

# Baterías termofotovoltaicas para almacenamiento de energía de larga duración

Esther López y Alejandro Datas

Instituto de Energía Solar, Universidad Politécnica de Madrid, Madrid (SPAIN)



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SOLAR



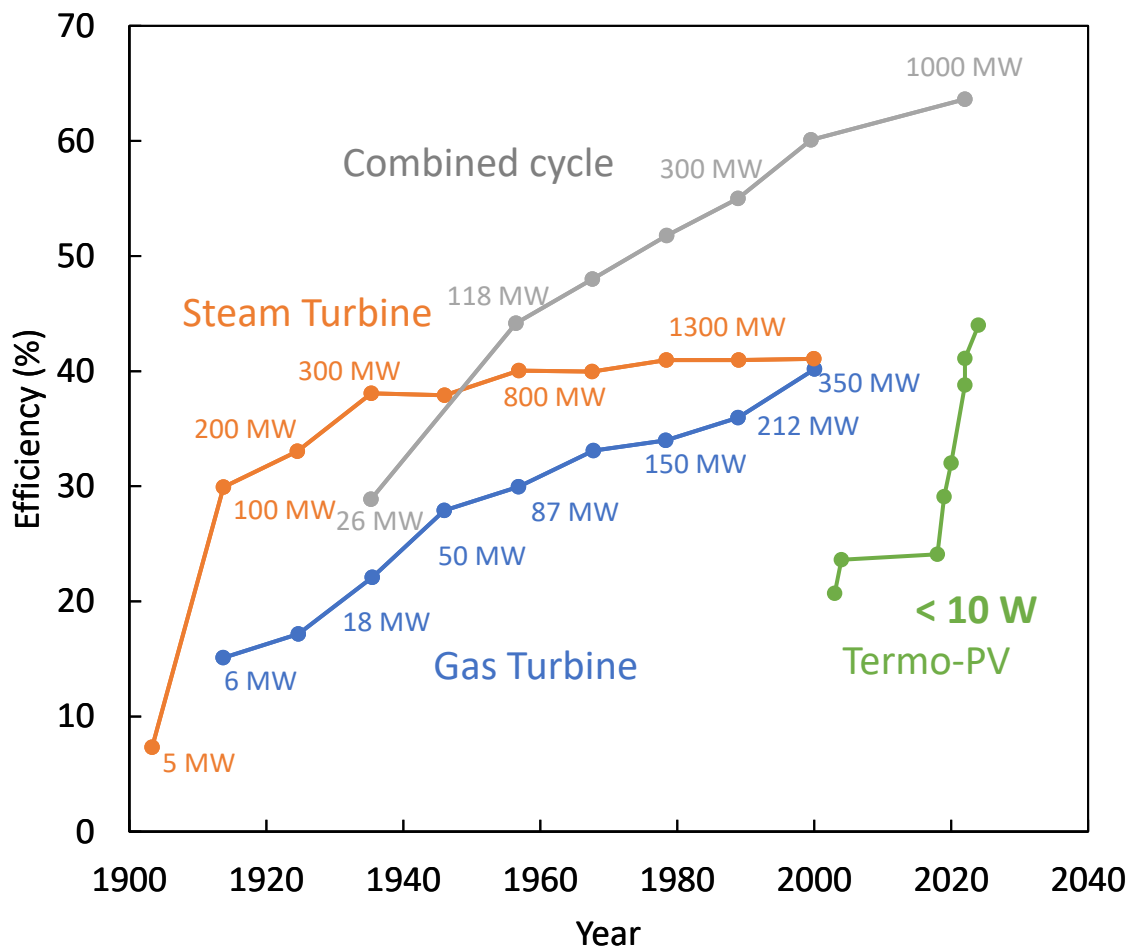
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## Solar-PV



