



# ENGIE BU H2

## How to Boost R&D by Innovation and Business

*September 12<sup>th</sup> 2018*



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# How to Boost R&D by Innovation and Business

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## Chapter 1

H2 ENGIE'S VISION

## Chapter 2

HOW TO BOOST R&D BY INNOVATION AND BUSINESS

## Chapter 3

WHAT'S NEXT...



## H2 ENGIE'S VISION



# ENGIE's Positioning on Hydrogen

Renewable hydrogen is the “missing link” to **unlock the full potential of renewables** and drive **carbon free energy solutions**

FROM...



*Intermittent REN production hindering their full deployment*



*Pollution, noise and CO2 emissions in cities*



*High CO2 emission by industry*

## Renewable H2



...TO

*Full REN integration in the power mix enabled by large scale H2 storage*



*Zero emission and quiet mobility solutions*

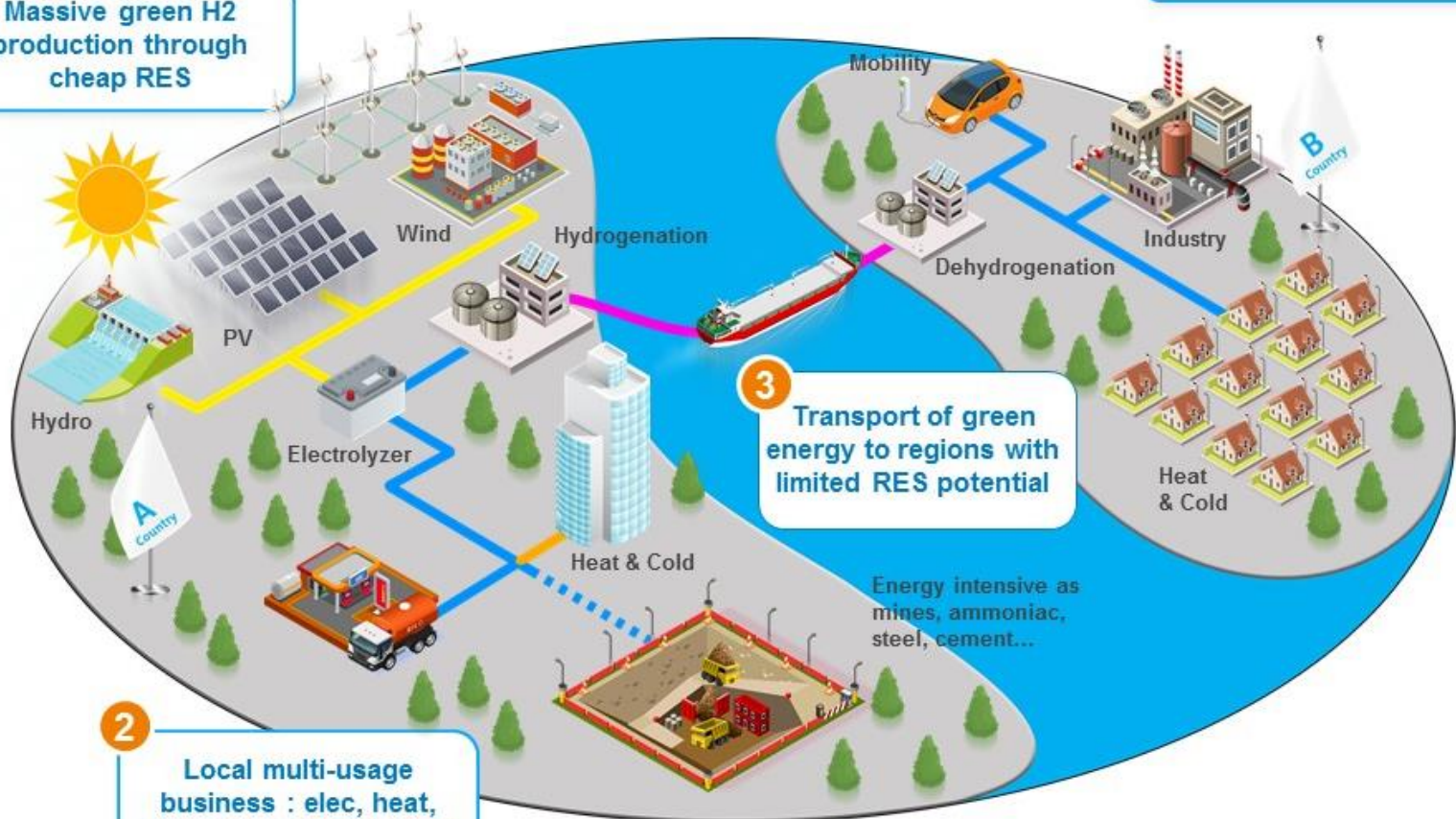


*Carbon free industry processes based on H2*



**1** Massive green H2 production through cheap RES

**4** Multi-usage green offer

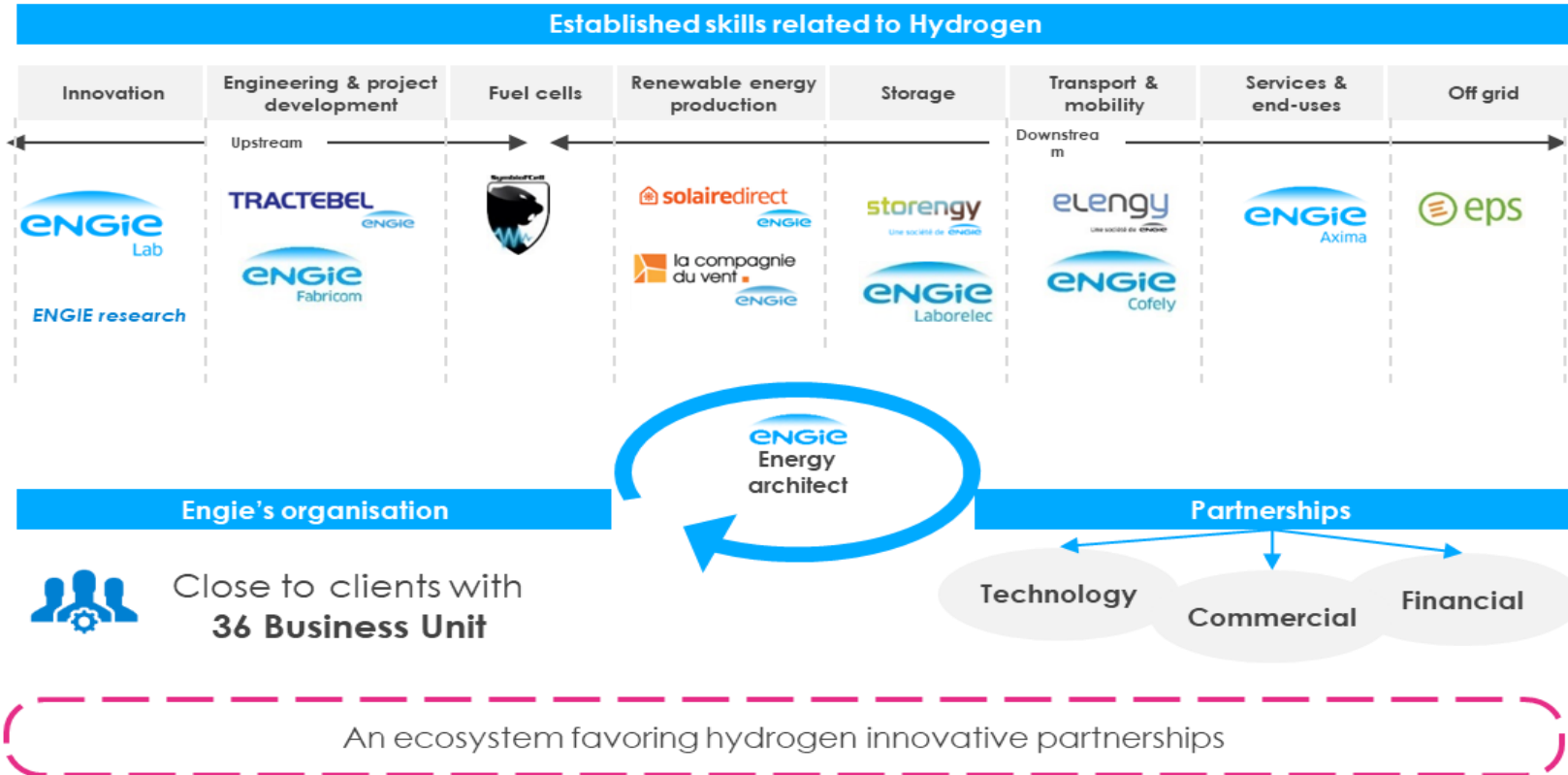


**2** Local multi-usage business : elec, heat, cold, process, transport

**3** Transport of green energy to regions with limited RES potential

Energy intensive as mines, ammoniac, steel, cement...

