Well-to-Wheel Potentials of H_2-Mobility

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HyCentA Research GmbH

Austria's Research Centre for Hydrogen since 2005

Research Organization at
Graz University of Technology

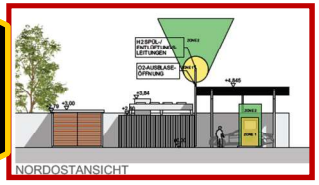
- **28 Researchers:**
  Mechanical Engineering, Physics, Chemistry, Process Engineering, Electrical Engineering
- **State-of-the-art research infrastructure**
  - **High pressure test bench up to 1000 bar**
  - **Refueling infrastructure 350 & 700 bar**
  - **Two test cells for components/systems**
  - **Fuel cell system test bench with HiL up to 160 kW**

References / Projects

E LOG Bio Fleet I & II (Linde, HyC)

w2h (OMV)

ReFUEL (Fronius)



FC REEV (MAGNA)

Zillertalbahn (ZVB)

KEYTEC4EV (AVL)

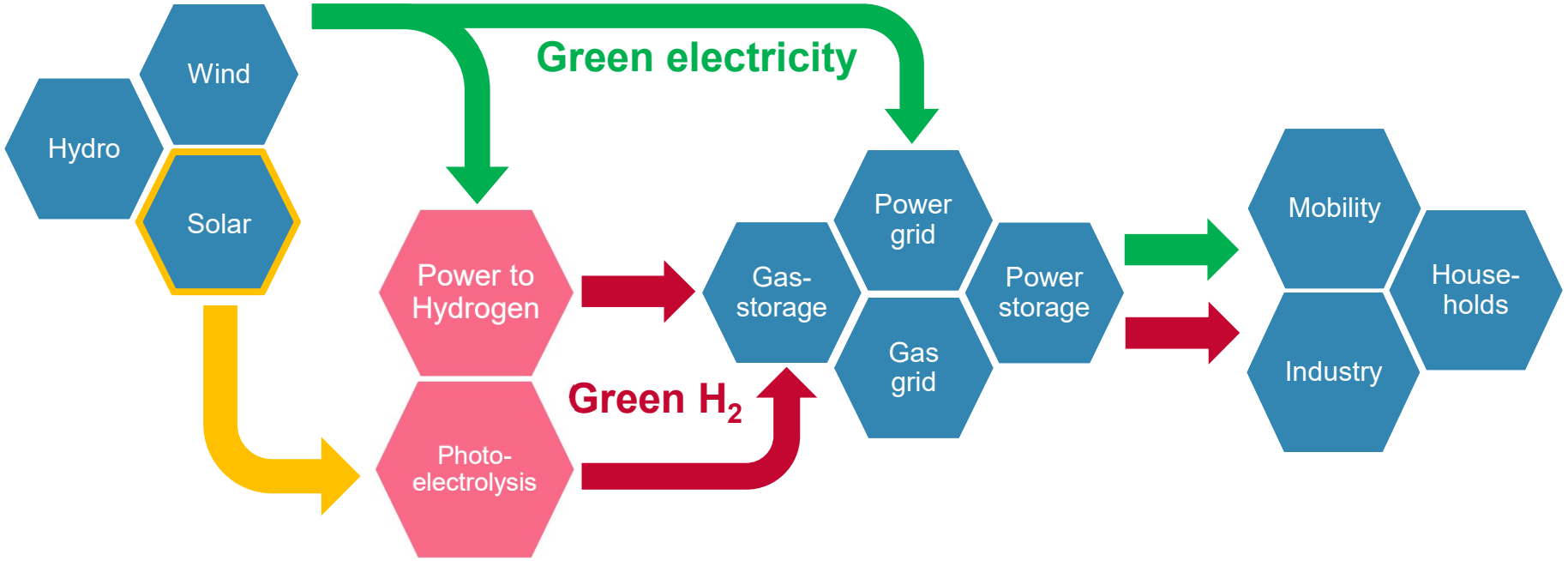
HySnow (BRP)

HIFAI RSA (HyC)

