

# Green hydrogen: lessons learnt from Spanish market projects

First Hydrogen and Energy Efficiency  
Congress | Andi y Naturgas

October 18<sup>th</sup>, 2023



# Introductions: With you today



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#### Education

- Industrial Engineer from UPV (Universidad Politécnica de Valencia)
- Minor in Economics from UNM (The University of New Mexico, US)
- Master's dual degree in Financial Analysis and Banking from UC3M (Universidad Carlos III de Madrid)

*Vicente joins KPMG España in 2016 and has extensive experience in energy market analysis projects, with a holistic view of the entire value chain and its regulation in Spain*

# >10 green hydrogen related projects in 2022 and 2023

## KPMG recent hydrogen experiences (2022 and 2023)

Project Development	NextGen	-PMO European funds
	Catalina	-Socio-economic impact analysis
	Market Entry	-Strategic Analysis
Generation and logistics	Project H2	-Commercial Due Diligence
	Project Zero	-Commercial Due Diligence
	Cavendish	-Commercial Due Diligence
Hydrogen consumption	Industrial	-Strategic Plan
	Ex-Bus	-PMO Scanning opportunities
Market	Nabucco	-Strategic Analysis

## KPMG recent biomethane experiences (2023)

 Biomethane portfolio  Commercial Due Diligence	 H2/Biomethane portfolio  Commercial Due Diligence	 Biogas/ Biomethane plant  Strategic Analysis
 Biogas/ Biomethane plant  Business Plan	 Renewable gases  Strategic Analysis	 Renewable gases  Strategic Analysis

# 10 learnings from the Hydrogen Spanish development:

1. Need for low power prices...
2. Regulatory support...
3. Initial public support...
4. Stakeholder Buy-in...
5. Flexibility is key...
6. Value for first-movers...
7. No-need for infra readiness...
8. Biomethane as a bridge...
9. Application competitiveness...
10. Offtaker's investment role