## To Support this Vision, ENGIE has key competencies throughout the value chain

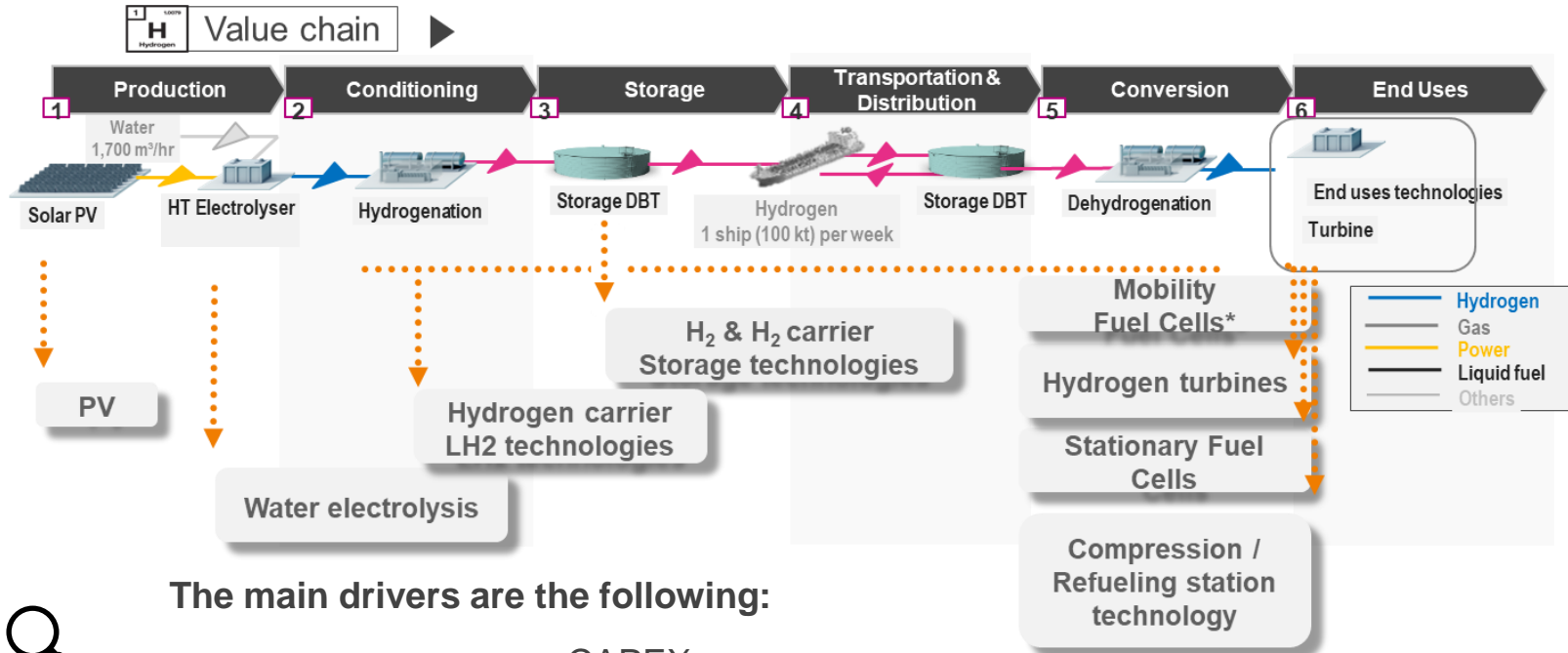




