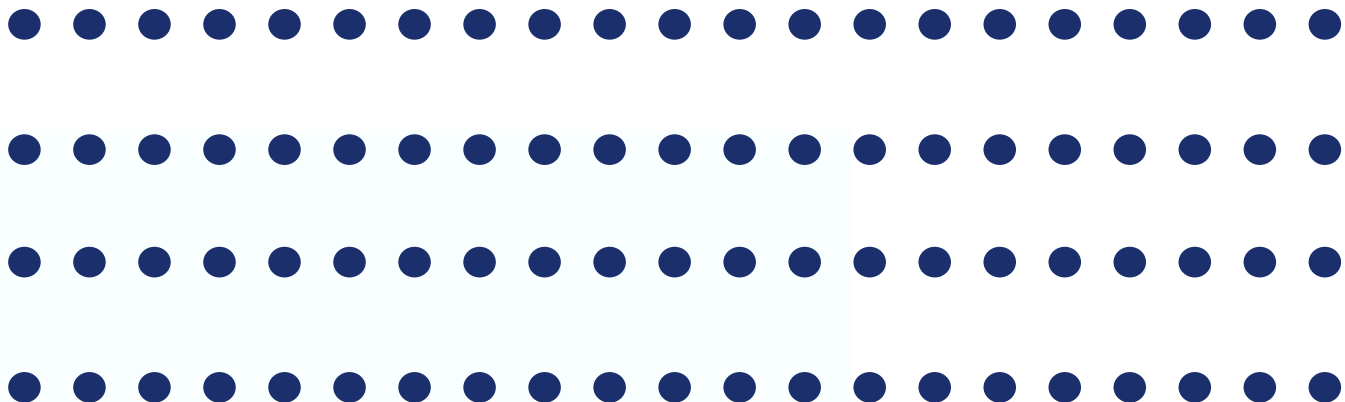


# The Electrolyzer Market:

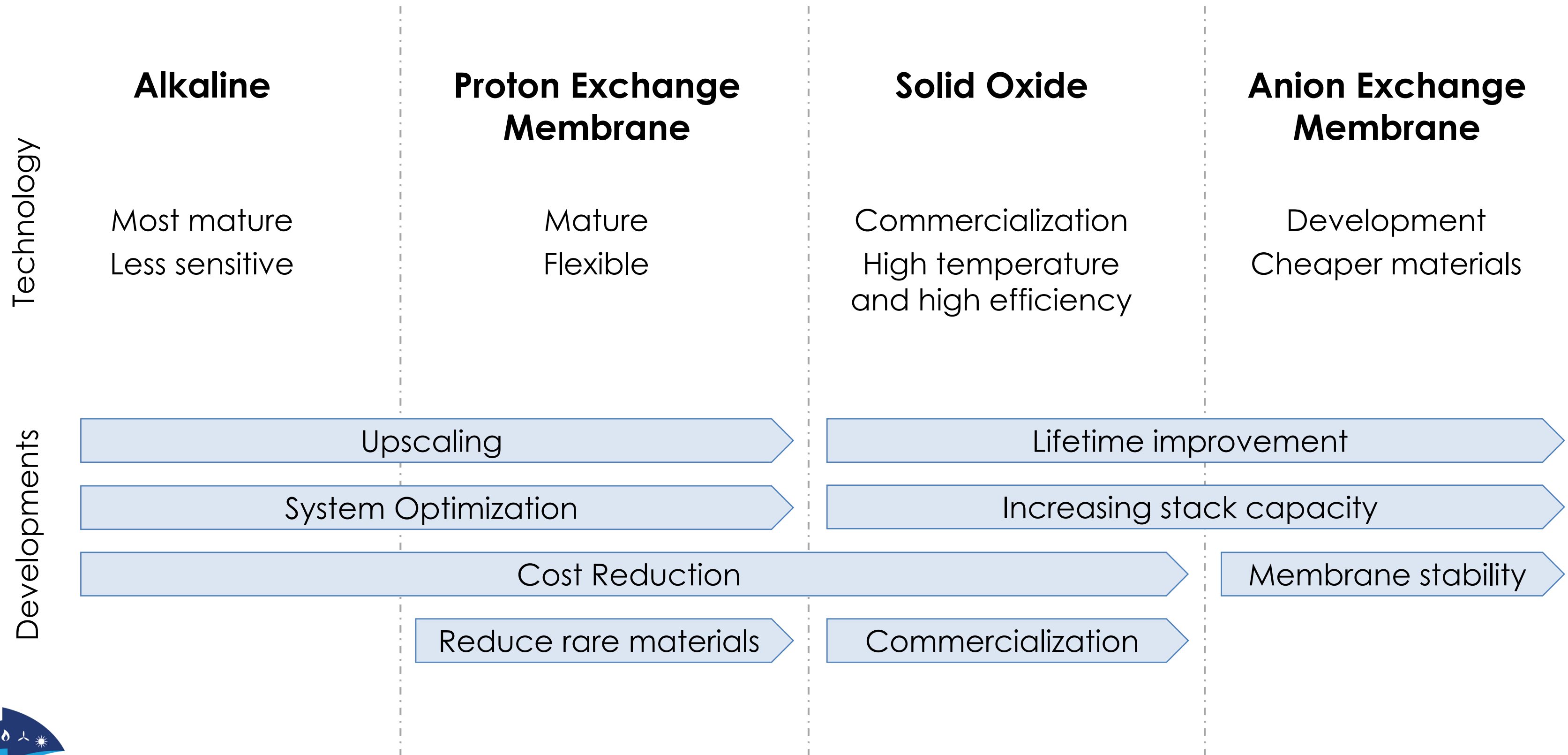
Where Are We Now and Where are We Going

Jillian Johnson, M.Sc., P.Eng.

