

# PHOTOVOLTAIC R&D FINANCING IN FRANCE

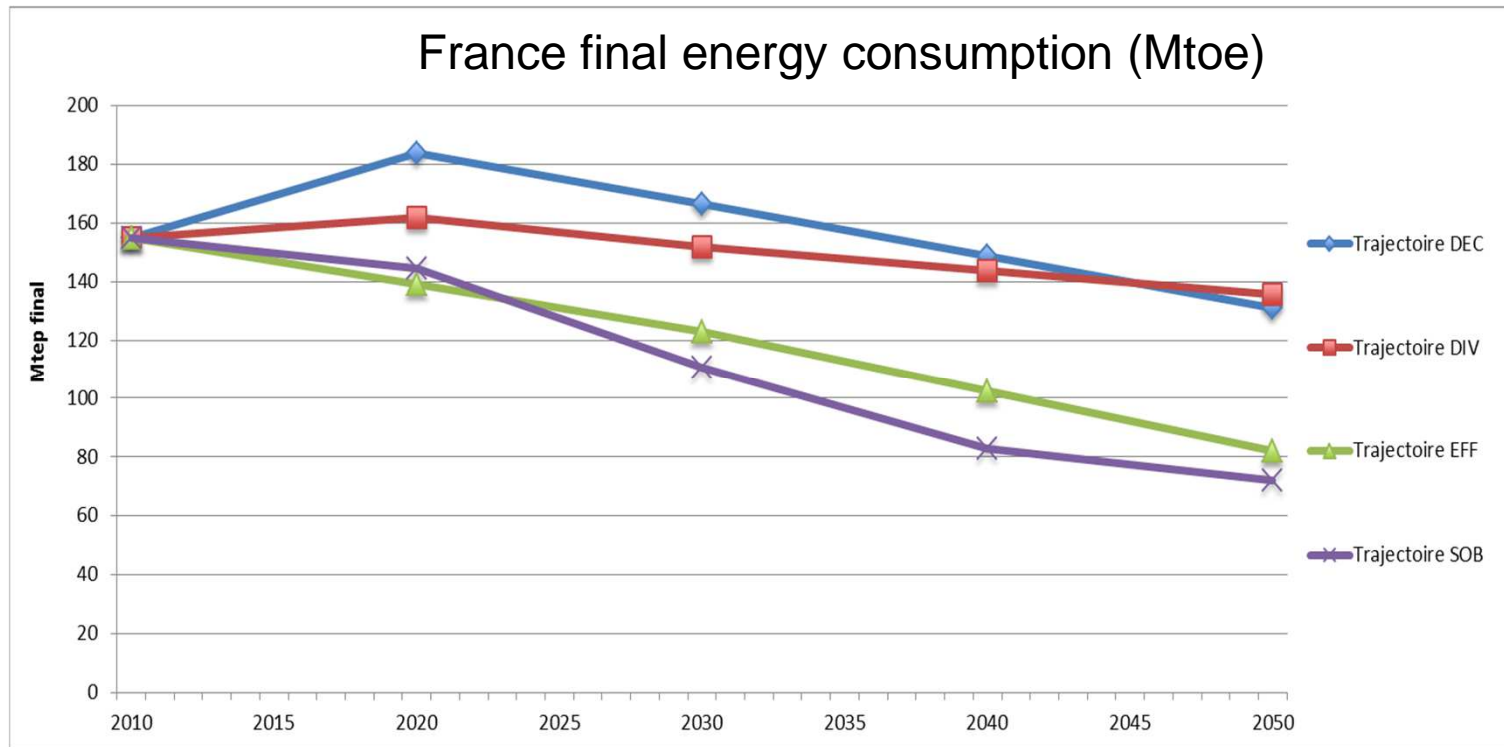


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François MOISAN  
Executive Director Strategy, Research, International  
ADEME

- **French debate on energy transition to 2030 and 2050 : scenarios and contribution of PV**
- Public funds for Research and Innovation on PV in France : budgets and priorities
- Innovation for the future program managed by ADEME