# HOW TO BOOST R&D BY INNOVATION AND BUSINESS



# Key Bricks to Achieve H2 Revolution



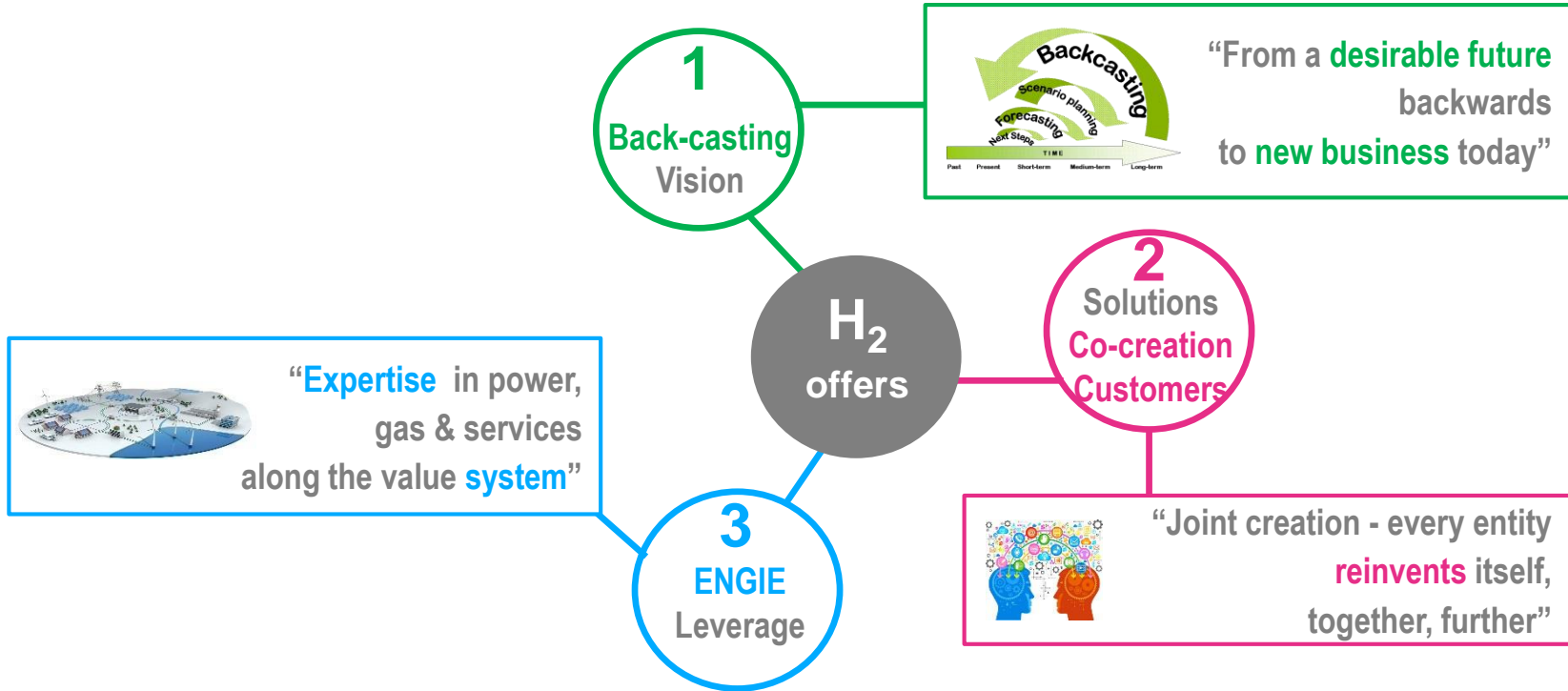
The main drivers are the following:



- Efficiency
- Safety
- CAPEX
- Scalability



# The Future has to be Prepared now by Innovative and Disruptive Approaches at Scale



## 2 R&D Initiatives on H2 Transportation and H2 Production (SOEC) to Reach Large Scale



### H2 TRANSPORTATION

*The goal is to reach massive H2 production and competitiveness at scale*

#### 1 – Focus on Long Distance Sea Transportation

- Open Innovation Challenge and pre-feasibility studies on Fos Tonkin for long distance sea Transportation



### H2 PRODUCTION

#### 2 – Prepare a game-changer technology - SOEC

- Partnership with CEA (French Public Research Center on Energy) and other academic and industrial players

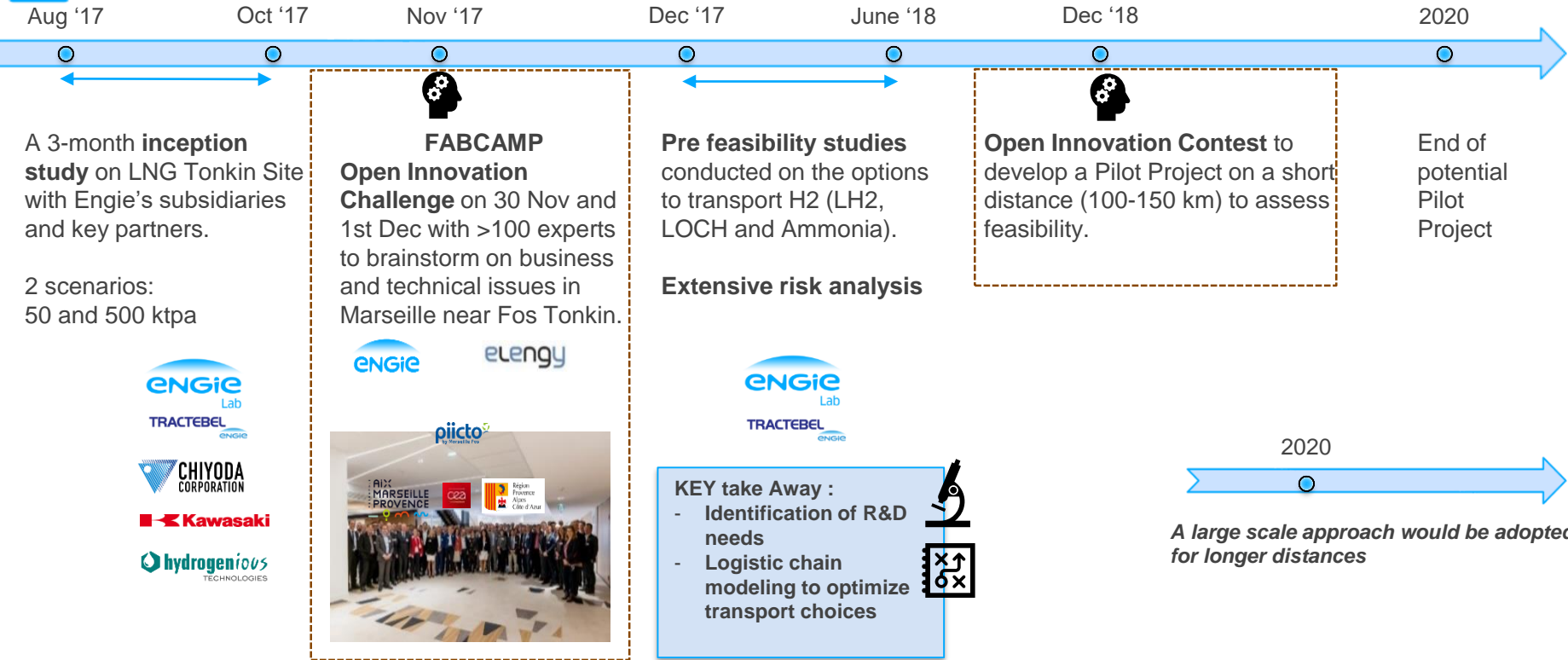


&

Partners



# Innovative process to Study H2 Sea Transportation using LNG site Conversion case



# “The FabCamp”: How does Engie pilot an Open Innovation Challenge?



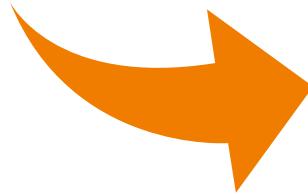
- **Open Innovation Challenge “FabCamp”** held in Marseille on 30 Nov & 1 Dec 2017
- **International exposure** : 50+ experts invited from international companies, startups, labs, Authorities, financing institutions...
- **Co-organized with Metropole Marseille- Aix-en-Provence** and the **Region PACA** and **Elengy**
- **Boost of the H2 ecosystem**

- **R&D targets:**