## Thermo-PV

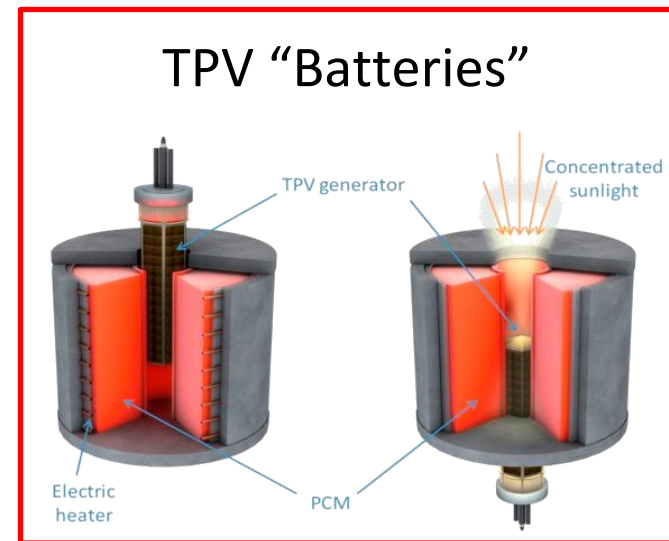




## Waste heat recovery



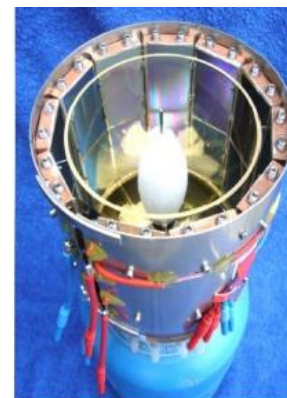
## TPV "Batteries"



## Fuel-fired (portable power) Solar-thermal power



(a)



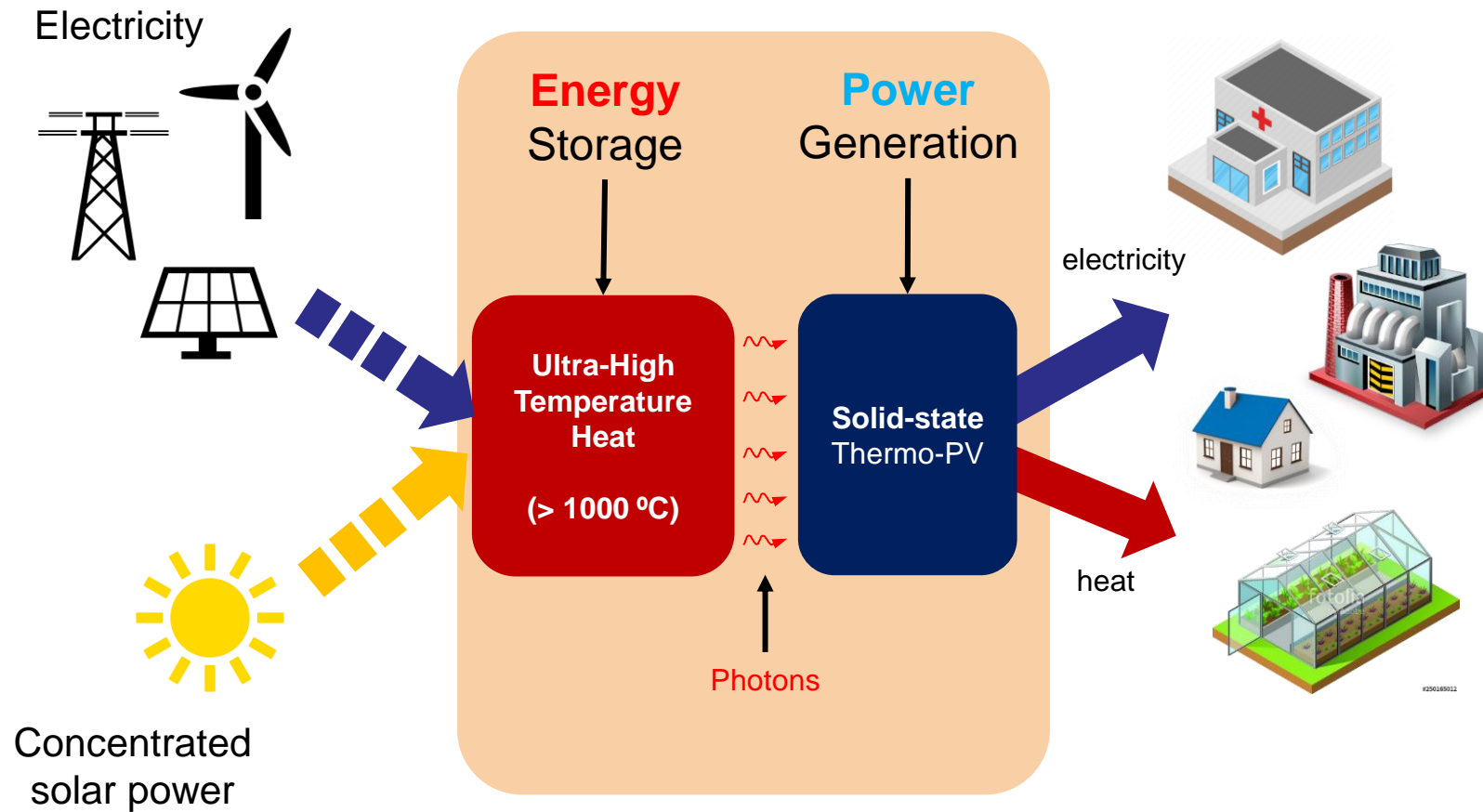
(b)