# 1

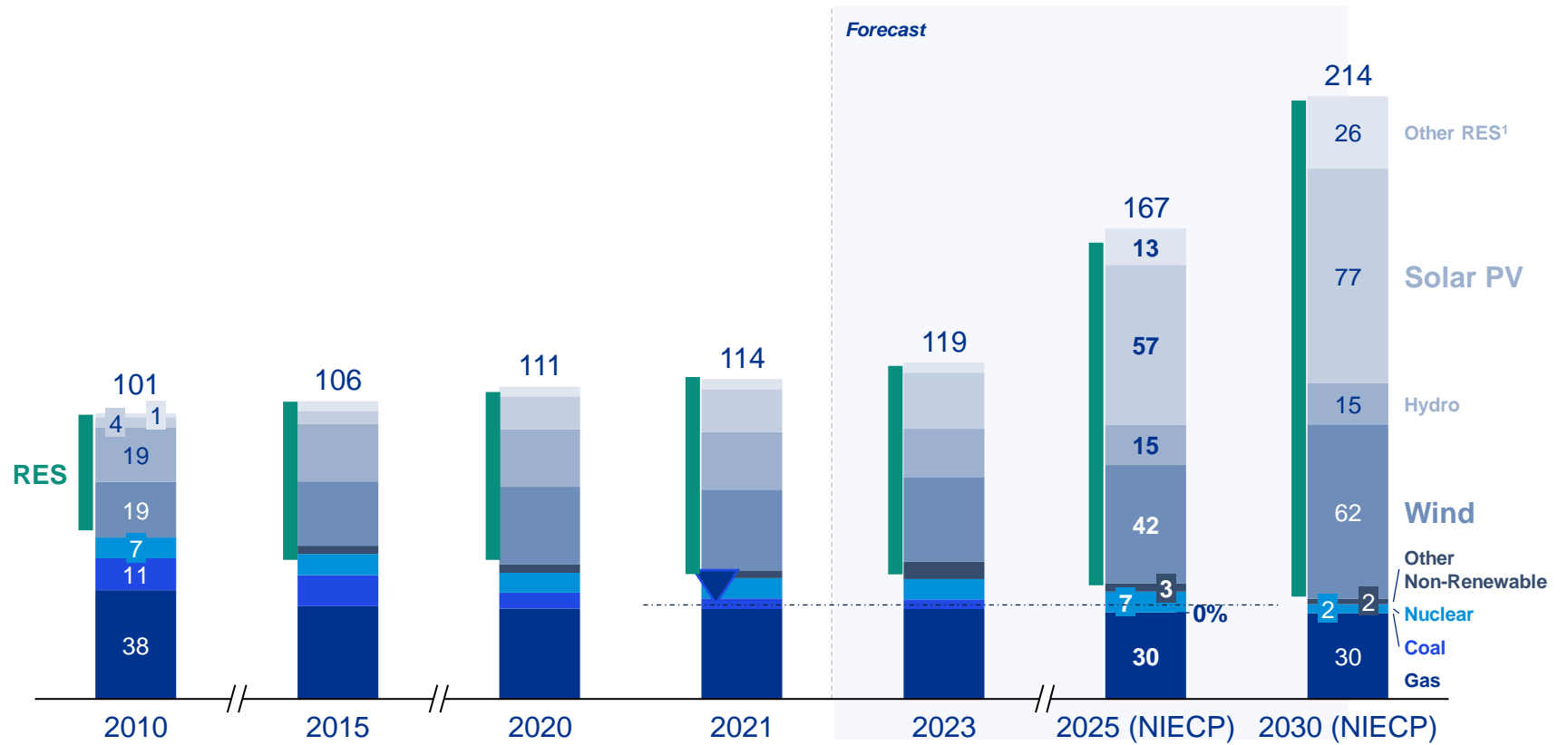
Need for low power prices

## It will be necessary to continue relying on competitive electricity prices, with renewables being an excellent option for this

Main competitive hydrogen levers

Expected evolution of Spanish energy mix

- A Low Cost RES**
- B Grid infrastructure**
- C Economies of scale**
- D Efficient Electrolysis**



Source: PNIEC












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# 2

## Regulatory support

# A comprehensive regulatory framework paves the way for a transparent and efficient transition to renewable energy

### Energy and climate objectives







	2023 NECP
 Wind capacity by 2030	62 GW
 Solar PV by 2030	76.4 GW
 Distributed generation's % in renewables	81%
 Capacity target by 2030	22 GW
 Installed electrolyzer capacity by 2030	11 GW
 Net export balance	51 TWh
 Existing facilities maintain CCGT capacity in 2030	26 GW
 Nuclear capacity	-57%
 Million electric cars	5.5

Source: PNIEC and Hoja de ruta del hidrógeno



### Hydrogen Roadmap

A commitment to renewable hydrogen (57 measures and lines of action)

		
150-200 FCEV Buses	25% of consumption of H <sub>2</sub> in industry	100-150 H <sub>2</sub> chargers of public access
		
5,000-7,500 FCEV for shipment and two H <sub>2</sub> commercial train lines	4.6 Mton p.a. of CO <sub>2</sub> eq's emissions avoided	€8,900m investment for renewable H <sub>2</sub> production projects

## Initial Public Support

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# In the early stages, subsidies might be necessary to bolster the profitability of pioneering projects (as seen with NextGen in Spain)

	Announced PERTE	Public investment	Total est. investment <sup>1</sup>	Approved date	Announced auctions/bids
Launched	Development of EV and connected Vehicle	€4,300m	€12,000m	July/2021	€2,950m
	Renewable energy	€6,920m	€16,370m	Dec/2021	€300m
	Advance-guard health	€982m	€1,469m	Nov/2021	€70m
Pending approval	Aerospace	€2,193m	€4,533m		
	Water cycle digitalization	€1,700m	€3,000m		
	Other 6 PERTES (agrobusiness, naval, etc)	€14,252m	€19,868m		
	<b>Total</b>	<b>€30,347m</b>	<b>€55,140m</b>		

The 2 PERTES related to energy sum up to €11,220m, near 60% of total approved public investment

Source: Hoja de Ruta del Hidrógeno; Hoja de Ruta del Biogás; PNIEC; Hoja de Ruta del Autoconsumo; KPMG analysis



