eurecat

# Innovació amb impacte

Promovem, **mitjançant la recerca aplicada i** la innovació, la **competitivitat de les empreses** i el benestar de la societat.

# Context: The EU Green Deal

The European Green Deal is about **improving the well-being of people**. Making Europe climate-neutral and protecting our natural habitat will be good for people, planet and economy. No one will be left behind.

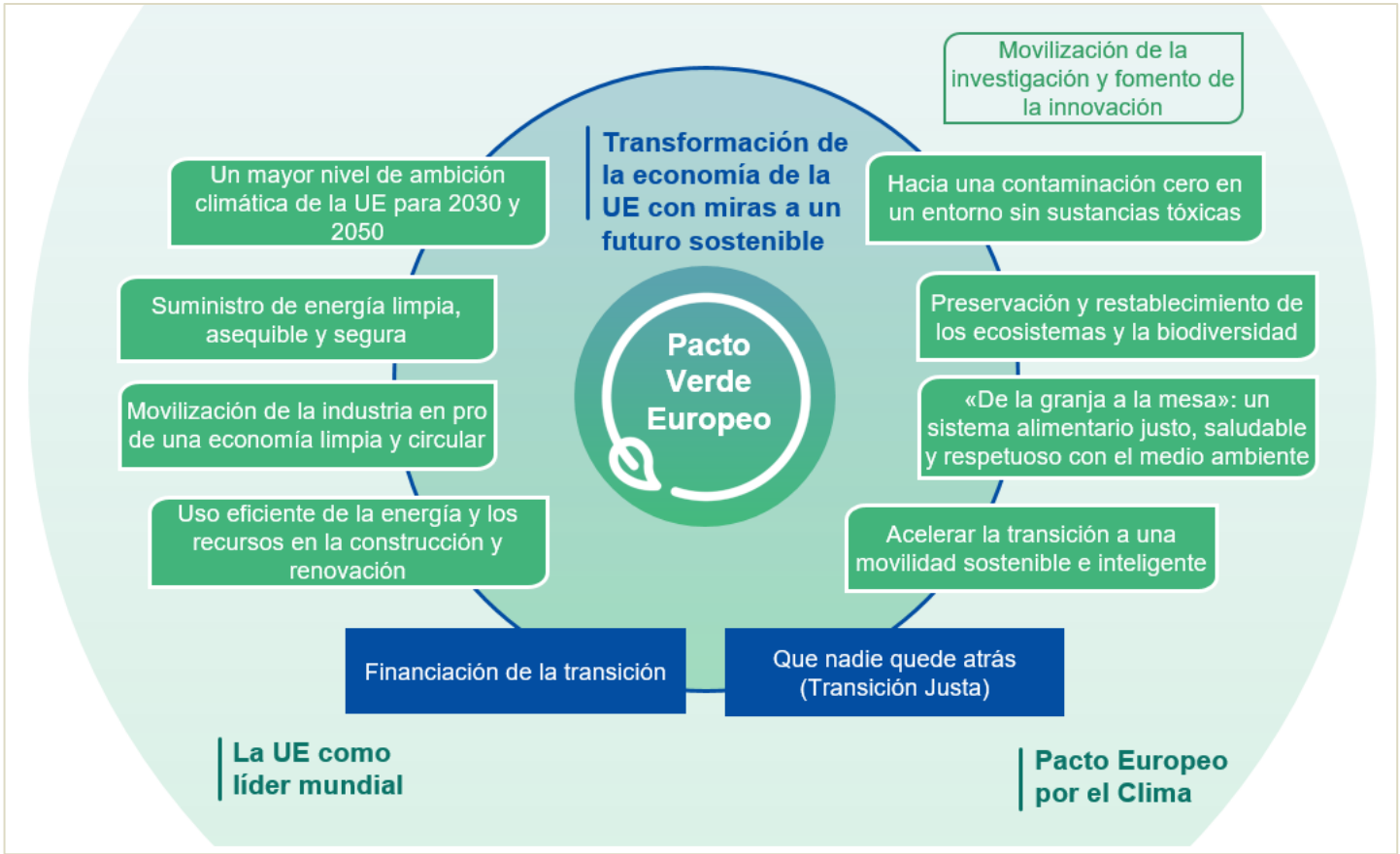
**The EU will:**

- Become climate-neutral by 2050
- Protect human life, animals and plants, by cutting pollution
- Help companies become world leaders in clean products and technologies
- Help ensure a just and inclusive transition

reducirá las emisiones

creará empleo y crecimiento

hará frente a la pobreza energética




reducirá la dependencia energética respecto del exterior

mejorará nuestra salud y bienestar

Font: Comissió Europea

# The EU Green Deal
## Transport eficient, segur i respectuós amb el medi ambient

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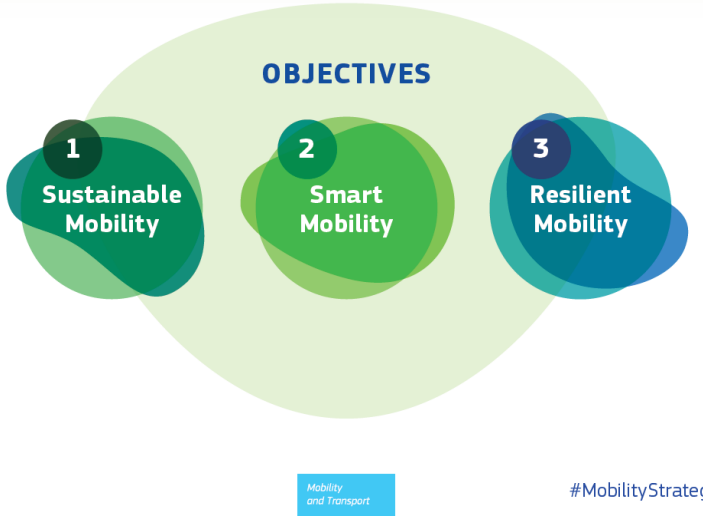


El transporte contribuye en torno al 5 % al PIB de la UE y da empleo a más de 10 millones de personas en Europa, lo que hace que **el sistema de transporte sea fundamental para las empresas europeas y las cadenas de suministro mundiales**. Al mismo tiempo, el transporte tiene unos costes para nuestra sociedad: emisiones de gases de efecto invernadero y contaminantes, ruido, atascos y accidentes de tráfico.

Actualmente, las emisiones de los transportes representan alrededor del 25 % de las emisiones totales de gases de efecto invernadero de la UE, y estas emisiones han aumentado en los últimos años. Nuestro objetivo de ser el primer continente climáticamente neutro para 2050 requiere **cambios ambiciosos en el sector del transporte**. Se necesita un camino claro para lograr **una reducción del 90 % de las emisiones de gases de efecto invernadero relacionadas con el transporte para 2050**.

La Comisión Europea adoptó una serie de propuestas para adaptar las políticas de la UE en materia de clima, energía, transporte y fiscalidad con el fin de reducir las emisiones netas de gases de efecto invernadero en al menos un 55 % de aquí a 2030, en comparación con los niveles de 1990. Más información sobre el cumplimiento del Pacto Verde Europeo.