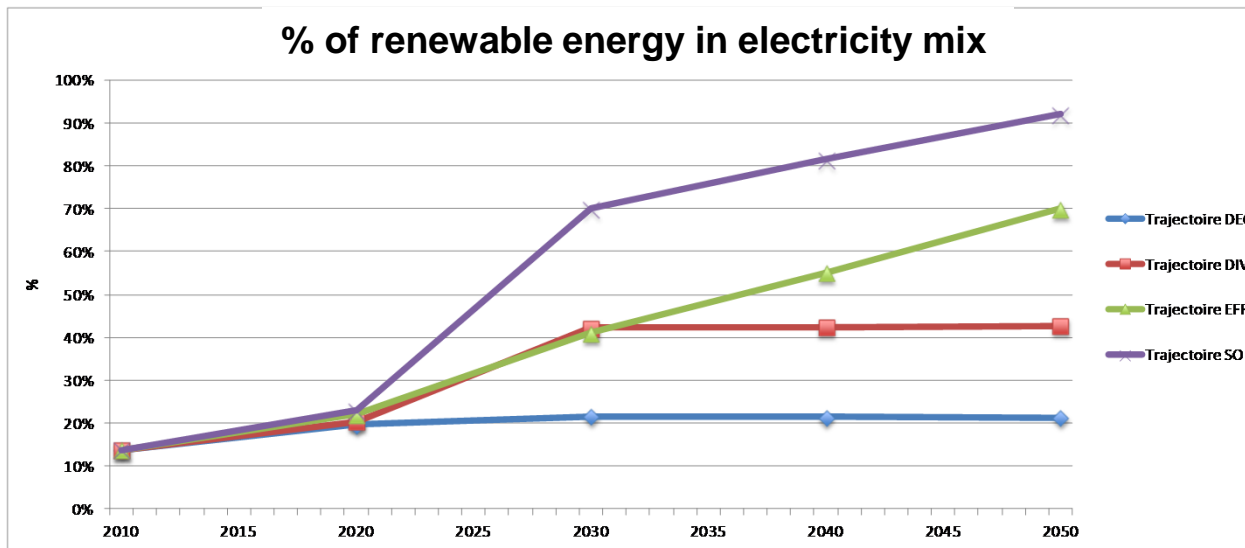
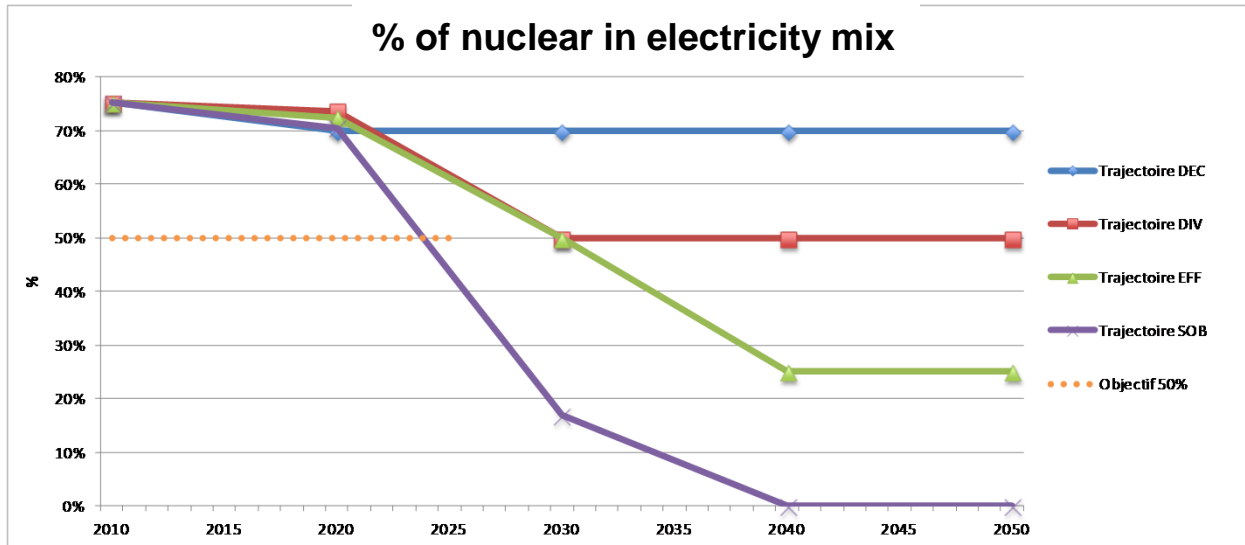
## Energy demand trajectory in France : decrease from 20% to 50% to 2050