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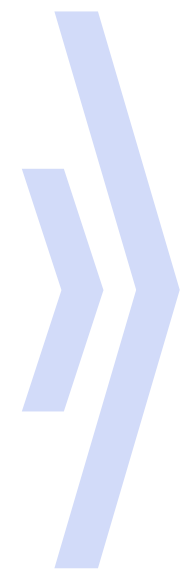
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## Stakeholder Buy-in

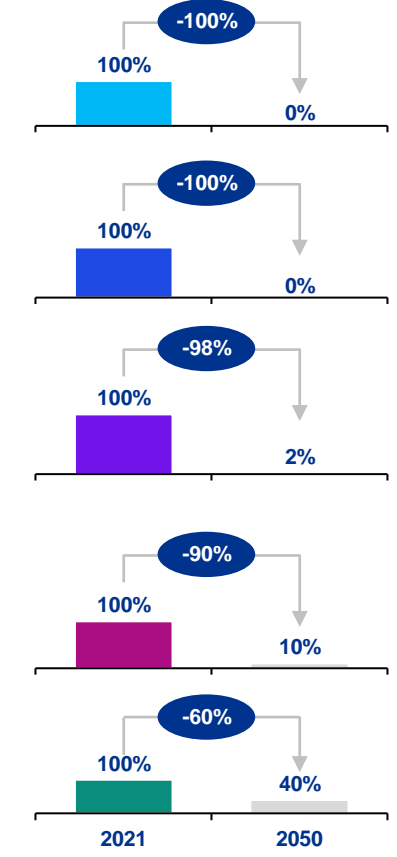
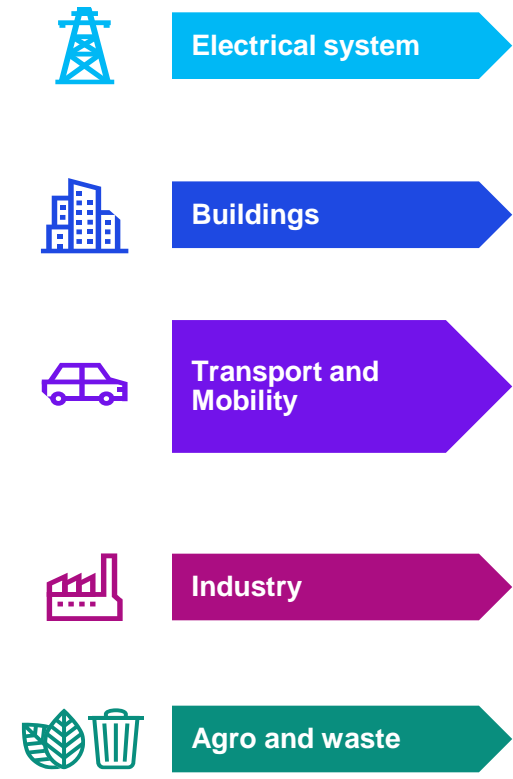
# Successful energy transitions require commitment from all major energy consumers and producers towards decarbonization

### Pressures for ESG transformation

- A Investors:** Funding to incentivize ESG investments
- B End consumers:** Exemplary corporate behaviour and emission reductions
- C Companies:** Driven by boards of directors, management teams are making long-term commitments to ESG criteria
- D Suppliers:** Decarbonization targets on their supply chains, as Scope 1, 2 and 3 emissions are measured in ESG performance
- E Regulators:** Establishment of the appropriate regulatory frameworks and incentives to achieve the objectives