Font: Comissió Europea

# The EU Green Deal
## Transport eficient, segur i respectuós amb el medi ambient

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**90% reduction**
greenhouse gas emissions in transport by 2050

### Reducing its dependence on fossil fuels

**By 2030**, there will be at least 30 million zero-emissions cars and 80 000 zero-emission lorries in operation.

**By 2030**, there will be at least 100 climate-neutral cities in Europe. Scheduled collective travel under 500 km should be carbon neutral **by 2030** within the EU.

Zero-emission large aircraft will become ready for market **by 2035**.

### Making alternative choices available

All large and medium-sized cities put in place their own sustainable urban mobility plans **by 2030**.

Traffic on high-speed rail will double **by 2030**. **By 2050** rail freight traffic will double.

Transport by inland waterways and short sea shipping will increase by 25% **by 2030**.

### Pricing to reflect environmental impact

The internalisation of external costs of transport at the latest **by 2050** will ensure that those who use transport will bear the full costs rather than leaving others in our society to meet them.

Font: Comissió Europea

#MobilityStrategy

# Evolució emissions CO2 (g/km) automòbils nous

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**Vehículos ligeros** - Reglamento (UE) 2019/631
(automóviles/ furgonetas)

EUROPA

2021 - 95 g/km
Objetivo 2020
(95/147 g/km) NEDC

2025 - 81 g/km
Objetivo 2025
-15% vs 2021, WLTP

2030 - 59 g/km
Objetivo 2030
-37,5% / -31% vs 2021 WLTP

Publicación en Diario Oficial 24.04.2019

Entrada en vigor 15.05.2019

Fecha aplicación 01.01.2020

Revisión 2023

Eco-innovaciones: Ajustar límite, MAC

**COP26 (Nov/2021)**
**2040 → 0 g/km**

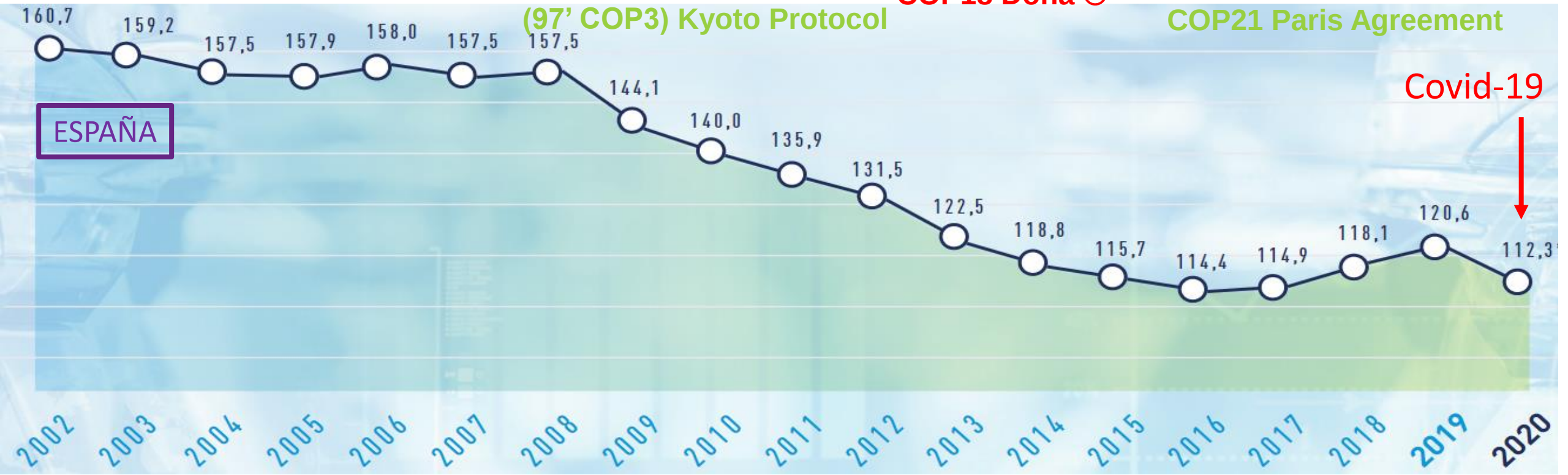
COP18 Doha ☹

(97' COP3) Kyoto Protocol

COP21 Paris Agreement

ESPAÑA

Covid-19



# PROENCAT 2050
## Prospectiva Energètica de Catalunya

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Parteix de la Llei 16/2017, del canvi climàtic, i les bases del Pacte Nacional per a la Transició Energètica (PNTE) determinen que cal afavorir la transició cap a una economia neutra en emissions de gasos amb efecte d'hivernacle, competitiva, innovadora i eficient en l'ús de recursos

S'aposta per una **alta electrificació de la demanda energètica** en tots els sectors

| Sector | Grau d'electrificació de la demanda energètica (%) | | Consum d'energia elèctrica (TWh) | |
|---|---|---|---|---|
| | 2017 | 2050 | 2017 | 2050 |
| **TOTAL** | **24,0%** | **77,5%** | **43,9** | **99,5** |
| **Consum final** | **24,8%** | **76,4%** | **43,4** | **93,3** |
| Primari | 15,7% | 53,4% | 0,4 | 1,3 |
| Indústria | 30,3% | 78,5% | 17,6 | 41,3 |
| Transport[1] | 1,5% | 62,6% | 1,0 | 21,6 |
| Serveis | 67,9% | 97,5% | 14,4 | 16,7 |
| Domèstic | 42,0% | 79,8% | 10,0 | 12,4 |
| **Sector energètic** | **7,0%** | **100,0%** | **0,5** | **6,2** |

[1] Inclou el transport terrestre, transport aeri i transport marítim de cabotatge

