

Asociación Española del Hidrógeno

# Maximizing renewable energy deployment by means of hydrogen as energy vector

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# Who are we?



**IMPULSAMOS LAS TECNOLOGÍAS  
DEL HIDRÓGENO Y PILAS DE  
COMBUSTIBLE**



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# Why hydrogen in Spain?

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# Why Hydrogen in Spain?

## ➤ GREAT DECARBONIZATION and increase in RENEWABLE ENERGIES

### PNIEC – Integrated National Plan on Energy and Climate



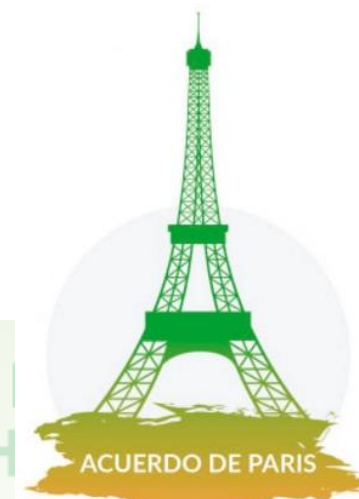
#### PNIEC Objectives to 2030

- ☛ 21% reduction in CO<sub>2</sub> emissions.
- ☛ 42% of renewables over total energy consumption.
- ☛ 74% renewable in electricity generation.
- ☛ 39.6% improvement in energy efficiency.

#### PNIEC Objectives to 2050:

- ☛ 90% reduction in CO<sub>2</sub> emissions.
- ☛ 100% renewable electrical system.

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# PNIEC – Integrated National Plan on Energy and Climate

## CO<sub>2</sub> equivalent emissions by sector: Historical and projection at 2030 (kt)

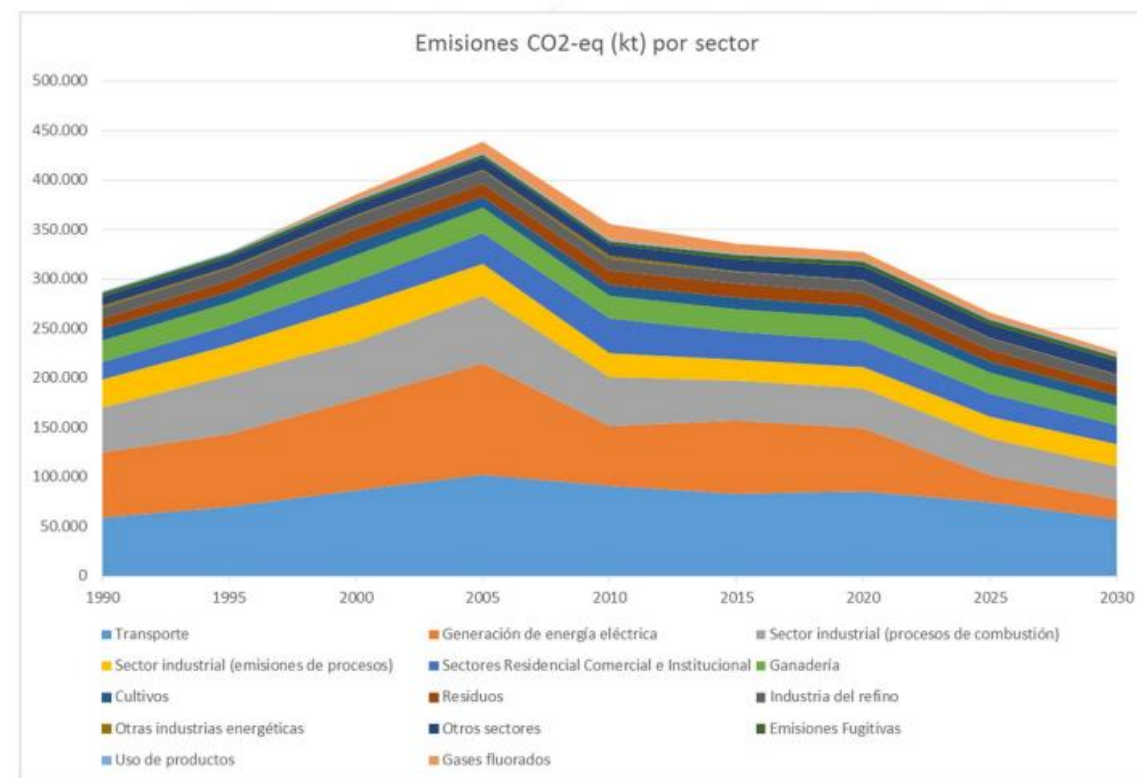
Tabla 1.1 Evolución de las emisiones (miles de toneladas de CO<sub>2</sub> equivalente)

