

# Enabling large consumption technologies to provide flexibility to the system

4th Sustained seminar

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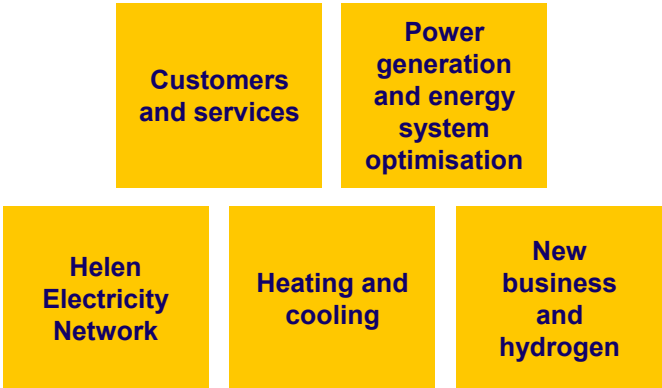


**HELEN**

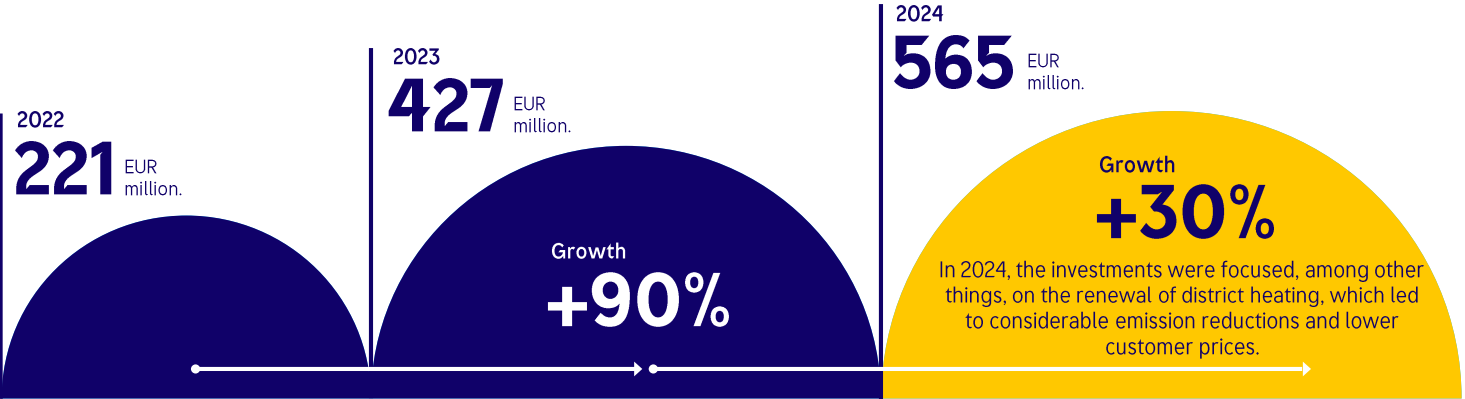
# We are one of the largest energy companies in Finland



Our core business is the generation, distribution and sale of electricity and heat