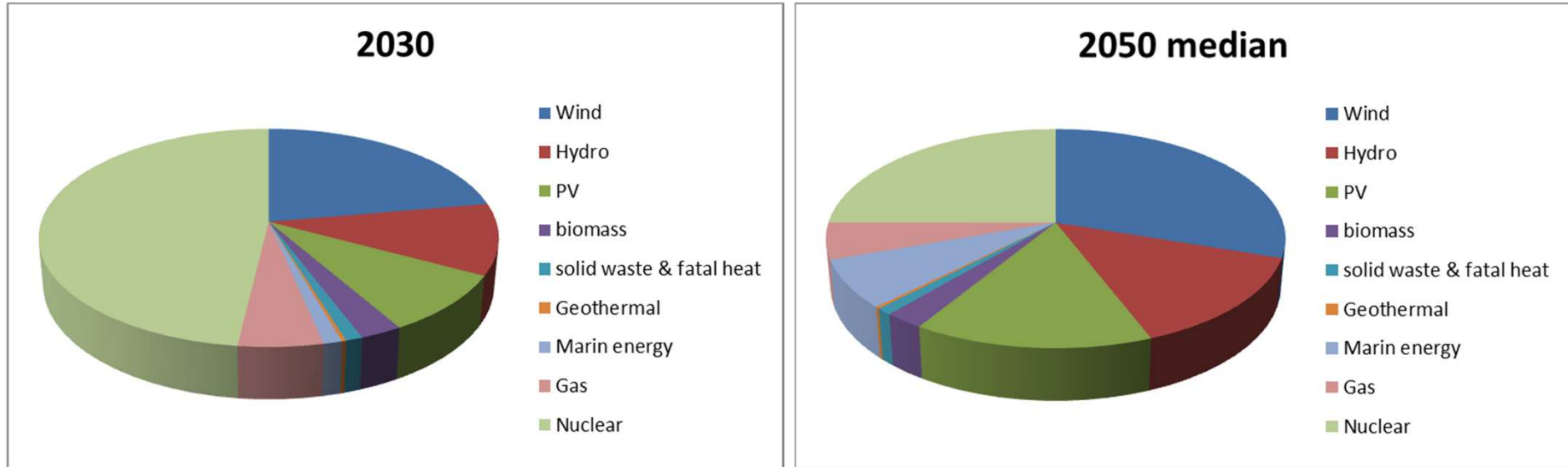
Different trajectories among sectors :