Adapted from J. Islas, Technological Forecasting and Social Change, 1999.



A. Datas et al. "Embracing Thermophotovoltaic Electricity: Pathways to Market Adoption" <http://dx.doi.org/10.2139/ssrn.4981703>



## El calor representa el 50% de toda la demanda energética de la UE

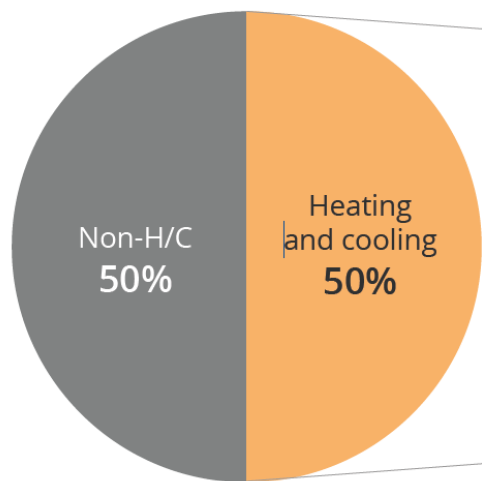


Figure 1: Total final energy in 2015 (EU28)

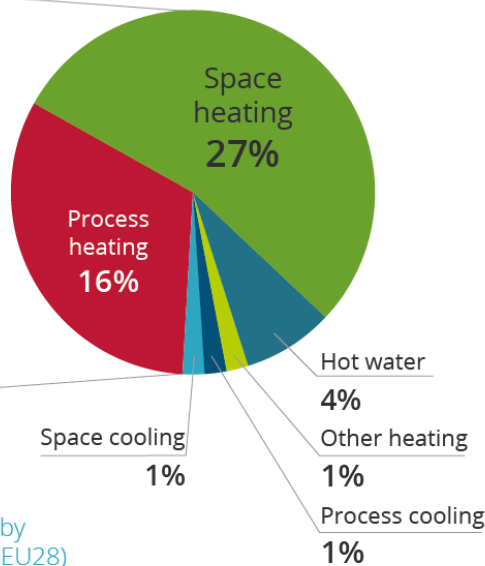
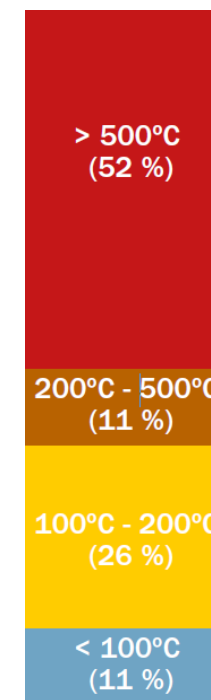
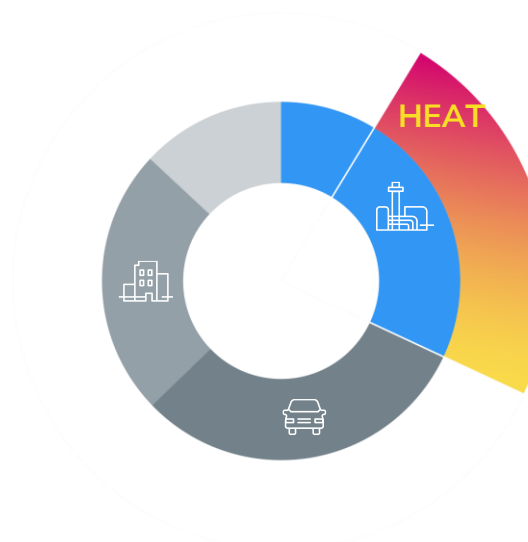
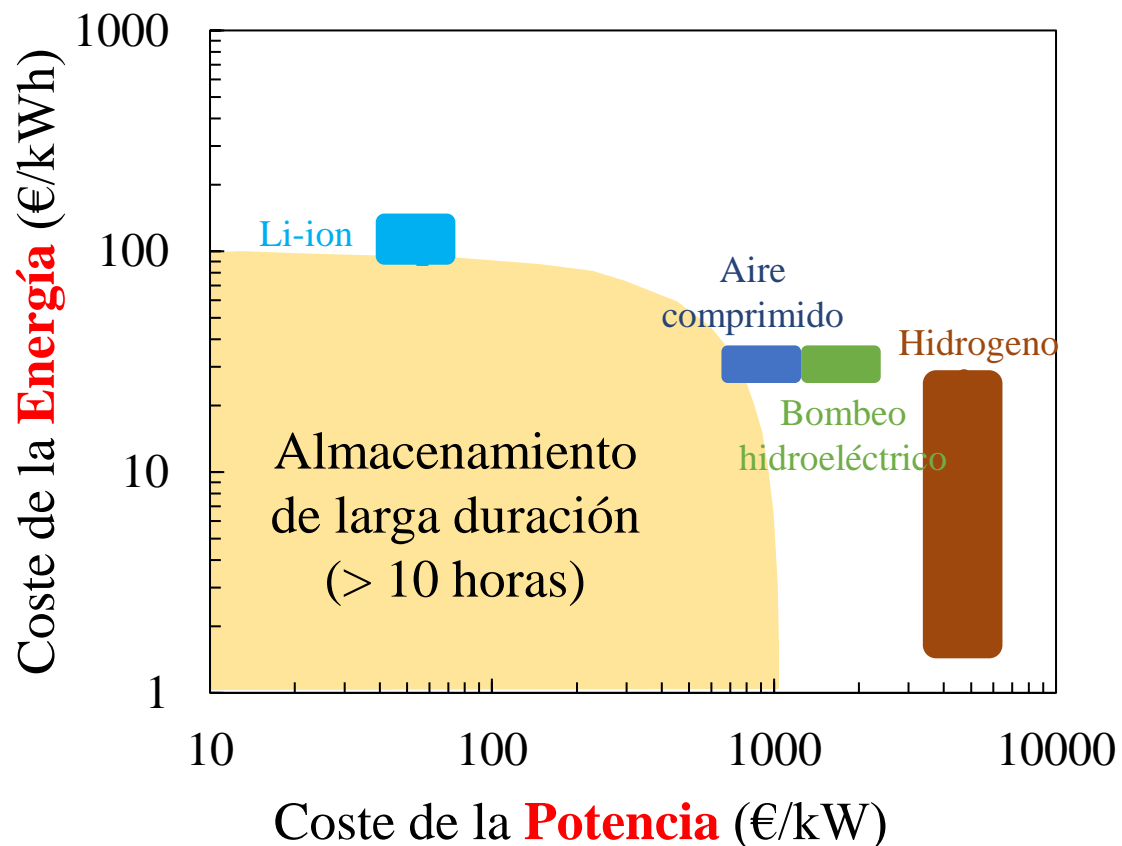


Figure 2: H&C final energy by end-use in 2015 (EU28)