Años	1990	2005	2015	2020*	2025*	2030*
Transporte	59.199	102.310	83.197	85.722	74.638	57.695
Generación de energía eléctrica	65.864	112.623	74.051	63.518	27.203	19.650
Sector industrial (procesos de combustión)	45.099	68.598	40.462	40.499	37.246	33.530
Sector industrial (emisiones de procesos)	28.559	31.992	21.036	21.509	22.026	22.429
Sectores residencial, comercial e institucional	17.571	31.124	28.135	26.558	23.300	19.432
Ganadería	21.885	25.726	22.854	23.247	21.216	19.184
Cultivos	12.275	10.868	11.679	11.382	11.086	10.791
Residuos	9.825	13.389	14.375	13.657	11.898	9.650
Industria del refino	10.878	13.078	11.560	12.247	11.607	10.968
Otras industrias energéticas	2.161	1.020	782	721	568	543
Otros sectores	9.082	11.729	11.991	14.169	13.701	13.259
Emisiones fugitivas	3.837	3.386	4.455	4.715	4.419	4.254
Uso de productos	1.358	1.762	1.146	1.231	1.283	1.316
Gases fluorados	64	11.465	10.086	8.267	6.152	4.037
<b>Total</b>	<b>287.656</b>	<b>439.070</b>	<b>335.809</b>	<b>327.443</b>	<b>266.343</b>	<b>226.737</b>

\*Los datos de 2020, 2025 y 2030 son estimaciones del Escenario Objetivo del PNIEC.

