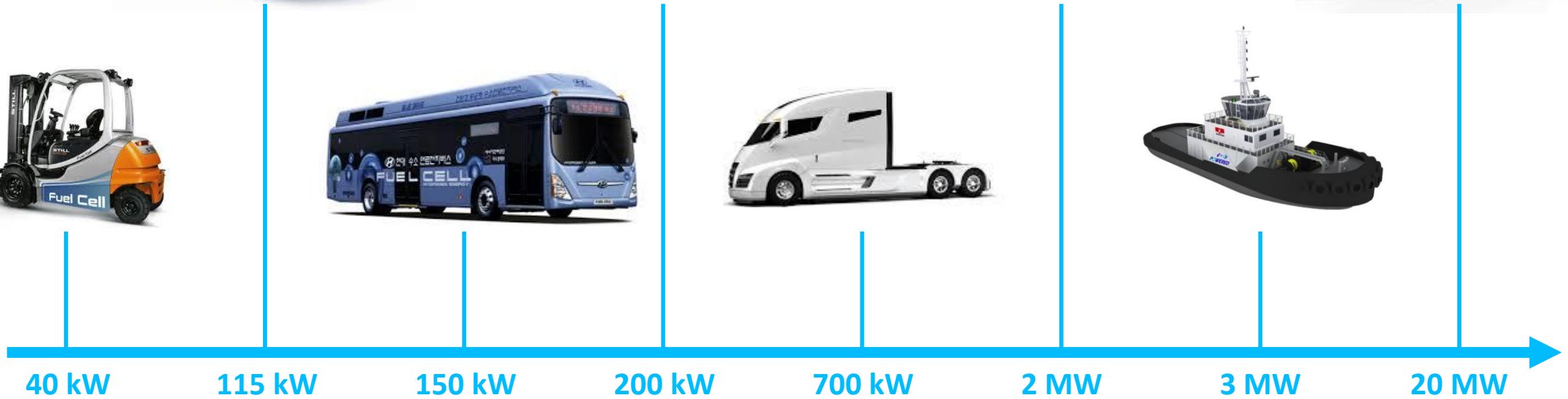




# Hidrógeno en movilidad

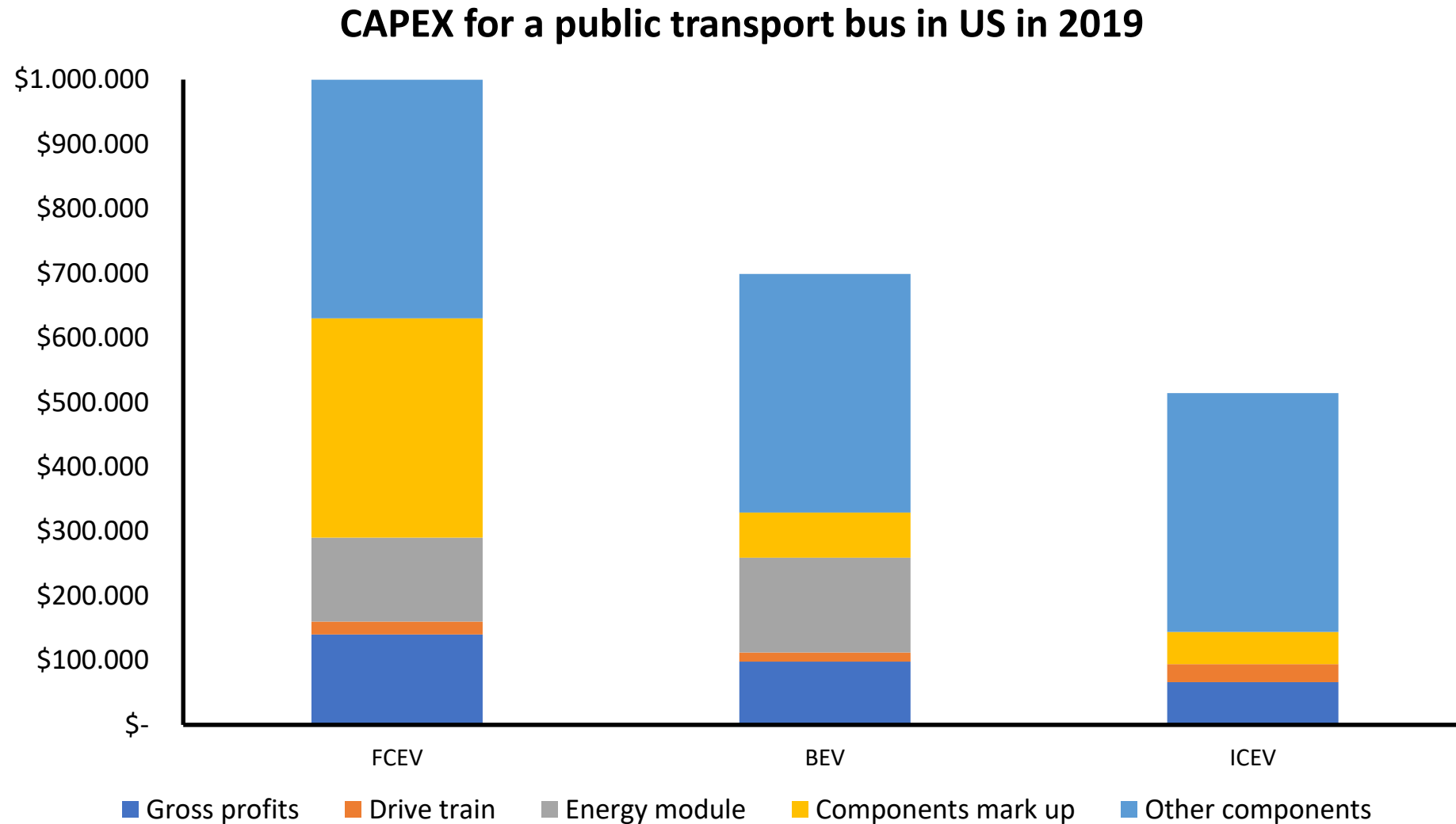
[Kimberly.sanchez@engie.com](mailto:Kimberly.sanchez@engie.com)

