

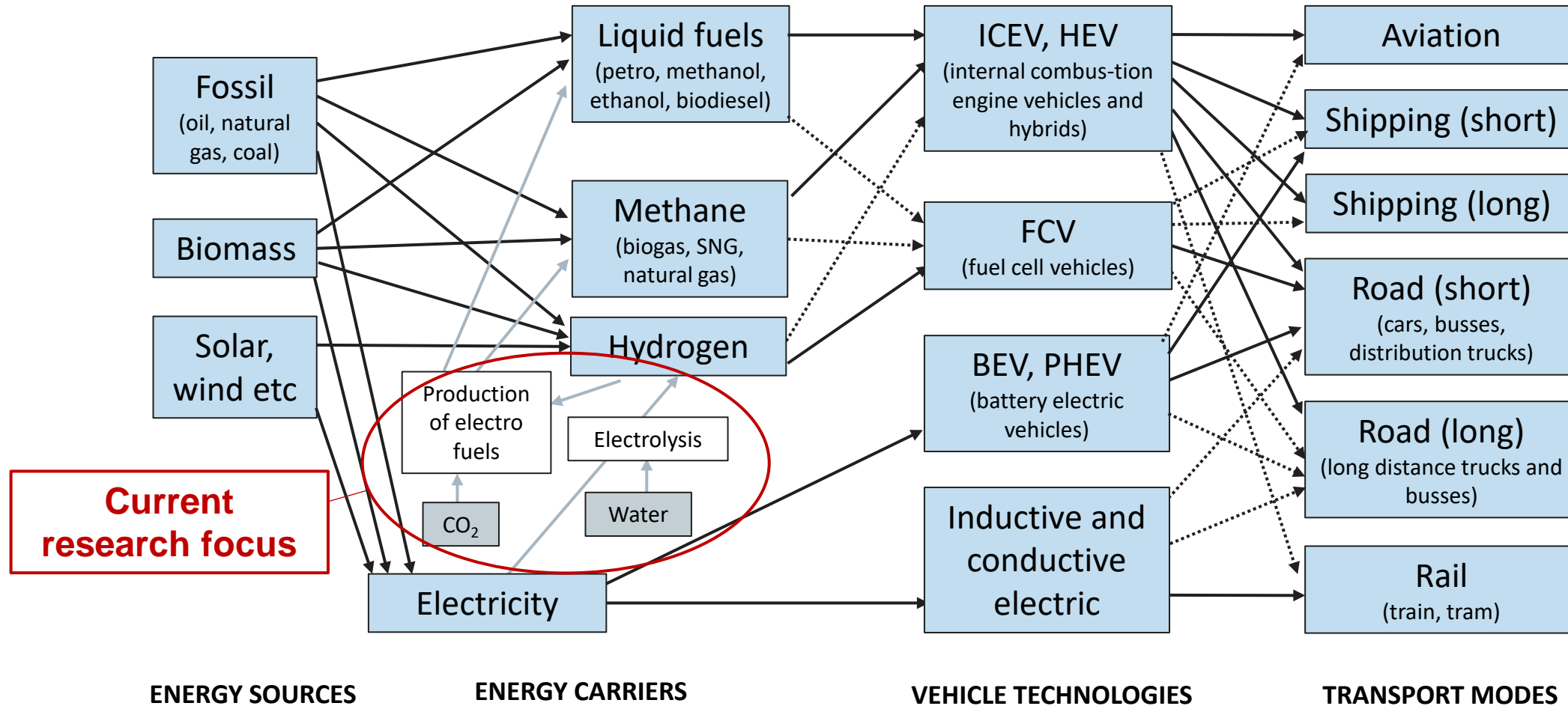
# En introduktion till elektrobränslen

3 december 2020

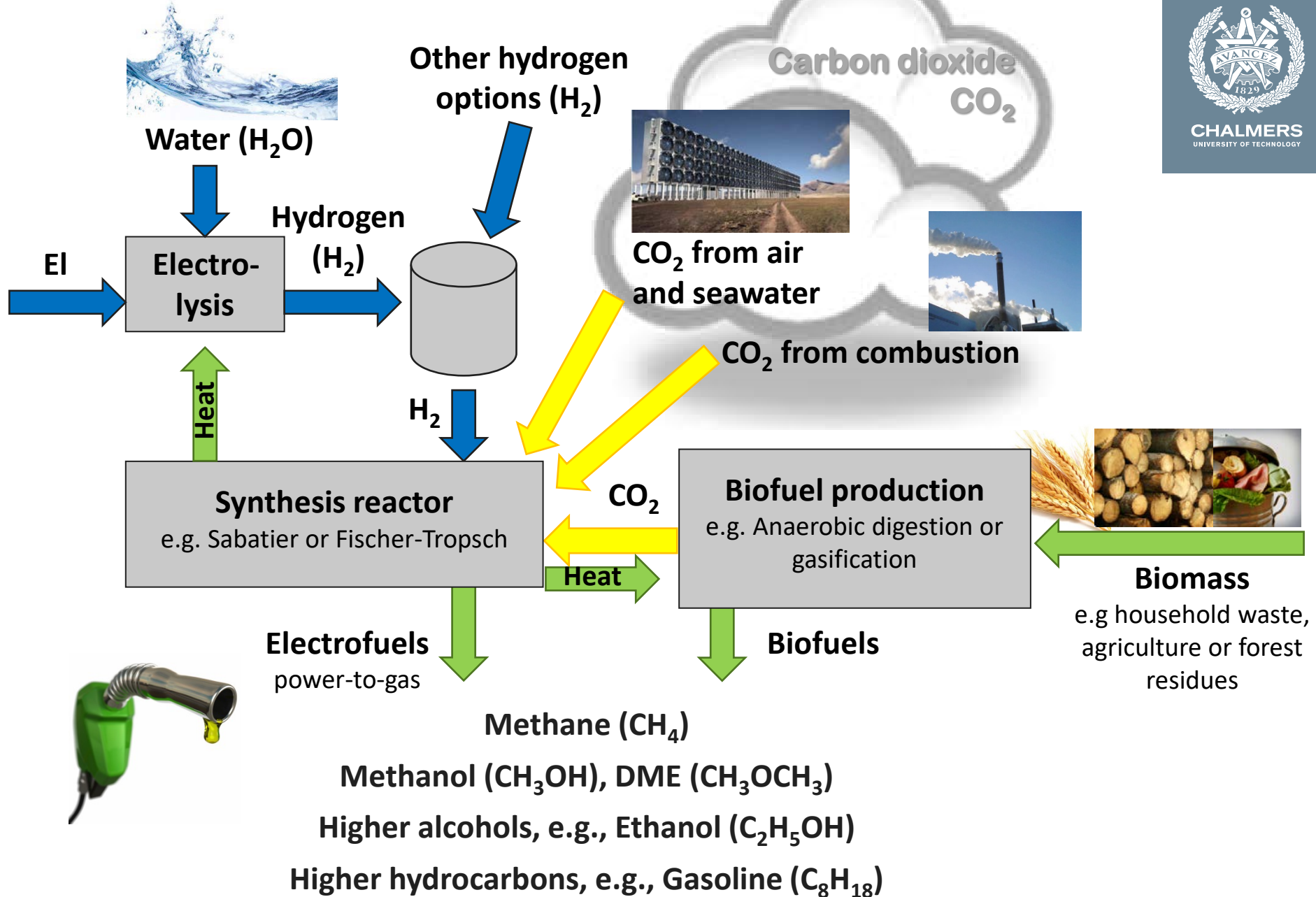
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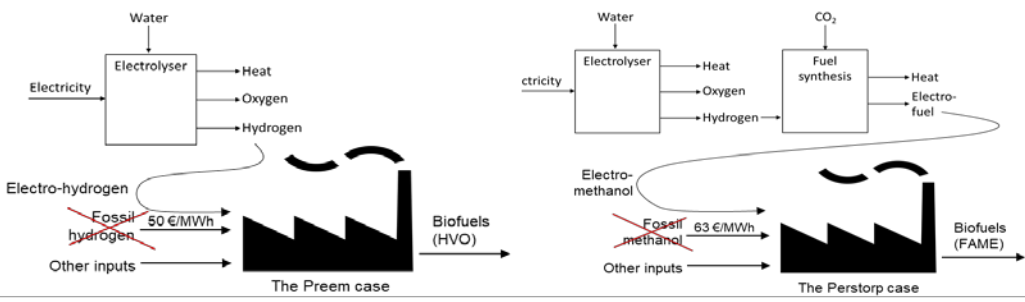
# Different types of fuels and vehicle technology options for different transport modes?