# Where are we now?



# Technologies and Developments



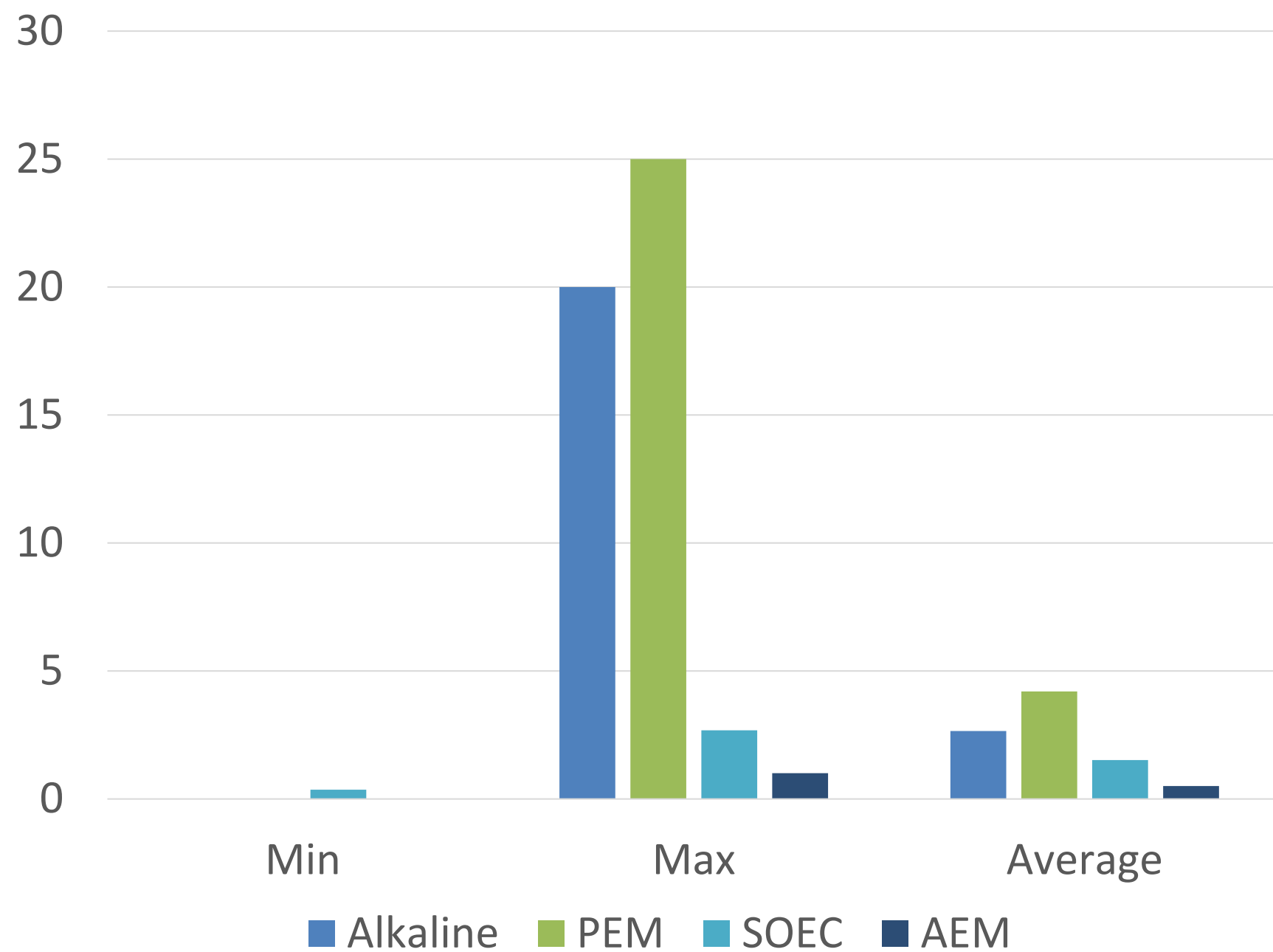
# Electrolyzer Manufacturers



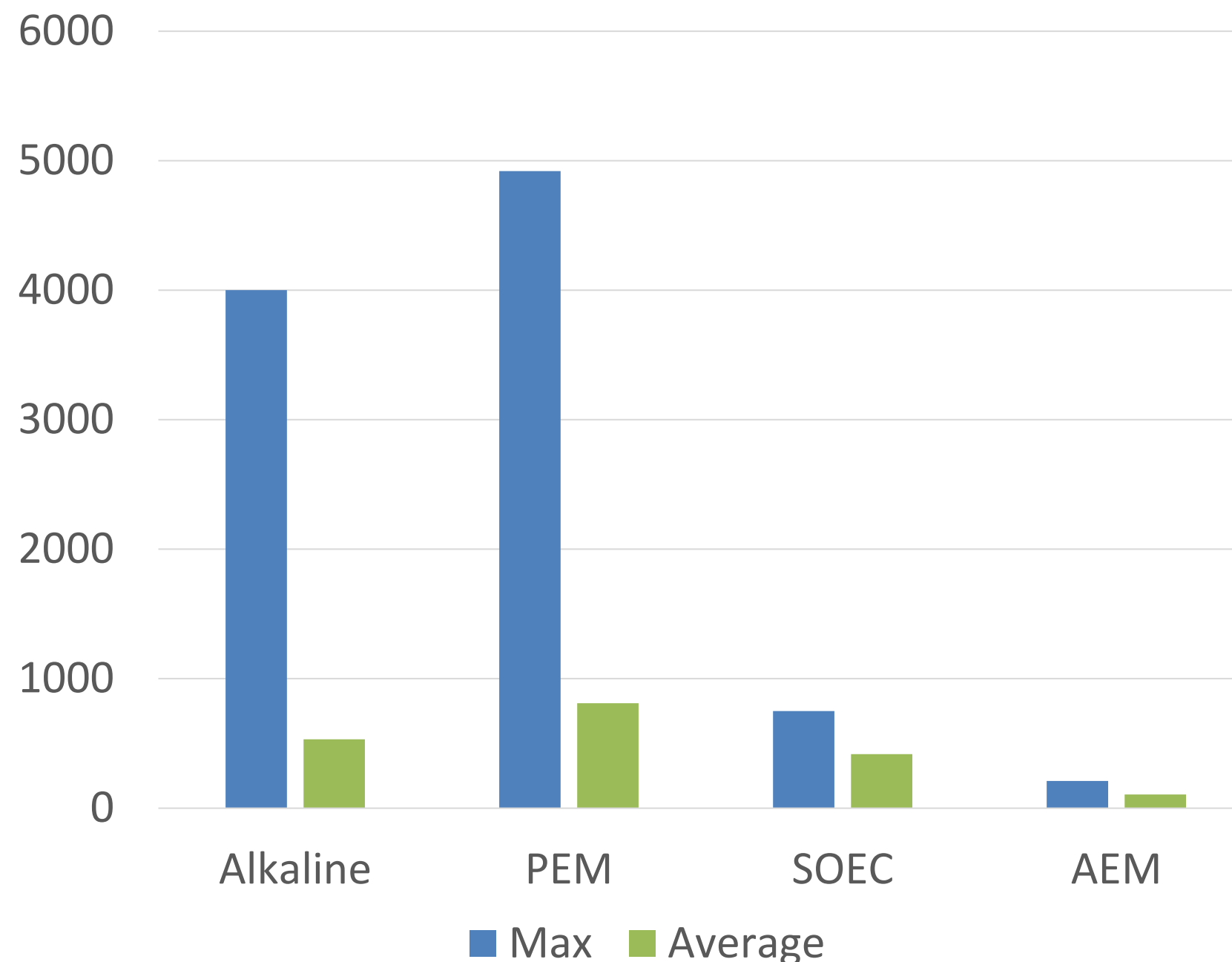