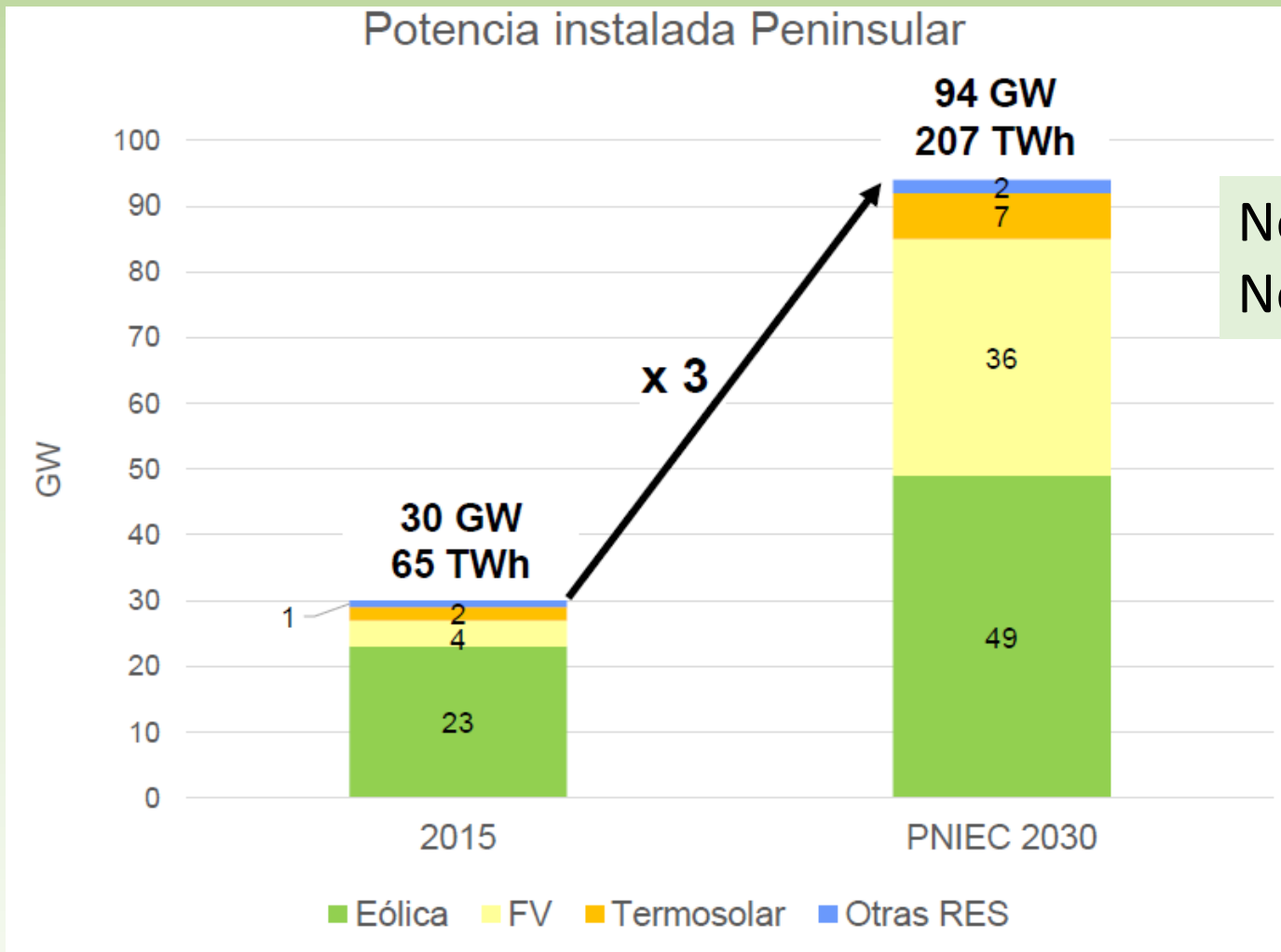
Fuente: Ministerio para la Transición Ecológica, 2019.

Figura 1.1. Emisiones CO<sub>2</sub> equivalente por sector. Histórico y proyección a 2030 (kt)



Fuente: Ministerio para la Transición Ecológica, 2019.