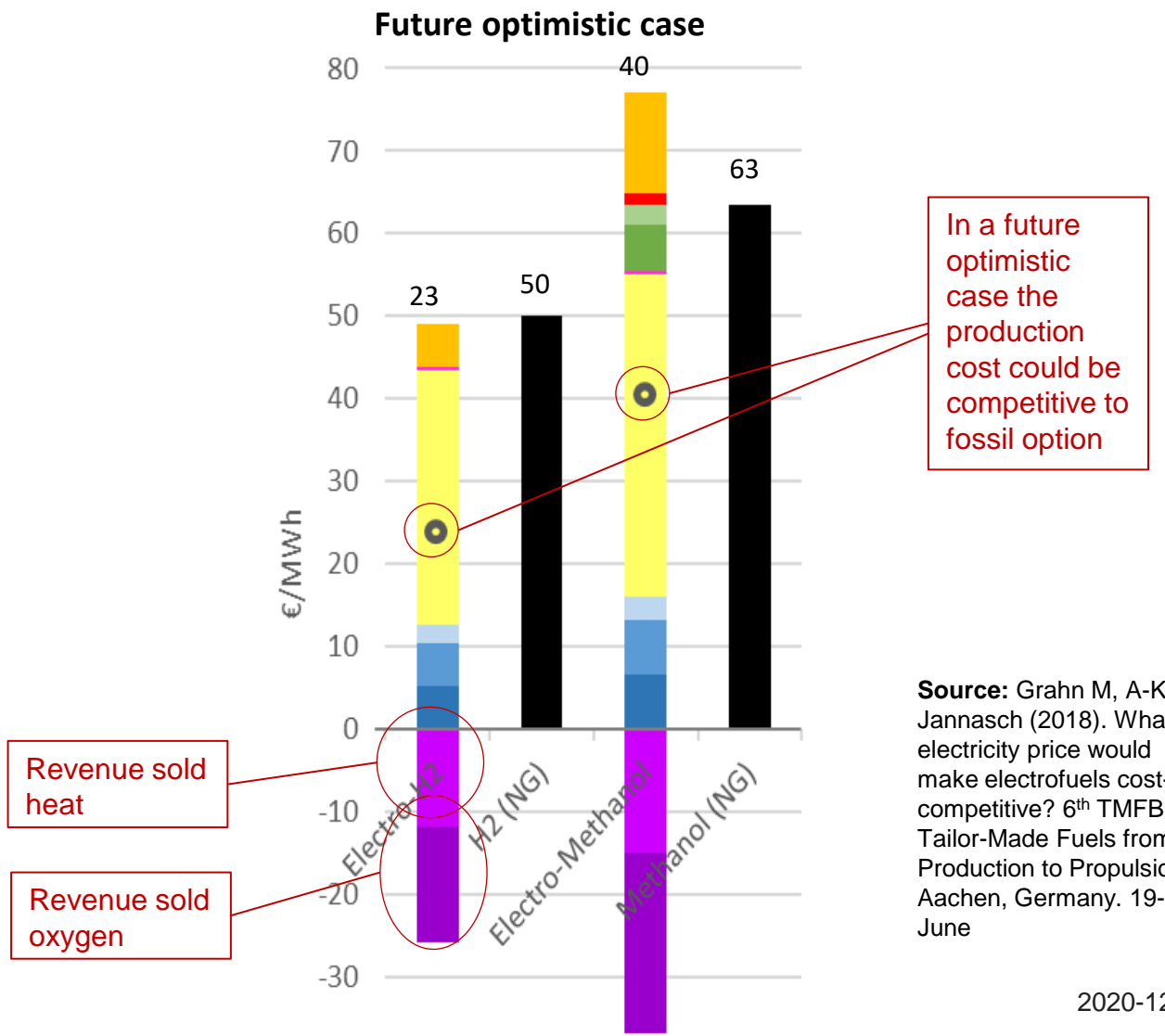
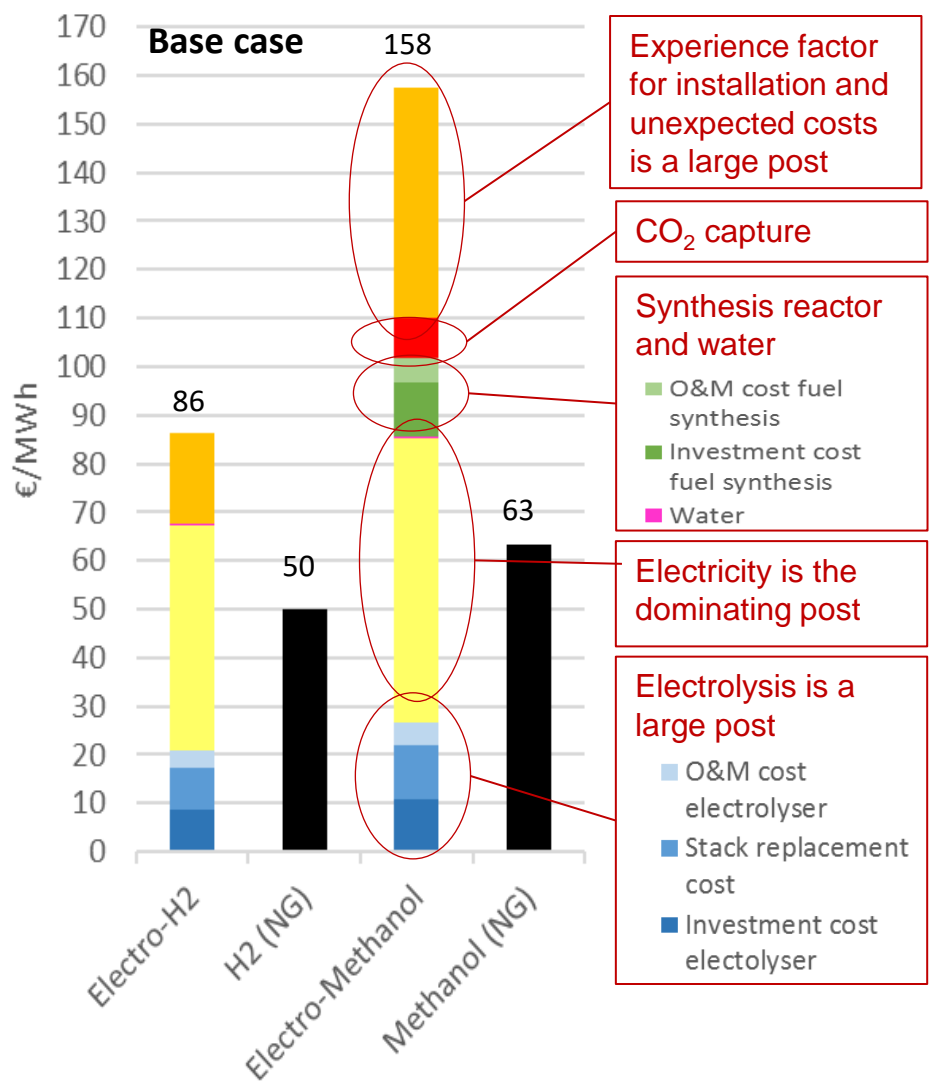
**Production of electrofuels (power-to-gas/liquids)**