#transicióenergètica

Generalitat de Catalunya
Institut Català d'Energia

30 anys energia neta

Catalunya 2030

# PROENCAT 2050
## Prospectiva Energètica de Catalunya

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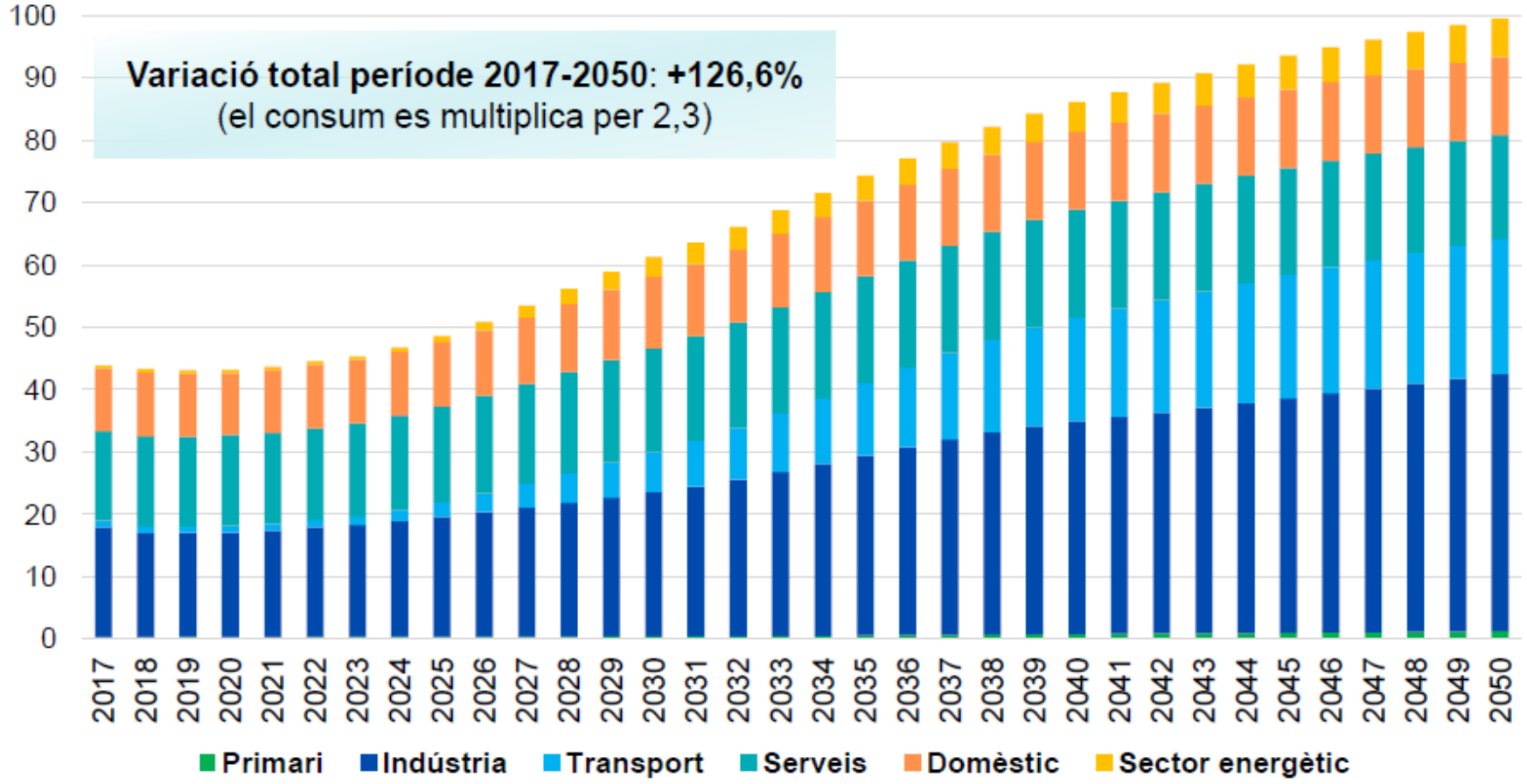
Centre Tecnològic de Catalunya

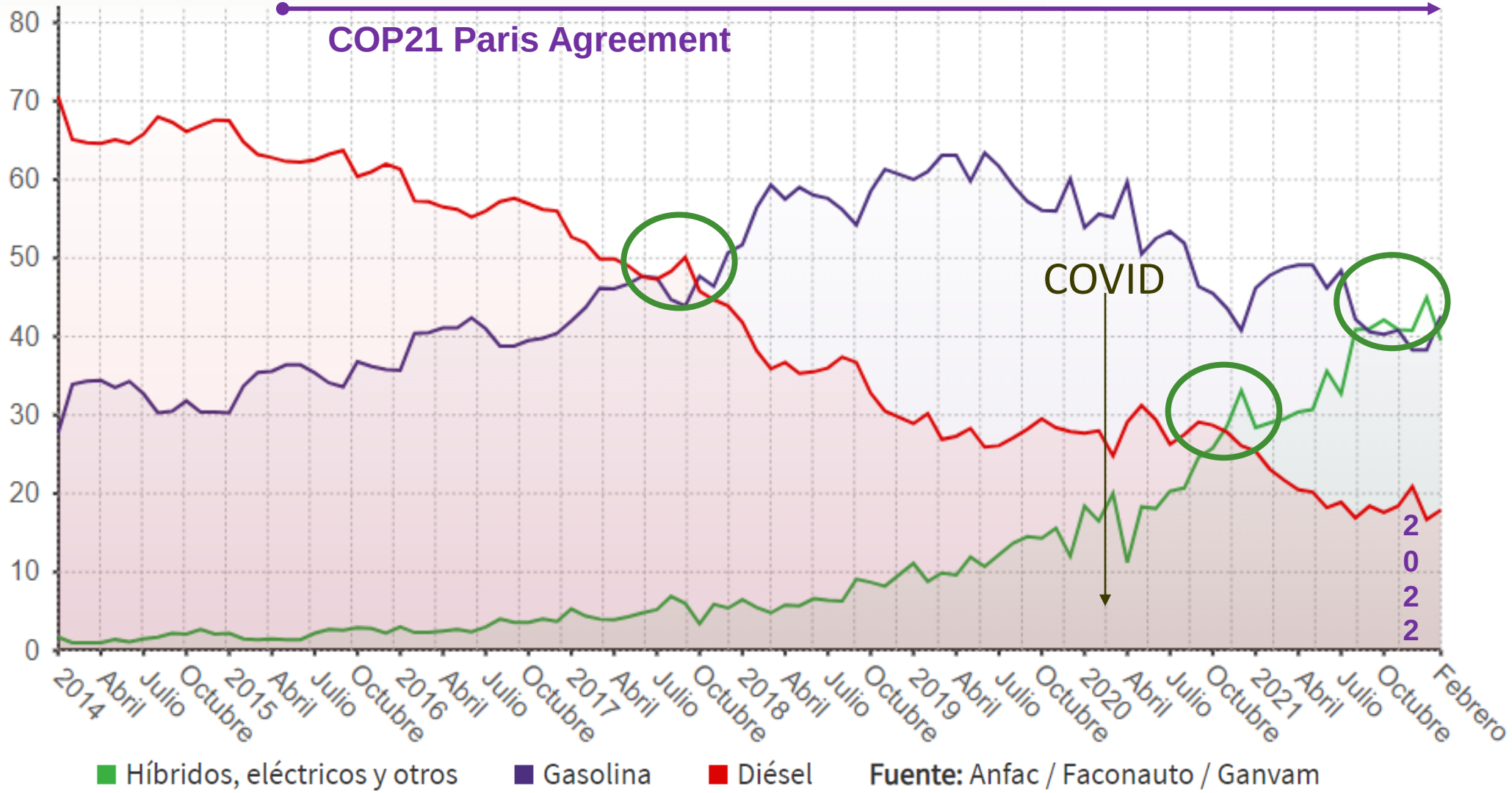
### Evolució del consum total d'energia elèctrica (TWh)




#transicióenergètica

Generalitat de Catalunya
Institut Català d'Energia
30 anys energia neta
Catalunya 2030