## We make significant investments in carbon-neutral energy

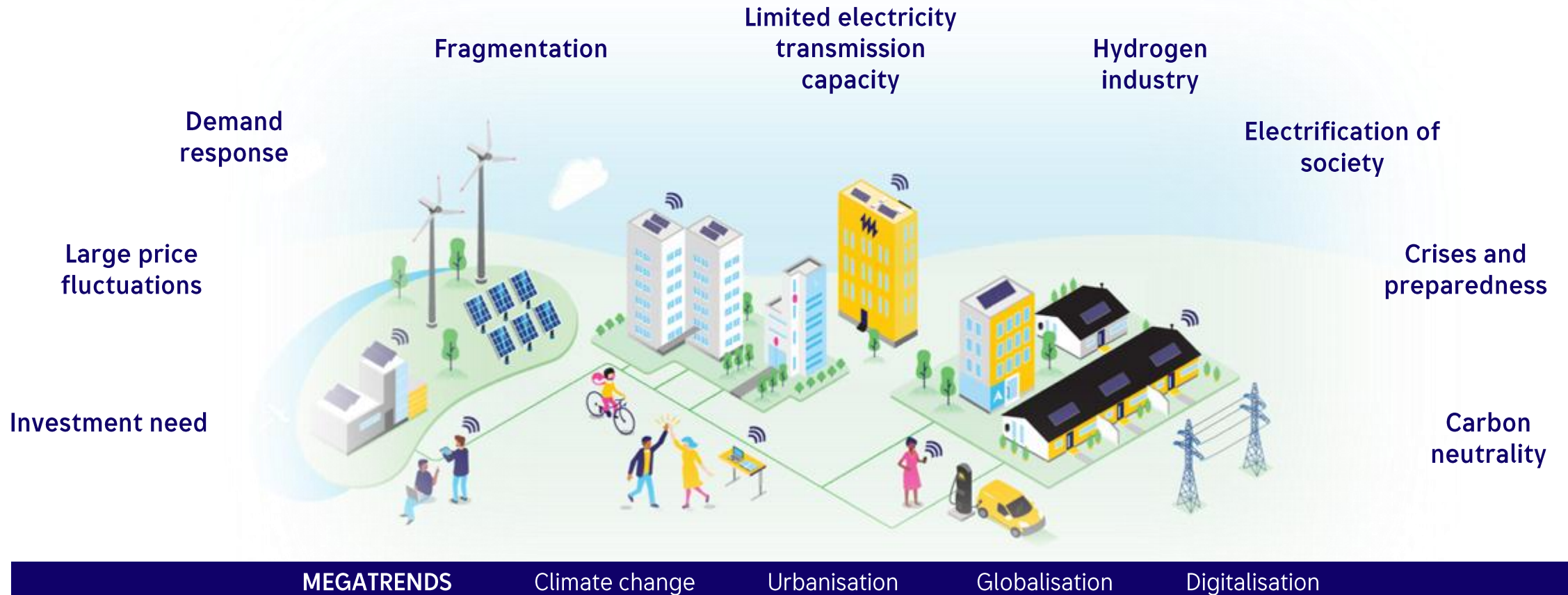


A future where energy is clean and flexible

The clean transition | Flexibility | Profitability