# PNIEC – Integrated National Plan on Energy and Climate



New renewable power: **64 GW**  
 New renewable generation: **142 TWh**

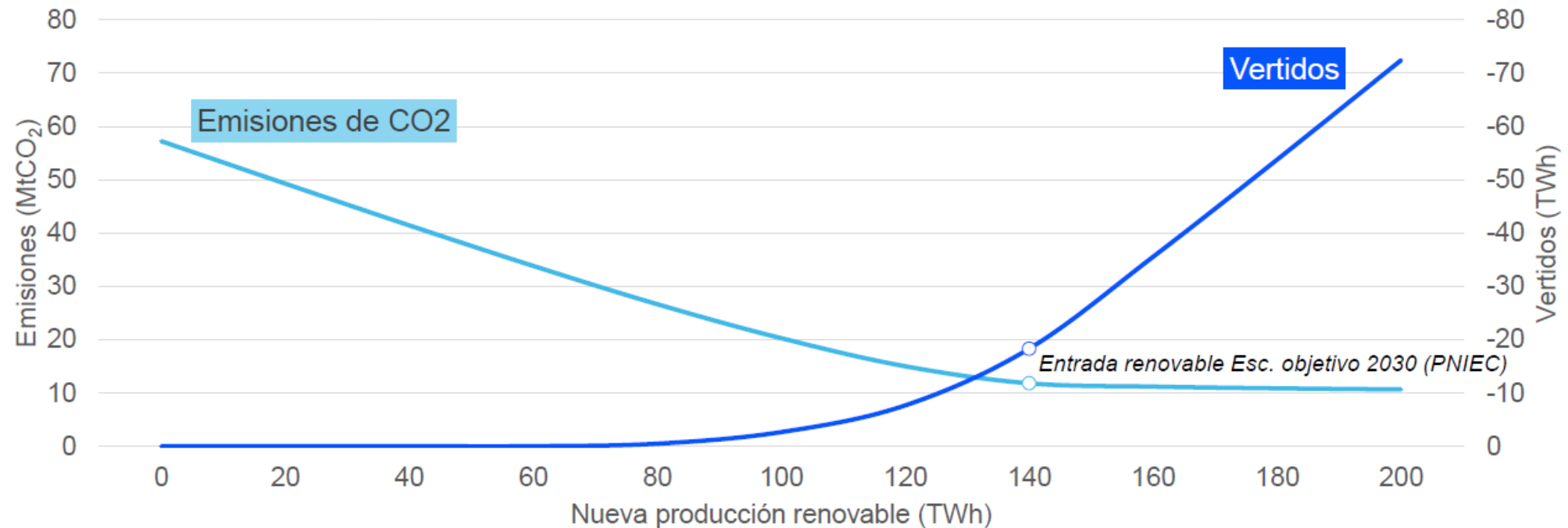


Source: Eduardo Moreda, (18 junio, 2019). "Almacenamiento y transición energética: La visión de ENDESA"