# Production cost electro-hydrogen and electro-methanol compared to market price for fossil natural gas based options

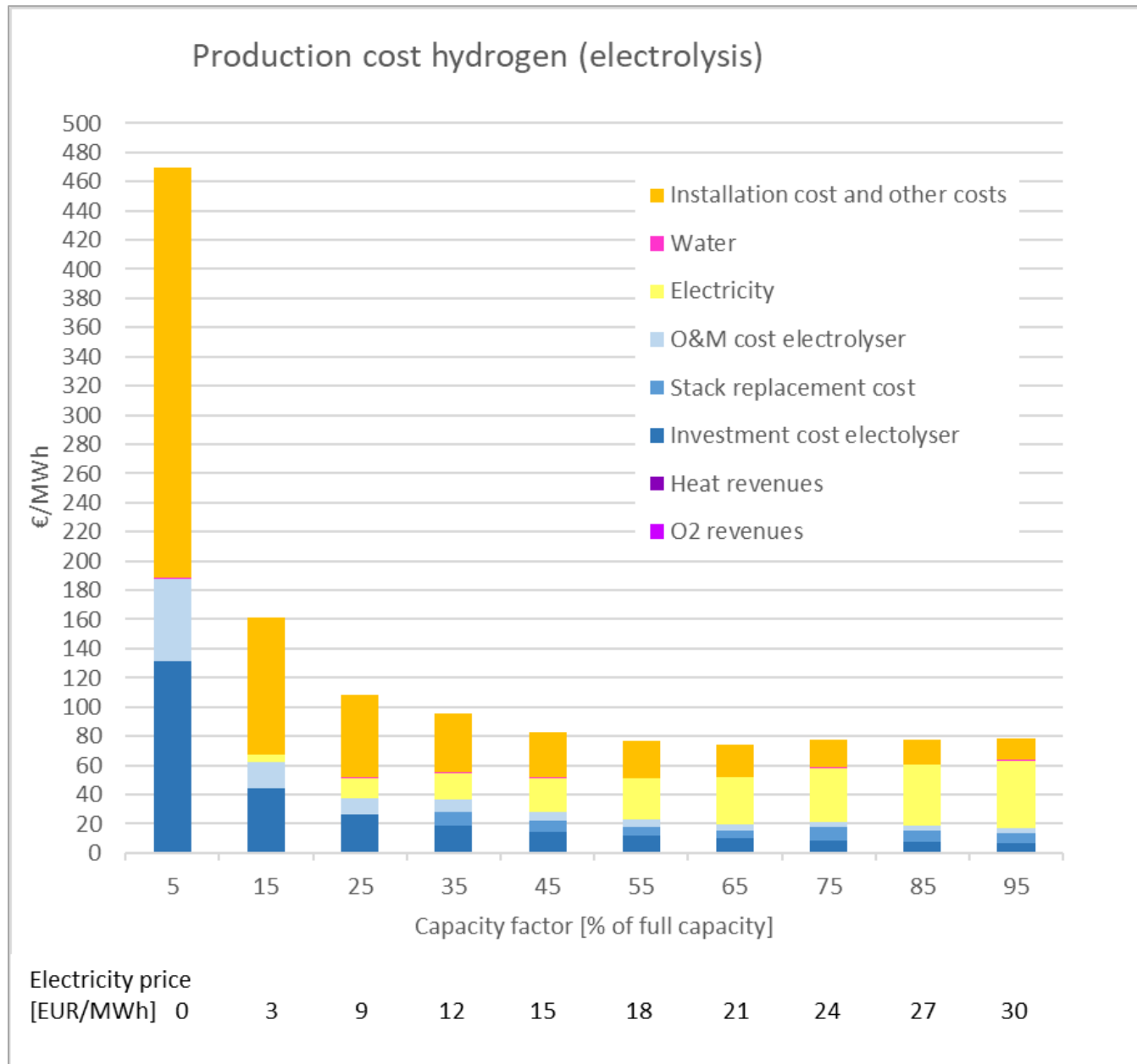


	Base case	Future case
Investment cost electrolyser (alkaline)	[€/kW <sub>el</sub> ] 500	300
Heat revenue	[€/MWh <sub>heat</sub> ] 0	30
Oxygen revenue	[€/ton <sub>O2</sub> ] 0	50
Investment cost methanol synthesis reactor (base:5 MW, future: 50 MW)	[€/MW <sub>MeOH</sub> ] 1000	500
Cost for CO <sub>2</sub> capture (10–50% concentration)	[€/ton <sub>CO2</sub> ] 30	5
Electricity price	[€/MWh <sub>el</sub> ] 30	20
Experience factor for indirect investment costs	3.14	2



**Source:** Grahn M, A-K Jannasch (2018). What electricity price would make electrofuels cost-competitive? 6<sup>th</sup> TMFB, Tailor-Made Fuels from Production to Propulsion Aachen, Germany. 19-21 June

# Production costs depend on capacity factor



## Base case assumptions

Capacity factor	share	0.05-0.95
Interest rate	share	0.08
Electricity cost	€/MWh(el)	0-30
Water cost	€/t	1
Heat revenue	€/MWh(heat)	0
Oxygen revenue	€/t	0
Efficiency (LHV H <sub>2</sub> /electricity input)	share	0.65
Heat efficiency (heat/electric input)	share	0.30
Electrolyzer Investment cost	€/kWel	400
Stack replacement cost (share of investment cost)	share	0.50
Stack life time	hours	75000
O&M cost (share of investment cost)	share	0.04
System life time	years	25
Other costs e.g. installation and uncertainty costs	Factor multiply investment costs	3.14



# Some insights from our research on electrofuels

- Costs for electrolyser and electricity are dominating posts building up the production cost.
- Since the synthesis reactor is a relatively small share of the production cost, the differences between the fuel options are minor, i.e., electro-methane slightly lower than electro-methanol, electro-DME, electro-gasoline and electro-diesel but no significant difference.
- Potential revenues (oxygen, heat) would benefit the business model.
- Production cost depends on capacity factor. Below 40% result in much higher costs per produced MWh of fuel.
- Production costs may lie in the order of 100-150 EUR/MWh in future (similar to advanced biofuels).