# The energy industry is undergoing a tremendous transformation

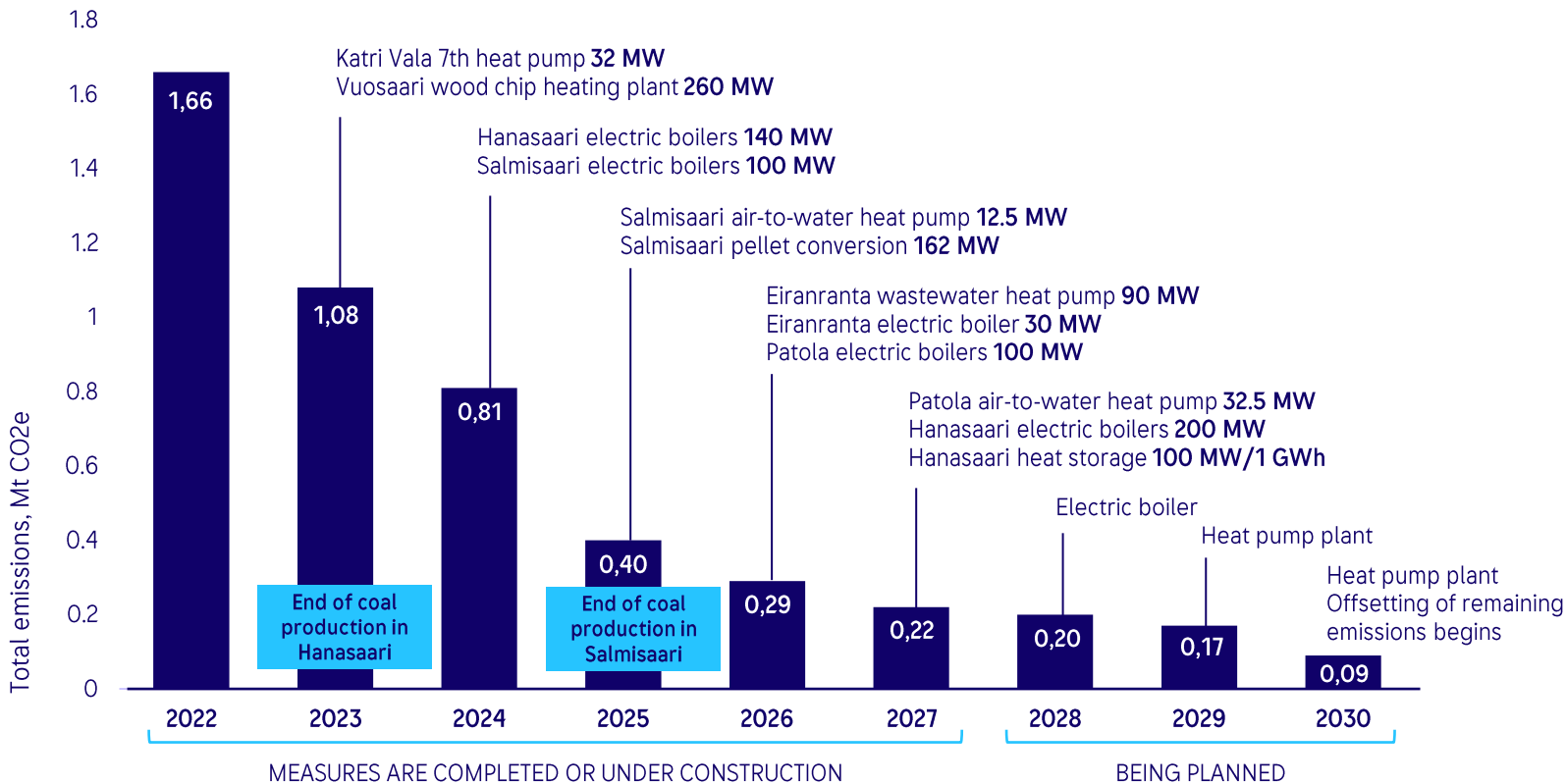
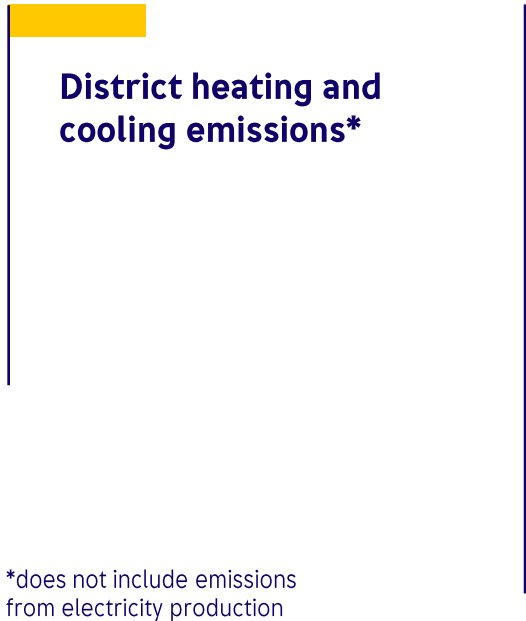




