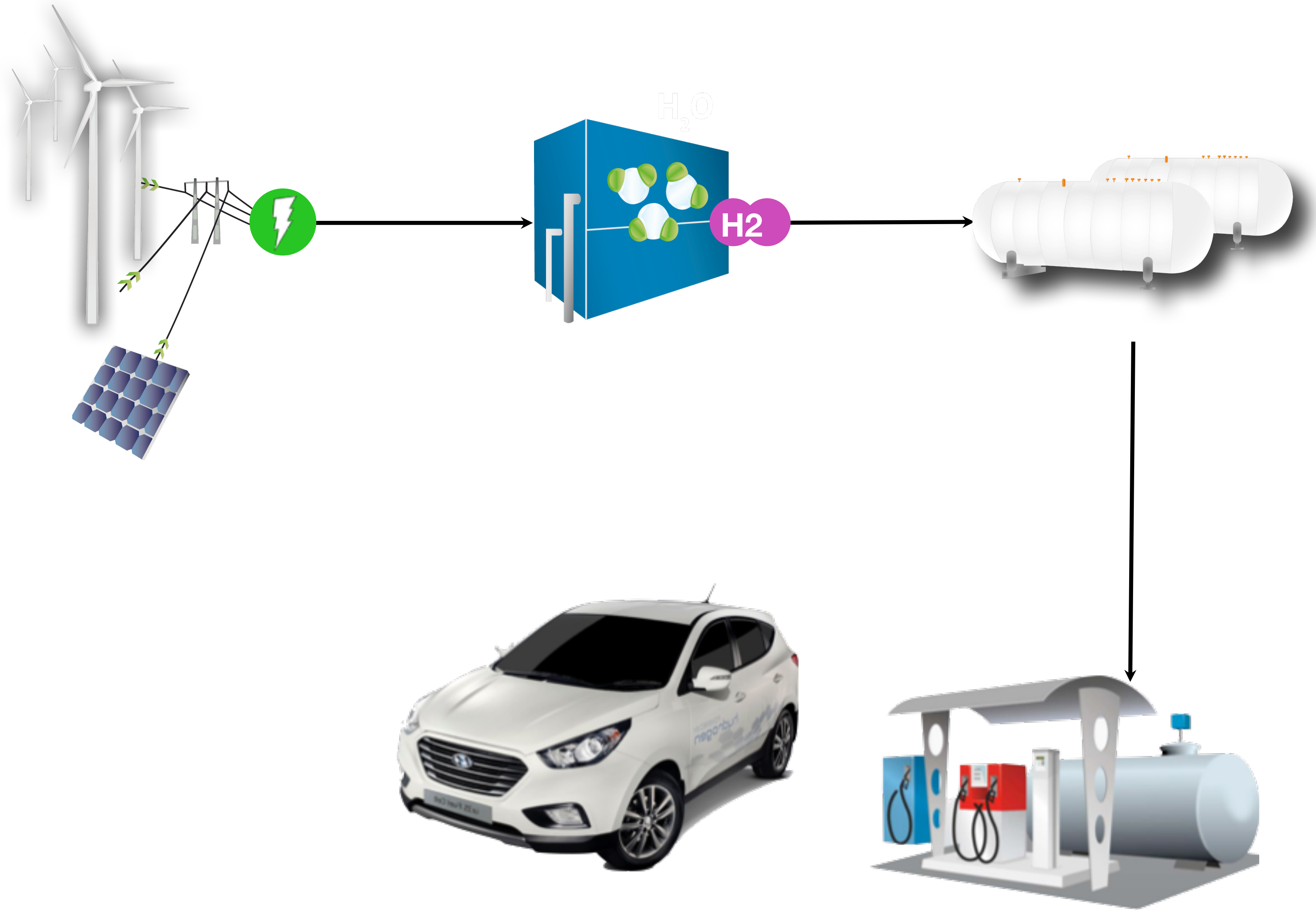
Hydrogen infrastructure


H2O
H2

Världen

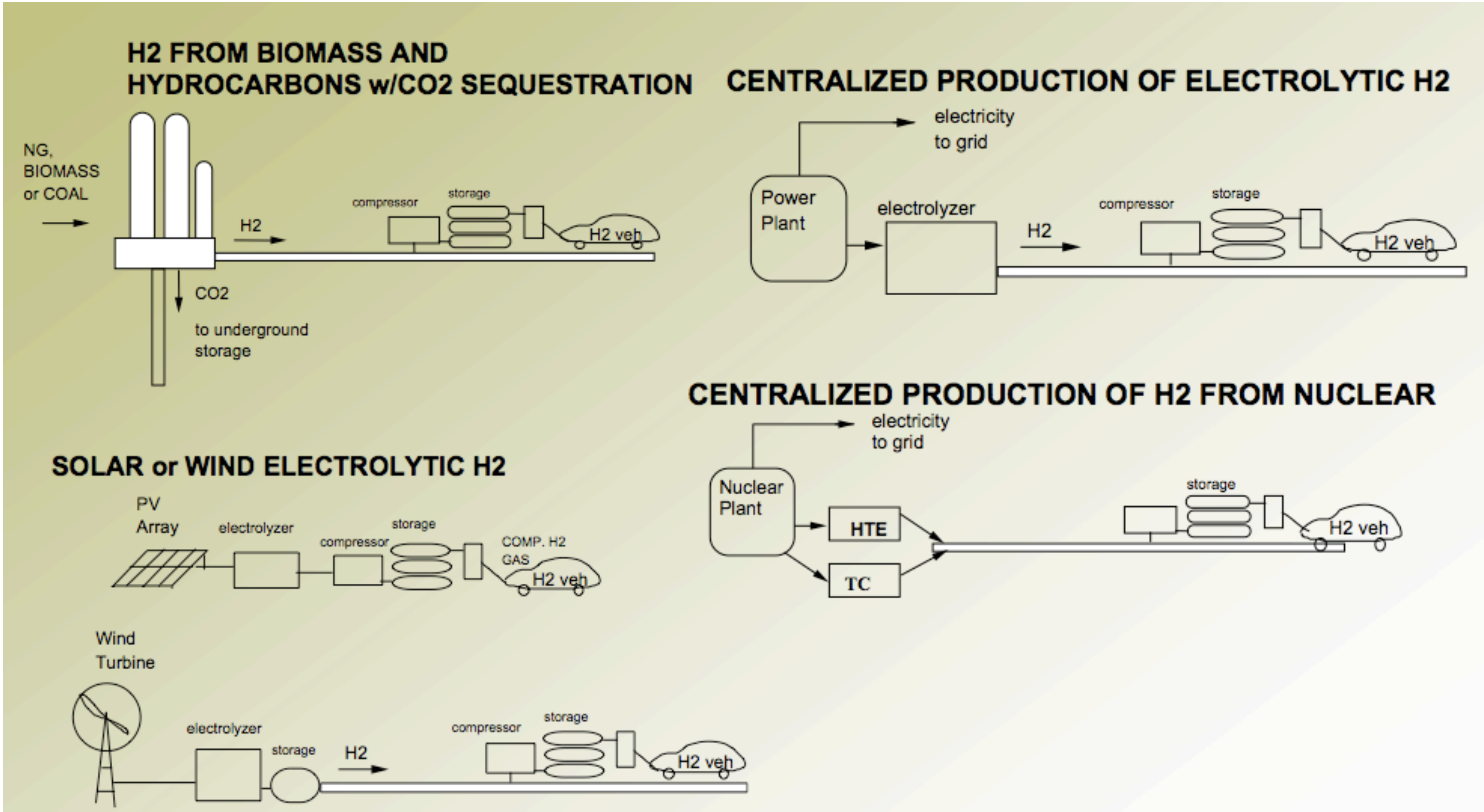
Global utblick

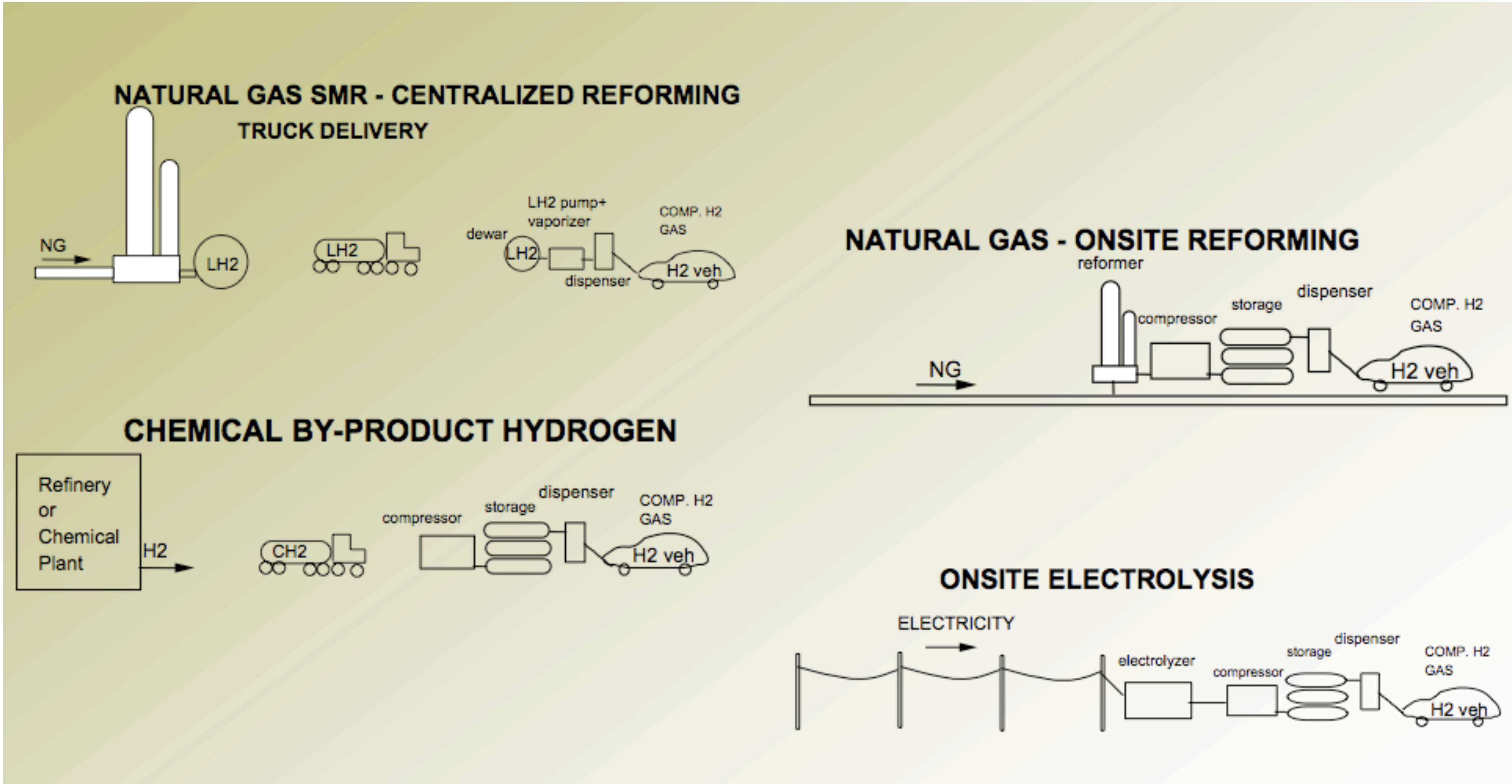
Sydkorea

Japan

Nordamerika

Europa

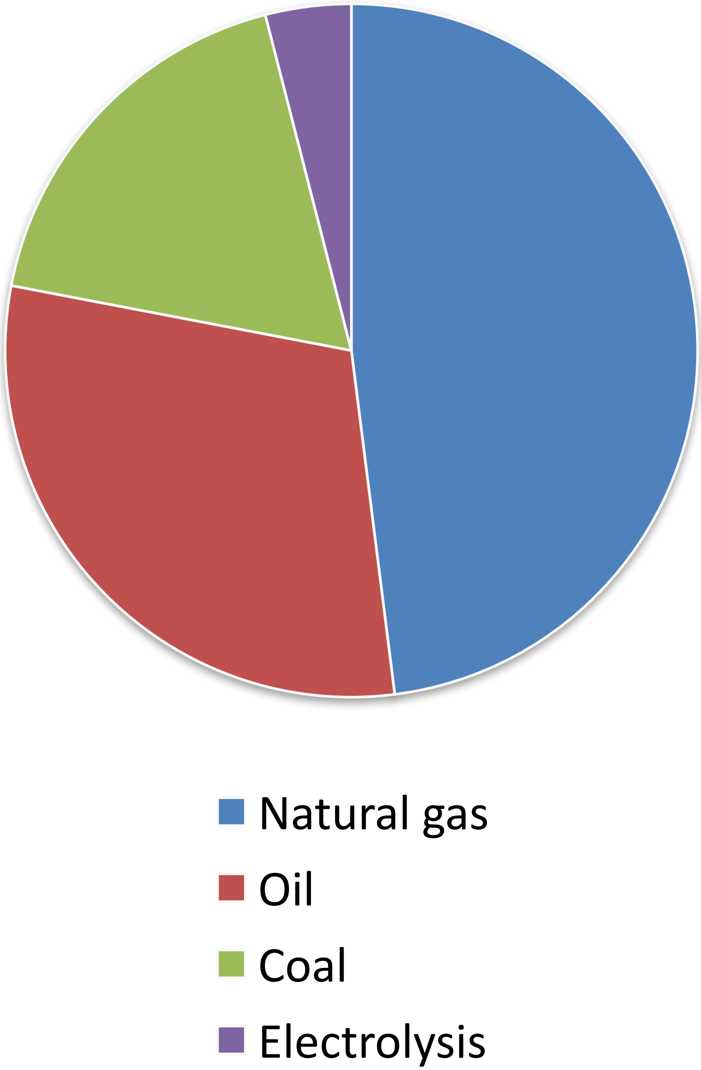

H2 FROM BIOMASS AND
HYDROCARBONS w/CO2 SEQUESTRATION
NG,
BIOMASS
or COAL
H2
compressor
storage
H2 veh
CO2
to underground
storage
CENTRALIZED PRODUCTION OF ELECTROLYTIC H2
electricity
to grid
Power
Plant
electrolyzer
H2
compressor
storage
H2 veh
SOLAR or WIND ELECTROLYTIC H2
PV
Array
electrolyzer
compressor
storage
COMP. H2
GAS
H2 veh
Wind
Turbine
electrolyzer
storage
H2
compressor
storage
H2 veh
CENTRALIZED PRODUCTION OF H2 FROM NUCLEAR
electricity
to grid
Nuclear
Plant
HTE
TC
storage
H2 veh