# System Specifications



### Power Rating (MW)

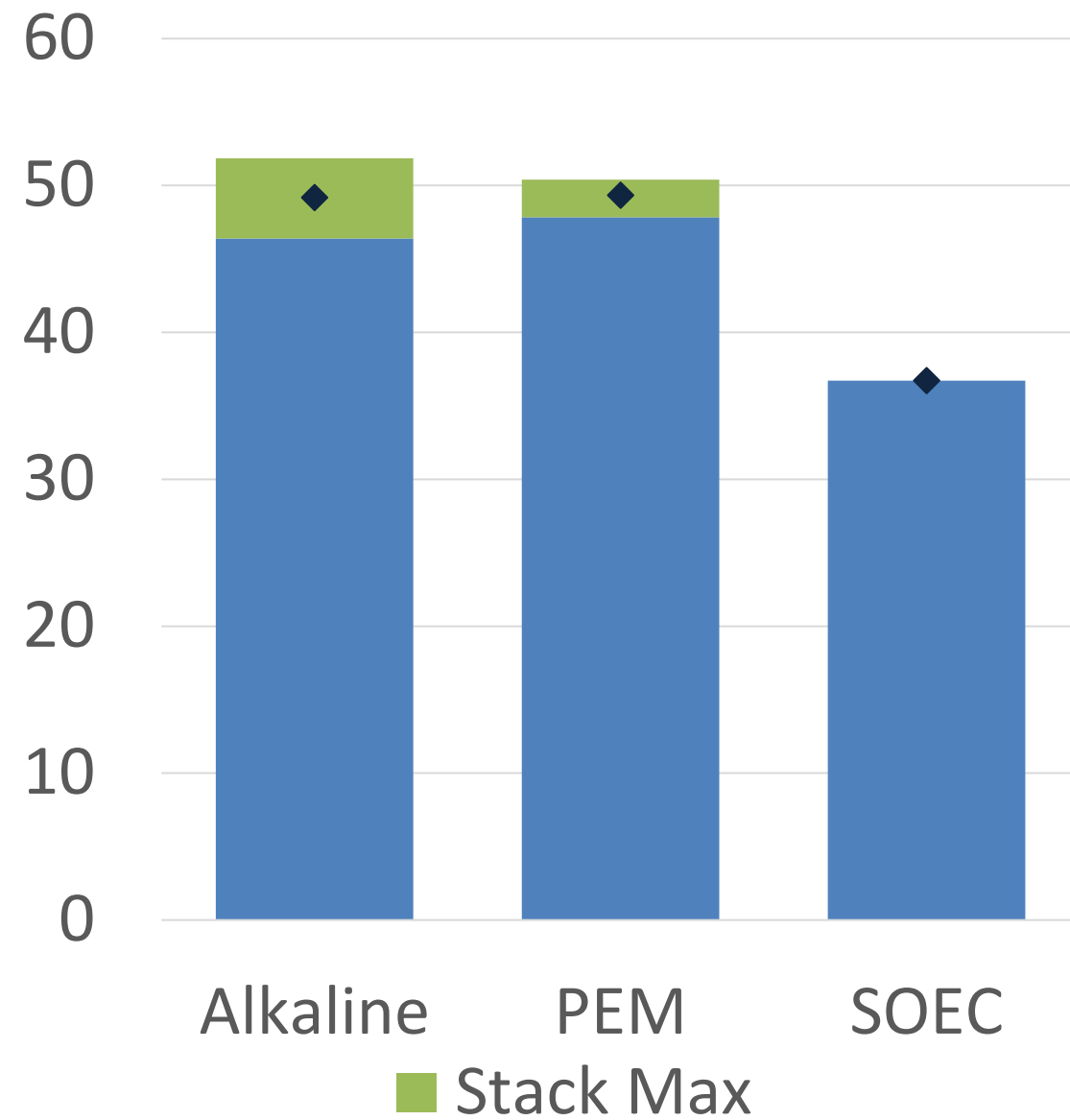


### Maximum Hydrogen Production Capacity (Nm<sup>3</sup>/h)

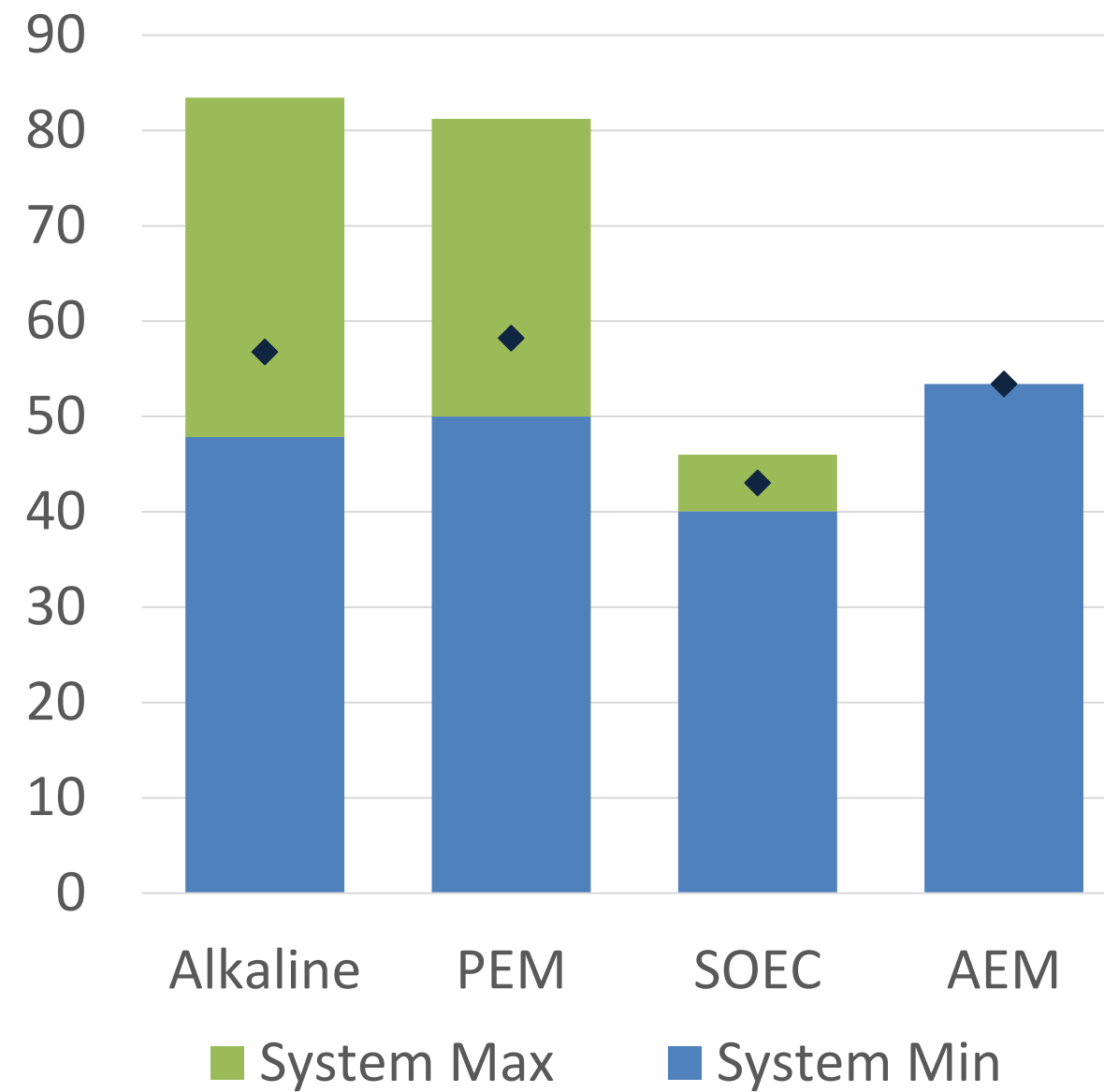


# System Specifications

### Stack Power Consumption (kWh/kg)



### System Power Consumption (kWh/kg)



Stack average:

- Alkaline: 49.3 kWh/kg
- PEM: 49.3 kWh/kg
- SOEC: 36.7 kWh/kg

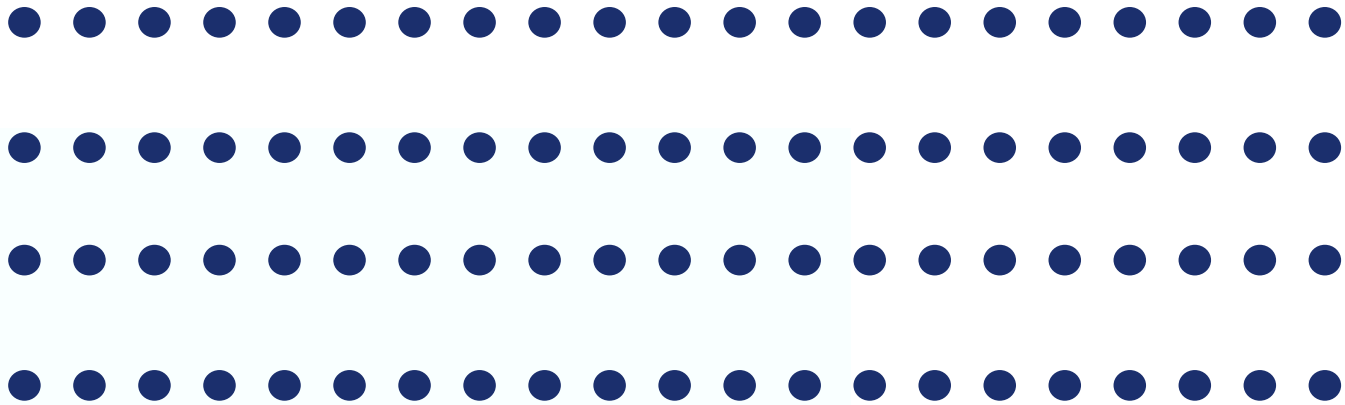
System average:

