

# SMART SPECIALISATION WORKSHOP ON FUEL CELL AND HYDROGEN

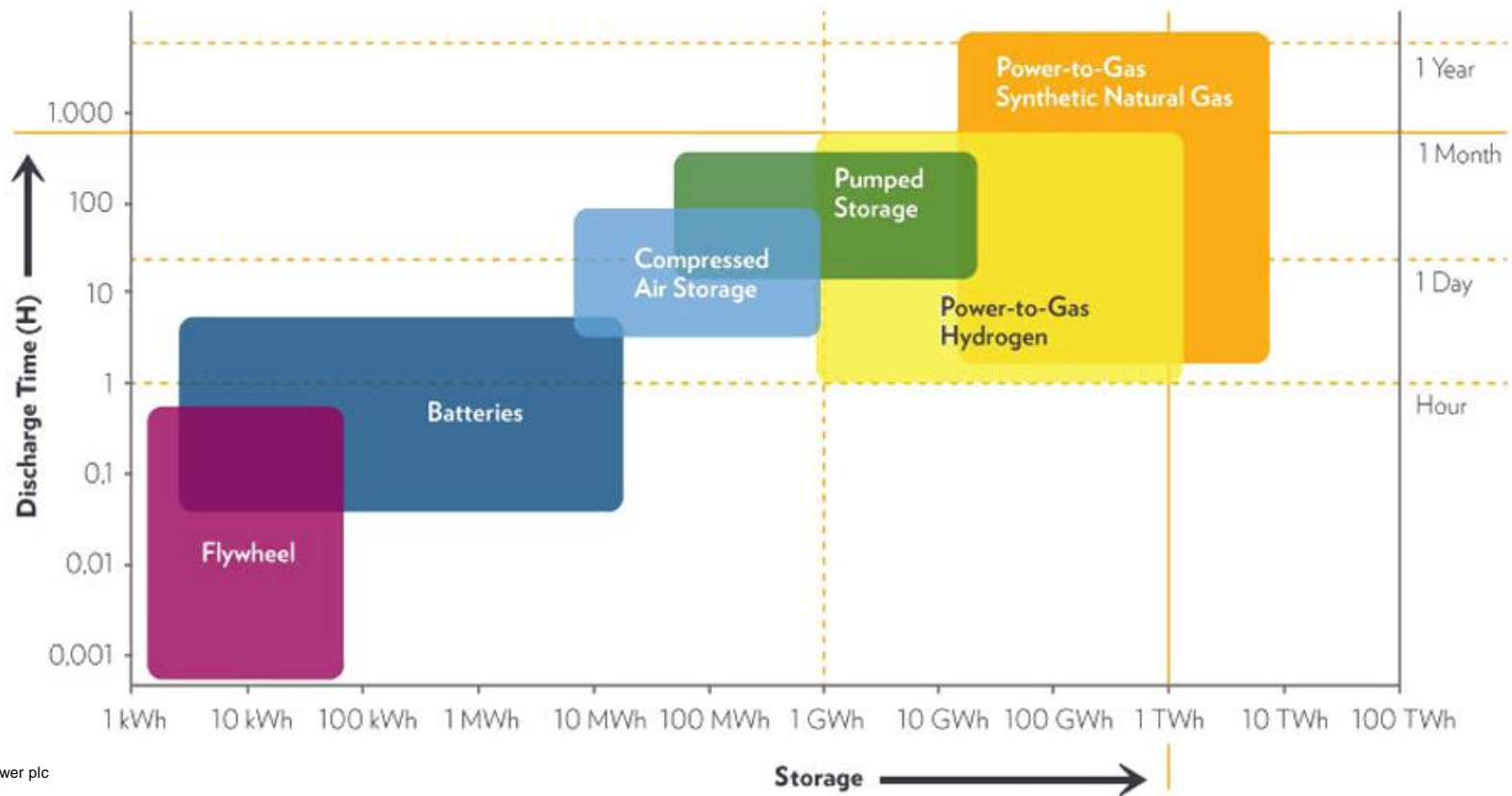
23<sup>TH</sup> APRIL 2015, LYON



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# ENERGY STORAGE TECHNOLOGIES