NATURAL GAS SMR - CENTRALIZED REFORMING
TRUCK DELIVERY
NG
LH2
LH2
dewar
LH2
LH2 pump+
vaporizer
dispenser
COMP. H2
GAS
H2 veh
NATURAL GAS - ONSITE REFORMING
reformer
compressor
storage
dispenser
COMP. H2
GAS
NG
H2 veh
CHEMICAL BY-PRODUCT HYDROGEN
Refinery
or
Chemical
Plant
H2
CH2
compressor
storage
dispenser
COMP. H2
GAS
H2 veh
ONSITE ELECTROLYSIS
ELECTRICITY
electrolyzer
compressor
storage
dispenser
COMP. H2
GAS
H2 veh

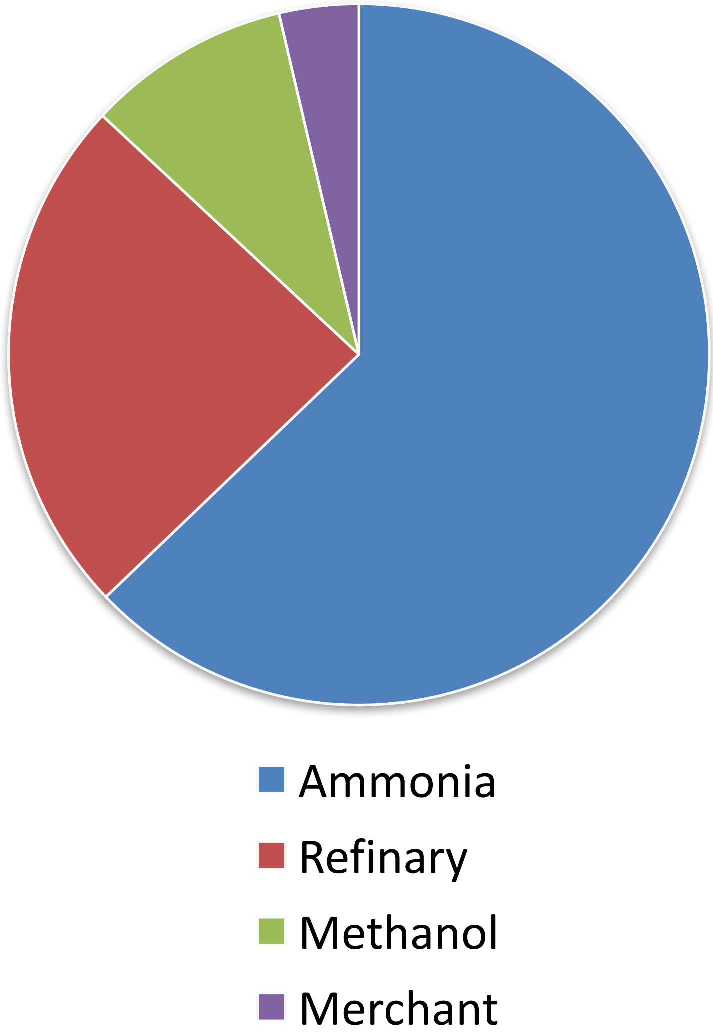
Production method comparison

	On-site Electrolysis	Centralised Electrolysis	On-site SMR	Centralised SMR
CAPEX	Medium	Low	Low	Low
OPEX incl. transportation	Low	High	Low	High
CO2	Low	Low	High	High
Energy losses	Medium	Medium	High	High
Purifying cost	Low	Low	Medium	Medium

Hydrogen production



Hydrogen Usage



Hydrogen transportation

- Pipeline transportation
- Compressed trucked
- Liquified trucked
- On-site production

Liquified hydrogen transportation – An example

	Tyskland	Japan	Kalifornien
Antal stationer idag	33	88	35
Planerade till 2015	50	100	68
Planerade 2025	400*	1000	>100***
Antal fordon antaget 2025	-	200 000	1.5 miljoner**
Offentliga medel avsatta	3371 mn SEK Till 2025	325 mn SEK Under 2013	426 mn SEK**** Till 2015

ITM och Linde i UK

NEL och Uno-X bygger minst 20 HRS

Serieproduktion av HRS i Danmark