# Hoy



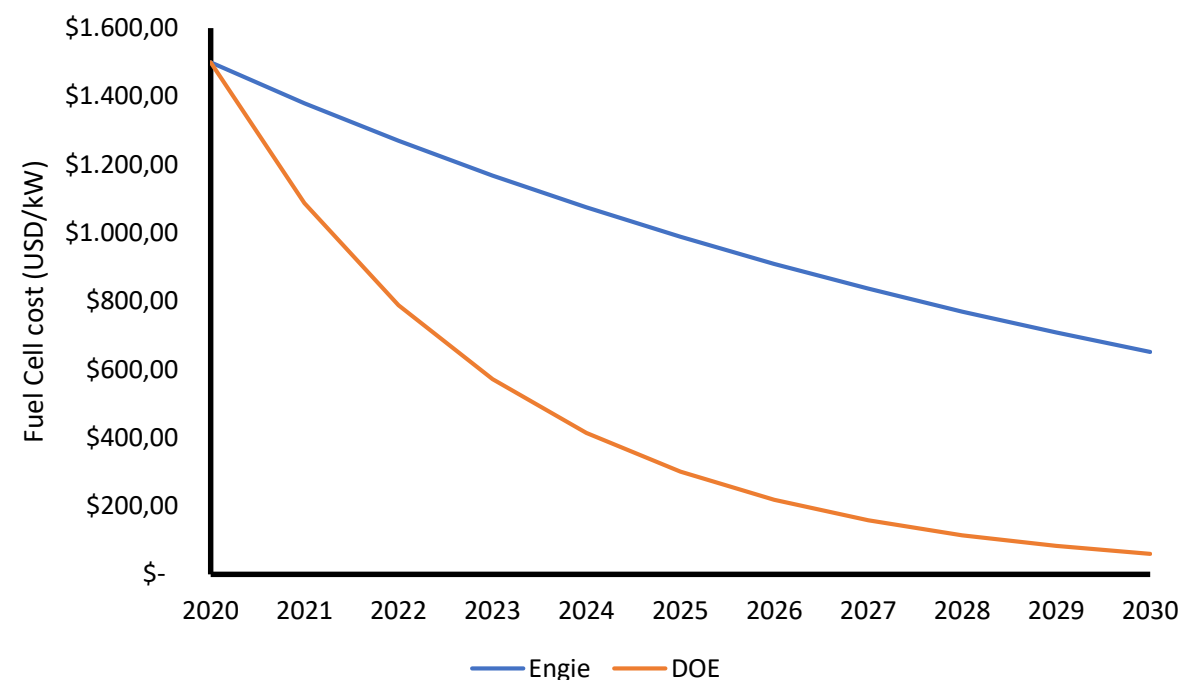
POWER

# Altos costos de inversión



# Costos esperados

Expected Fuel Cell Prices

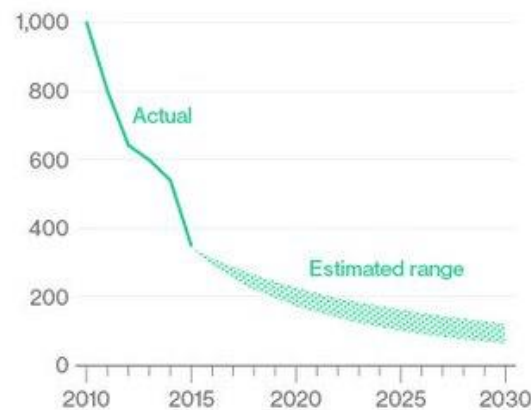


## It's All About the Batteries

Batteries make up a third of the cost of an electric vehicle. As battery costs continue to fall, demand for EVs will rise.

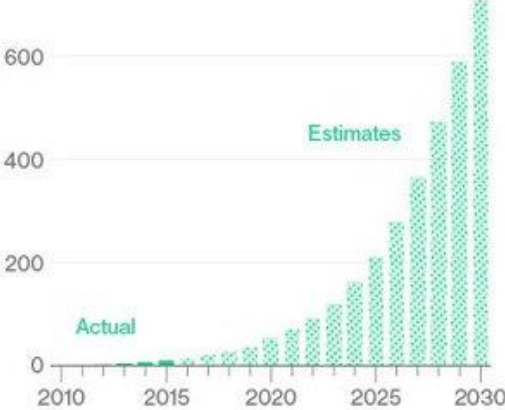
Cost for lithium-ion battery packs

\$1,200 per kilowatt hour

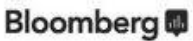


Yearly demand for EV battery power

800 gigawatt hours



Source: Data compiled by Bloomberg New Energy Finance



# Debemos mirar el TCO

2020

Combustion Engine

Dual Combustion

Fuel Cell - Electric

Battery Electric

CAPEX	100%	120%	170%	150%
Maintenance	100%	120%	55%	55%
Storage*	100%	70%	25%	5%
Efficiency	35%	32%	45%	90%
Energy recovery	0%	0%	100%	100%
Emissions**	100%	60%	0%	0%
Energy cost	100%	110%	140%	25%

\* Compared on producable energy per kW including weight of storage infrastructure

\*\* Depends on electricity mix and hydrogen carrier

Unfavorable

favorable

Analysis done for 2 MW system



# Debemos mirar el TCO

2030

	Combustion Engine	Dual Combustion	Fuel Cell - Electric	Battery Electric
CAPEX	100%	105% ↓	120% ↓	120% ↓
Maintenance	100%	105%	30% ↓	20% ↓
Storage*	100%	70%	25%	10%
Efficiency	35%	32%	50% ↑	90%
Energy recovery	0%	0%	100%	100%
Emissions**	100%	60%	0%	0%
Energy cost	100%	85% ↓	60% ↓	15% ↓

\* Compared on producable energy per kW including weight of storage infrastructure

\*\* Depends on electricity mix and hydrogen carrier



Analysis done for 2 MW system

A photograph of a warehouse interior. In the foreground, a yellow Yale forklift is being operated by a person wearing a dark beanie and a striped shirt. The forklift is moving through an aisle between tall, blue metal shelving units. The racks are filled with various items, including stacks of white boxes and brown cardboard boxes. Some racks have white labels with the numbers '12' and '11' in blue. The floor is a light-colored concrete. The overall scene is dimly lit, with some overhead lights visible.