# Evolució del mercat de venda de vehicles



# REPTES
## Generació d'energia elèctrica de fonts renovables

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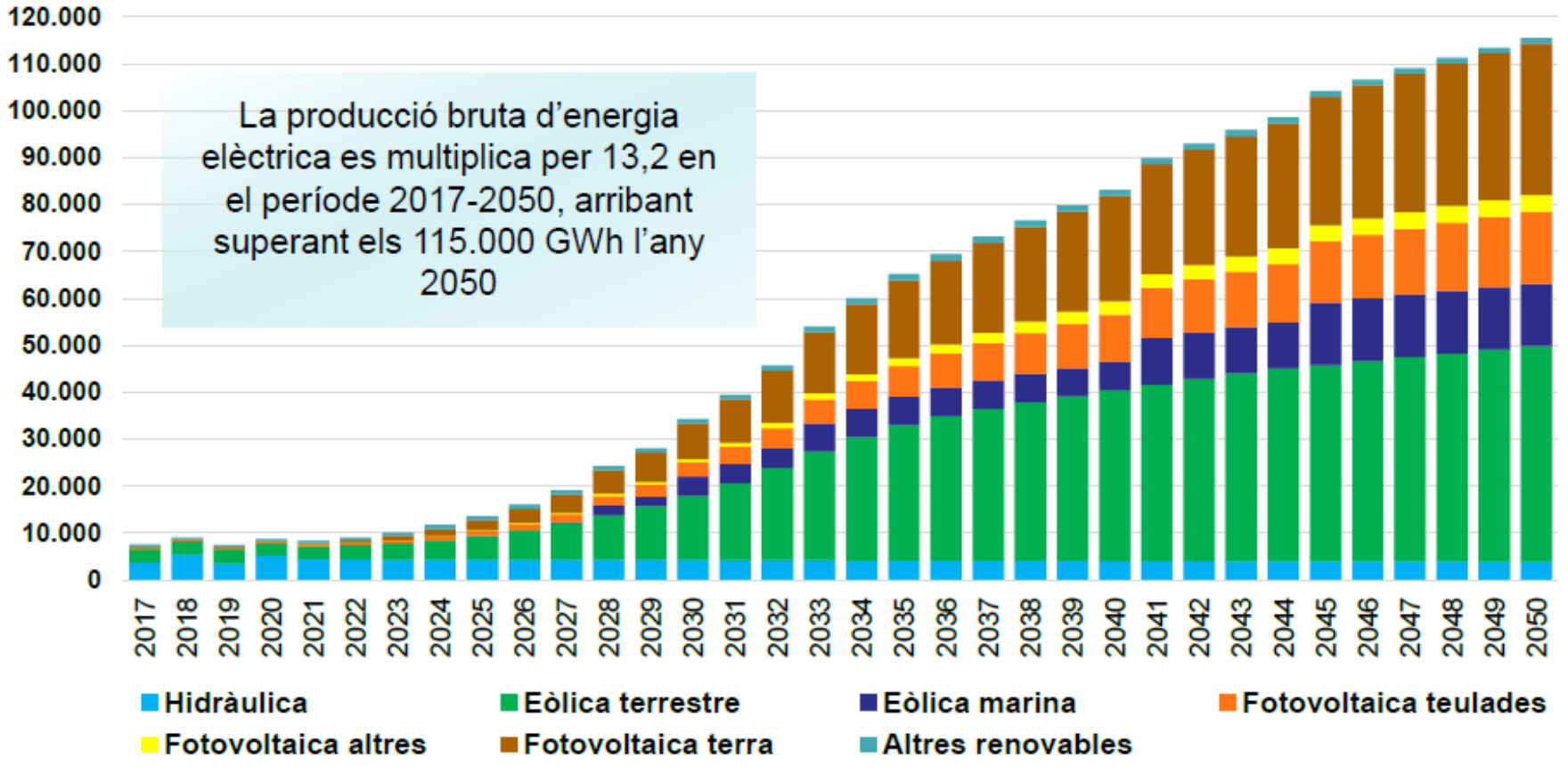
Centre Tecnològic de Catalunya

**Evolució de la producció bruta d'energia elèctrica amb energies renovables (GWh)**




La producció bruta d'energia elèctrica es multiplica per 13,2 en el període 2017-2050, arribant superant els 115.000 GWh l'any 2050

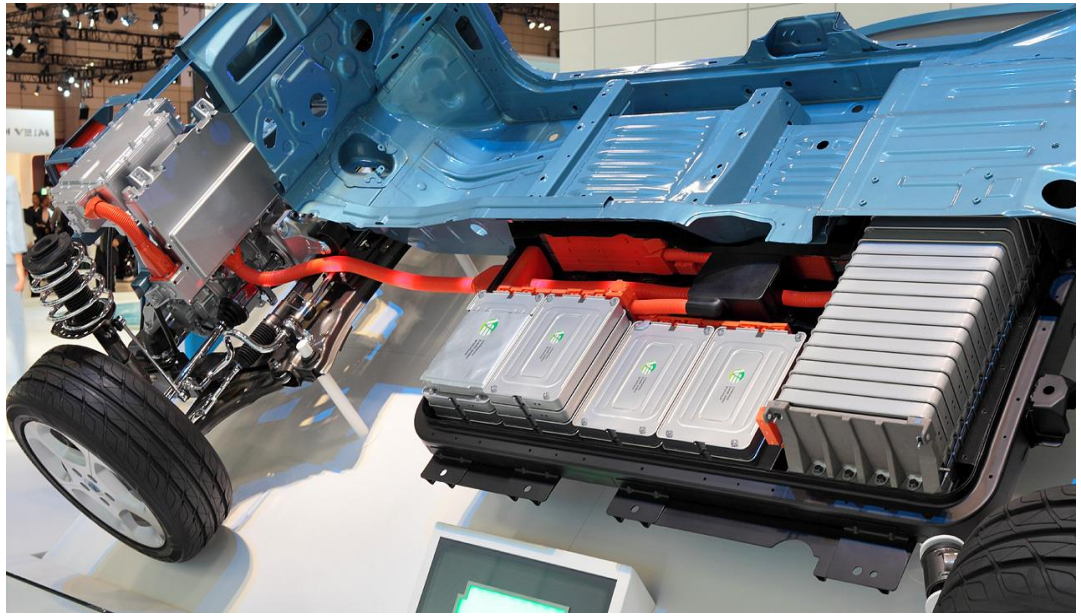
* **Altres renovables inclou:** RSU renovable, cogeneració renovable, biogàs, biomassa forestal i agrícola i solar termoelèctrica

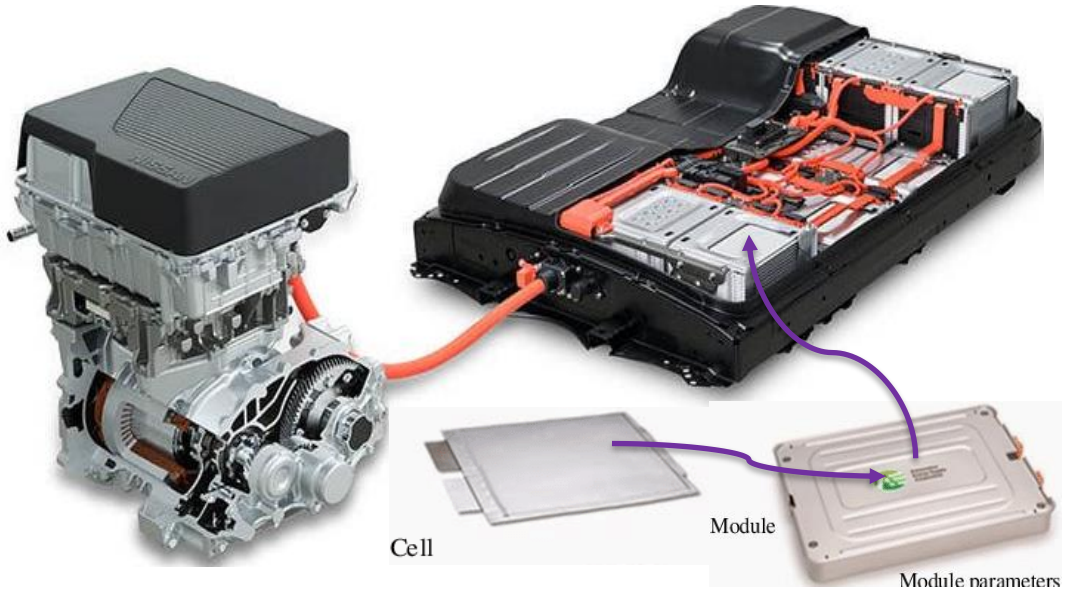
#transicióenergètica

Generalitat de Catalunya
Institut Català d'Energia
30 anys energia neta
Catalunya 2030