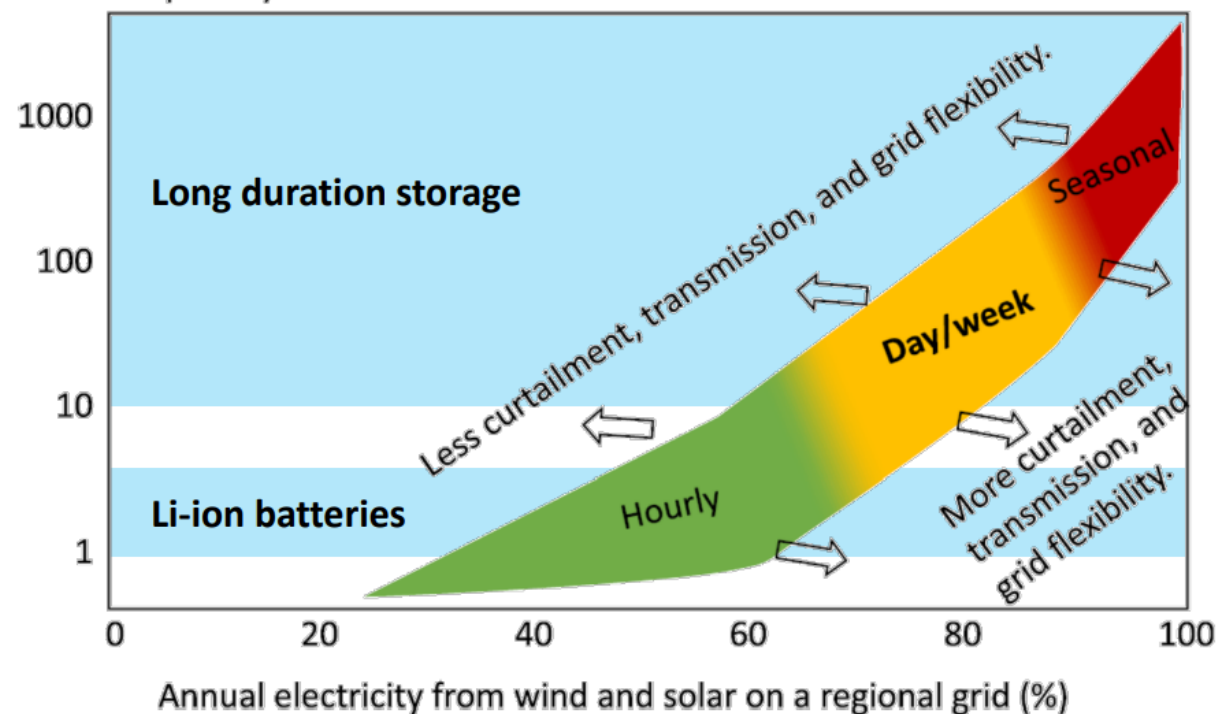
Share of heating and cooling on final energy consumption of the EU-28 in 2015  
Source: Heating and Cooling – Facts and Figures

## Process heat temperature





Maximum required storage duration (hours at rated power)



P. Albertus, et. al. "Long Duration Electricity Storage Applications, Economics, and Technologies", Joule (2020)



**Esther López**  
Assist. Prof.



**Pablo G-Linares**  
Assoc. Prof.



**Carlos del Cañizo**  
Prof.



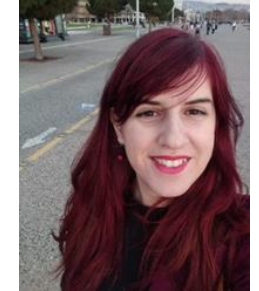
**Alejandro Datas**  
Assoc. Prof.



**Juan Villa**  
PostDoc



**Nicolas Loubet**  
PostDoc



**Myrto Zeneli**  
Postdoc



**Alvaro Medrano**  
PhD. Student



**Ignacio Izquierdo**  
PhD. Student



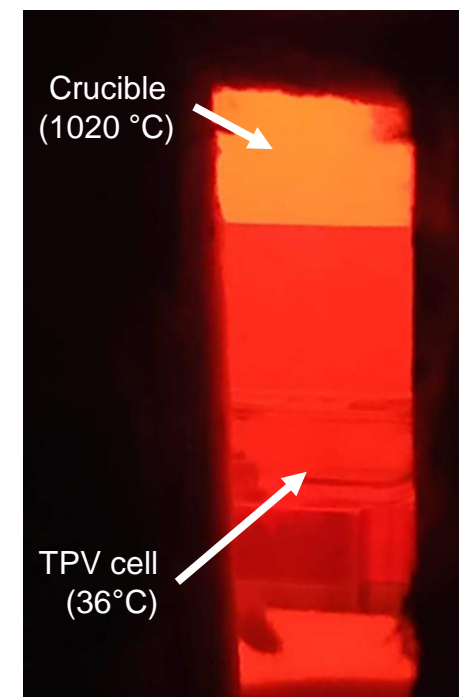
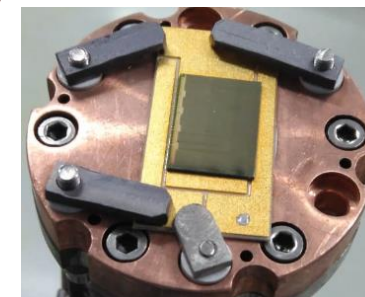
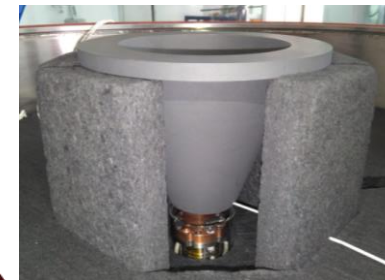
**Daniel Milovich**  
PhD. Student