### Spain's Net-Zero 2050 Plan - Emission reduction goals



Source: KPMG analysis



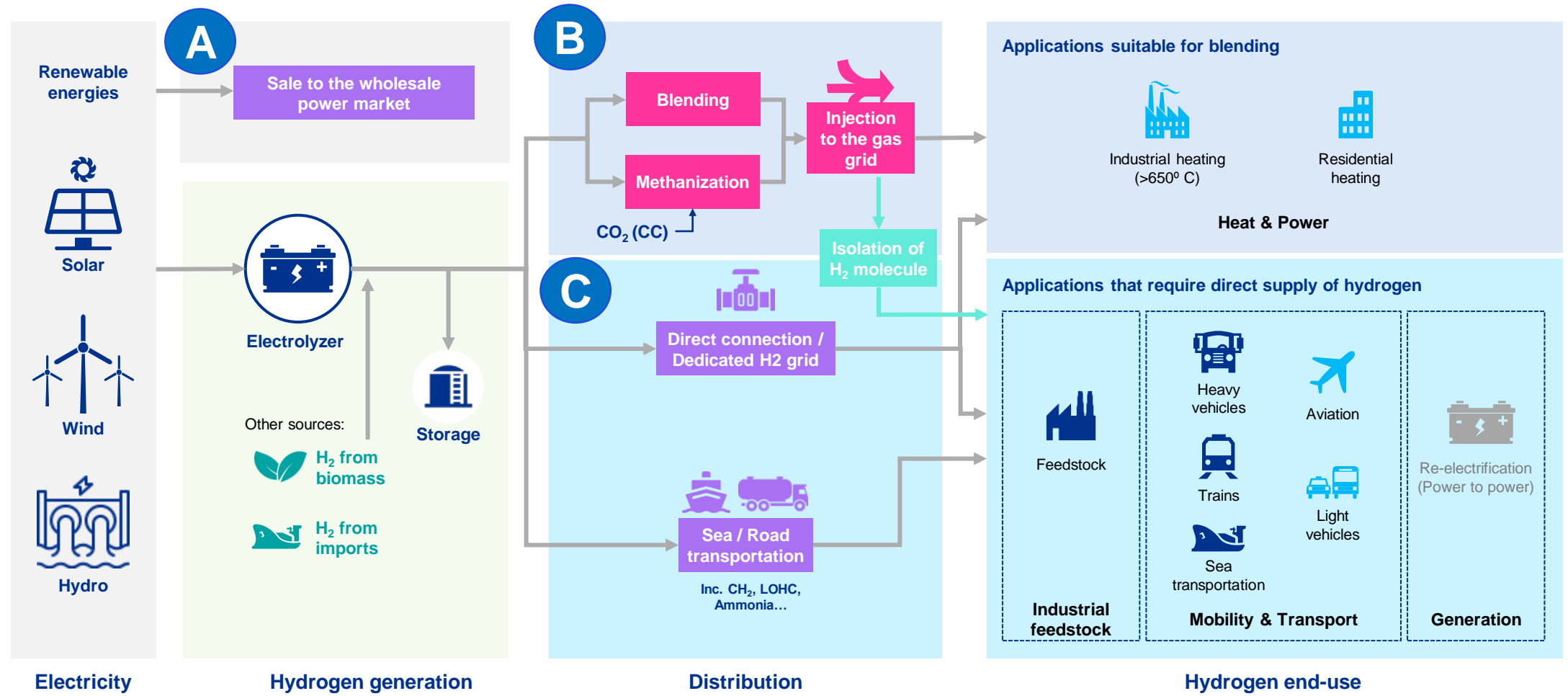
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Flexibility is key

## Increasing the diversity of revenue sources enhances the potential of a hydrogen project (electricity sales, pure hydrogen sales, blended injection in gas network, etc.)