# REPTES
## Bateries

- Augment de la densitat energètica
- Reducció del temps de recàrrega
- Augment de la vida útil
- Disseny per la circularitat (segona vida i reciclatge)
- Fer ús de matèries primeres no crítiques
- Reducció de costos





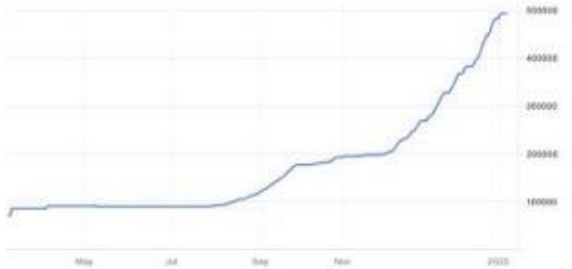
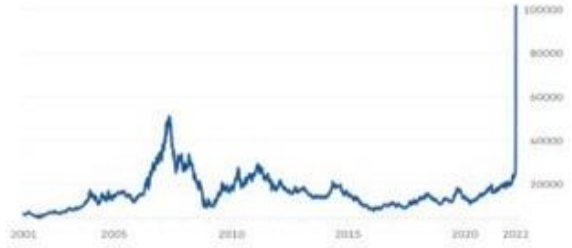
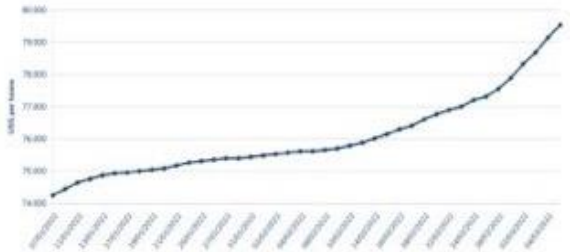
# REPTES
## Escassetat dels materials crítics

| Reservas | Producción |
|---|---|
| 1. Chile | 1. Australia |
| 2. Australia | 2. Chile |
| 3. Argentina | 3. China |
| 4. China | 4. Argentina |
| 5. EEUU | 5. Brasil |
| 6. Zimbabue | 6. Zimbabue |

| Reservas | Producción |
|---|---|
| 1. Indonesia | 1. Indonesia |
| 2. Australia | 2. Filipinas |
| 3. Brasil | 3. Rusia |
| 4. Rusia | 4. (F) N.Caledonia |
| 5. Filipinas | 5. Australia |
| 6. China | 6. Canadá |

| Reservas | Producción |
|---|---|
| 1. RD Congo | 1. RD Congo |
| 2. Australia | 2. Rusia |
| 3. Indonesia | 3. Australia |
| 4. Cuba | 4. Filipinas |
| 5. Filipinas | 5. Canadá |
| 6. Rusia | 6. Cuba |

Year on Year Change in Costs of the Battery Cell Cathode Materials of Tesla Model 3 (60 kWh)

| Amount | Cost March 2021 | Cost 8th March 2022 | Price Charts |
|---|---|---|---|
| 38.8 kg Lithium Hydroxide | 465 USD 12 USD/kg | 2440 USD 63 USD/kg |  |
| 47.5 kg Nickel | 785 USD 16.5 USD/kg | 4750 USD 100 USD/kg |  |
| 2.7 kg of Cobalt | 145 USD 55 USD/kg | 210 USD 80 USD/kg |  |

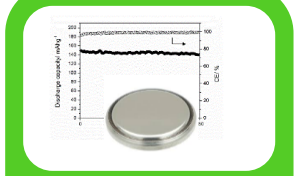
2021

Reservas Mn → 1. Sudáfrica; **2. Australia**; **3. Brasil**; **4. Ucrania**; 5. Gabón; **6. China**

Producción Mn → 1. Sudáfrica; 2. Gabón; **3. Australia**; **4. China**; **5. Ucrania**; 6. Ghana

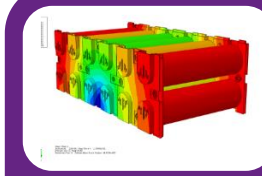
# Battery value Chain

## Technology for cell, battery packs, and systems development



**Materials & Cells R+D**

- Li-ion, Na-ion, Li-S batteries, All Solid State batteries, Redox flow batteries, Supercapacitors and hybrid systems
- Synthesis-structure-properties correlation of (nano)electrodes
- Electrode coating
- Ionic liquid cell electrolytes
- Polymer electrolyte membranes



**Module & Battery Pack development**

- Housing BP
  - Multi-material
  - Light materials (Composites,Al, AHSS)
- Battery Management Systems (BMS)
  - BMS Development
  - Power converter & controls design
  - Energy systems hybridization
- Sensors integration

**Testing & Characterization of Cells, Modules and Battery Packs**

- Benchmarking
- Quality control
- Safety
- Accelerated ageing
- Cell to Battery validation (standards or tailor-made)
- Abusive tests following standards for safety (UN, UL and R100)
- User-defined tests

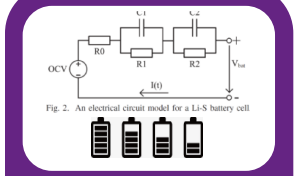


Fig. 2. An electrical circuit model for a Li-S battery cell

**Modelling & Simulation**

- Model generation:
  - Empirical
  - Electrochemical
  - Ageing
  - Thermal
- Algorithms for State-of-charge (SOC), State-of-health (SOH)
- Cell, module and battery electrochemical and thermal simulation

**Power Electronics & Grid Integration**

- Battery Management Systems (BMS) validation
- Power electronics & Grid integration
  - Grid integration studies & validation
  - Smart Charging/V2G, AC/DC charging points design

**Energy Systems Analytics**

- Charging point management
- V2G, Smart charging & EMS integration
- EMS including electromobility services
- EV forecasting
- Data management: usage of EV data for BM evaluation, SOH & EoL, new services.