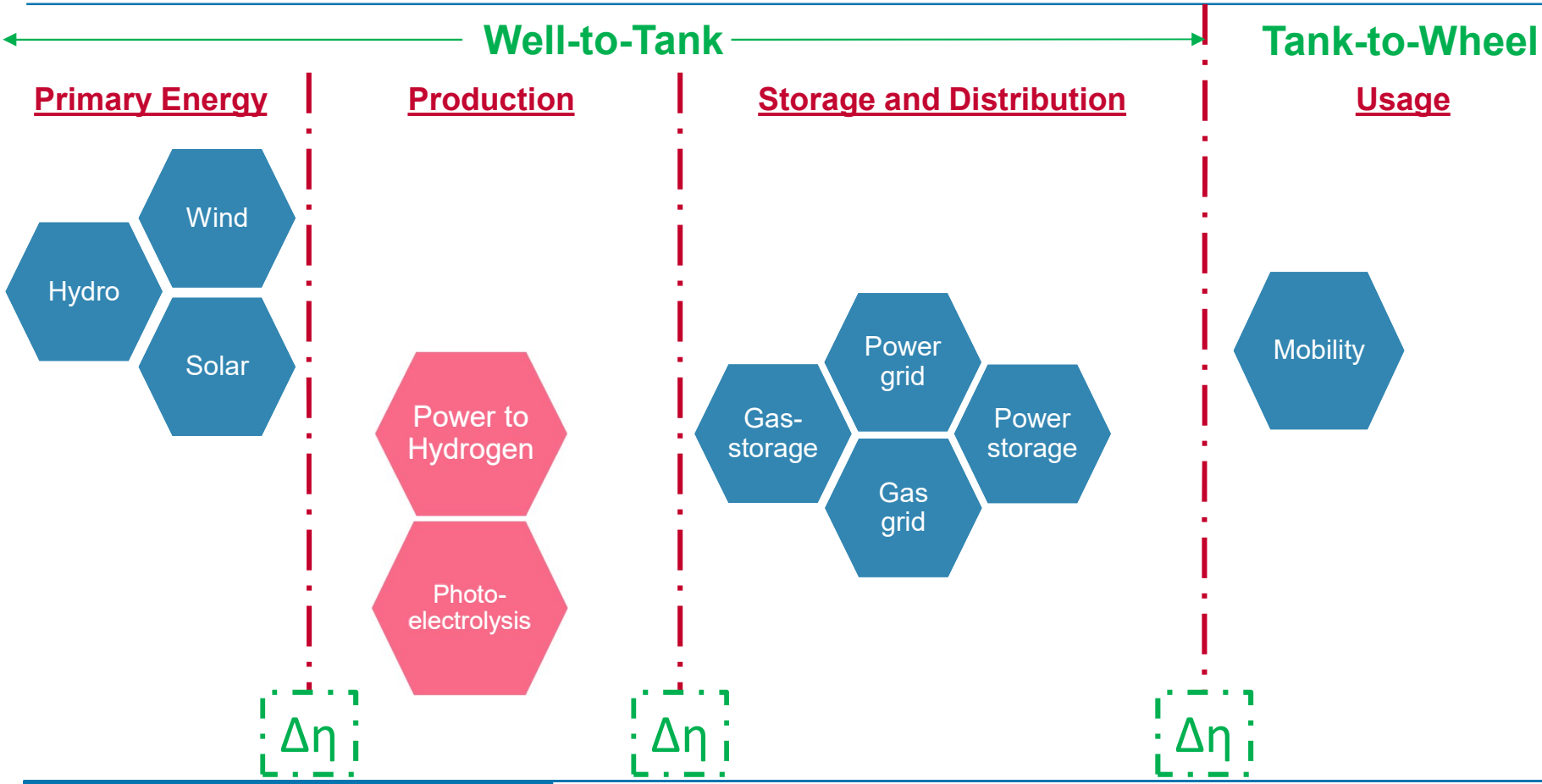
WIVA (EI)

Vision Hydrogen Economy

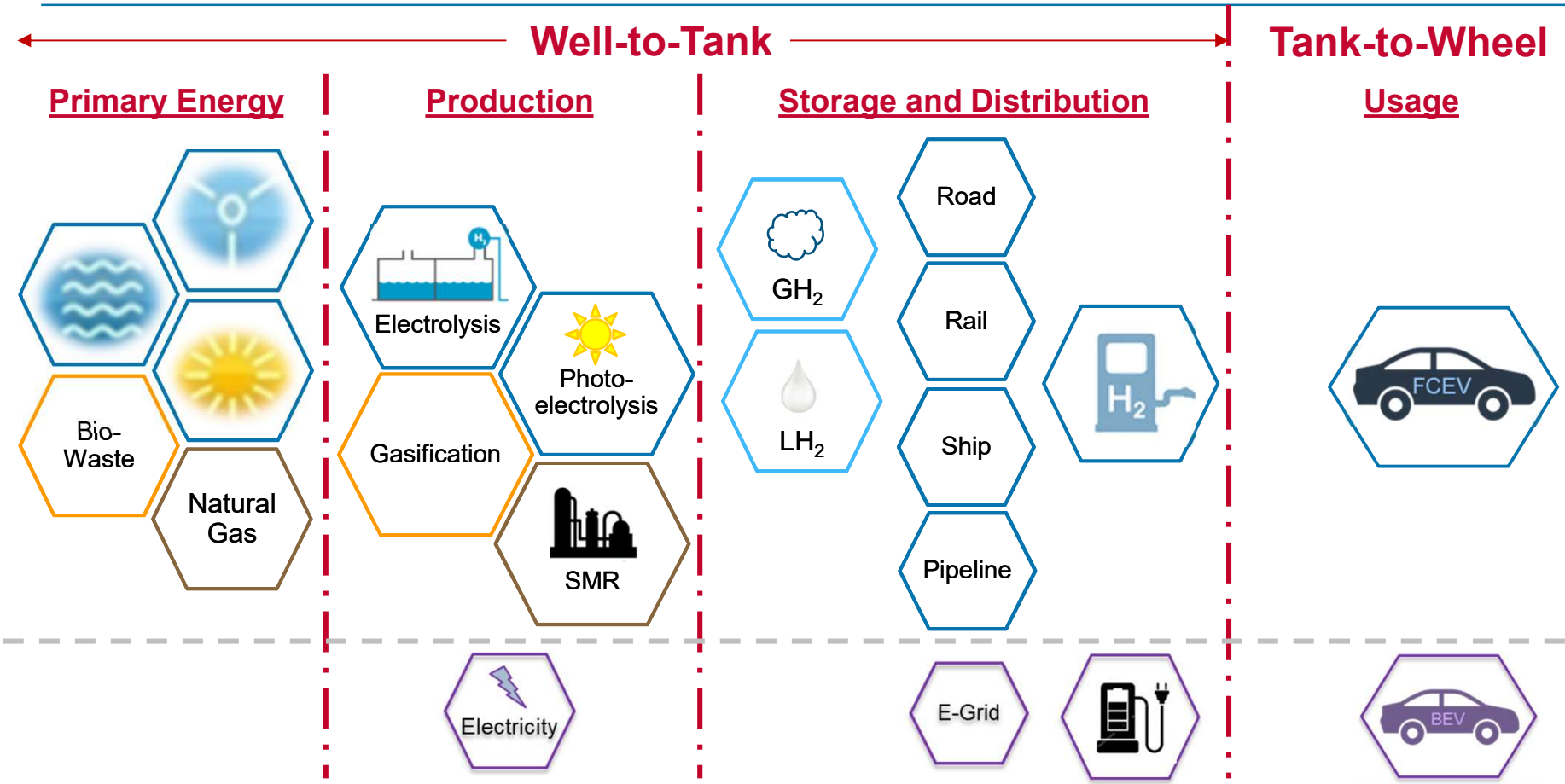
Hydrogen economy as a solution for renewable energy systems