Power-to-gas is efficient | long term | low energy cost



Source: ITM Power plc

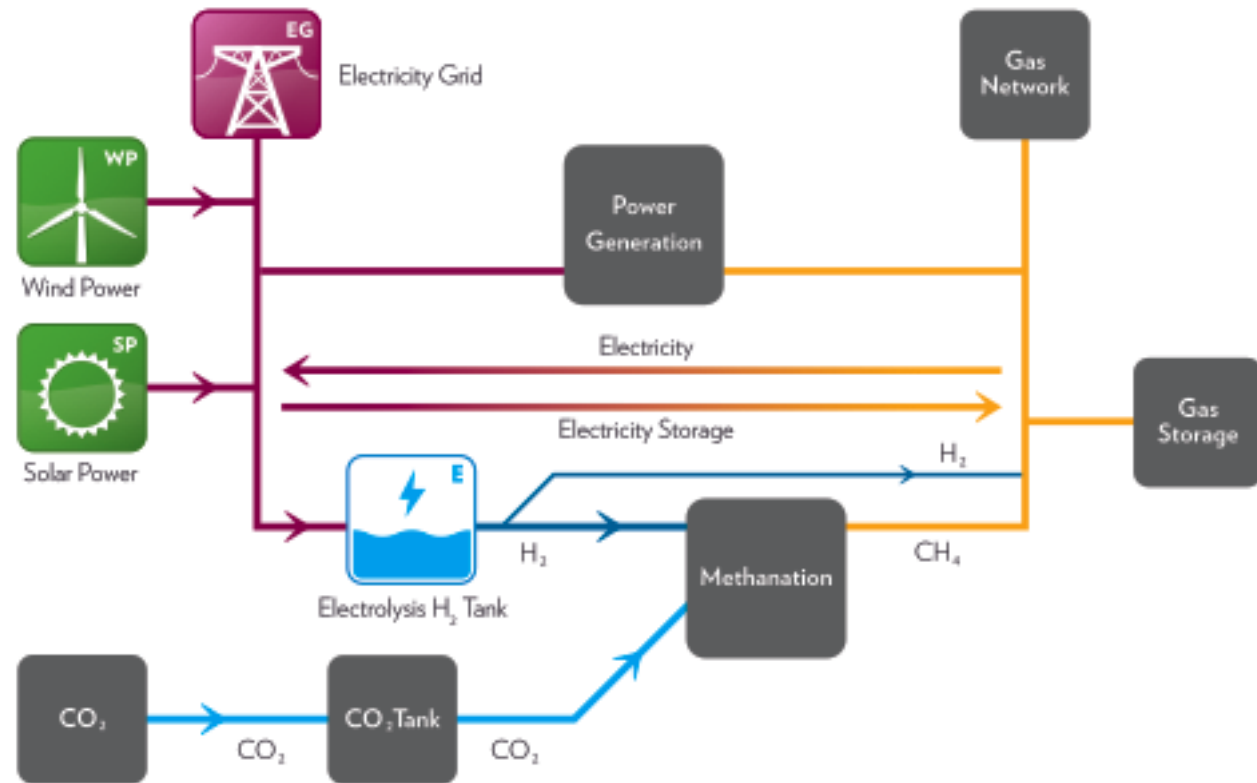
## ENERGY STORAGE TECHNOLOGIES

### ENERGY STORAGE | CLEAN FUEL

# WHY POWER-TO-GAS?

Electricity cannot be stored easily | Hydrogen can be stored easily in the gas grid

- **Support RES penetration and Energy transition :**  
Energy storage for excess of renewable / Grid power
- **CO<sub>2</sub> footprint reduction**
- **Grid balancing services:**  
Direct link between Power grid and Gas Grid ,



POWER-TO-GAS RATIONALE  
HYDROGEN ENERGY SYSTEMS

# HGAS

HGas brings together rapid response and self-pressurising PEM electrolysis into a fully integrated package.