**2nd and End of life batteries**

- Reuse and recovery battery and cells
- 2nd life studies
- Post-mortem analysis
- Safe dismantling and preparation for recycling
- Metal recovery
- Battery Passport
- HAZOP Analysis

**Circular Economy**

- Eco-design/Design for Circularity
- Safe dismantling and preparation for recycling
- Life Cycle Cost & Social Life Cycle Assessment
- Levelized cost of energy (LCOE)

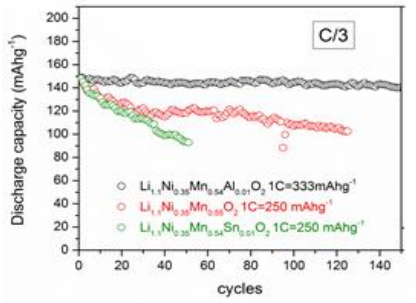
# Projecte Cobra

Les cel·les del futur

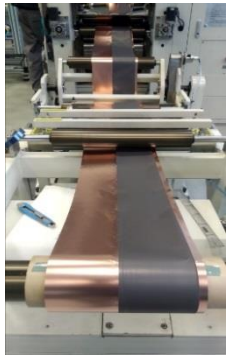
Total budget ~ 12 M€

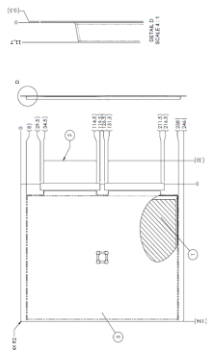
## Cobalt-free batteries for future automotive applications

**COBRA aims to develop a novel Cobalt-free Lithium-ion battery technology** that overcomes many of the current shortcomings faced by **Electrical Vehicle (EV)** batteries. The proposed Li-ion technology will be **demonstrated at TRL6 (battery pack level)**.

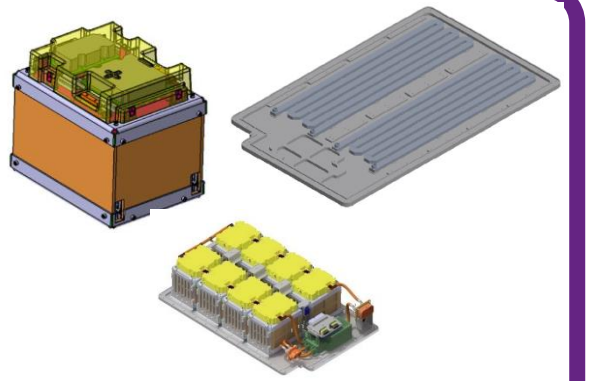



Material testing





Cell development



Module and battery pack assembly

The project is coordinated by IREC.

# Projecte Marbel

Les bateries del futur

Total budget ~ 12 M€

MARBEL

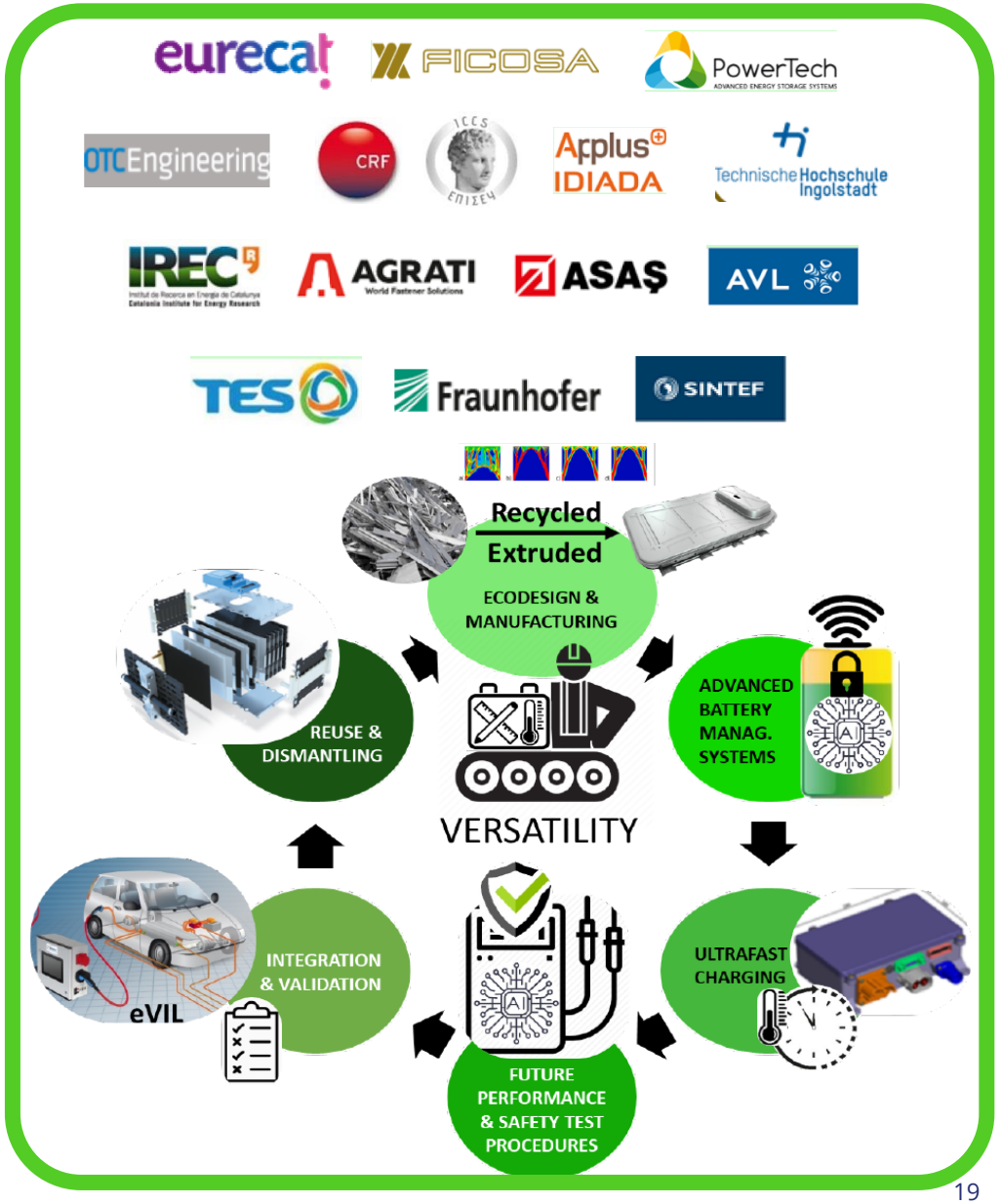
**Manufacturing and Assembly of modular and Reusable EV Battery for Environment-friendly and Lightweight mobility**