# Hidrógeno verde

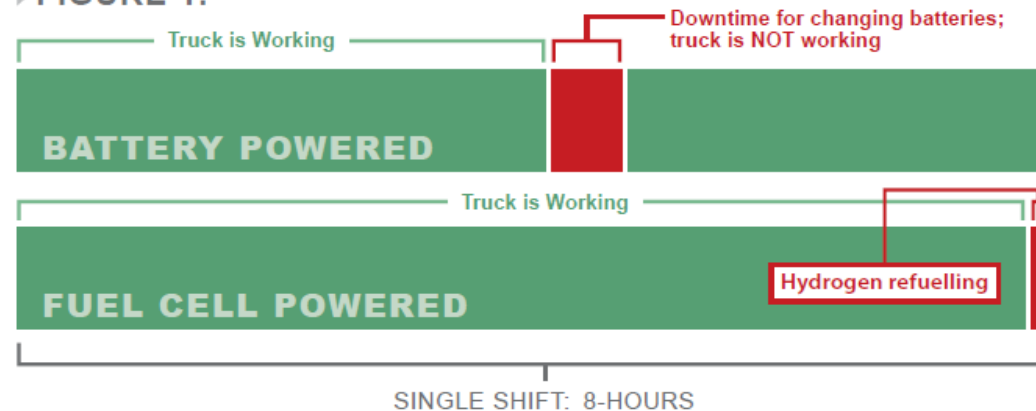
## Incrementando productividad de forklifts

# ¿Por qué incrementa la productividad?

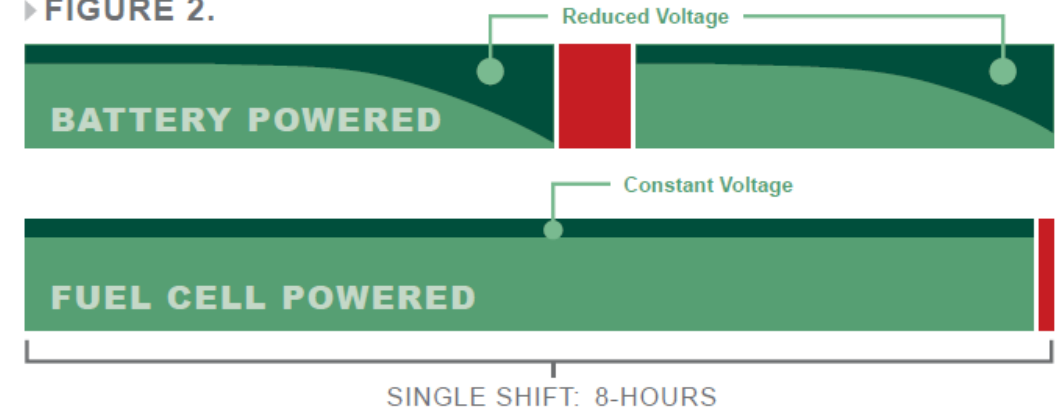
1. **Extensión rango de operación** permite operación multi-turnos con **recarga rápida**, sin necesidad de tiempos muertos por recarga de baterías y,

2. **Potencia constante** durante todo el ciclo de trabajo, permitiendo que conductores puedan **mover mayor cantidad de bienes** en un periodo de tiempo

► FIGURE 1.



► FIGURE 2.