Source: KPMG analysis

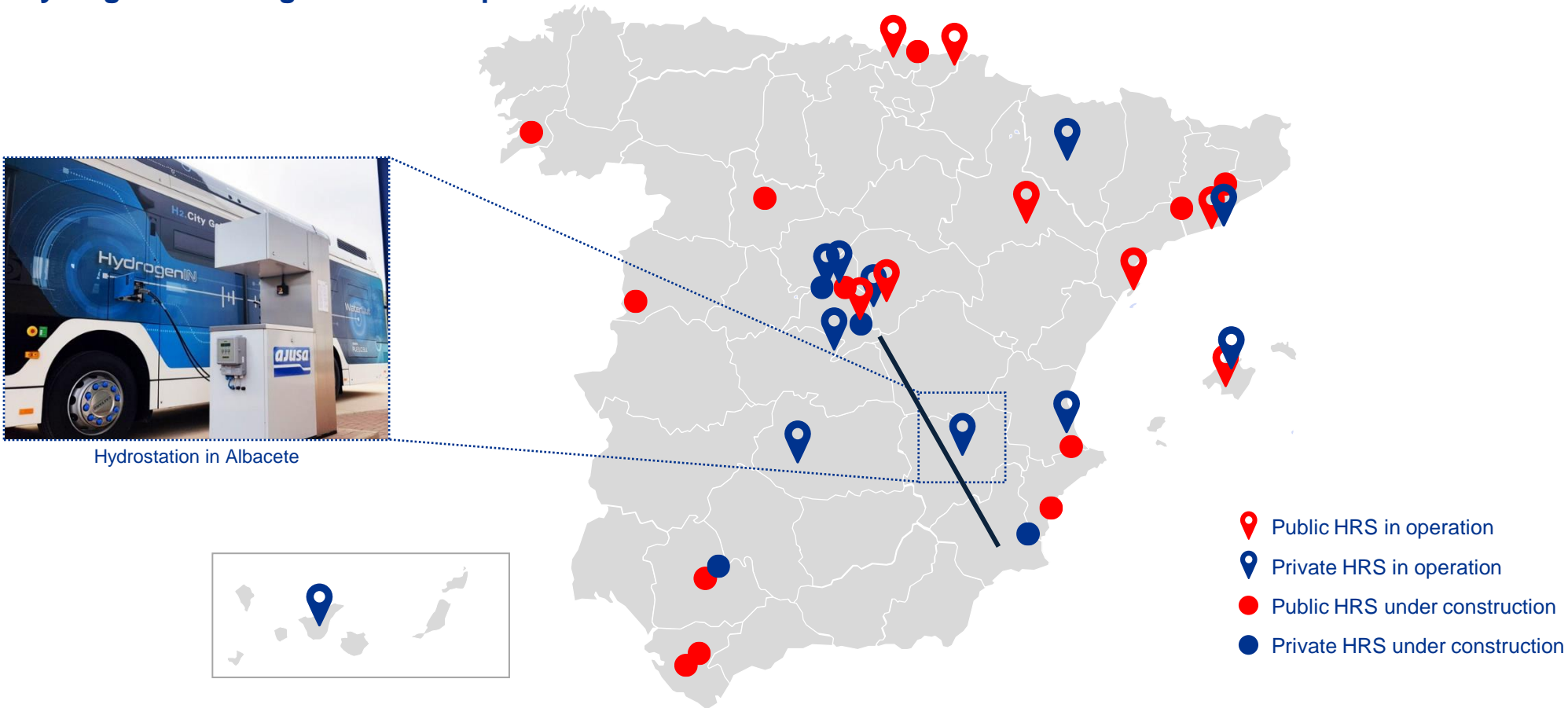


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# Early investment in hydrogen, even in the absence of immediate demand, positions for future market leadership – there is value in being the first ones

## Hydrogen Refueling Stations in Spain



Source: KPMG Analysis



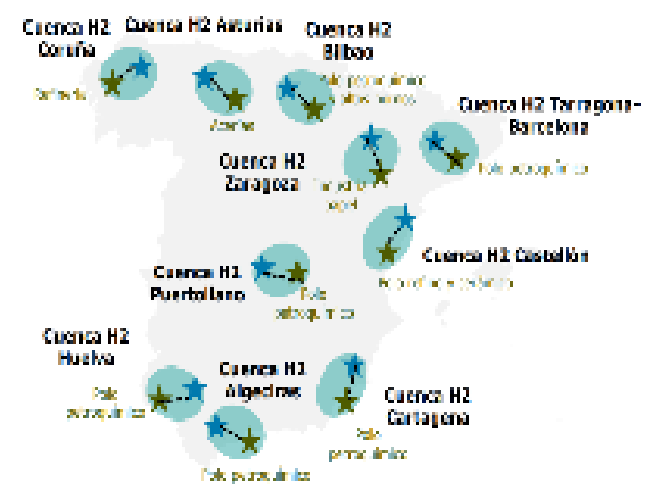
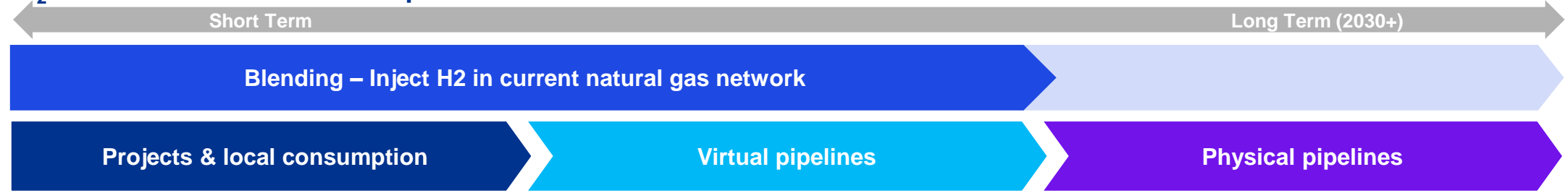
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## No-need for infra readiness