Power-to-Gas



# HFUEL

HFuel is a self-contained module suitable for refuelling hydrogen-powered road vehicles and forklift trucks.

Refuelling Stations



REFUELLING STATIONS | P2G UNITS  
HYDROGEN ENERGY SYSTEMS



# PEM ELECTROLYSIS MARKET OFFERING

**Rapid Response | High Pressure | High Efficiency | MW scale**

- Rapid response: less than 2s; for primary power grid balancing
- High Pressure: up to 80bar; for direct injection
- High Efficiency: 75% measured by third parties in the field
- MW Scale: 1MW modules available today
- Compliant: EU, USA and Asia



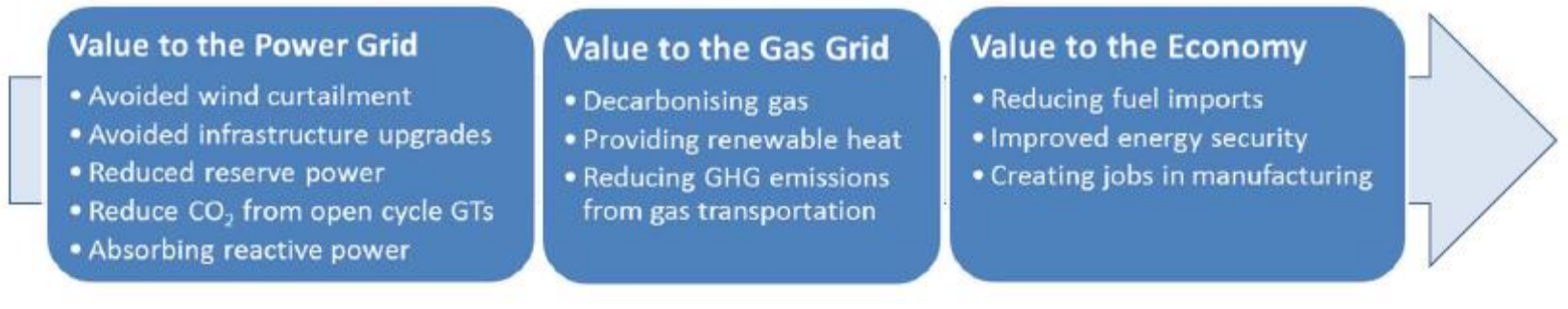
MARKET OFFERING IS THERE WITH PEM  
HYDROGEN ENERGY SYSTEMS

# REALITY CHECK

## Pioneering is tough

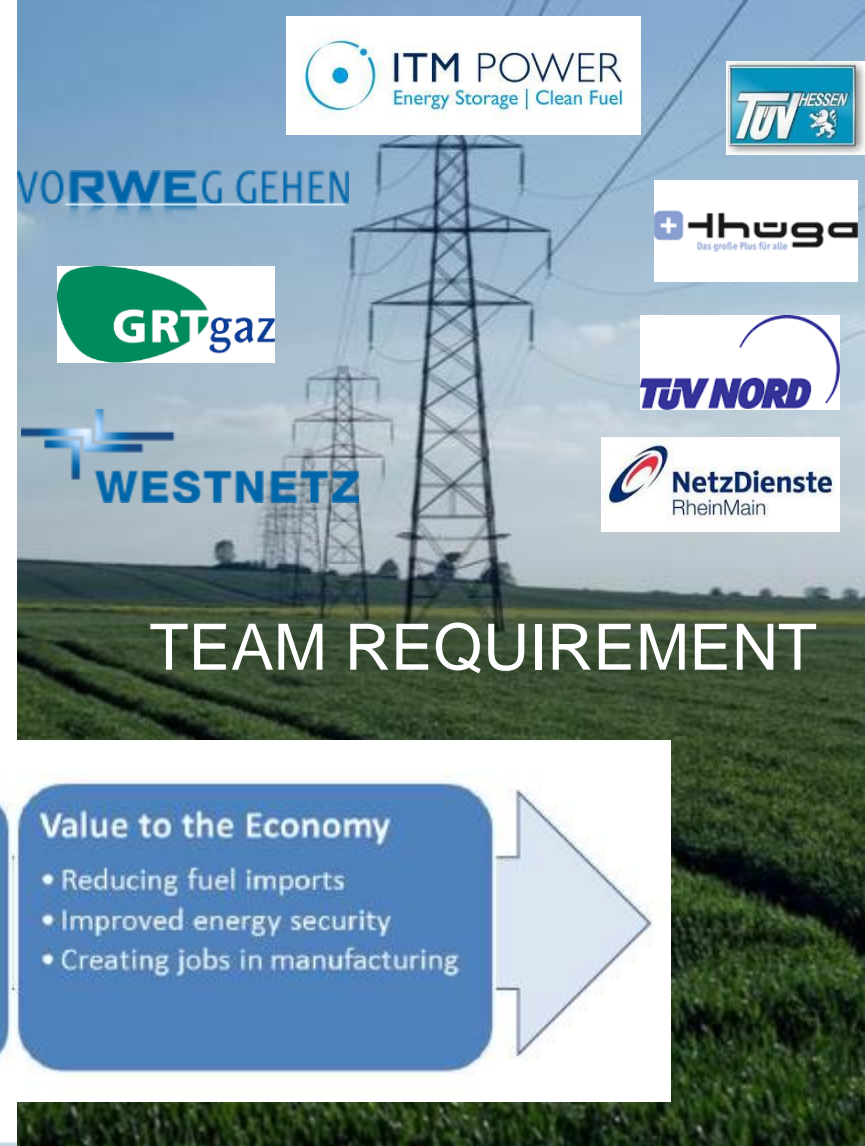
- ITM strongly believes in P2G and its benefits
- Significant learning from several projects
- Detailed specification is crucial
- A clear compliance pathway is crucial
- Partnering with the right players is key