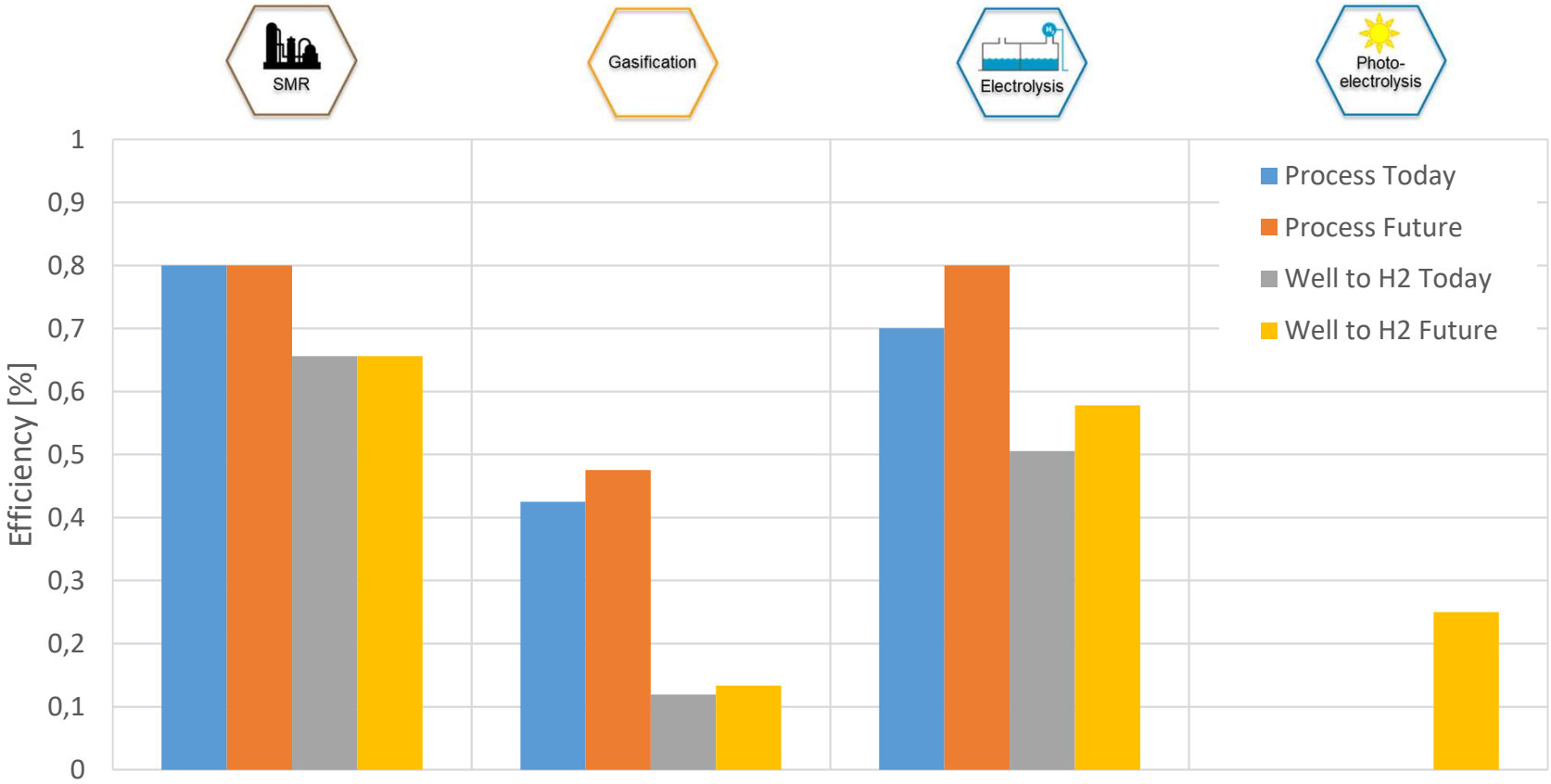
Well to Wheel Analysis



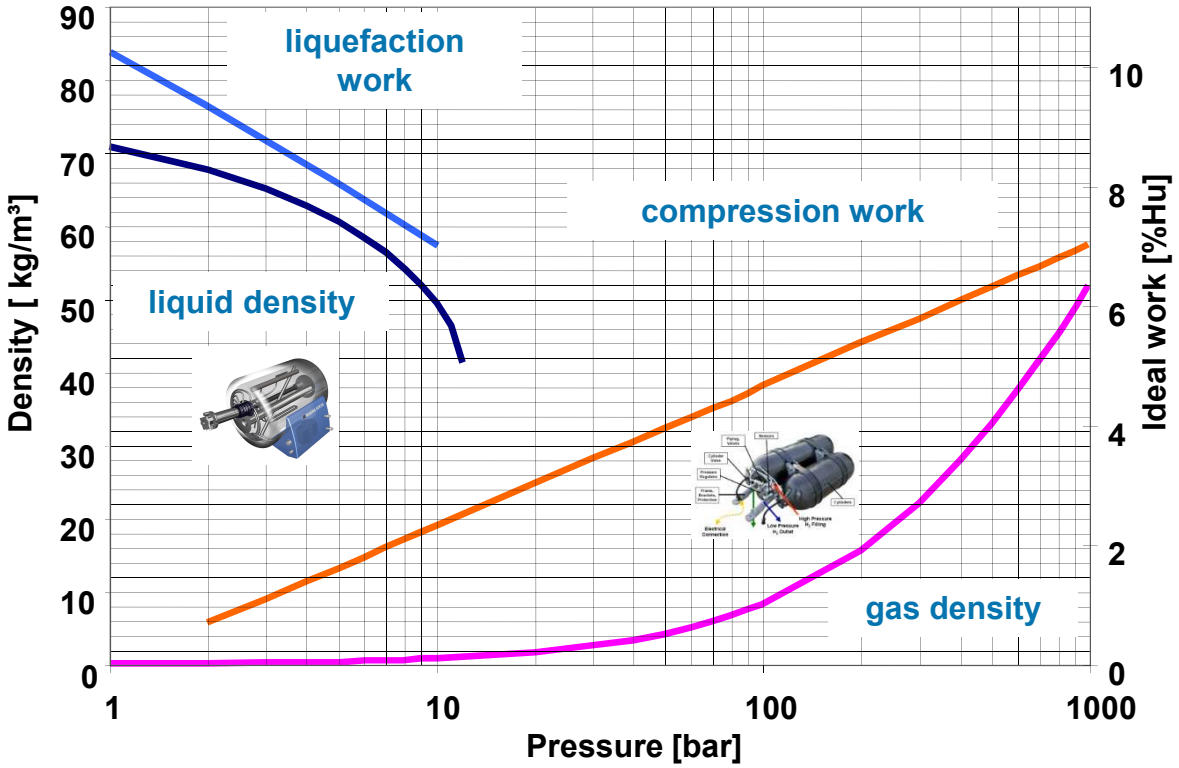
Well to Wheel Analysis



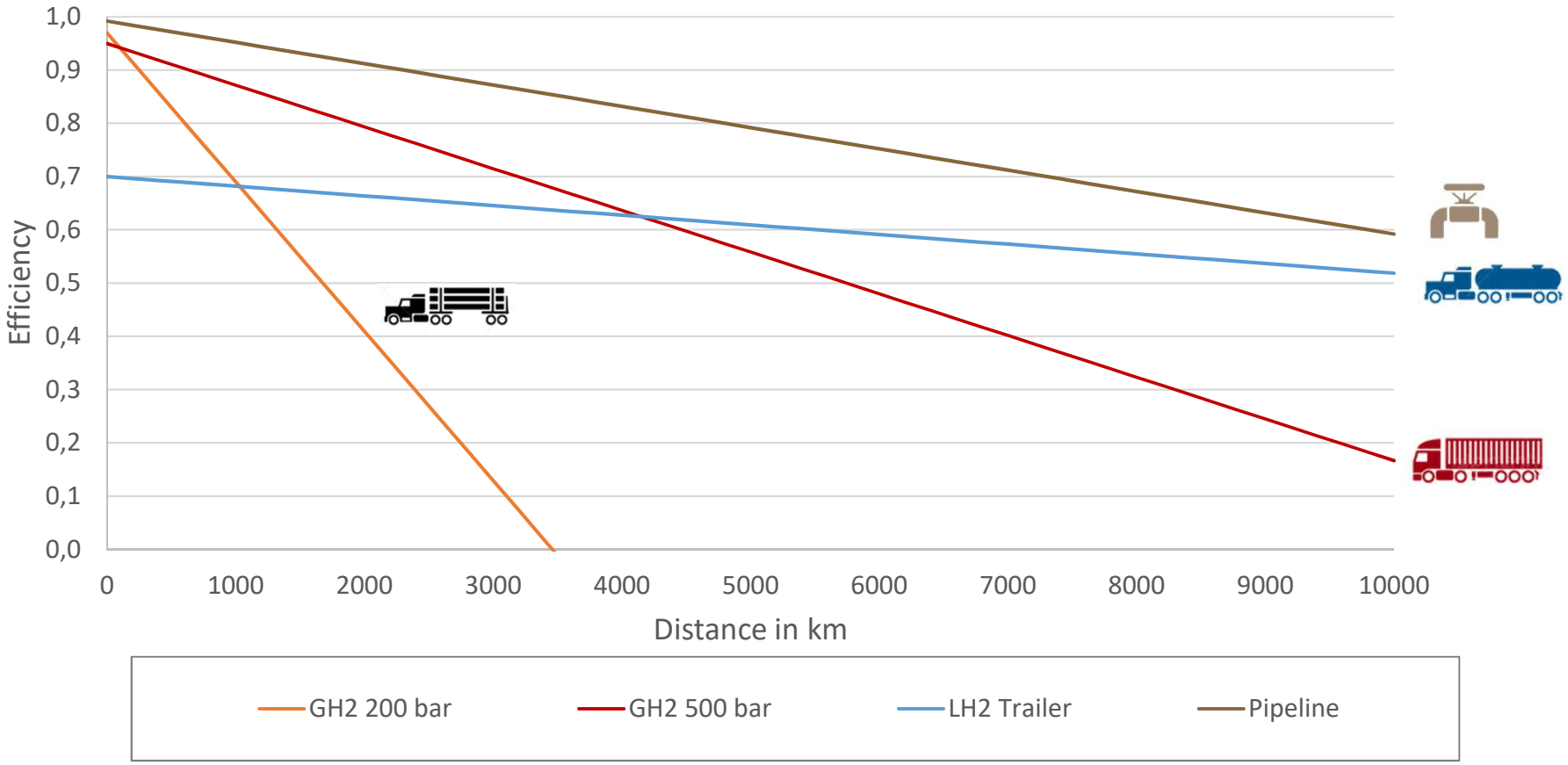
Hydrogen Production



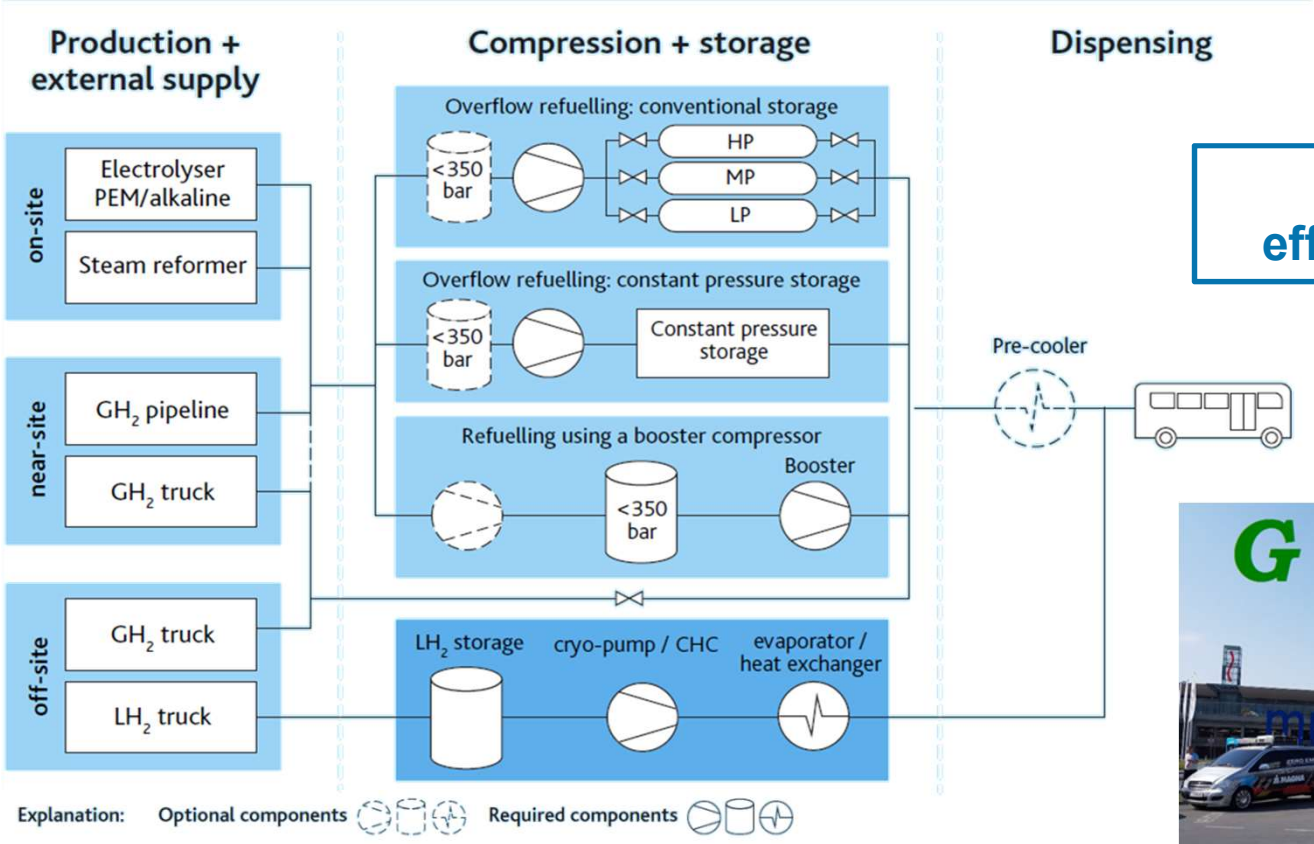
Hydrogen Storage