# PNIEC – Integrated National Plan on Energy and Climate

## Evolution of curtailment and CO<sub>2</sub> emissions as renewables increase

### PNIEC 2030 scenario



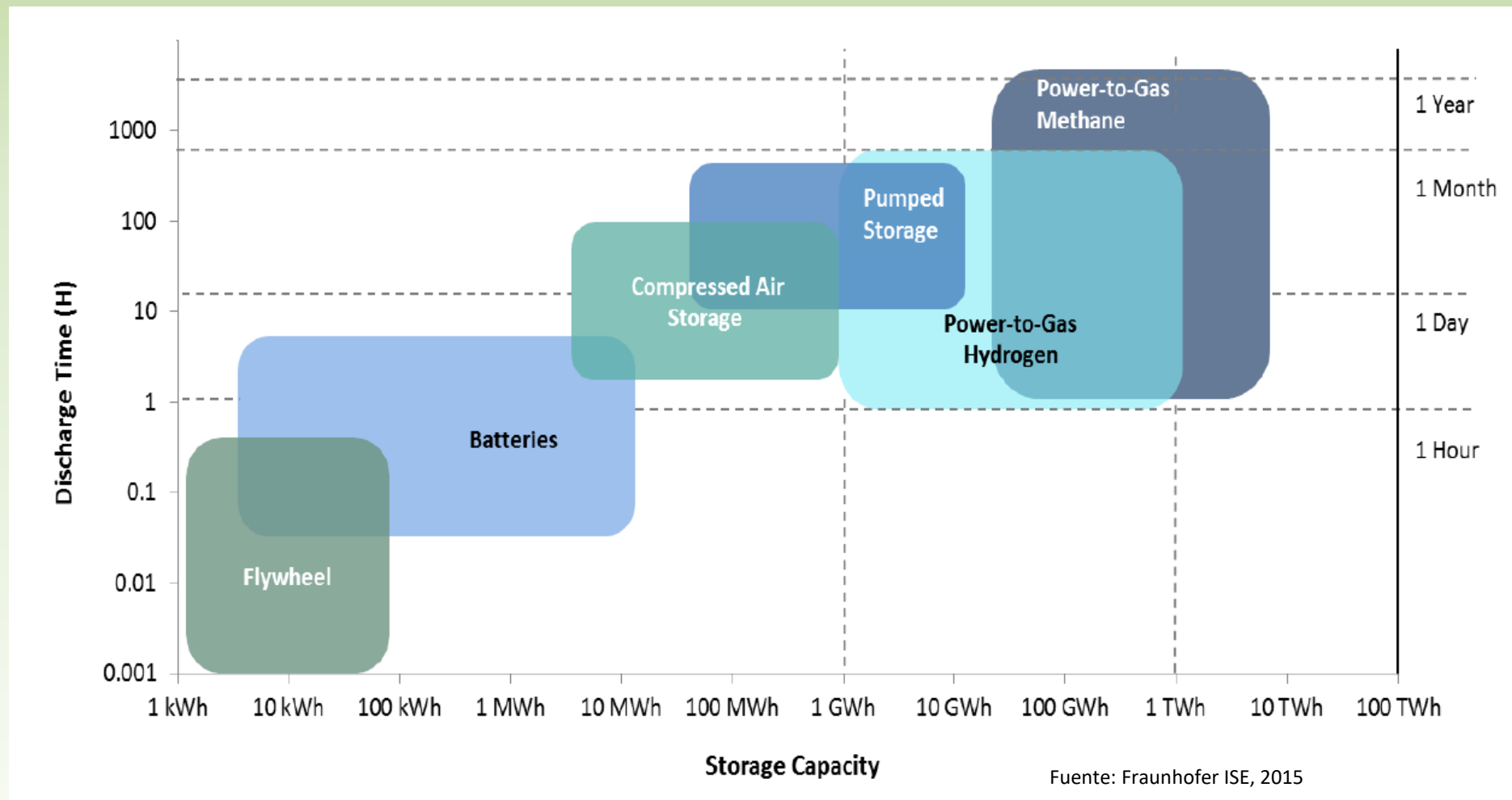
From > 120 TWh curtailments increase strongly  
More renewable energy doesn't imply a significant reduction of emissions