- Alkaline: 56.8 kWh/kg
- PEM: 58.8 kWh/kg
- SOEC: 43.0 kWh/kg

# Capital Costs

- Current electrolyzer capital costs vary depending on the technology and the manufacturer
- Costs are also changing quickly as manufacturers upscale their manufacturing and the size of their systems
  - Alkaline: 750 – 1000 USD/kW for 10 MW systems; can be up to 2000 – 3000 USD/kW for small systems
  - PEM: 1000 – 1500 USD/kW
  - SOEC: 2500 USD/kW

# Where are we going?

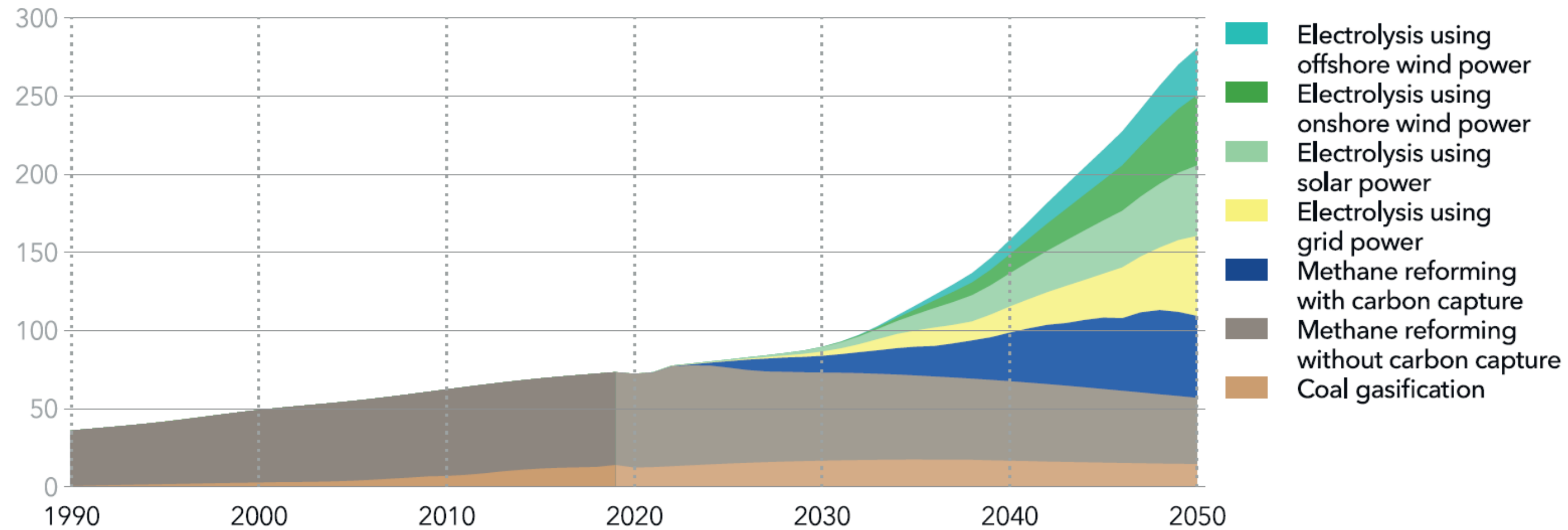




# Predicted Rise in Electrolysis Demand

### World hydrogen production by source

Units: Mt/yr



