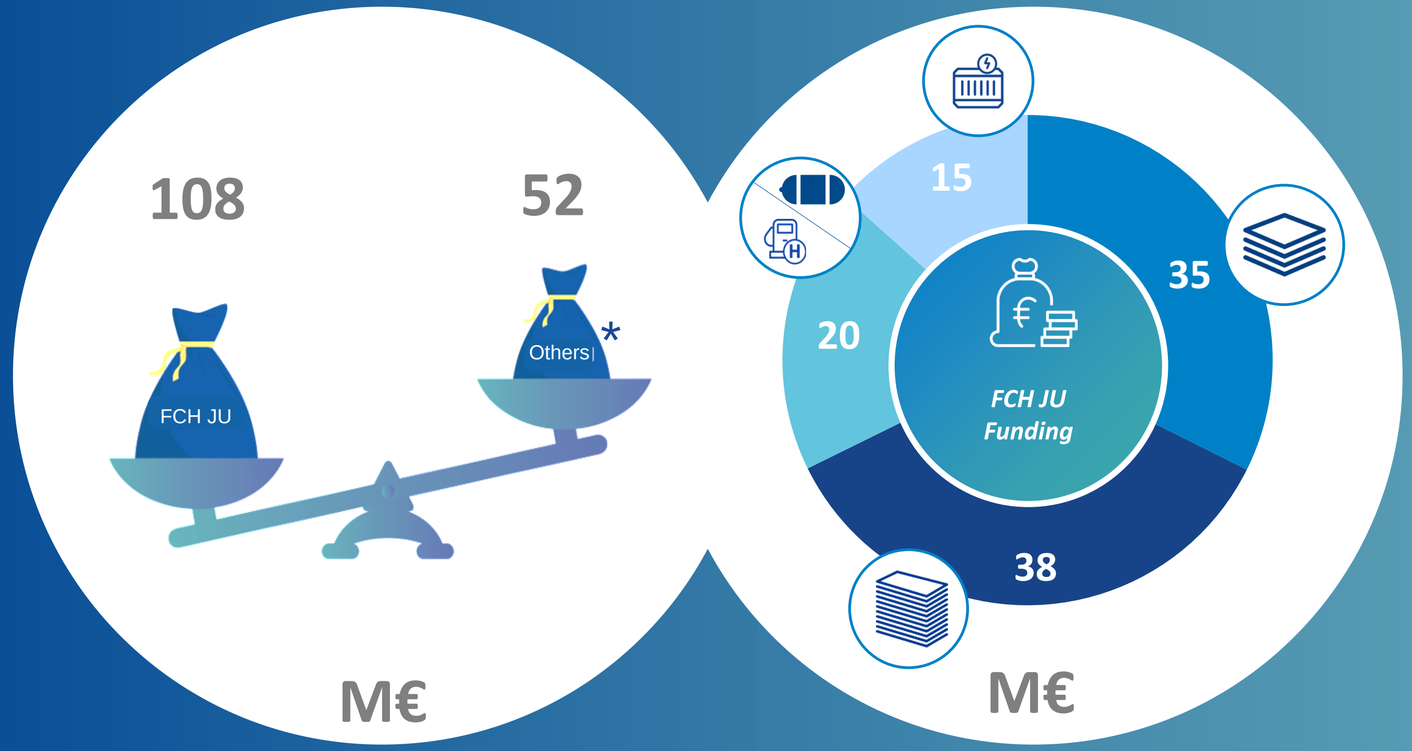
Next Generation products

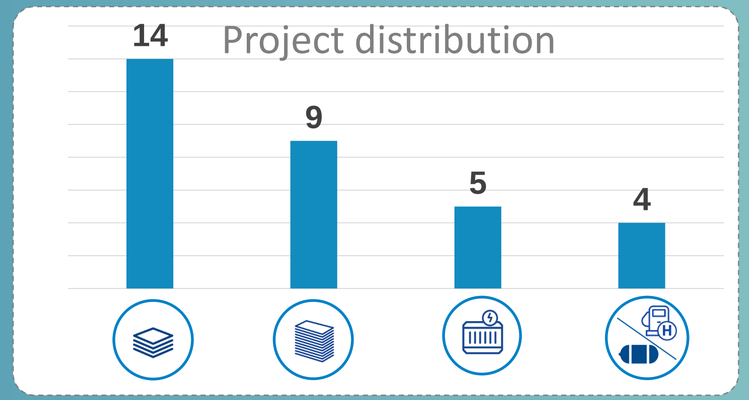
108 M€

32 Projects

Towards competitiveness

32 projects – 160 M€





MEA, catalysts, GDL, BPP, materials

Stack modelling, development, manufacturing, next generation

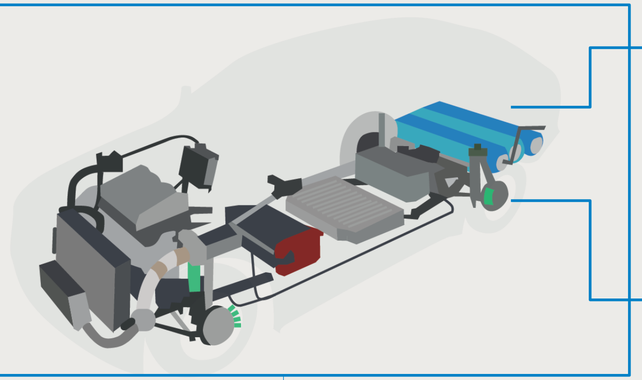
Auxiliary power units

Hydrogen refueling station, On-board H2 storage