Hydrogen Distribution



Hydrogen Refueling Stations



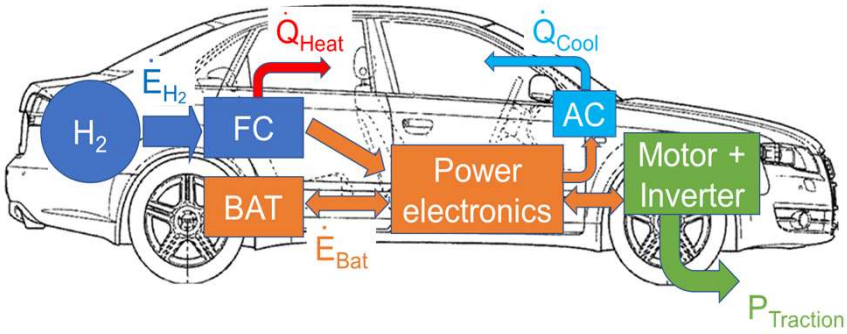
Source: NOW

700 bar station
efficiency loss ~ 7%

Source: energytours

Fuel Cell Electric Vehicle

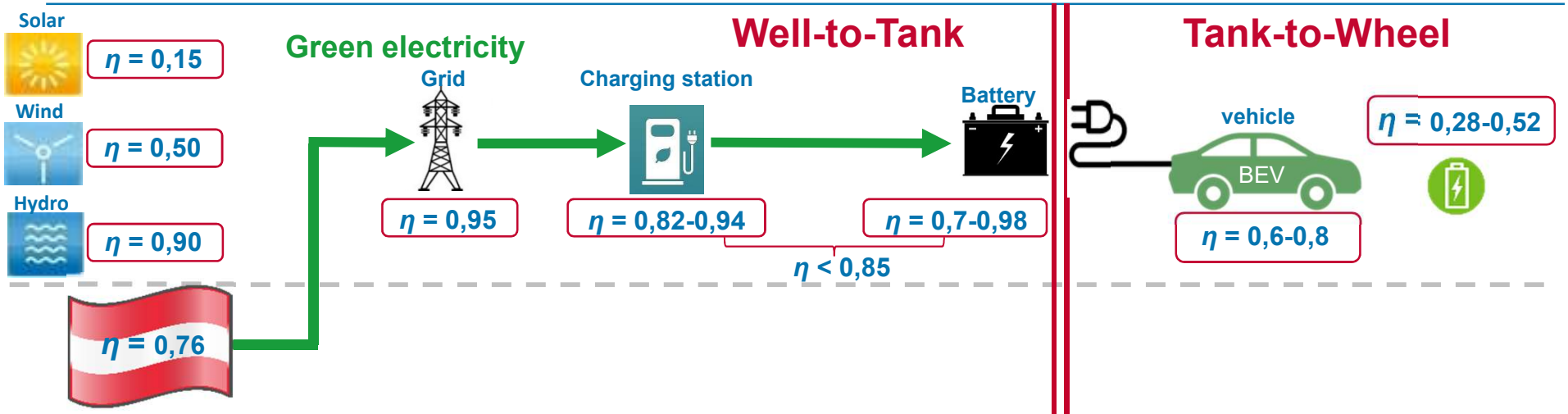
Hybrid of Battery and Fuel Cell