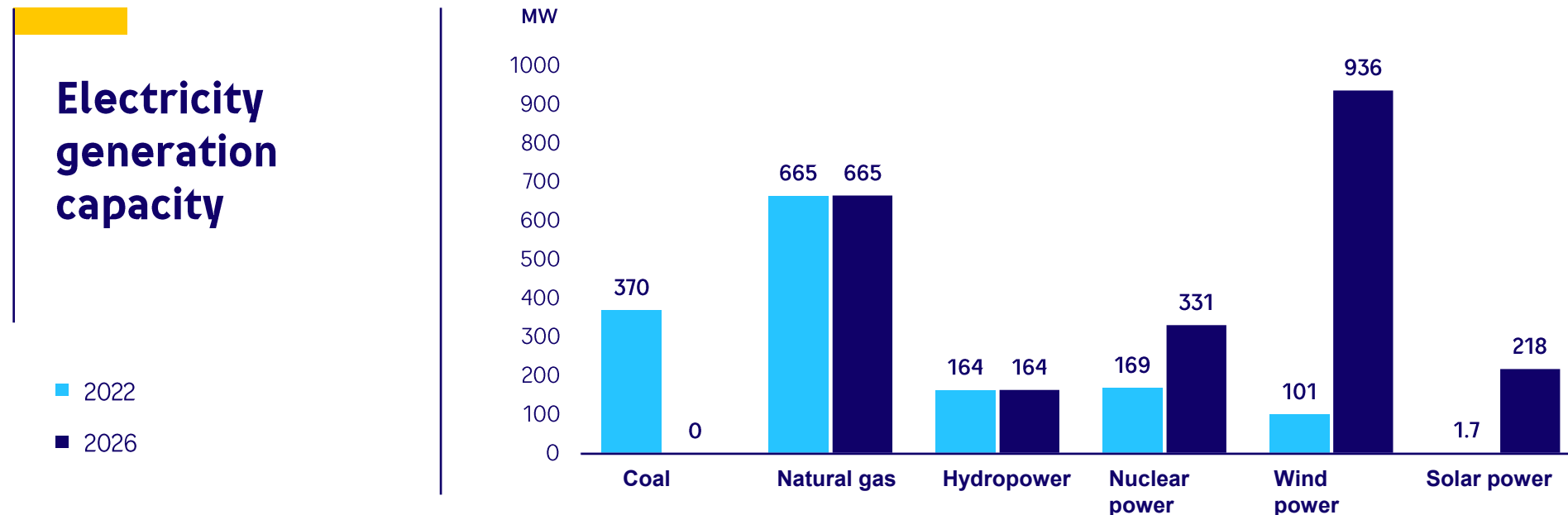
# Clean flexibility



# Helen's district heating investments and emission reduction path



## Significant increase in the importance of wind power in electricity generation



# Flexibility throughout the value chain(s)

## H2 production and utilization

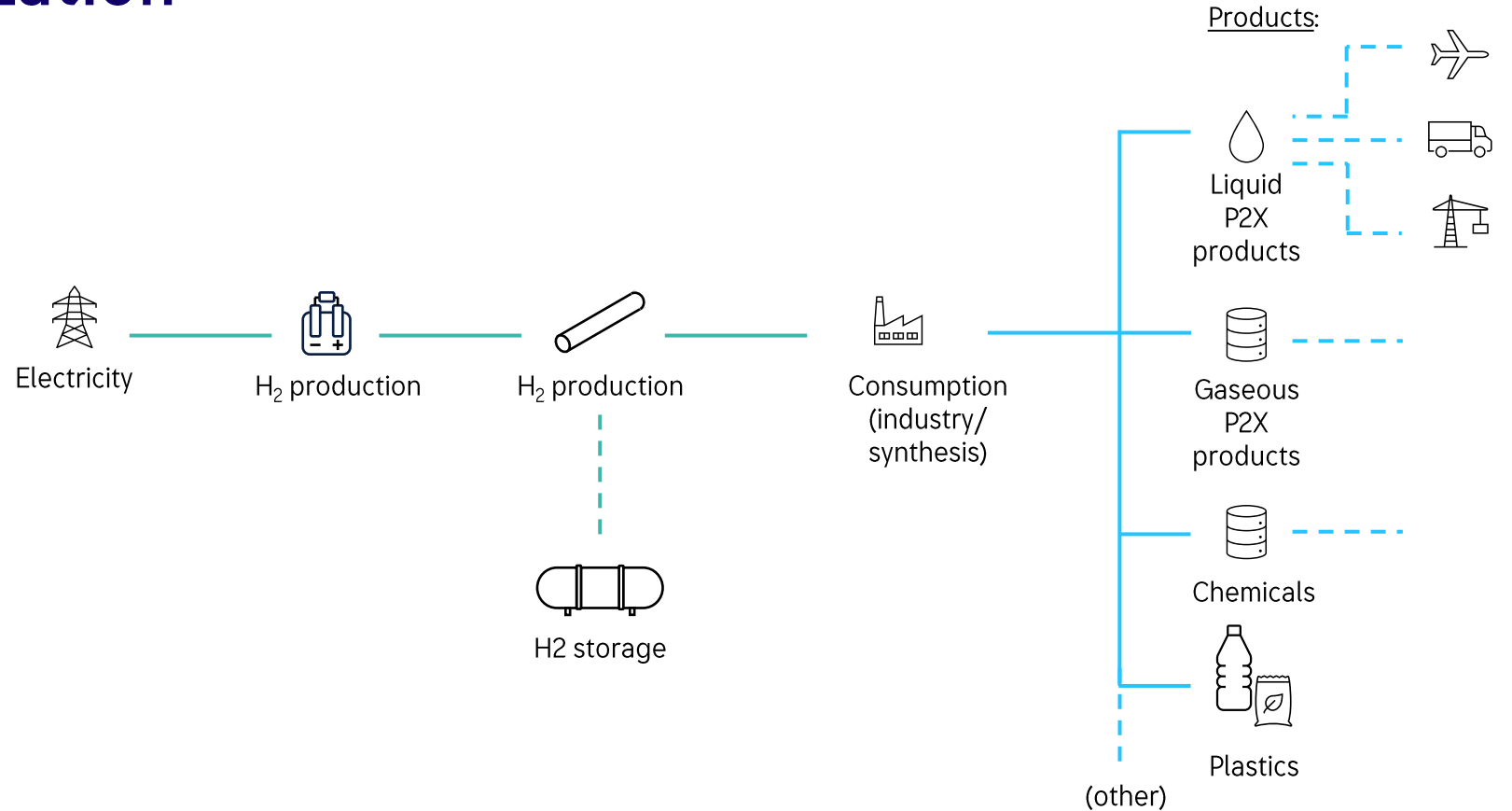
**Hydrogen as a flexibility asset**, yet today its flexibility also comes with a cost

Flexibility required from a **systemic point of view**

Means of *value sharing* to encourage for further flexibility

Flexibility through *flexible operations* and/or *storages* of different commodities and goods

→ Creation of the **highest value over the full value chain**



# 3H2

## *Helen's pilot plant for h2 production*

- @ Vuosaari, Helsinki, FI
- Ministry of economic affair and employment investment aid 12/2023, FID 3/2024, construction started 5/2025, start of operation H2/2026
- Main goal of the pilot plant is to build capabilities in development, operation and optimization of hydrogen plants
- Designed for flexibility
  - 3 MW PEM electrolyser
  - Waste heat utilization via heat pump to district heating network
  - Hydrogen quality and quantity measurements
- Main use for heavy-duty transport
  - Hydrogen refueling station is expected to be built by partner next to 3H2
  - Hydrogen container filling and export terminal





# Flexibility

## *Hydrogen production can bring flexibility into electricity system*

- *The promise*: H<sub>2</sub> balances the electricity supply and demand, caused by large amount of intermittent, renewable electricity production – *Reality*: high cost of electrolyzers demands high utilization rates for affordable hydrogen prices
- Electrolyzers are flexible in nature – flexibility required to be defined
- Besides the technological flexibility, flexibility required to be accounted into the contracts in new ways
- Future expectation: electrolyser CAPEX lowers – optimal utilization rate wider → wider range of flexibility with very affordable added cost

- *Balancing element in wholesale electricity market*
- *Balancing of forecasting errors*
- *Reserve markets (aFRR, mFRR)*





# Summary

## *Enabling H2 as a large consumption technology to provide flexibility*

- Flexibility is needed to be considered through the value chains
- There is a value in flexible hydrogen production, but it is no silver bullet yet
- More systemic view needed
- In large scale pipe transportation of H2, pipeline network should act as a buffering element to hydrogen act as a balancing element. Longer balancing period than that of electricity market would aid effective interplay of electricity market with future hydrogen market.
- Flexibility should be inherently embedded into the (offtake) contracts