## First lab-scale experiments

2017-2022

- First proof of principles
- Ferrosilicon alloys optimization
- Crucible-PCM interaction analysis
- First Ge and InGaAs TPV cells



NTNU  
Norwegian University of  
Science and Technology



Consiglio Nazionale  
delle Ricerche



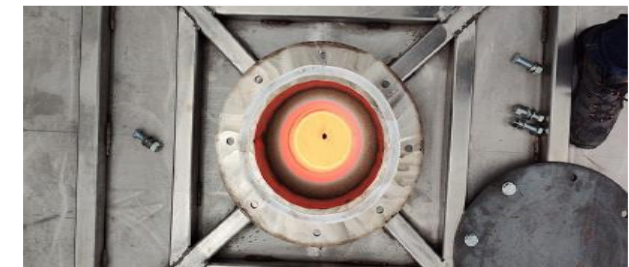
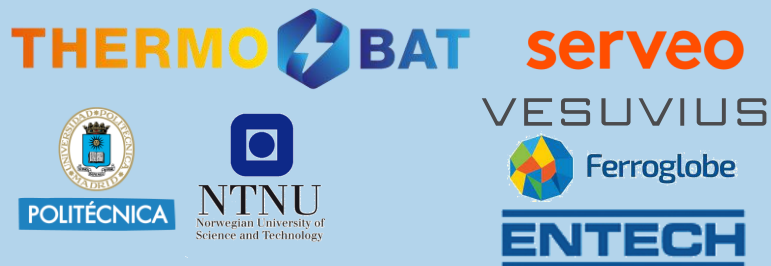
Łukasiewicz  
Krakowski Instytut Technologiczny



## Scale-up to prototype

2022-2026

- Scale-up
  - 1 kWh → 100 kWh
  - 1 W<sub>e</sub> → 500 W<sub>e</sub>
- Reliability
  - > 100 thermal cycles
- Sustainability
  - New ferrosilicon manufacturing methods
- TPV
  - InGaAs  $\eta = 24.7\%$  @1704 °C
  - Ge  $\eta = 11.2\%$  @1440 °C



# Proyectos de investigación en Baterías TPV



Total EU funding

12 M€



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EIC Pathfinder – AMADEUS (3.2 M€)

EIC Launchpad (100 k€)

Horizon Europe (3 M€) SUNSON

EIC Transition (2.5 M€) THERMOBAT

EIC Booster (50 k€)

Horizon Europe (3 M€) BLAZE TEC

CDTI Neotec (350 k€)



TRL 3 (Proof of Concept)

TRL 5 (Validated in the lab)

TRL 6 (Validated in final user)

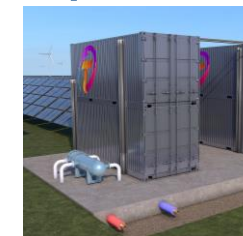
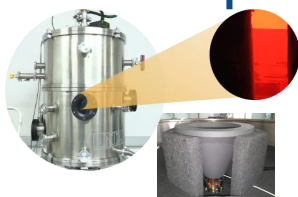
TRL 7-8 (Demonstrated and qualified)

TRL 9 (Competitive product)

2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030



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# Gracias por su atención

[esther.lopez.estrada@upm.es](mailto:esther.lopez.estrada@upm.es)



## FOTOPLAT

Plataforma Tecnológica Española Fotovoltaica



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