Source: Eduardo Moreda, (18 junio, 2019). "Almacenamiento y transición energética: La visión de ENDESA"

# Energy storage (& management) by using Hydrogen

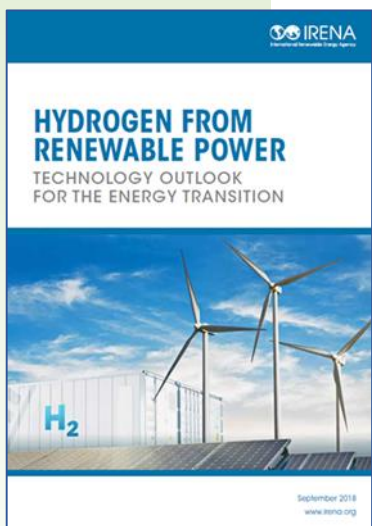
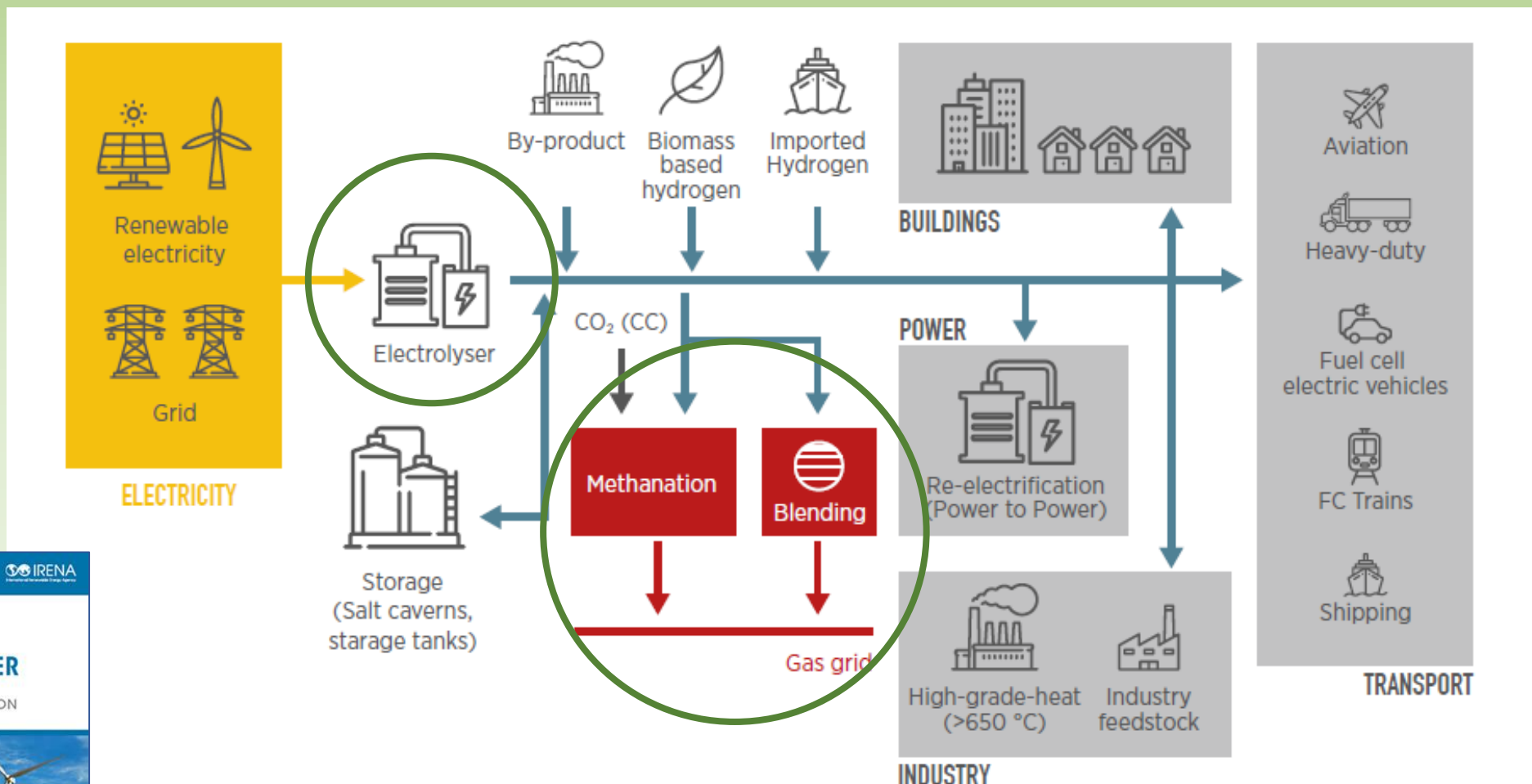
Is it possible to store that amount of energy with batteries?