# A phased approach, starting with alternative transportation methods for hydrogen, can precede mature pipeline infrastructures

### H<sub>2</sub> distribution network development



Source: KPMG Analysis



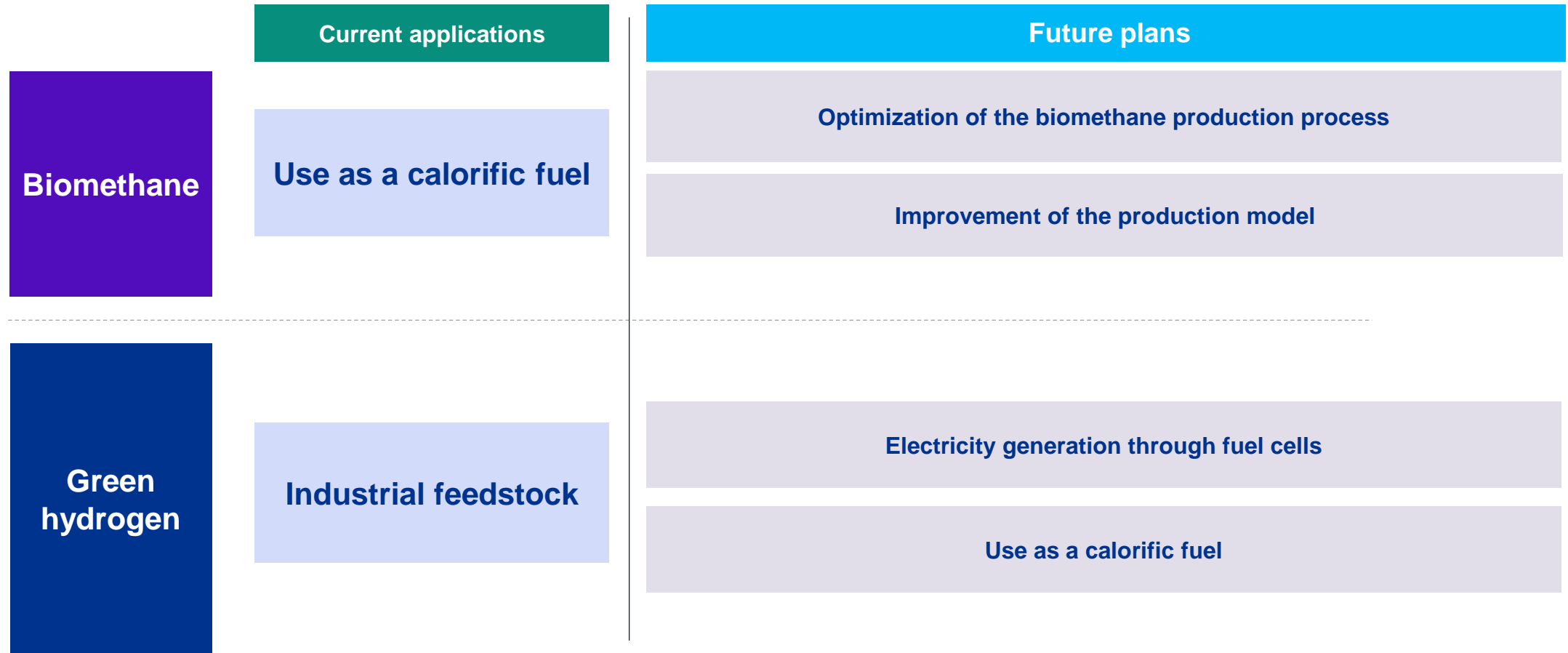
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Biomethane as a bridge