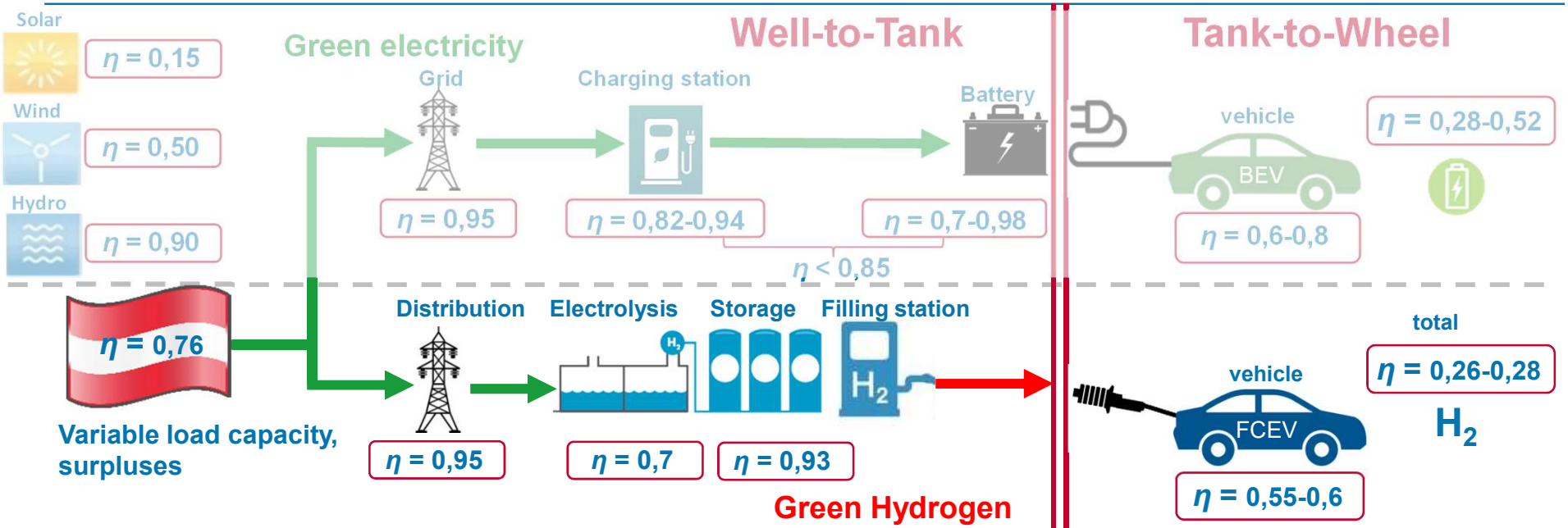
Source: Hyundai

Powertrain Efficiencies	
BEV	60 - 80 %
FCEV	55 - 60 %

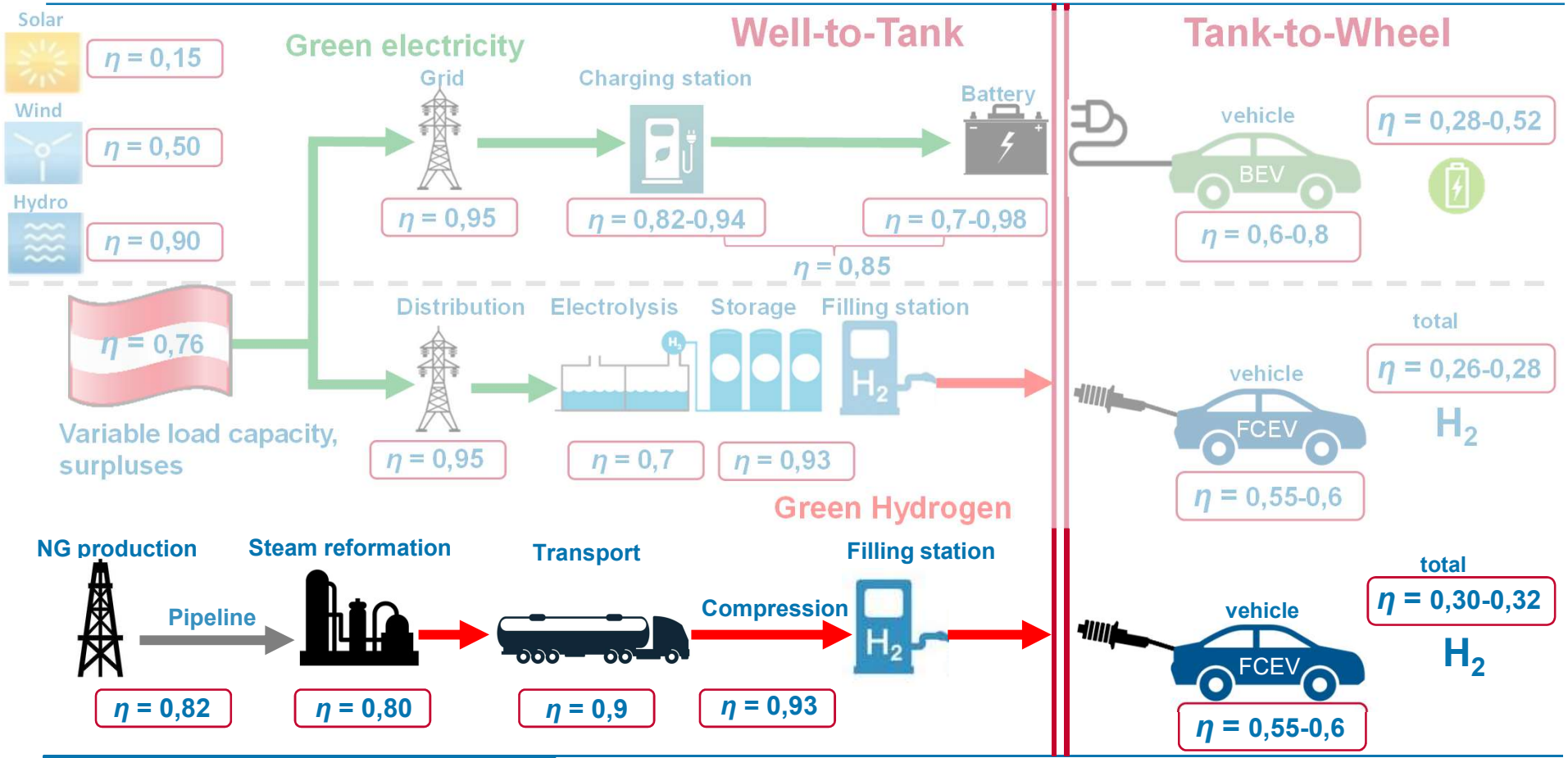
Efficiencies – Battery



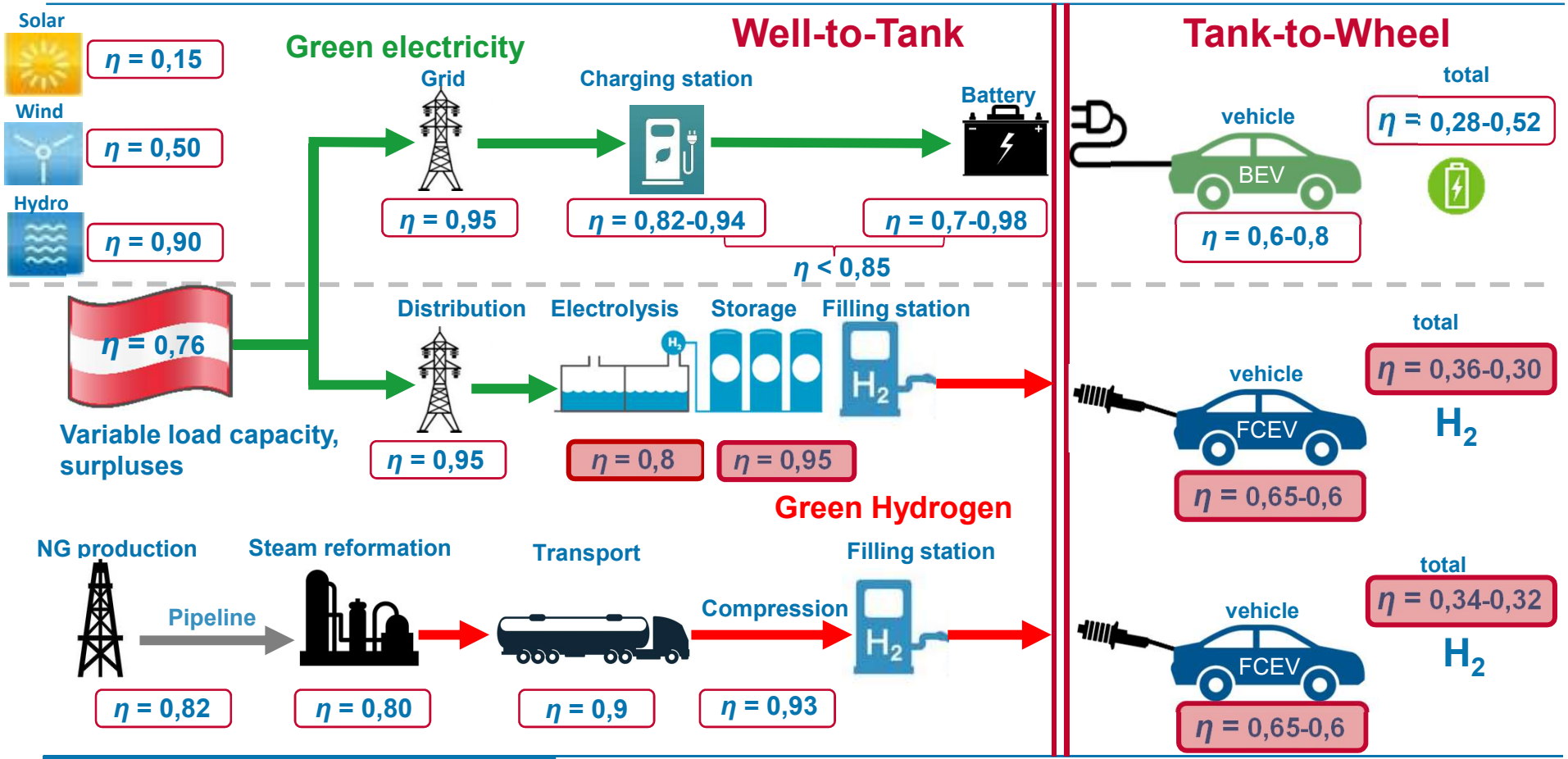
Efficiencies – Electrolysis Central



Efficiencies - SMR



Efficiencies – FCEV (Potentials)



Summary BEV – H_2 FCEV

H_2

	Battery	Hydrogen – Fuel Cell
Efficiency	Very high	High
Resources	Co, Li, rare earths	actually Pt, is available
Recycling	Co: 98 %, Li: is not practised	Pt: > 98 %
Eco-Footprint	large (battery)	low
Temperature	Sensitive to cold	Insensitive to cold
Electricity-Mix	Fossil Mix	Easy use of renewable energy
Costs	Increasing	decreasing
E-grid	Additional load, high power	Stabilisation, energy storage
Charging / fuelling	Long > 20 min up to hours	Short, max. 5 min (passenger car)
Weight	Higher compared to ICE	Comparable to ICE
Application	Short range, small vehicles	Long range, large vehicles, heavy-duty vehicles
Monopole	Existing (Asia)	Actually no know-how monopole

« *Simply Hydrogen* »

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