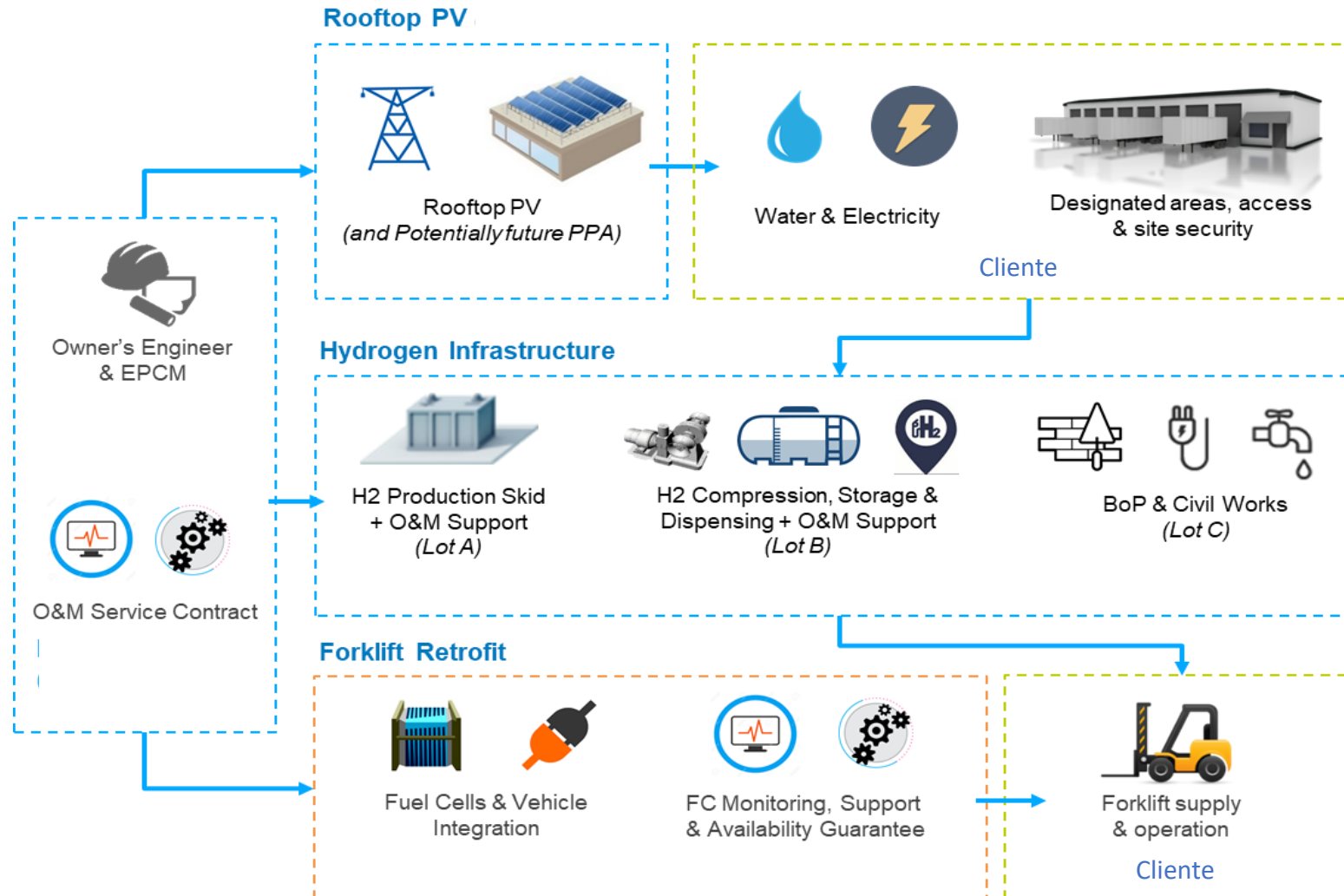


# Experiencias a nivel mundial

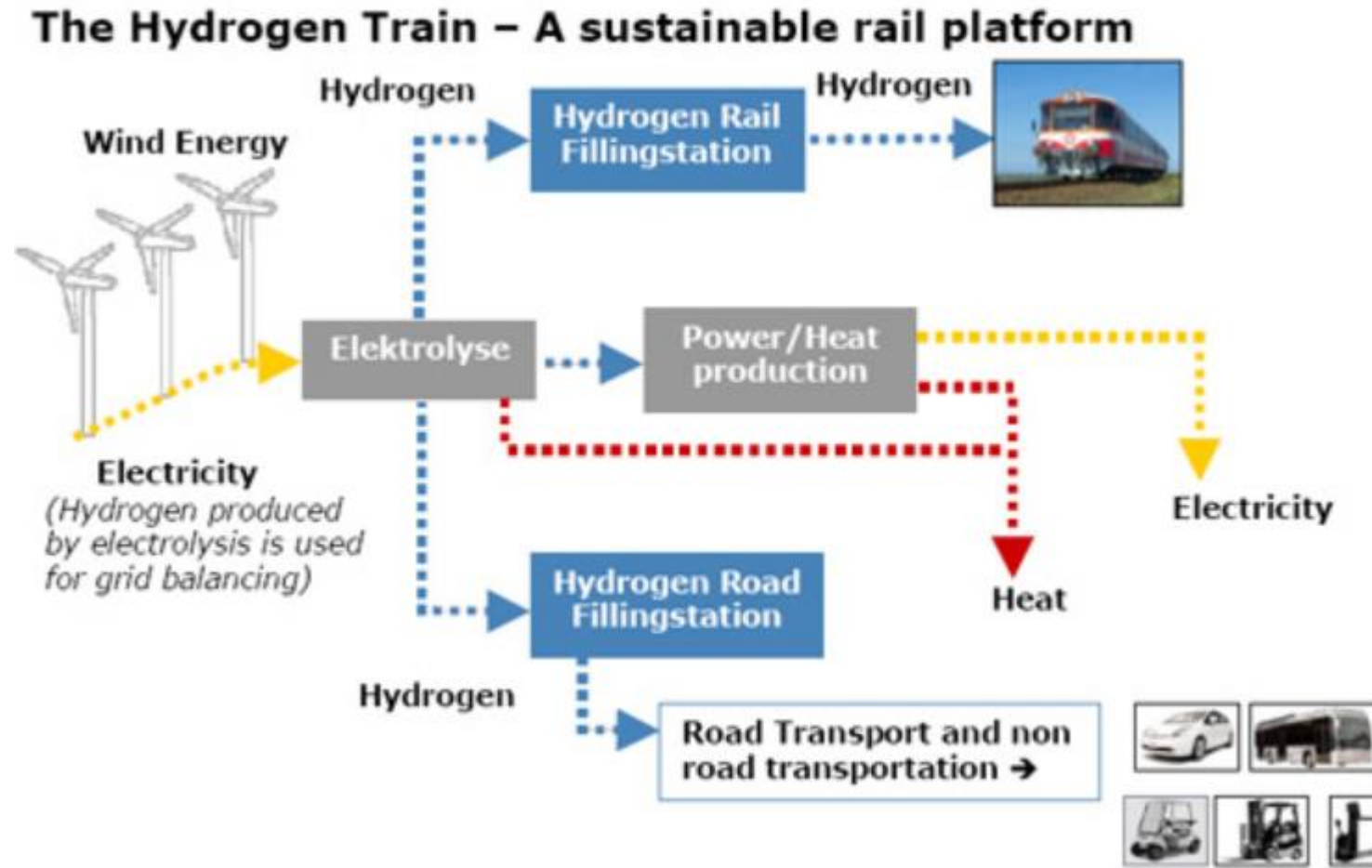


Año	País	Localidad	Proyecto	Suministrador	Resultados
2010	Canadá	Alberta	70 Grúas con Gendrive	Air Liquide	Reducción en costos de operación de 269.000 US/año reducción de GEI sobre un 72%
2010	EEUU	Carolina del Sur	Toda su flota con Hidrógeno	Linde (+ gas de vertedero)	
2012	EEUU	California	19 Carretillas y 37 Grúas	Air Liquide (H <sub>2</sub> Líquido)	"Incrementa la productividad en un 15% y disminuye en un 30% los costos operacionales"
2008	EEUU	Texas	32 Celdas Gendrive	Air Liquide (H <sub>2</sub> Líquido)	
2009	EEUU	Texas	98 Grúas y Camiones con Celdas Gendrive	Air Products	Estamos ahorrando casi \$ US100.000 por año en HH en repostaje de pilas de combustible versus intercambio de baterías
2016	Francia	Saint-Cyr-en-Val	46 Grúas con Celdas de Hidrógeno	Air Liquide	