** Other resources including private and national/regional funding*

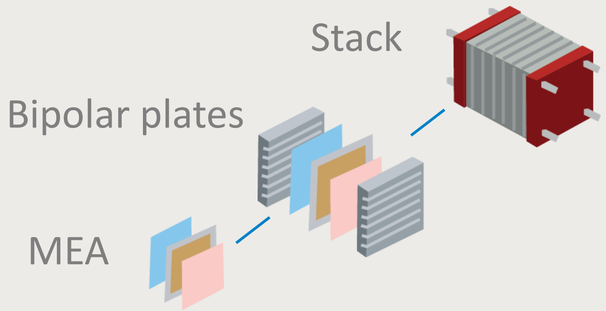
FCH JU support to all FCEV research aspects

Supporting the competitiveness of the technology and the EU supply chain

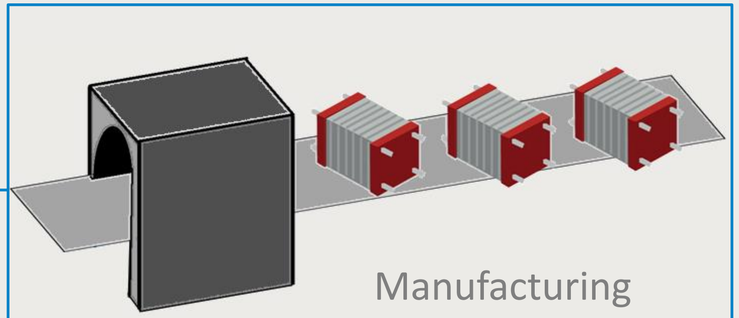


Tanks design optimisation and development of components

Optimised H_2 compression and storage systems



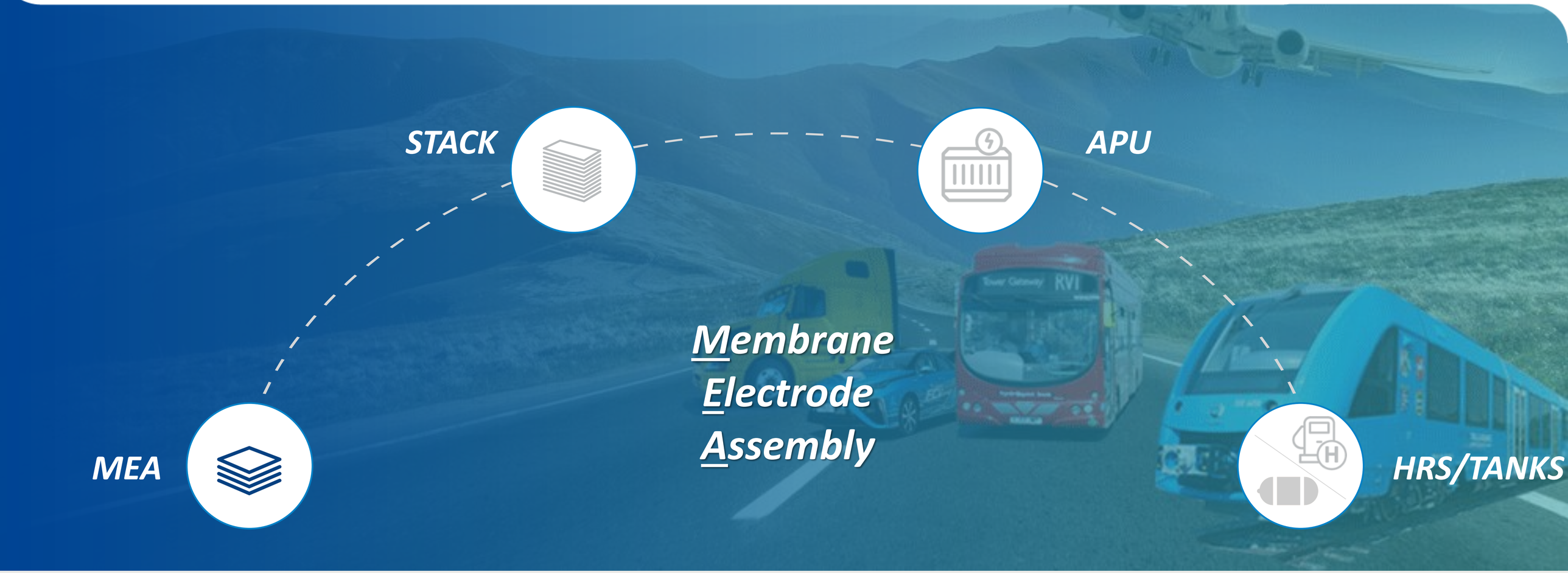
Low-costs and high-performance FC systems