## P2G: Elements of Value

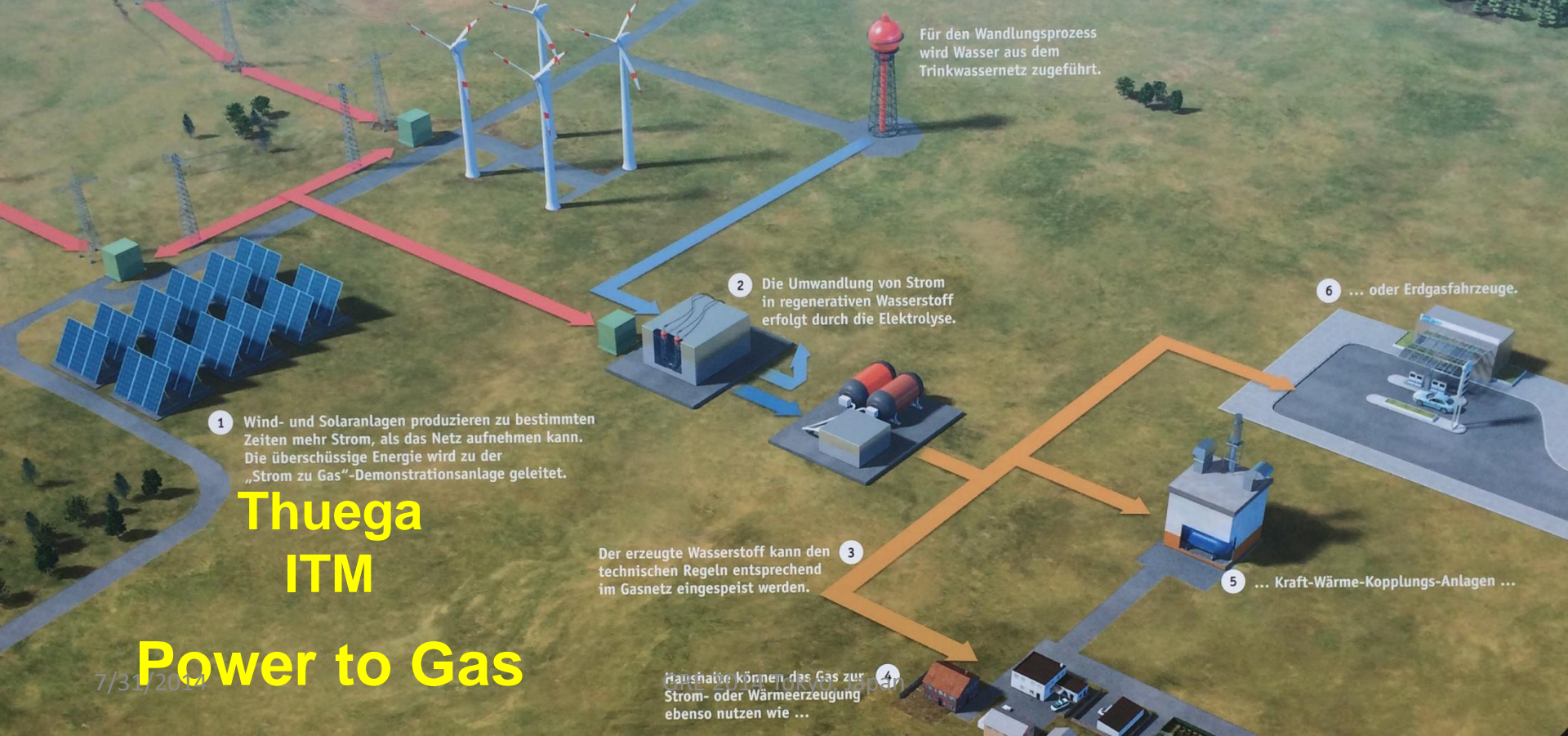


## THE CHALLENGE

## ENERGY STORAGE | CLEAN FUEL







**Thuega  
ITM**

**Power to Gas**

7/31/2014





ITM Power's HGas System was delivered to RWE within 10 weeks of receiving the order, which was won as part of a competitive tender. The system is a second generation ITM Power PEM electrolyser system using a higher current density, permitting higher hydrogen output per stack. The system efficiency is also increased by simplification of the balance of plant.



POWER-TO-GAS 2<sup>ND</sup> GENERATION PLANT  
ENERGY STORAGE | CLEAN FUEL





# POWER-TO-GAS IN UK AND FRANCE

## National Grid | AMEC

- Grid Gas: NG | SSE | Shell
- NG/AMEC 1: Feasibility study | £120k funded by NG
- 200/300 x Multi-MW opportunities in the UK alone
- NG/AMEC 2: Contract to identify the first project sites