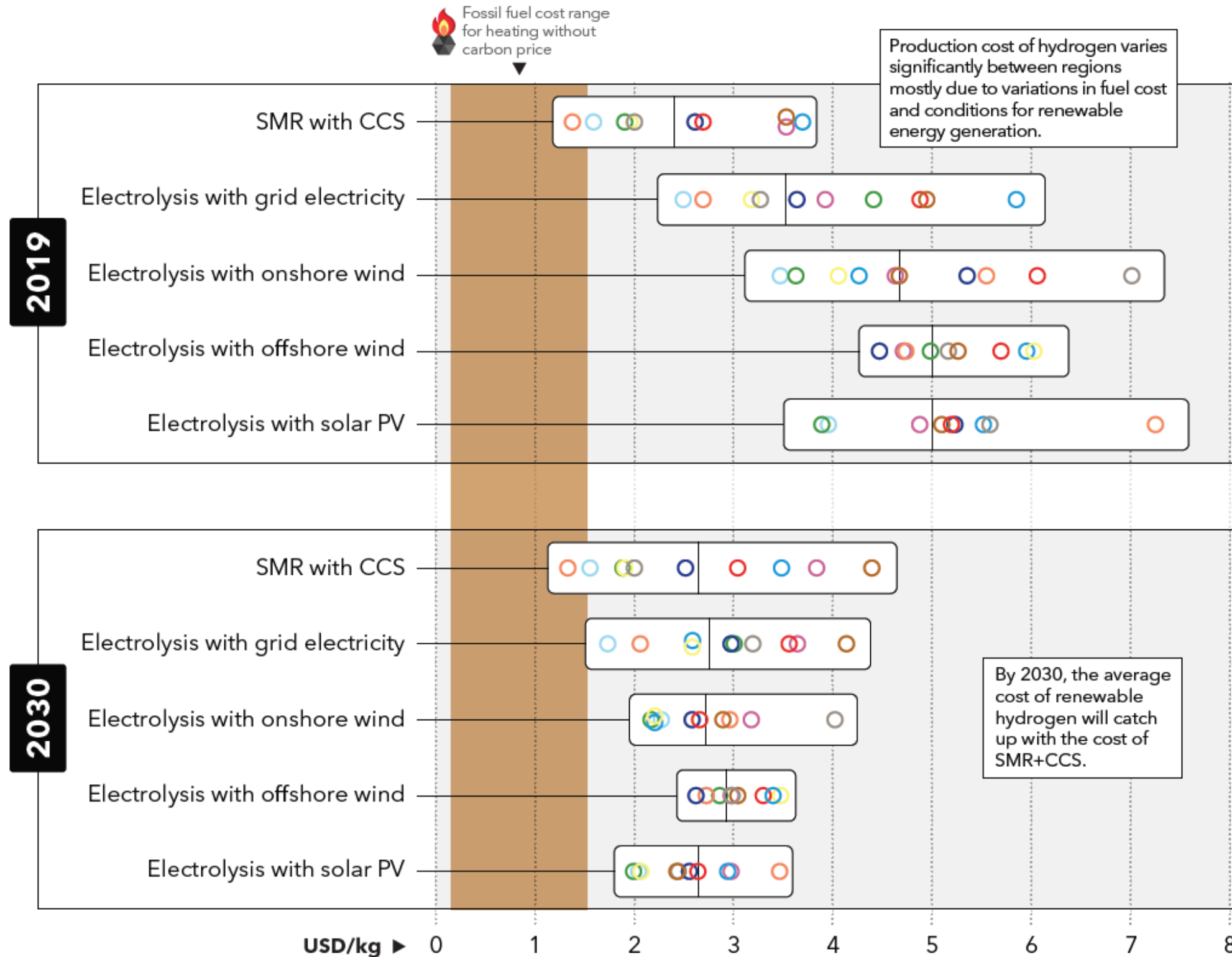
Only includes pure hydrogen supply. Historical data source: IEA Future of Hydrogen (2019)

DNV's 2021 Energy Transition Outlook predicts that by 2050: hydrogen production will have tripled over 2022 production rates, and 43% will come from dedicated capacity from solar and on/offshore wind.

Source: DNV Energy Transition Outlook (2021)

# Cost Forecasts - Global

○ NAM 
 ○ LAM 
 ○ EUR 
 ○ SSA 
 ○ MEA 
 ○ NEE 
 ○ CHN 
 ○ IND 
 ○ SEA 
 ○ OPA | Weighted Average



DNV predicts that electrolysis capital costs will decrease by almost 50% by 2030\*.