Lean and quality manufacturing at volume

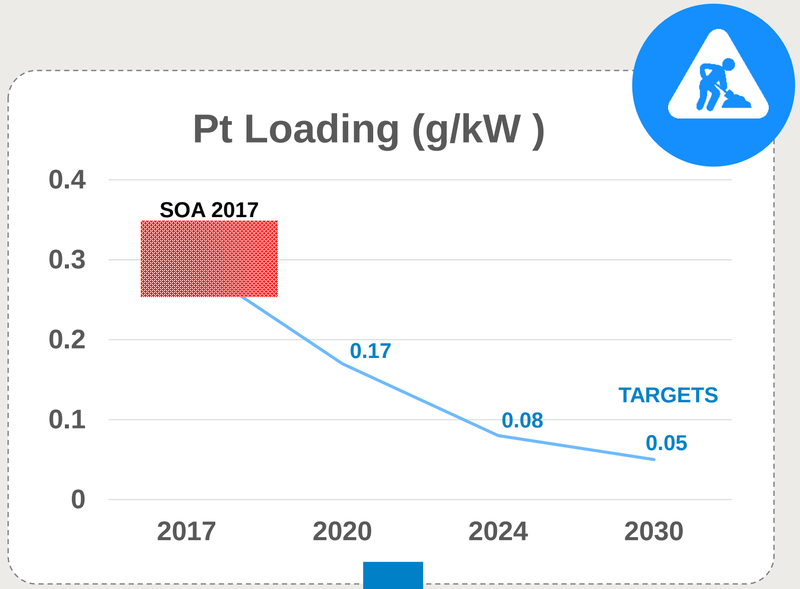
- From basic research to validation and testing
- From materials to manufacturing
- Very strong industrial and academic cooperation
- Connected projects