## FRENCH development on 1MW P2G project

GridGas

NG/AMEC 1

NG/AMEC 2

First Plant  
Sale

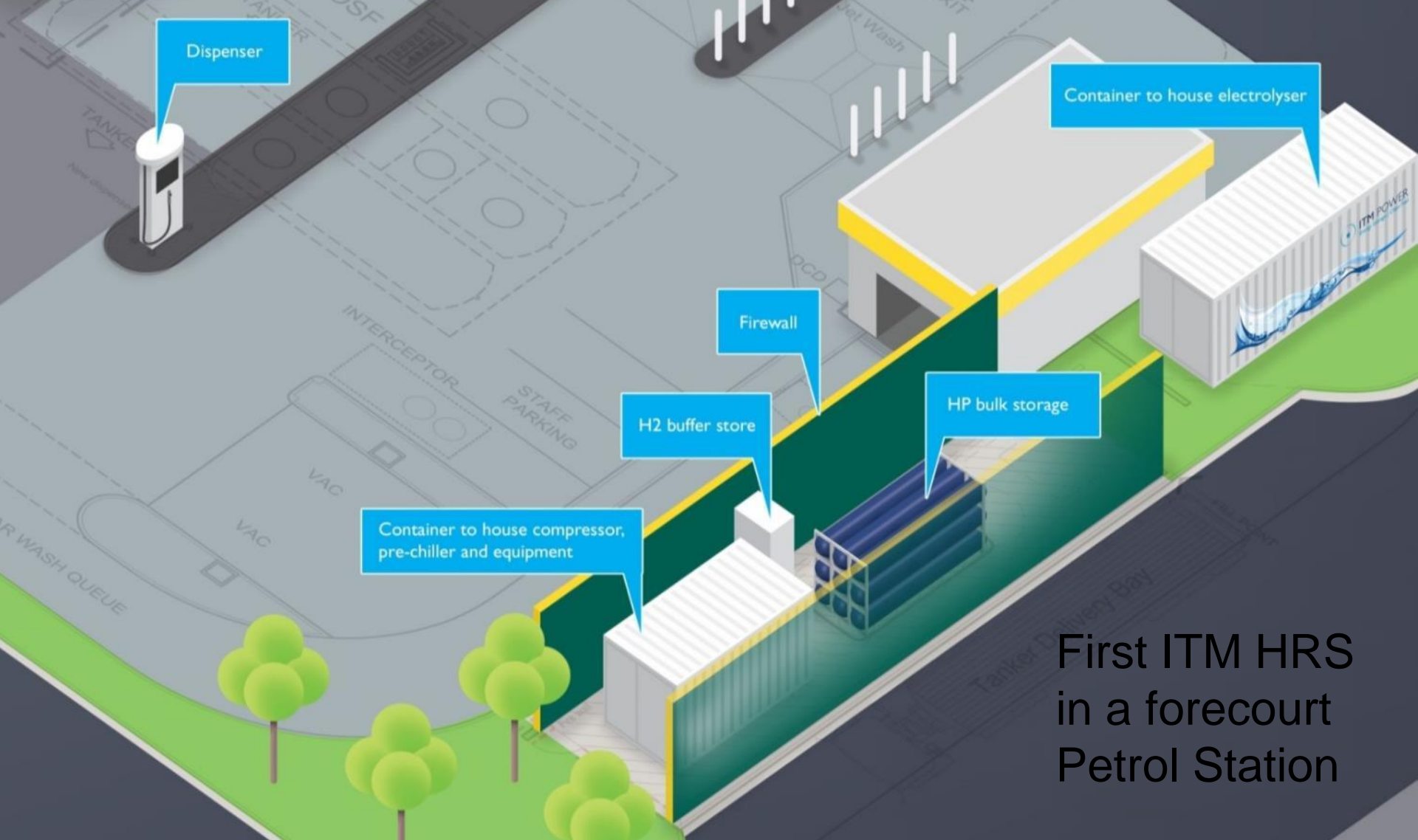
nationalgrid



POWER-TO-GAS

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First ITM HRS  
in a forecourt  
Petrol Station

ON-SITE HYDROGEN PRODUCTION  
ENERGY STORAGE | CLEAN FUEL

# SUMMARY:

- Hydrogen via Water electrolysis represent a unique offering to guarantee Energy independence and security.
- Standard electrolyser product platforms now established
- Traction in both Energy Storage & Clean Fuel markets
- First plants deployed and integrated into wider P2G system (Thüga/RWE)
- Electrolyser HRS is the ultimate solution to decarbonate transport.
- PEM electrolysis affords cash-flows above and beyond the price of hydrogen