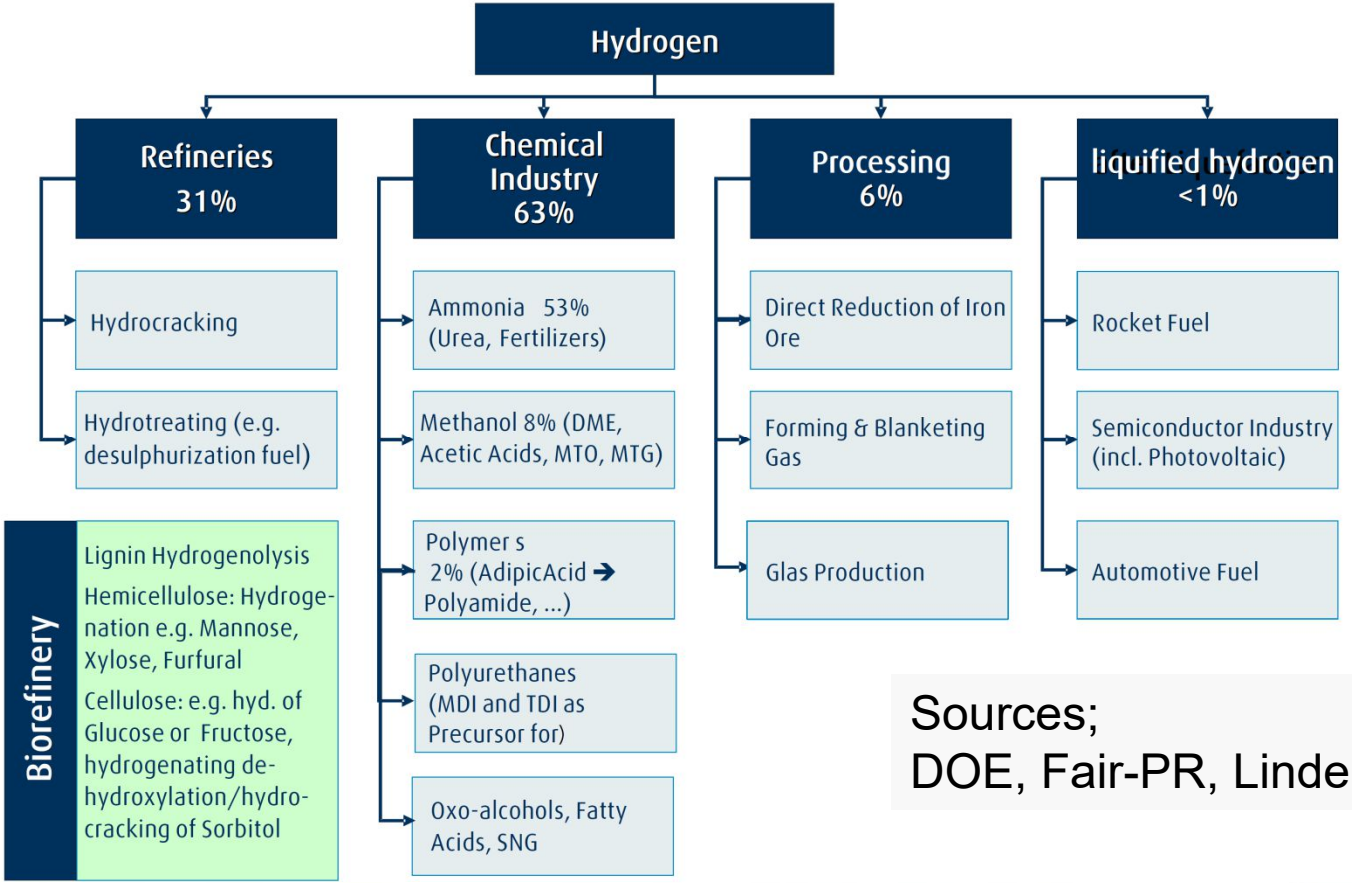
Hydrogen, current use



Sources;
DOE, Fair-PR, Linde

DECHEMA

Constraints and current merit-order for hydrogen utilization

Constraints:

- Hydrogen generally produced on-site, „captive hydrogen“
- Scattered pipline infrastructure
- Missmatch of volume requirements of different use cases (power, chemicals, transport)
- Current hydrogen either fossil-based or grey
- Hydrogen generation via SMR, gasification, catalytic reforming
- Co-production (chlorine-alkaline electrolysis)

Merit-order:

1. Chemical use of hydrogen on-site
2. Industrial gas for external clients
3. Energetic use within processes, on-site
4. Energetic use (co-firing) for heat and electricity generation, on-site

Future developments and opportunities (short-term)

Developments:

- Limited availability of „green“ H_2
- Ever more stringent GHG mitigation targets
- Industrial sector
  - Rethinking of established processes
- Transport sector
  - Limited FCEV (e.g. cars, trains, buses)
- Scattered H_2-infrastructure
  - Pipelines, filling stations

Opportunities (short-term):

- industrial symbiosis (site-specific)
  - Efficient use of current local H_2-surplus
  - H_2 as reducing agent (chemical)
  - Fuel switch, general (industrial + heat & power)
- Sector-coupling (site-specific) of industrial and transport sector (local incubator)
  - H_2 for local vehicle fleets

Future developments and opportunities (long-term)

Developments:

- Increased availability of „green“ H_2
- Close to zero / negative GHG emissions
- Industrial sector
  - Replacement of established processes
- Transport sector
  - FCEV (cars, trains, …)
- H_2 /CO_2 infrastructure in place
  - Pipelines, filling stations, LOHC, Storage options

Opportunities (long-term):

- industrial symbiosis (site-specific)
  - H_2 as reducing agent (metal)
  - Feedstock switch (chemical)
  - Fuel switch, general (industrial + heat & power)
- Sector-coupling (site-specific) of industrial and transport sector
  - Artifical fuels (E-fuels), esp. ships, airplanes, heavy-duty vehicles,…

Constraints and possible policy recommendations

Constraints:

- Transport of hydrogen
- Sheer volume of H_2 required for chemcials and fuels

  (1 Mio. t fuel ≈ 30 TWh electricity)
- Scaling-up of electrolysers
- Cost of transformation
- Cost structure of H_2-based vs. fossil

Requests to policy makers:

- Demonstrate real commitment
- Infrastructure development
  - Connect scattered H_2-infrastructure
  - H_2 in NG pipelines
  - CO_2 infrastructure for CCU (fuels, chemical feed)
- Manage transition
  - Opportunities for grey H_2
  - Incentivise new technologies
- Global/regional/national H_2 market?