Transport Portfolio: Research & Innovation

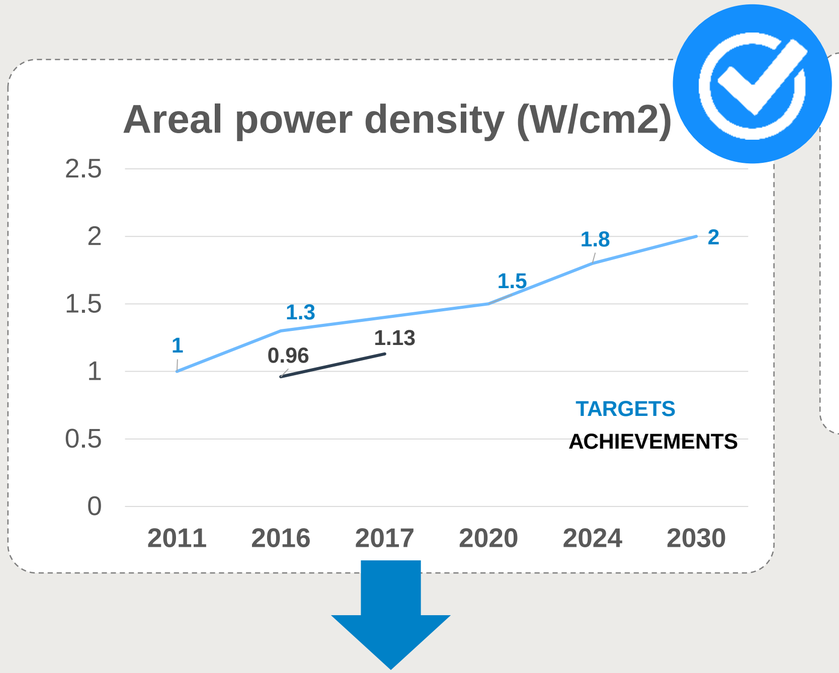


Delivering durable and competitive building blocks for H2 mobility

Reducing use of critical materials remains a priority



Towards next generation of PEMFC: Non-PGM catalysts



18% improvement compared to previous year

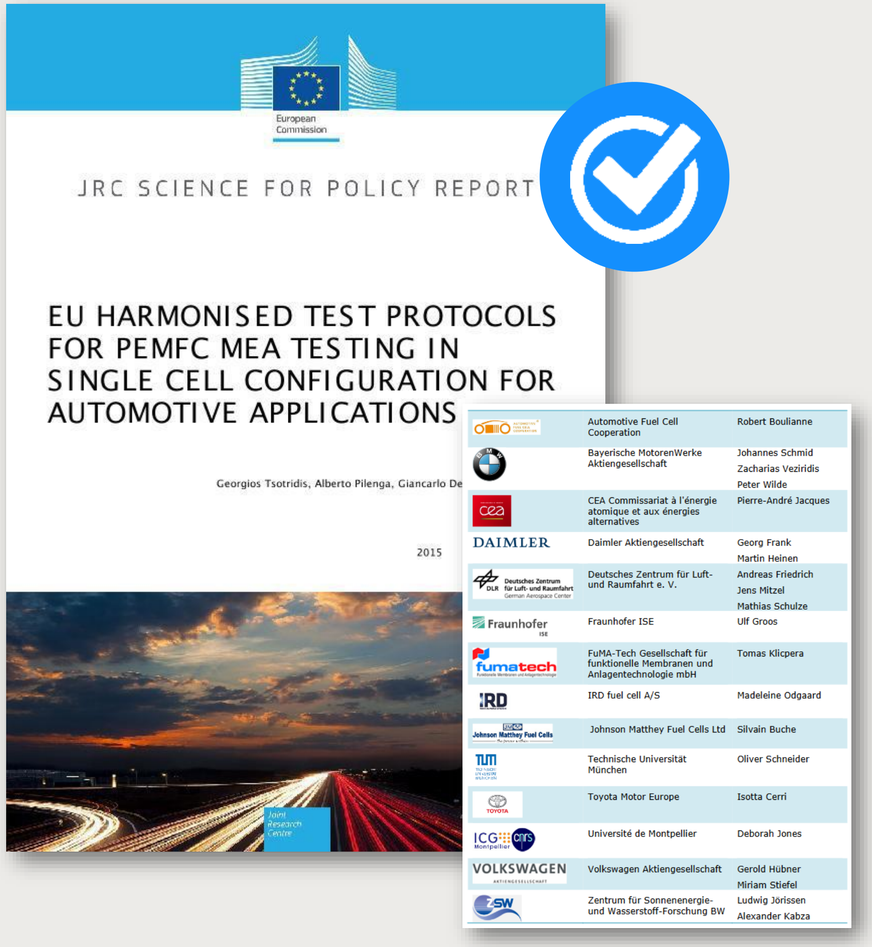
Indicator	*2017*
Durability	> 5.000 h

No changes to be reported compared to 2016

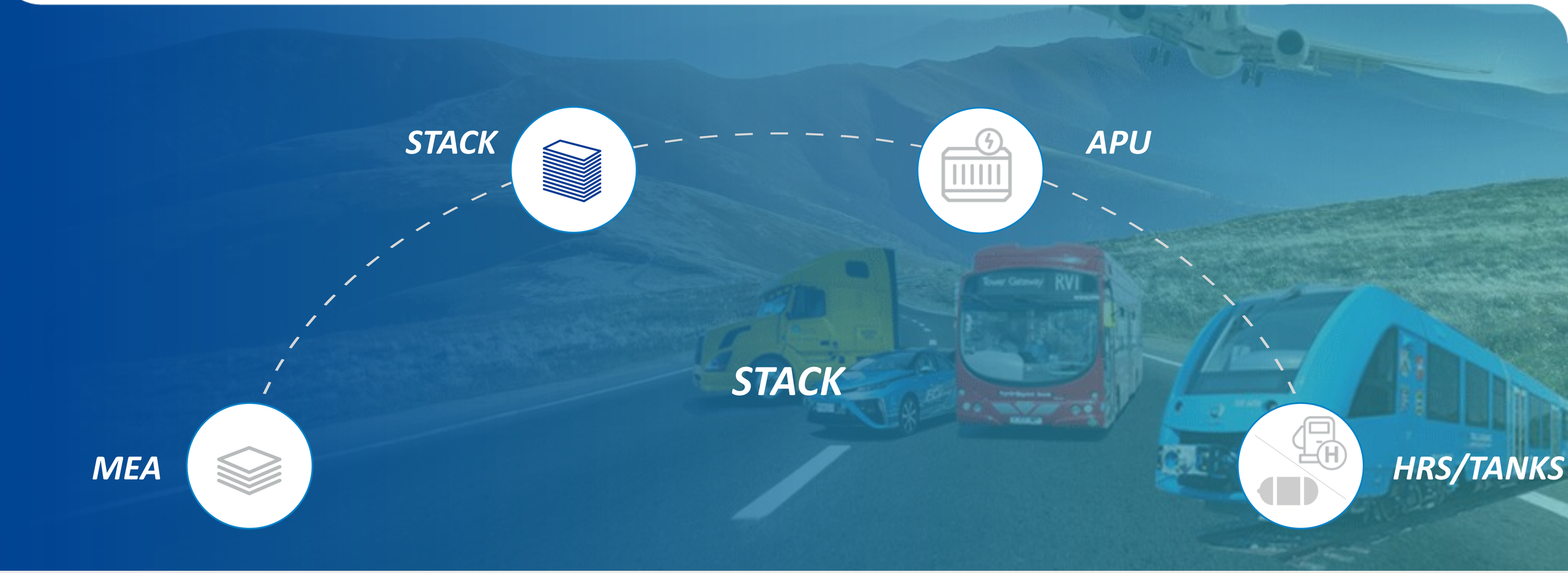
All results yet to be achieved simultaneously in a single project