> 20% weight reduction

> 25% charging time reduction

> 40% LCA improvement by using modularity

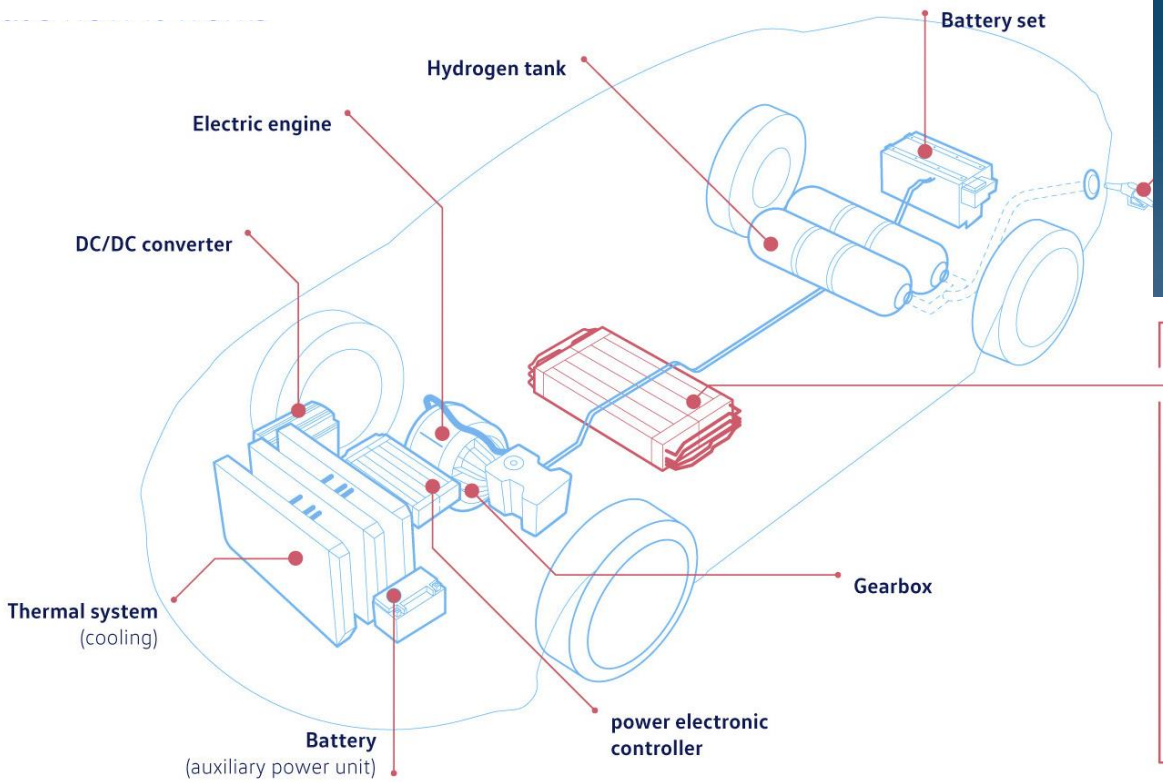
- Useful Battery life up to 300,000 km
- Easy & Safe (dis-)assembly automatization
- Reparability and 2nd life transition
- Adaptable to all cells and vehicles



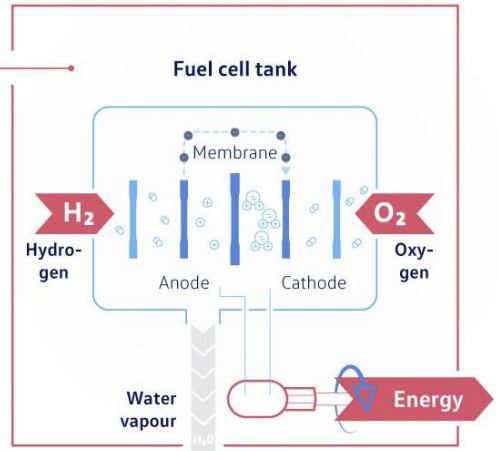

The project is coordinated by EURECAT.

# REPTES
## Piles d'hidrogen

- Industrialització
- Reducció de pes i volum
- Augment de la vida útil
- Disseny per la circularitat
- Reducció del cost








https://www.volkswagenag.com/en/news/stories/2019/08/hydrogen-or-battery--that-is-the-question.html

# Comparativa d'eficiències
## Bateries vs Piles d'hidrogen

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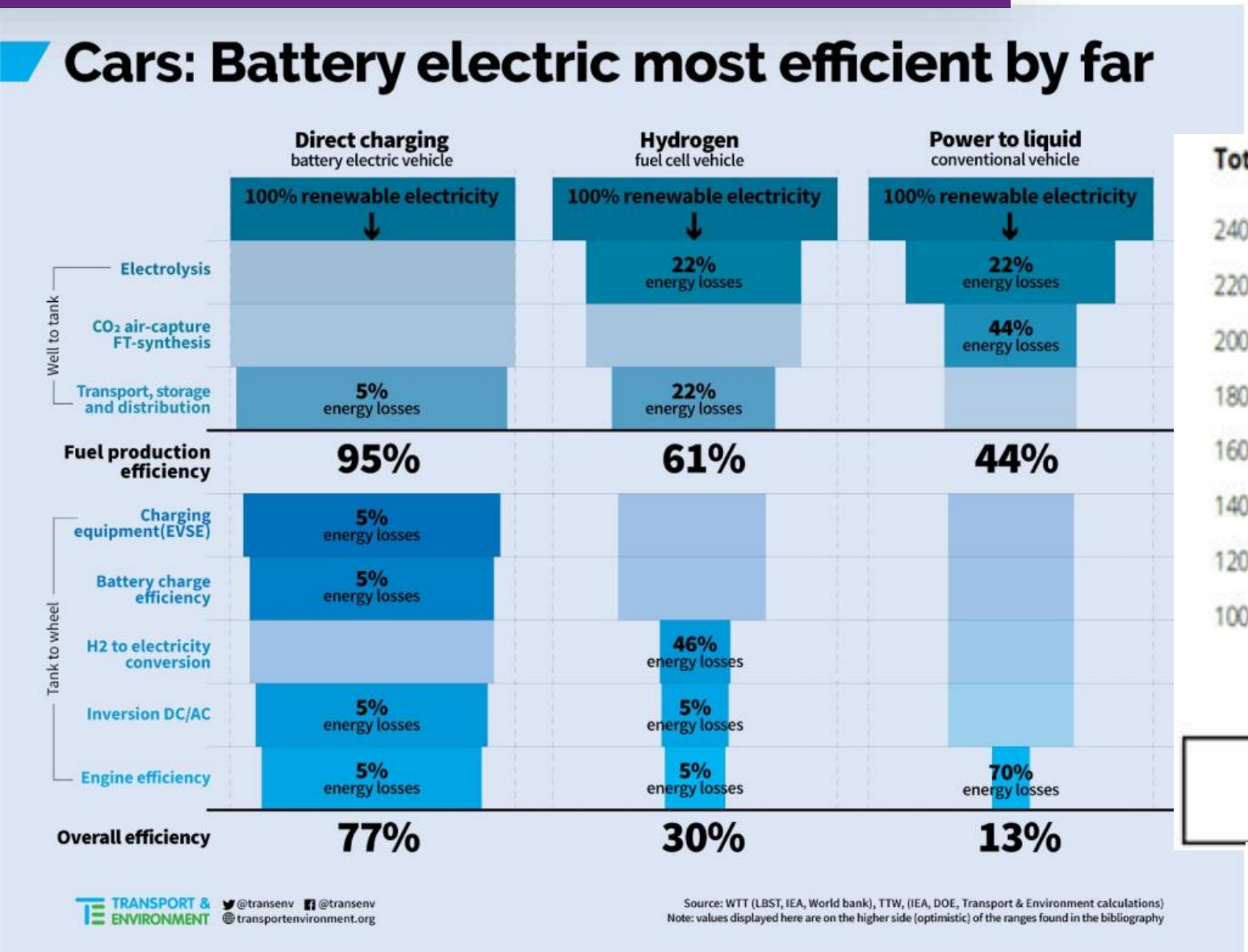
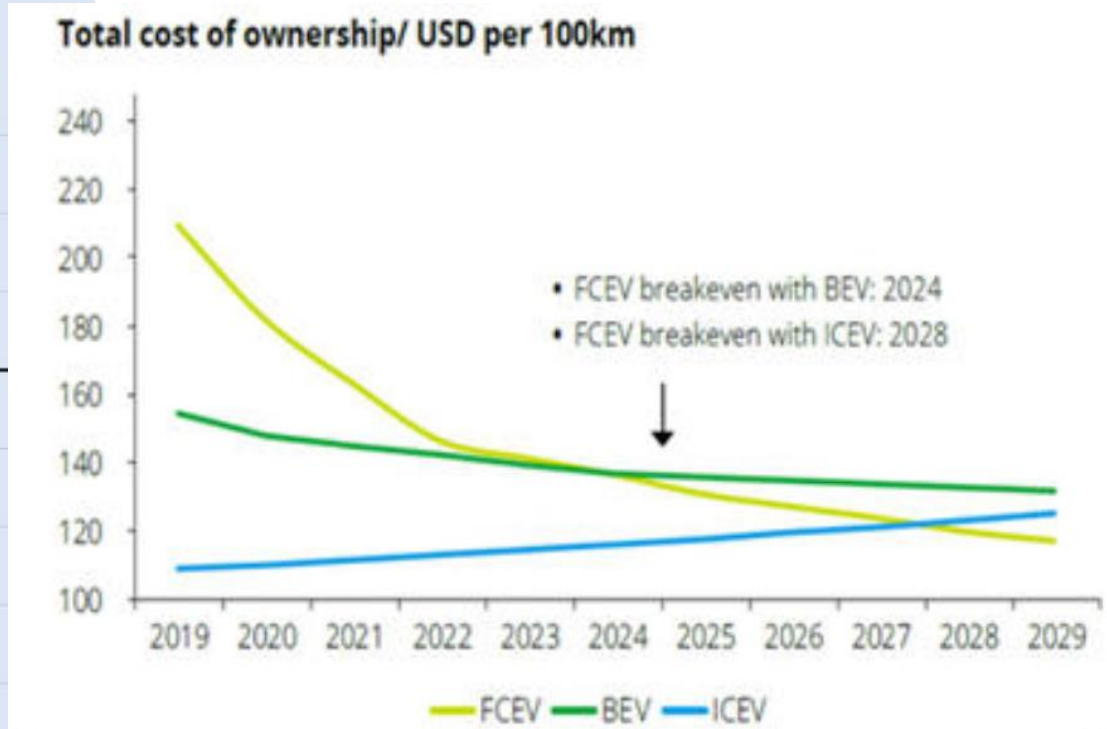
Centre Tecnològic de Catalunya