- Industry + 15% à - 30%
- Transports - 40% à - 70%

# Electricity mix in France to 2030 and 2050



## ADEME vision for electricity mix in 2030 and 2050



Total final electricity 2030 : 38,6 Mtoe

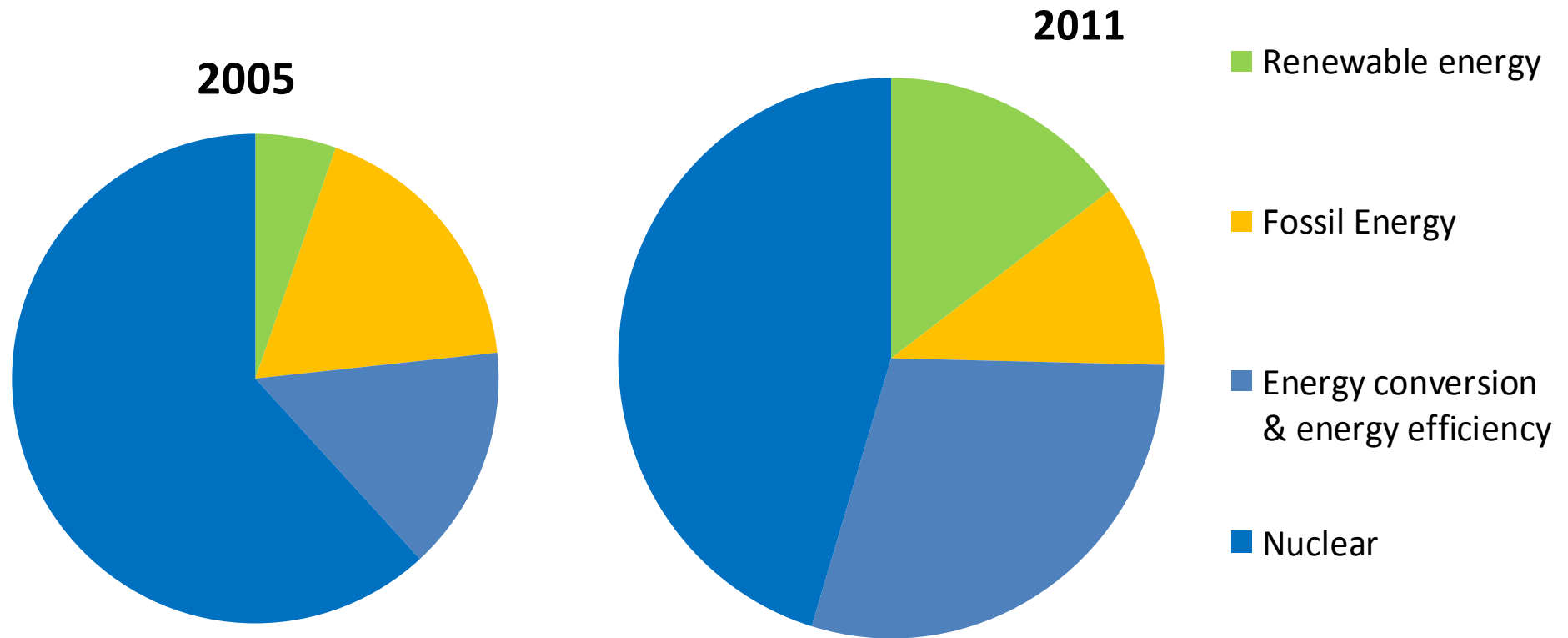
2050 : 40,9 Mtoe

**Renewable energy share of electricity mix :**  
**48% in 2030 between 48% and 79% in 2050**

**PV installed capacity :**  
**33 GW in 2030 and up to 65 GW in 2050**

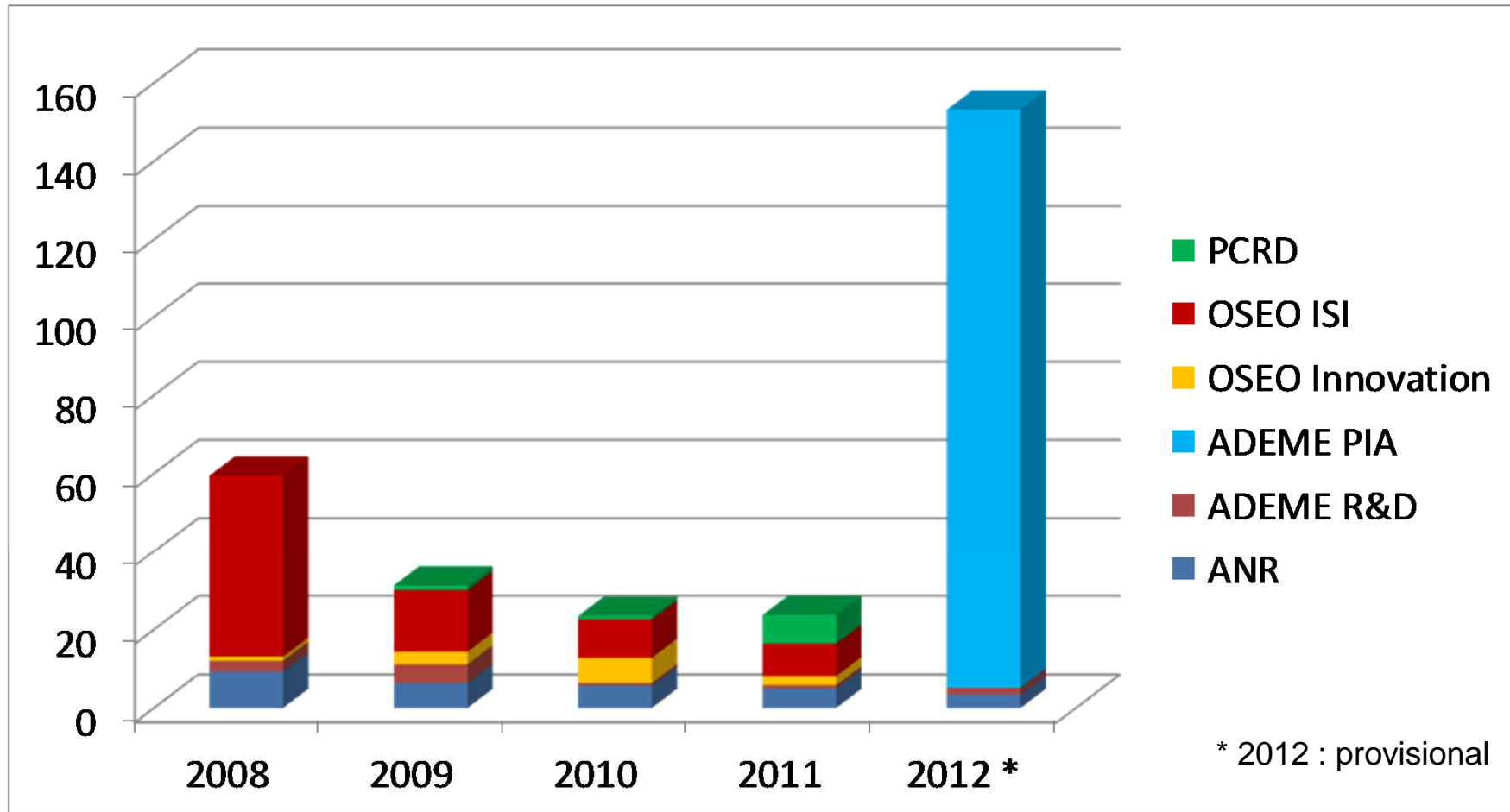
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## Public R&D funding on energy in France 2005-2011



**Global public funding to R&D on energy increased by 30 % between 2005 and 2011. Budget dedicated to renewable energy multiplied by 3.6 and increased its relative share of the total from 5% to 15%.**

# Public support to PV RDI from Funding Agencies



Public R&D budget for PV from agencies around 20 M€/year  
 Innovation budget increased dramatically with Investment for the Future fund



## Two R&D Institutes created for PV technologies

- The fund Investments for the Future has a section dedicated to the deployment of research infrastructures named « Institutes for Energy Transition » (operated by ANR) : 12 institutes decided
- Two institutes are being finalized in the field of PV:
  - *IPVF, « Institut PhotoVoltaire d'île de France » for technologies related to thin film (public funding: 18 M€). (Partnership between EdF, TOTAL, Air Liquide, CNRS, Polytechnique)*
  - *INES 2, « Institut National de l'Énergie Solaire » held by CEA, for Si technologies, integration of PV in buildings and in the grid. INES is located at « le Bourget du lac » (region Rhône-Alpes)*