# Biomethane emerges as an appealing solution for near-term decarbonization as we await the full maturation of the hydrogen economy

Current applications and future plans for biotmethane and green hydrogen



Fuente: Información pública; Gasnam; Análisis KPMG

Source: KPMG Anaylisis



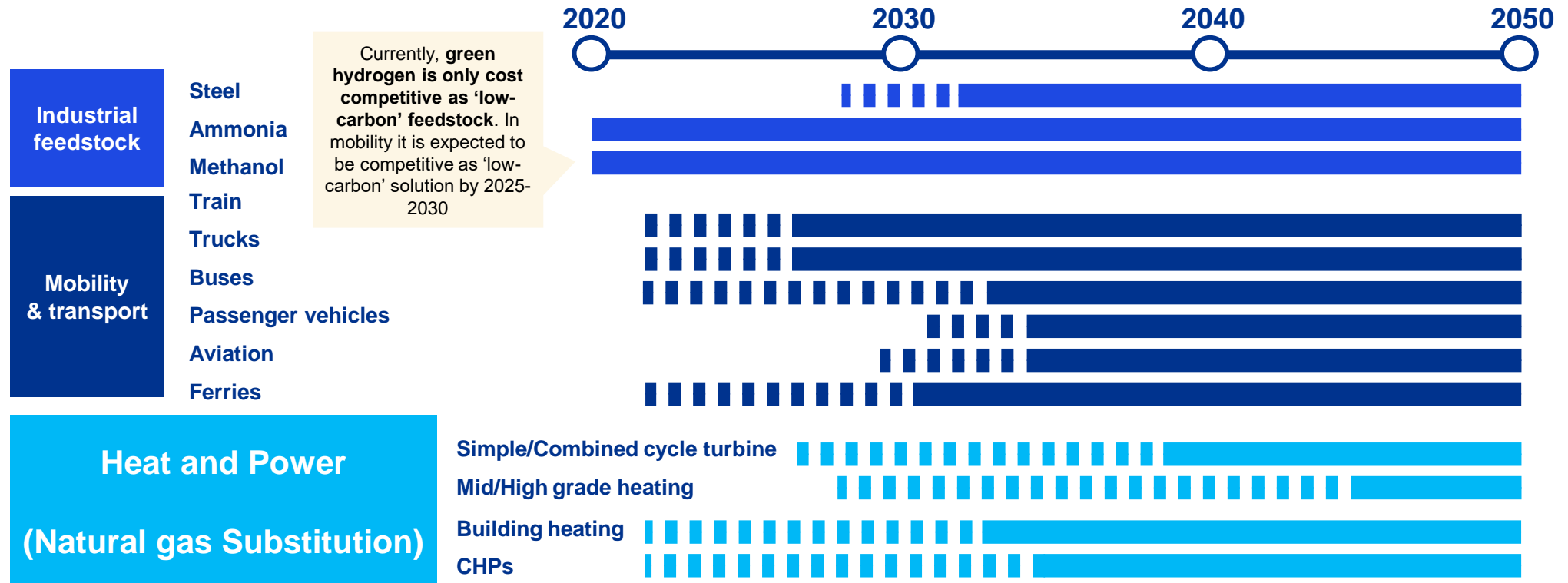
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## Application competitiveness

# While pioneering hydrogen offers initial advantages, understanding its application's evolving competitiveness over time is crucial

Cost competitiveness trajectories of green H2 against 'low-carbon' solutions, by application