*Comparative TCO analysis of a drayage truck Fuel Cell Electric Vehicle (FCEV) operating in California*

**Fuente**: *Fueling the Future of Mobility. Hydrogen and fuel cell solutions for transportation. Ballard & Deloitte*

# REPTES
## Punts de recàrrega elèctrica

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Centre Tecnològic de Catalunya


**Infraestructura total de acceso público en España**

Proyección a nivel Comunidades Autónomas

**339.998** Puntos de recarga

VS 250.000 – 300.000 del Gobierno

| | Total | P < 50 [kW] | 50 ≤ P < 150 [kW] | 150 ≤ P < 250 [kW] | P ≥ 250 [kW] |
|---|---|---|---|---|---|
| Puntos | 339.998 | 307.659 | 24.349 | 2.435 | 5.556 |

Incluye el análisis de los principales corredores

ANFAC


FACONAUTO

TOTAL

PUNTOS DE RECARGA DE ACCESO PÚBLICO

2020 4T **8.545**

**Fuente:** Elaboración propia de ANFAC en base a Electromaps

2030

# REPTES
## Smart Grid elèctrica

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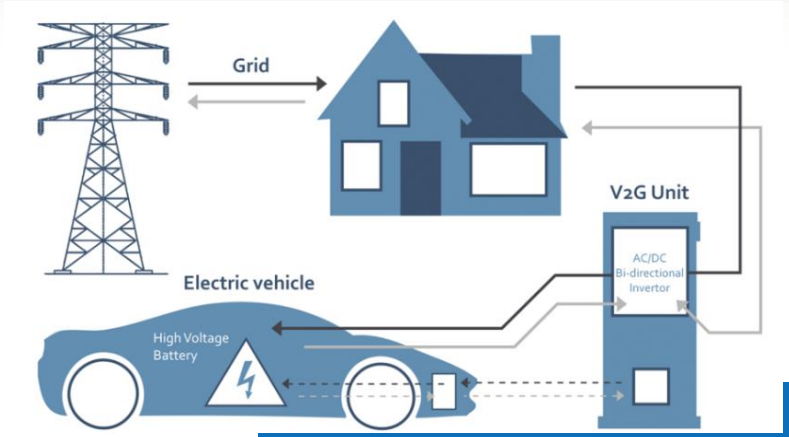
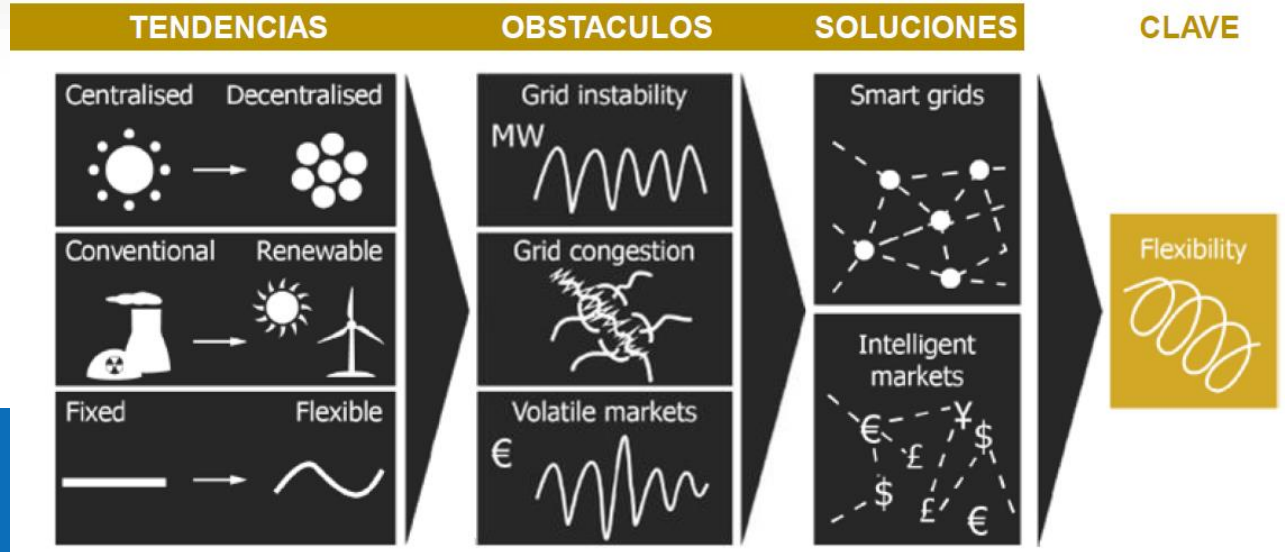
Centre Tecnològic de Catalunya




Font: IREC

*“ innovant amb les empreses “*

# Gràcies!

eurecat

www.eurecat.org


**Agustí Chico Roca**

*Support Laboratories Manager & Singular Projects Unit Director*

*BATTECH Technological Director (Battery Joint Research Unit among IREC&Eurecat)*

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