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## Investing with private sector for green technologies —

- A fund (2.35 billion €) for green energy technologies innovation set up by Government (Investments for the Future) managed by ADEME
    - 1,125 M€ on renewable energy (500 M€ funded as Sept 2013)
    - 165 M€ on smart grid (89 M€ funded as Sept 2013)
    - 950 M€ on future transports (road, railway, boats) (390 M€ funded)
    - 210 M€ on circular economy (62 M€ funded as Sept 2013)
  - Co-investing in demonstrators projects and industrial experimentations proposed by companies
  - Sharing innovation risk with companies for energy, environment, economic development and employment stakes.
  - Creating opportunities for international cooperation
- + Institutes for Energy Transition (fund operated by ANR)

## **PV Roadmap (2010) : Main challenges addressed — by ADEME call for proposals**

- Make PV a building component
- Make module a familiar component for everyone
- Controlling the cost of ownership for integrated systems
- More efficient cells and modules
- A better building integration



## **PV Roadmap (2010) : Priorities of ADEME call for proposals**

- Reduce the cost of solar systems
- Support sector of production to maintain the technological skills
- Understanding the new business models related to solar electricity
- Reduce environmental impacts
- Integration of solar technologies in building components
- Responding to a strong request without losing quality of materials
- Develop regulations (fiscal and economic incentives, technical regulations)
- Education and Training

# Investing with private sector for : PV Solar Energy (400 M€ Projects cost, 148 M€ aids) : PV (6 Projects)

## Silicium production

## Cells and modules production

### Solar quality Si from metallurgic

### PV wafers production

### RST technology for Si



**Photosil Industries, Ferropem, Appolon Solar, CEA-INES, CNRS-SIMAP**



**ECM Technologies, BEA, EFD Induction, CEA INES**



**SolarForce , CEA-INES, InESS , INSA-LaMCoS**

## Thin cells

## High efficiency Si

## Modules

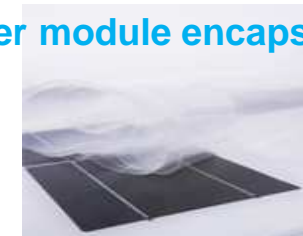
### CIGS cells & modules process

### Heterojunction

### Polymer module encapsulation



**NEXCIS, CNRS-ENSCP (IRDEP), EDF R&D (IRDEP), IMN2NP, MAGPIE, KN Systems, ARENA, ECP**



**Arkema, Fonroche, Solarezo, Innoveox, Mondragon, Nexcis, Polyrise, Recupyl, Alphanov, CSTB, INES, CNRS**

## Investing with private sector for : PV Solar Energy (400 M€ Projects cost, 148 M€ aids) : CPV (3 Projects)

Very high concentration (1024)  
demonstrations

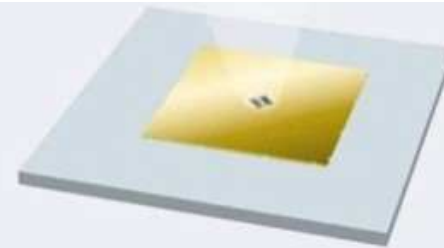


**Heliotrop**, CEA-LITEN,  
PROMES, Eolane, Exosun,  
GMD Mottaz, La Comp. Du  
Vent, NEOEN, INEO

Trackers



Multiple junction cells for CPV



**SOITEC**, Schneider,  
InPact, CEA

# Thank you for your attention

## More information on :

- ADEME IA & Recherche : [www.ademe.fr](http://www.ademe.fr)
- Projects selected : [www.ademe.fr/projets\\_laureats\\_ia](http://www.ademe.fr/projets_laureats_ia)
- Commissariat Général à l'Investissement :  
[investissement-avenir.gouvernement.fr](http://investissement-avenir.gouvernement.fr)