Other activities

Harmonisation of testing procedures



Transport Portfolio: Research & Innovation

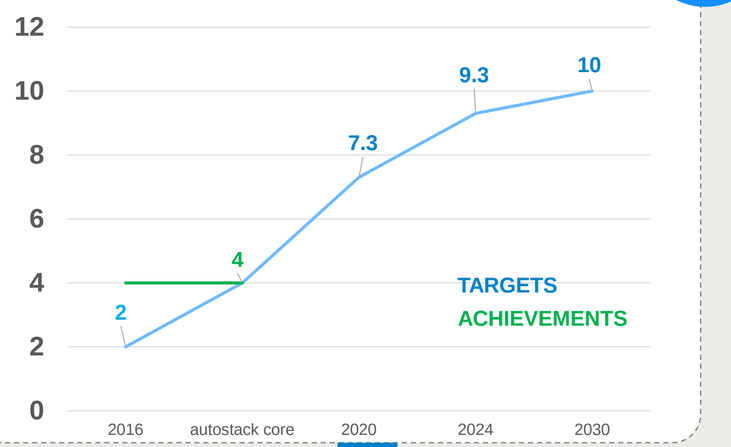


Supporting the next generation of EU stacks

Increased performance

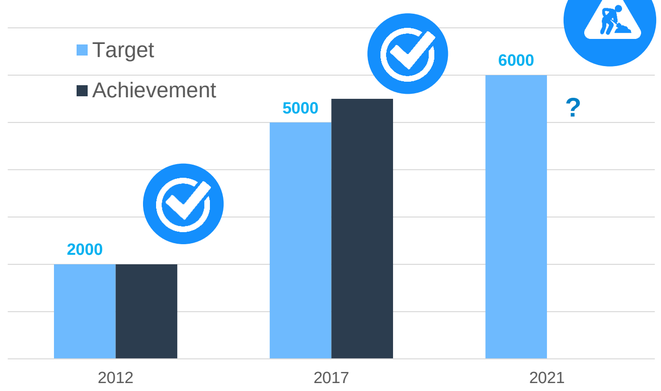
Performance

Volumetric power density (kW/l)



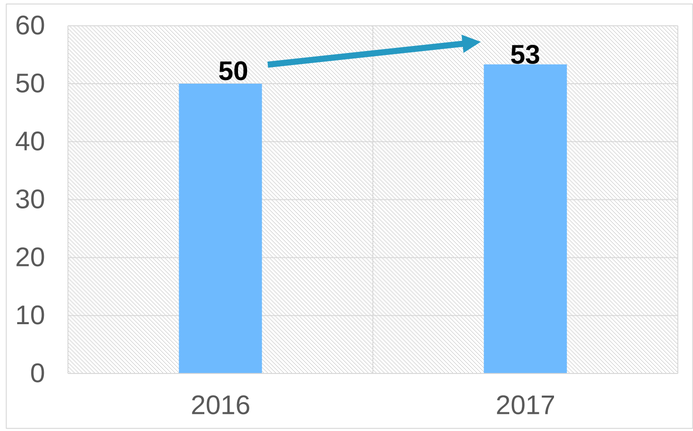
On the right path

Durability (h)



6.000 h stack durability next goal

Stack Electrical Efficiency (%)



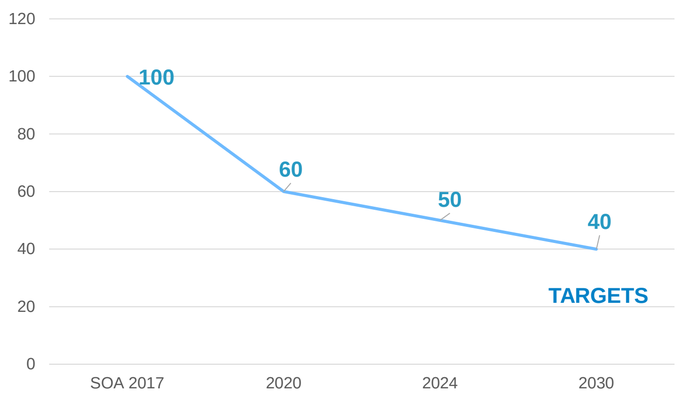
Improvement in efficiency compared to previous year.