Sources: Hydrogen Council; KPMG analysis

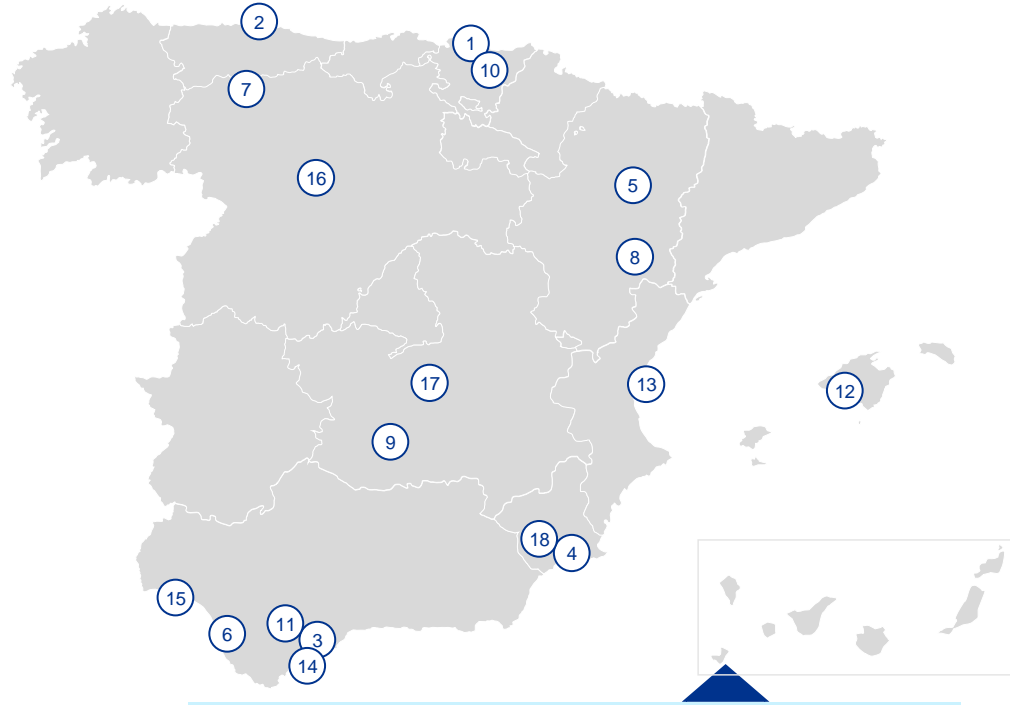


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# the oftaker's involvement as an investor is essential, setting a committed future H2 price as the foundational starting point

## Project landscape for green hydrogen in Spain



—First valleys already under development

	Plant Location	Electrolyzer Power (MW)	Production Capacity tn/y	Renewable Power (MWh)	Developer	Budget (€M)	Status
1	Abanto	2.5	379	n.a	AMPERUM	32	Operating
2	Aboño	100-1,000	12,000	n.a	cedp	140	Planned
3	Cádiz	100-700	n.a.	250	cedp	550	Planned
4	Cartagena	100	15,152	n.a	AMPERUM	1,555	Planned
5	El Cierzo	7	640	25	endesa	20	Planned
6	Huelva	570	59,000	n.a	enagas	1,500	Planned
7	La Robla	280	40,000	n.a	Naturgy	CONF	Planned
8	Proyecto Catalina	2,000	336,000	5	enagas Naturgy Feribem	2,000	Planned
9	Puertollano	20	3,000	100	Feribem enagas	150	Planned
10	Puerto Bilbao	10	1,515	n.a	AMPERUM	60	Planned
11	San Roque	1,000	150,000	n.a	CEPSA	1,500	Planned
12	Mallorca – Green Hysland	3	300	n.a	Redexis	50	Planned
13	Castellon	25	3,900	n.a	ip	70	Planned
14	Campo De Gibraltar	570	n.a.	n.a.	cedp	190	Planned
15	Palos De La Frontera	1,000	150,000	n.a.	CEPSA Feribem	2,200	Planned
16	Valladolid	645	32,280	807	ip	903	Planned
17	Urda	520	26,000	667	ip	776	Planned
18	Lorca	555	27,750	714	ip	888	Planned

Planned 
 In-build 
 Operating

Source: Desktop research; KPMG Analysis



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