  - Identification of the best H2 carrier
  - Feasibility study of the conversion of a LNG terminal to H2 terminal
  - Modeling of H2 transportation

# Innovative approach on H2 Production by back-casting and business modeling

**Today  
Mature  
Technologies**

Alkaline
PEM



**By 2030... game  
changer?**

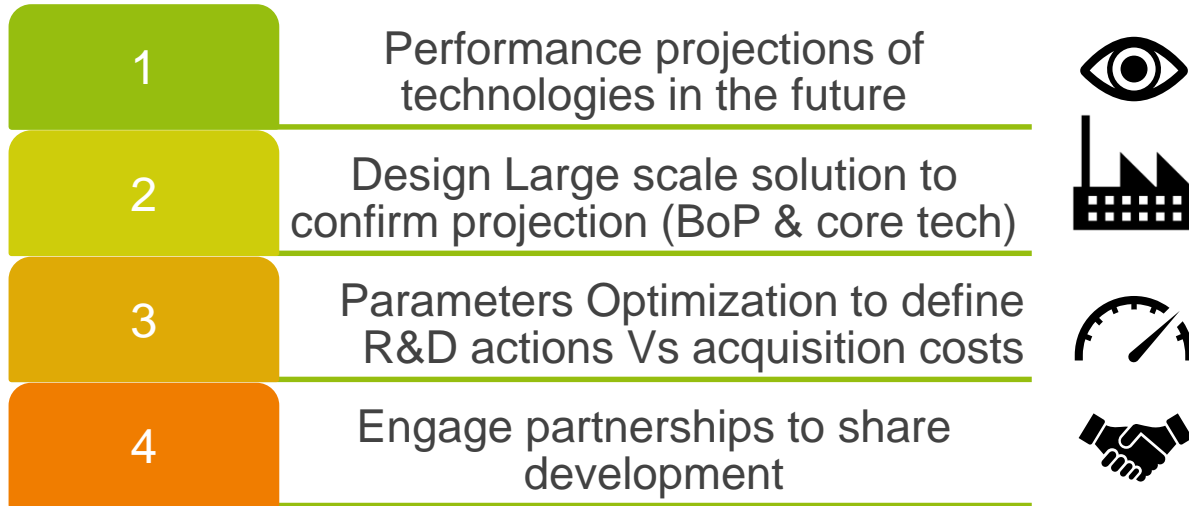
Efficiency ↗	> 95%
Durability ↗	>50 000h
CAPEX ↗	>200€/Kw

**SOEC/FC game changer  
technology ?**

**Developed now large scale  
Solution**

**Cost parity with oil  
and gas**

## A 4-steps Approach to Innovate in Widescale Hydrogen Infrastructures



**Engie is adopting a back-casting approach to ensure the business needs match R&D actions and investments.**

# 03

## WHAT'S NEXT



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## What are the Next Steps...

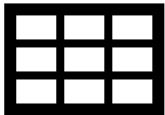
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Invest in **new technologies** through real projects at scale



Develop **partnerships** to amplify efforts and share risks on academic and industrial levels



Combine an approach of **modeling and experiments** by a back-casting approach



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Thank you for your attention,

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