Supporting the next generation of EU stacks

Competitive production at mass scale

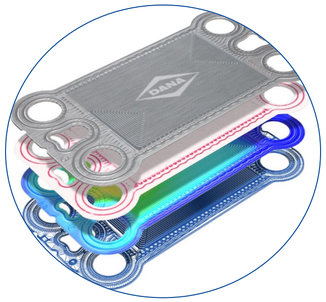
Costs

FC system cost €/kW



Contributing to FC system cost reduction

Bipolar plate



Nominee Innovation award

Manufacturing costs – 85%

PEMFC stack and MEA manufacturing workshop; volume & quality challenges workshop, 11 October 2018, Brussels

Volume, quality and cost

FUEL CELLS AND HYDROGEN JOINT UNDERTAKING

PEMFC stack and MEA manufacturing workshop; volume & quality challenges workshop, 11 October 2018, Brussels

Agenda

08:30 - 09:00	Welcome coffee
09:00 - 10.40	INTRODUCTION

Welcome & introductory remarks, Mrs. Mirela Atanasiu, Head of Operation and Communication

- Overview of the FCH JU manufacturing activities, Pietro Caloprisco, Project officer, FCH JU
- Victoria Petrova, adviser DG GROW, directorate Industrial Transformation and Advanced Value Chains
- Overview of the European FC supply chain, David Hart, director, E4tech
- Optimisation of the manufacturing value chain, Alicia Arce Rubio, Head of Control Systems Lab-R&D Project Manager, AYESA

10:40 - 11:10	Coffee break
11:10 - 12.30	SESSION I - OEMs vision & requirements

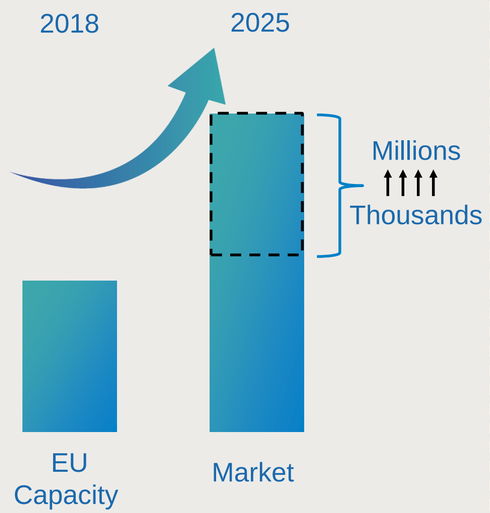
- Toyota Europe, Isotta Cerri, General Manager
- BMW, Thomas Mertens, Head of Technology Development and Prototyping Battery and Fuel Cell
- Viessmann, Volker Nerlich, Project manager PACE in the Viessmann Group
- OEM tbc

12:30 - 13:30	Lunch break
13:30 - 15.10	SESSION II - Stack; manufacturing processes & quality techniques - *presentations and panel discussion*

- Elringklinger, Jurgen Kraft, Head of PEM Fuel Cell Development (presentation and moderation of the panel)
- Panel discussion
  - PowerCell, Thomas Tingelöf, CTO
  - Proton Motor, Thomas Wannemacher, Team Leader Mgt & Doc
  - Intelligent Energy, Peart Richard, Head of Manufacturing Development
  - Borit, Joachim Kroemer, Manager Marketing and Sales
- Open discussion

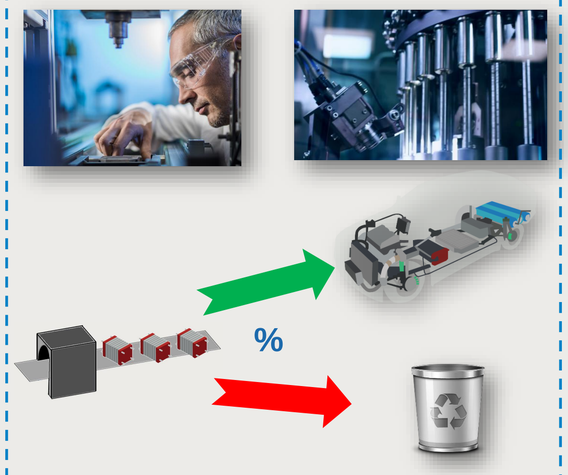
15:00 - 15:20	Coffee break

Capacity



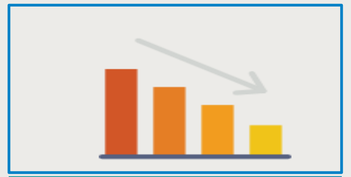
- Design for manufacturability
- Optimisation of the assembly processes
- Innovation & disruption