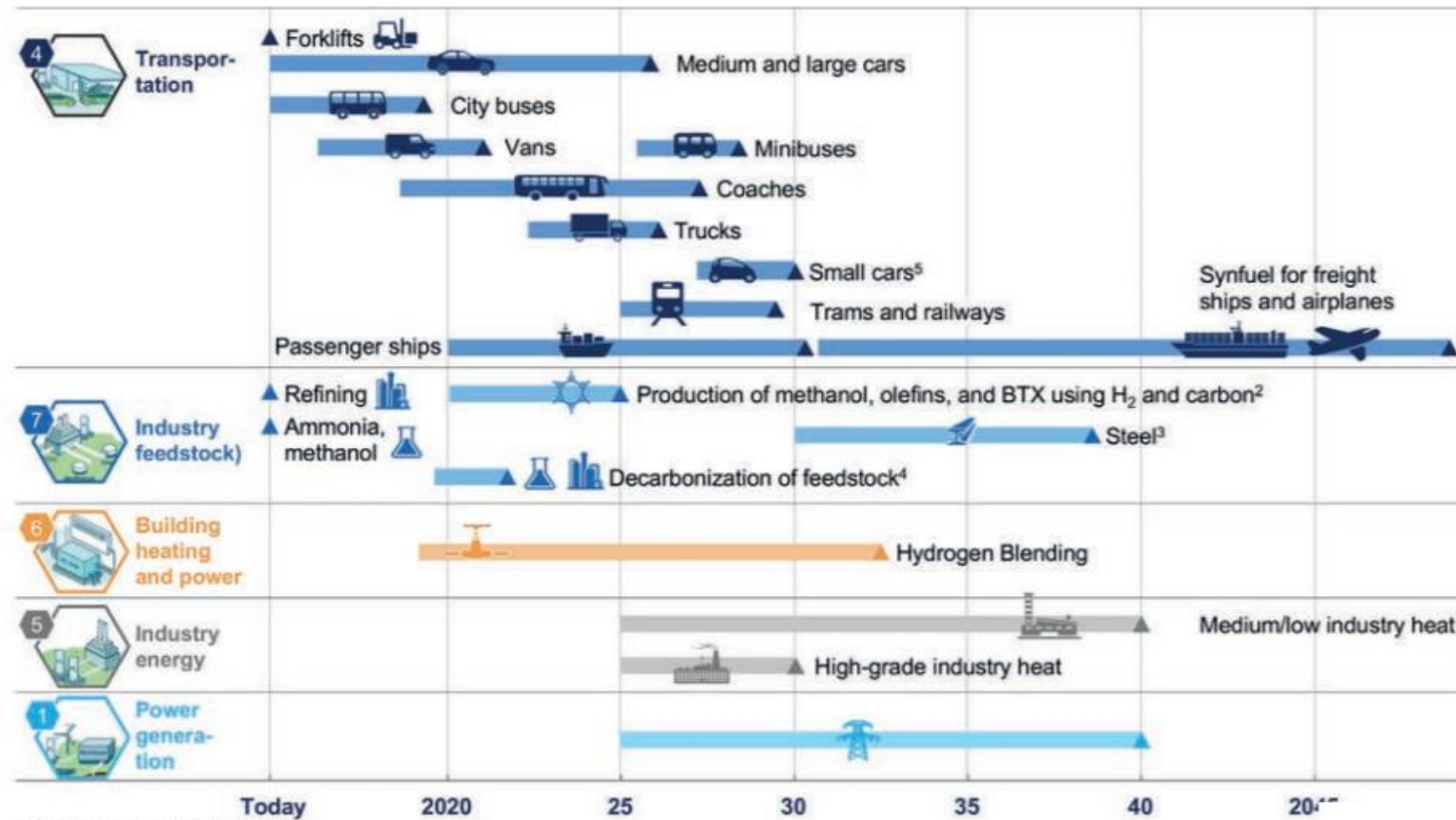
# Experiencia en Chile



# Escalabilidad



# La movilidad habilitará aceleración de madurez tecnológica



1 Defined as sales >1% within segment

2 Market share refers to the amount of production that uses hydrogen and captured carbon to replace feedstock

3 DRI with green H<sub>2</sub>, iron reduction in blast furnaces, and other low-carbon steel making processes using H<sub>2</sub>

4 Market share refers to the amount of feedstock that is produced from low-carbon sources

5 Commercialization date for France adjusted from global roadmap in accordance with ramp-up date

SOURCE: Hydrogen France Study team

An aerial night view of a city skyline, likely New York City, featuring the Hudson River on the left and a dense cluster of skyscrapers. A large white rectangle with a blue border is centered over the image, containing the text 'Gracias!', 'Kimberly Sánchez', and 'Kimberly.sanchez@engie.com'.

# Gracias!

Kimberly Sánchez  
Kimberly.sanchez@engie.com