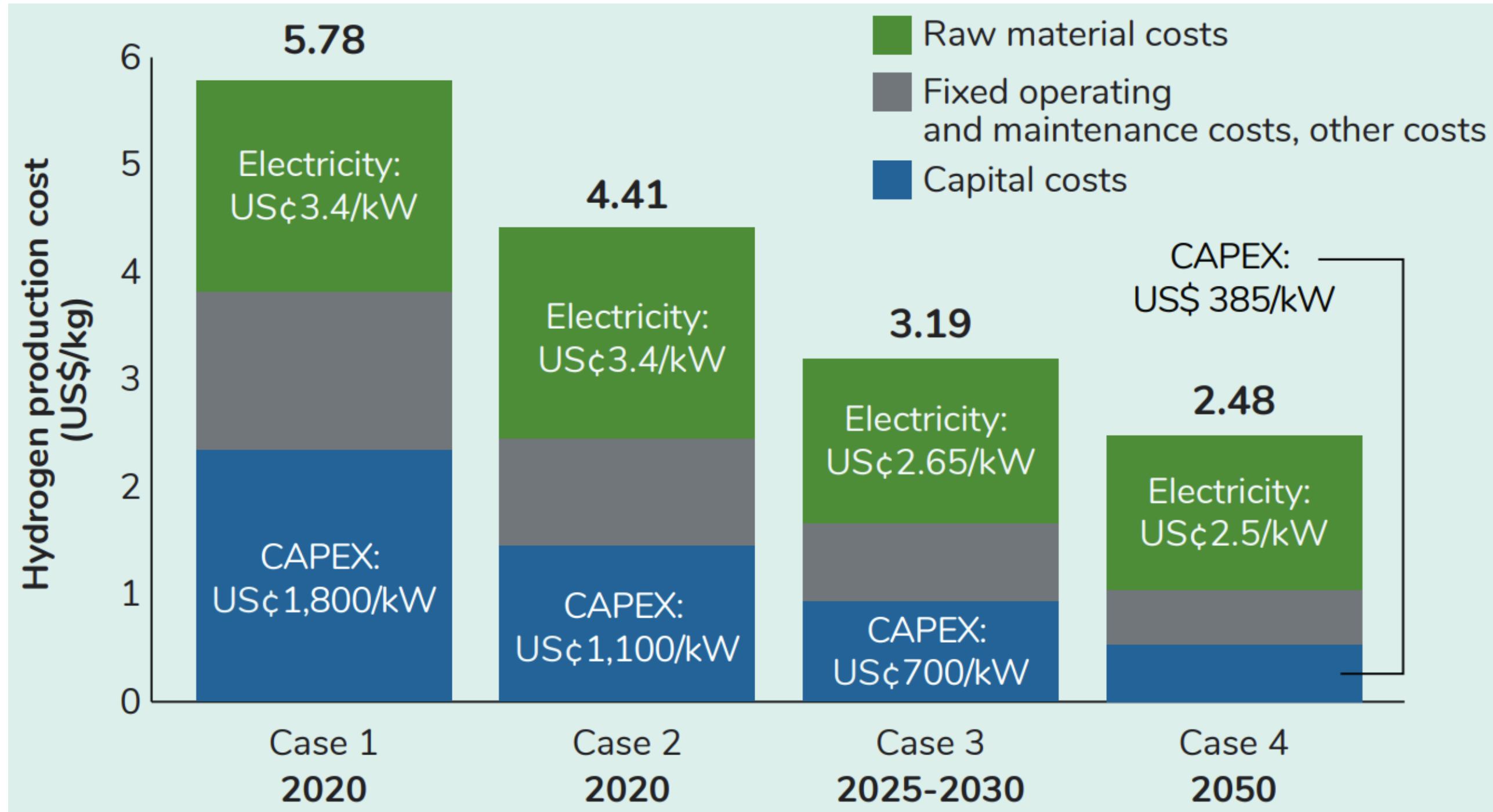
## 2030 Predicted Levelized Cost of Green Hydrogen

- Global: 2 – 4 USD/kg
- North America: <3 USD/kg

Source: DNV Energy Transition Outlook (2021)

\*Compared to 2019 costs.

# Cost Forecasts - Québec

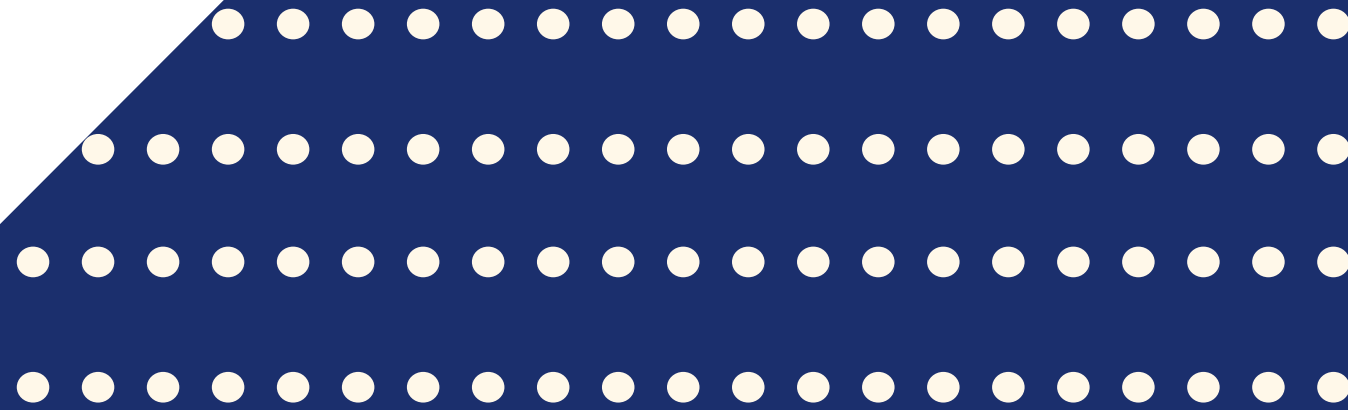


Cost forecasts for levelized cost of hydrogen specific to Québec align with DNV's predictions.

Source: Toward a 2030 Strategy on Green Hydrogen and Bioenergy – Consultation Document, Government of Québec (2021)



# Contact



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