Quality



- Irregularities & defects
- “Big Data”
- Inline quality controls
- 100% testing > samples

Cost



Cost FC system

100€/kW

- Modularity & scalability
- Materials research
- Long term purchase contracts

SLIDO Question

Use your smartphone; go to www.sli.do and insert the code #PRD2018

Q: In order to build 100.000 FCEVs each year, how many cells have to be produced on yearly basis ?

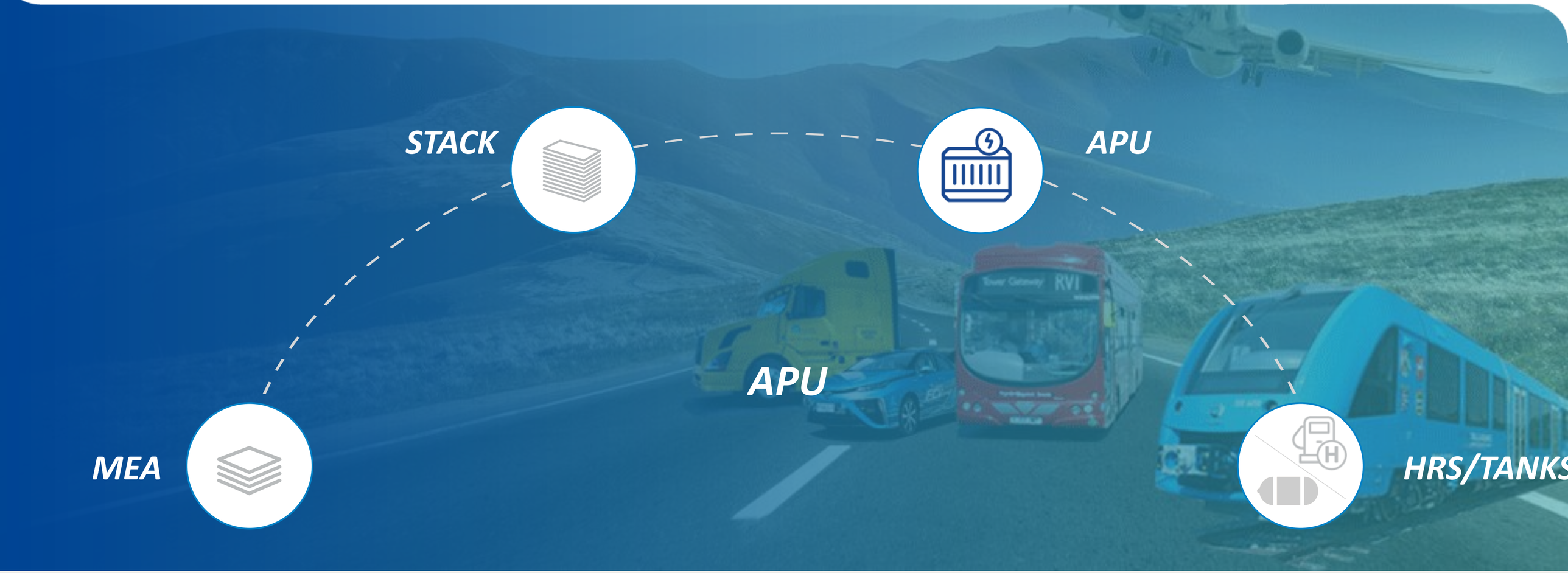
A1: ~ 40.000

A2: ~ 400.000

A3: ~ 4.000.000

A4: ~ 40.000.000

Transport Portfolio: Research & Innovation



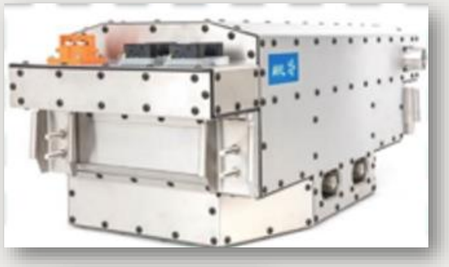
Auxiliary Power Units

Road, water & air

Shared goals

- Stack durability
- Efficiency
- Weight & Dimension
- Cost

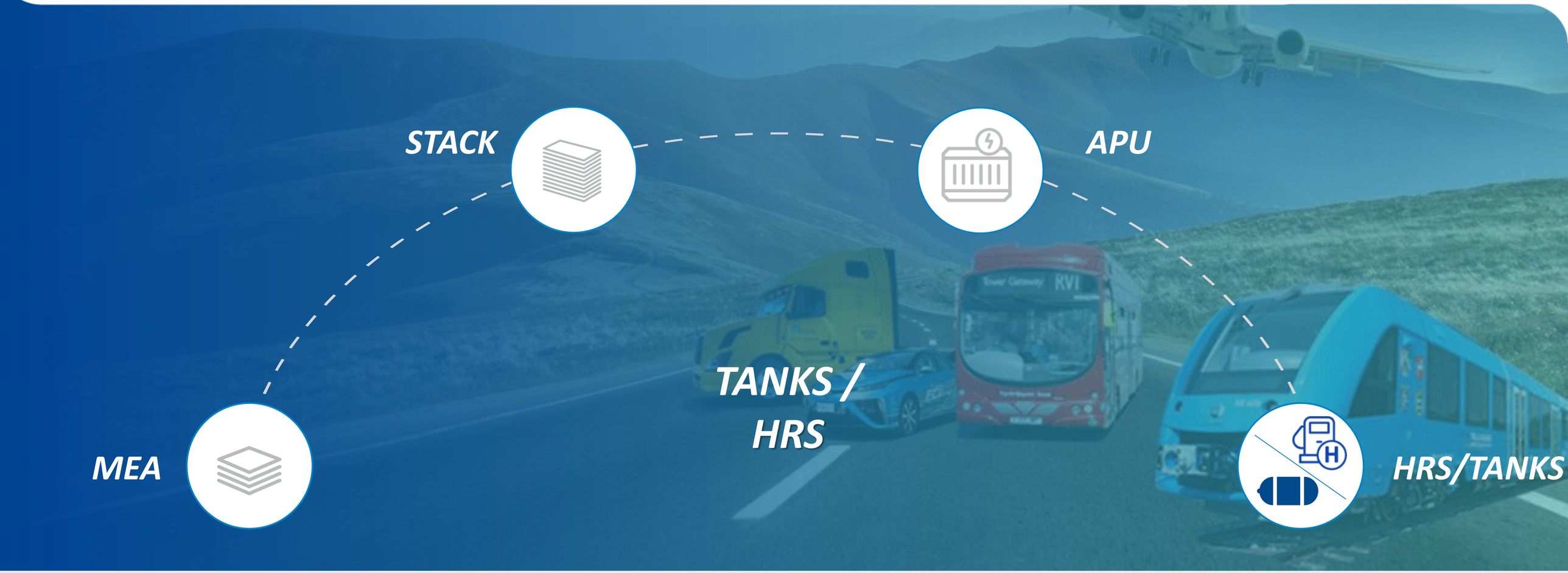
- Startup
- Efficiency
- Packaging



- Marinisation
- Freeze start
- Durability

- Flying conditions
