



# EUREC PV Workshop

June 09, Anis JOUINI - CEA-INES

# HJT technology – Lab to GigaFab : 15 Years



## Enel and French PV institute achieved an efficiency of 25.0% for a heterojunction solar cell

The solar cell calibration laboratory ISFH CalTeC has certified the efficiency of the cell, which was made with a standard M2 wafer.

AUGUST 28, 2020 CATHERINE ROLLET

MODULES & UPSTREAM MANUFACTURING TECHNOLOGY AND R&D FRANCE

- From 20% on 5 inch wafers / Cluster mode 50 w/day
  - To 20% on M0 wafers with 1200 wph / 25 FTE
- European alliance INES/MB/EGP for +23% on M2 wafers
  - 2400 wph / 35 FTE
- First phase for 250 MW Cell and bifacial module Line in Italy
  - Common team work and exciting results on first cells

- Vision for the future PV Cell technology
  - 16% on 25 cm<sup>2</sup>

**2006**  
Proof of concept

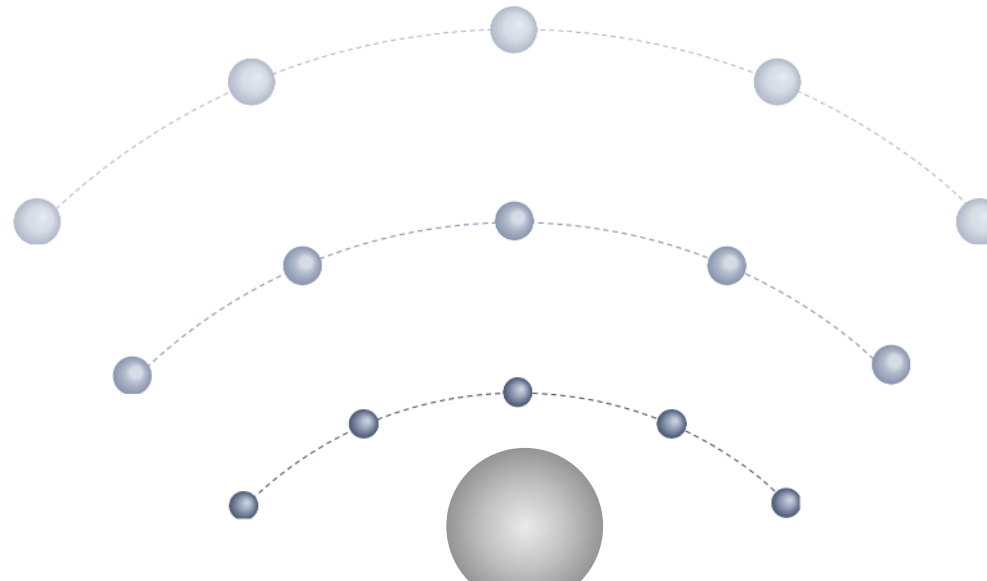
**2010**  
Pilot Line  
1200wph

**2014**  
Pilot Line  
2400wph

**2018-2019**  
First technology  
transfer To EGP

**2020-2021**  
Towards multi  
GW Ecosystem  
Larger wafer

- Very active initiatives are under progress.
- Competitive automated manufacturing in Europe associated to a detailed BP, CoO and LCOE models
- First phase of 3 GW Integrated Cell and bifacial module Giga-Fab in Italy



**25.03% Certified**



# The PV HJT Cell & Module : Six Blocks for a Future Transformation



## 2. Module Power and Price

Multi-GW scale fabs, Process automation, module power density and design, module weight

## 4. Multifunctional and integrated

Light weight, Flexible, Colored, Aesthetic, Auto-cleaning, Auto-cooling, Digital, ...

## 6. Eco-design and recyclability

New materials, new approach depending on applications,



## 1. Wafer and Cell Innovation

Bigger and thinner mono wafers  
Heterojunction & Tandem Technologies

## 3. Bifaciality vs High density

Transparent back sheet vs double glass  
Shingling, Gap-less,

## 5. Technology bankability, quality and Data Analytics (4.0 approach)

Fab and product quality, Field data, reliability, Guarantee