**NO, we need hydrogen.**





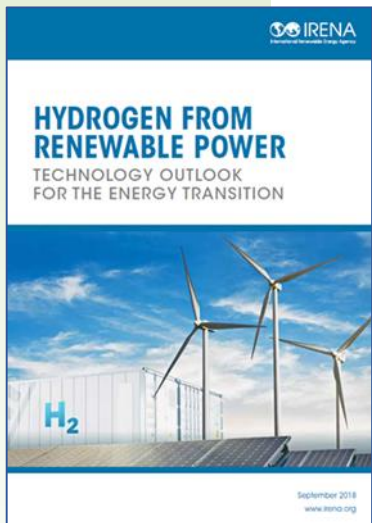
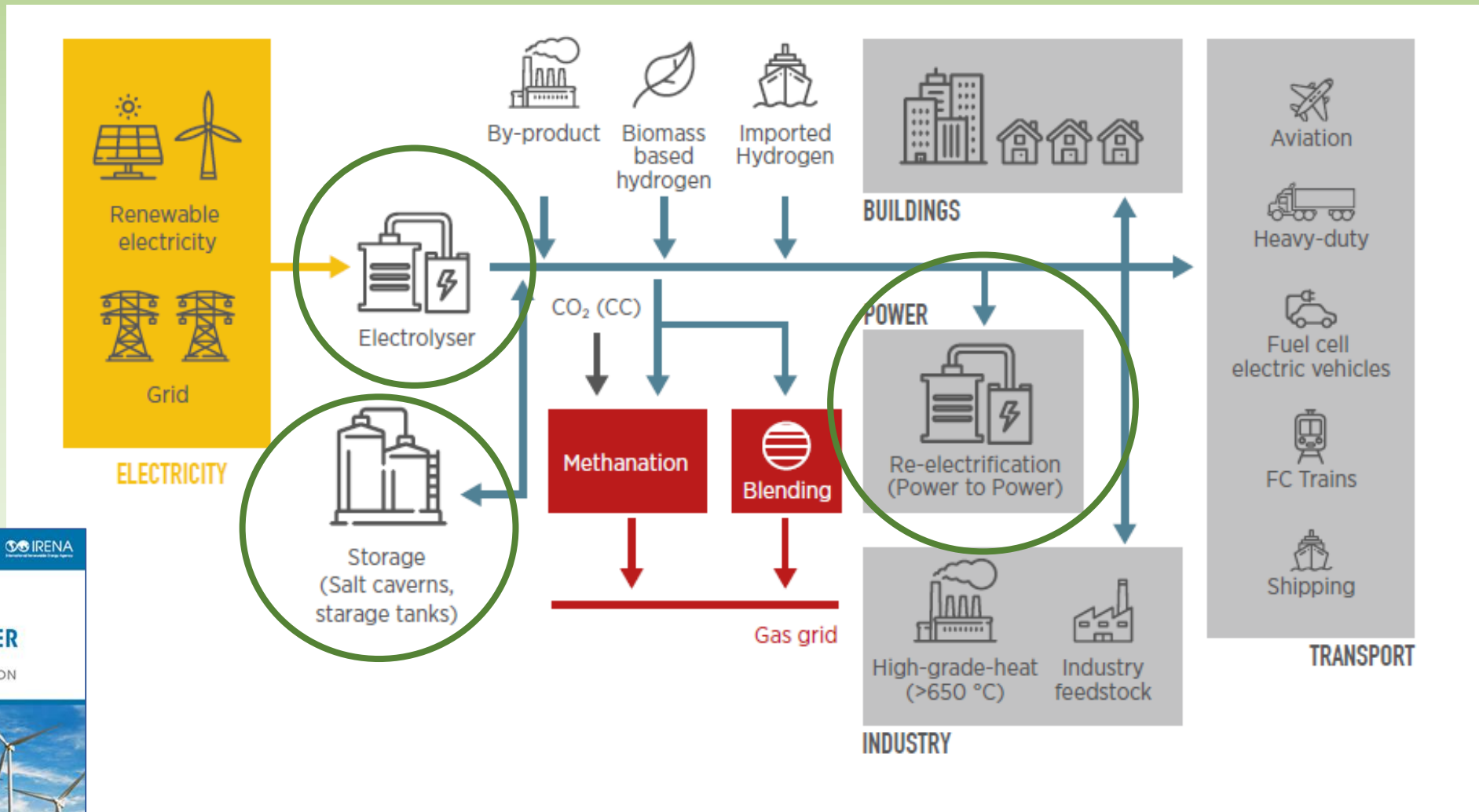
# Energy storage (& management) by using Hydrogen: **Power to Gas**



**7 - 8 TWh/year will need to be stored**

That could be easily stored adding a 5% of hydrogen (in volume) in the Spanish natural gas network

# Energy storage (& management) by using Hydrogen: **Power to Power**



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Thank you!

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