- Capture re-use byproducts
- Permitting - safety

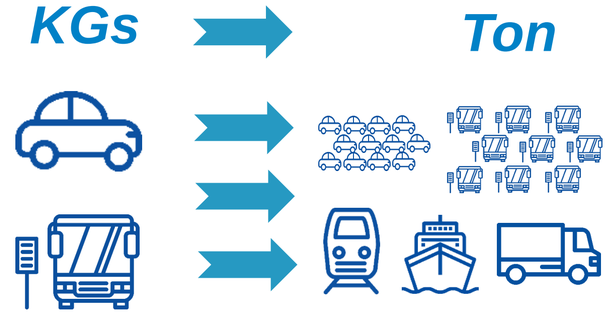
Transport Portfolio: Research & Innovation



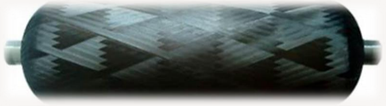
Hydrogen Refuelling Stations and On-board H_2 storage

Improved performance and technology

KPI	2017	2020	2030
Energy demand (kWh / kg H2)	10	5	3
System cost (Thousands € kg H2/day	7	4 – 2,1	2,4 - 1,3
Availability (%)	95	96	99



Mechanical & innovative compression



KPI	AWP 2012	COPERNIC	2020
Volumetric capacity (kg/l)	0.023	0.02	0.035
Gravimetric capacity %	4	5	6
Estimated cost (€/kg H2) @ mass prod	2.000	608	500

Key messages

The need for low TRL research remains strong

Manufacturing & Quality Control key to competitiveness

Research and industry alignment

Increased importance of all transport modes

FUEL CELLS AND HYDROGEN
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