MEGASTACK: STACK DESIGN FOR A MEGAWATT SCALE PEM ELECTROLYSER

Workshop on cost analysis, targets and reduction strategies:
Short summary of Session 1

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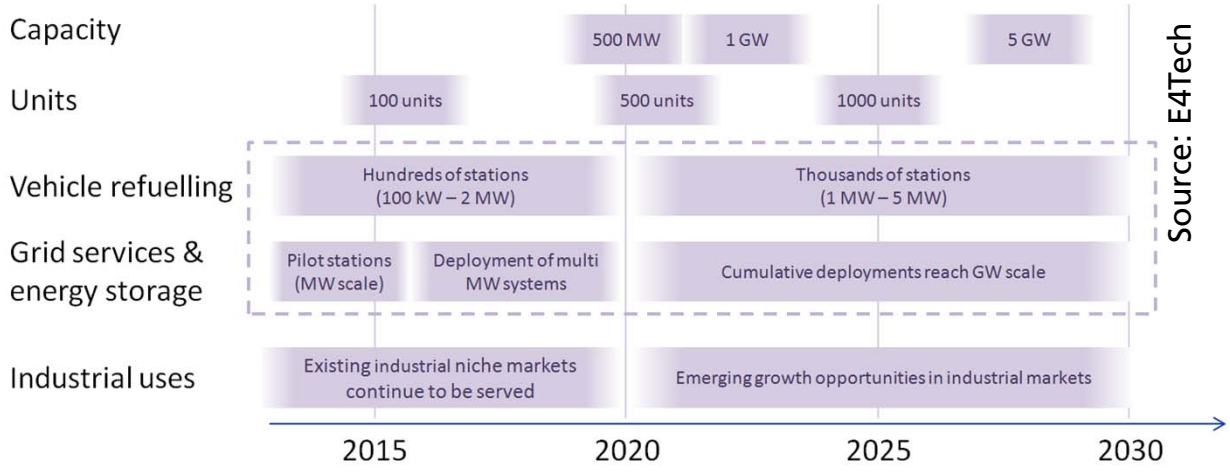
Summary of Session 1
Strategic orientation for electrolysis

- Japan
  - Renewable hydrogen generation (around 2040+)
    „Power to X": H2 for variable renewable energy integration
- Korea
  - Distributed power systems: RE hybrid systems, e.g.
    Urban renewable energy power plant
    Stand-alone energy independence system
- United States
  - Renewable hydrogen for mobility
- Europe & Germany
  - Hydrogen for mobility
  - Cross sectorial utilisation as Power to X (Germany)

Summary of Session 1
Market sizes

- Germany (NOW)
  - 2023: 1.5 GW / ~ 500 HRS
- Europe (E4Tech):
  - ~2020: 0.5 GW (500 units)
  - ~2023: 1.0 GW
  - ~2028: 5.0 GW
- USA (DOE)
  - CA: 100 HRS



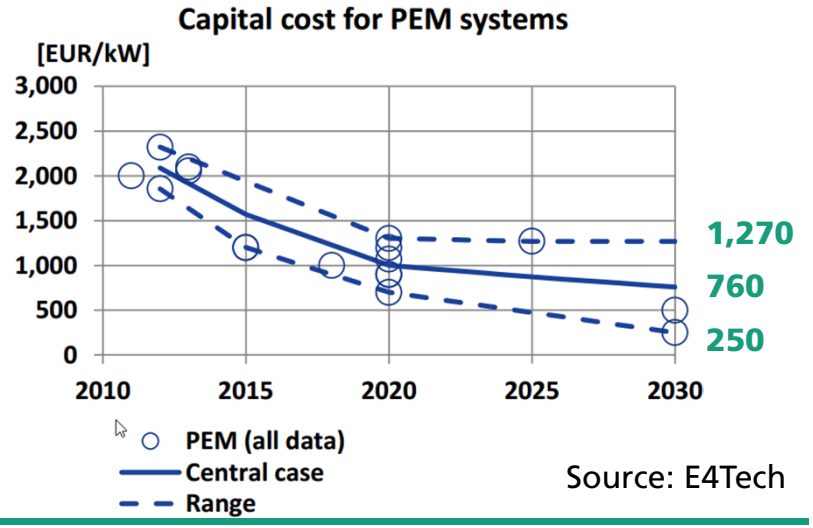
Summary of Session 1
Cost targets

Hydrogen costs

- US Target 2020
  - 2 USD/gge (production)
  - 4 USD/gge (production and compression/distribution)
- JP Target 2040
  - 2.5 USD/kg (production)
- EU targets 2023
  - 4.5-7 €/kg (production and compression/distribution)

CAPEX

- EU: 1.5 M€ /(t/d) EU (2023)
- JP: 1,600 €/Nm^3h^{-1} (2040)
- DE: 600 €/kW (2025)
- Expected cost reduction :



Source: E4Tech

FCH-JU 2.0 MAWP
Multi-Annual Work Programme

- Techno-economic objectives from the FCH 2 JU programme for the period 2014-2020

		State-of-the-art	2017	2020	2023
KPI 1	H2 production electrolysis, energy consumption (kWh/kg) @ rated power	57-60 @100kg/d	55 @500kg/d	52 @1000+kg/d	50 @1000+kg/d
KPI 2	H2 production electrolysis, CAPEX @ rated power including ancillary equipements and comissioning	8.0 M€/(t/d)	3,7 M€/(t/d)	2.0 M€/(t/d)	1.5 M€/(t/d)
KPI 3	H2 production electrolysis, efficiency degradation @ rated power and considering 8000 H operations / year	2% - 4% / year	2% / year	1,5% / year	<1% / year
KPI 4	H2 production electrolysis, flexibility with a degradation < 2% year (refer to KPI 3)	5% - 100% of nominal power	5% - 150% of nominal power	0% - 200% of nominal power	0% - 300% of nominal power
KPI 5	H2 production electrolysis, hot start from min to max power (refer to KPI 4)	1 minute	10 sec	2 sec	< 1 sec
	H2 production electrolysis, cold start	5 minutes	2 minutes	30 sec	10 sec

Table 3.1.1.2 State-of-the-art and future targets for Hydrogen production from renewable electricity for energy storage and grid balancing

2nd Session: Cost reduction strategies for PEM water electrolysis from the manufacture's prospect

09:00	Tom Smolinka	Fraunhofer ISE / Germany (Moderation and summary of the 1st session)
09:10	Pascal Pewinski	ArevaH2Gen / France
09:30	Everett B. Anderson	Proton OnSite / United States of America
09:50	Manfred Waidhas	Siemens / Germany
10:10	Frederic A L. Marchal	ITM Power / Great Britain
10:30	Discussion	

2nd Session: Cost reduction strategies for PEM water electrolysis from the manufacture's prospect

Topics to be discussed

- What are acceptable cost targets for PEM electrolysers in energy applications?
- What are main bottlenecks to achieve these cost targets?
- What are the most important actions that need to be taken to achieve these targets?
- Review of the KPIs for electrolysis in the FCH JU Multi-Annual Work Programme.

Thank you for your attention!

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