



NEW MARKET-BASED MECHANISMS: THE CASE OF COMPETITIVE SOLAR IN FRANCE

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SOLAIREDIRECT: A GLOBAL LEADER OF COMPETITIVE SOLAR POWER



€156 m in revenues for FY 2013-14 (45% annual growth in last 5 years), profitable since 2009



200+ employees worldwide



1 TWh+ generated since inception



One of only three global solar IPPs with a presence on **5 continents**



51 solar parks in operation or under construction



€1 bn raised for project financing (from Caisse des Dépôts, BlackRock, Union Investment...)



486 MW of installed capacity at FYE 2014-15



ISO 9001, ISO 14001, ISO 26000, OHSAS 18001

PIONEERING COMPETITIVE SOLAR POWER AROUND THE WORLD



**PPA with
local utility:
84 €/MWh**



**PPA with
utility:
54 €/MWh**



**Sale to wholesale
power markets:
52 to 104+ €/MWh**

**PPAs with
Discoms:
89 €/MWh**

HOW HAS SOLAR POWER BECOME COMPETITIVE?

Cutting capex

Modules, BOS, development,
EPC, soft costs

2008

4.00 –
4.75 €/W

2014

0.75 –
1.00 €/W

Cutting capital costs

Process, financial
structuring, guarantees

2008

10%-
12% IRR

2014

6%-8%
IRR

2008

20-year
contract

2014

30-year
contract

FROM SUBSIDIZED SOLAR TO SOLAR AS THE MOST COMPETITIVE POWER SOURCE

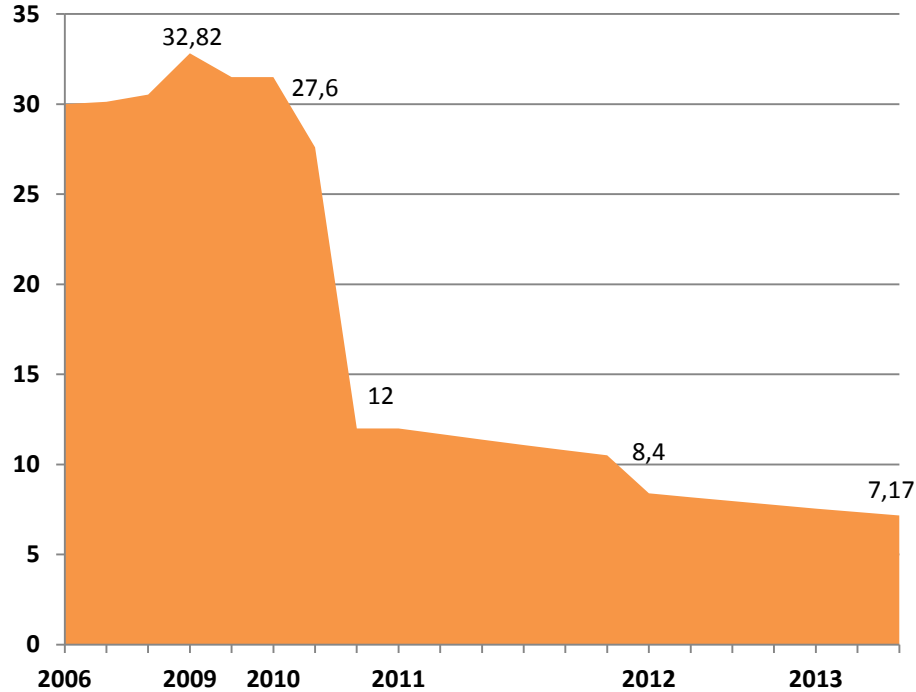
- **Beyond government-backed schemes (FITs, tenders, RPS), market-based models: PPAs with public and private off-takers, trading on wholesale power markets**

Energy Source (new generation only)	Generation cost (LCOE, €/MWh)
PV (solar park, high irradiation)	58-87
PV (small rooftop system)	98-142
Coal	38-80
Gas (CCGT – at 8-10 \$/mBTU)	76-99
Onshore wind	42-104
Offshore wind	120-196
Biogas	138-215

Source: Fraunhofer Institute, Germany

THE ECONOMICS OF SOLAR POWER IN FRANCE: FEED-IN TARIFFS CONVERGE WITH MARKET PRICES

T5 Feed-in tariff (in c€/kWh)



Prix du produit Calendaire Base Y+1 en France



SOLAR POWER TENDERS IN FRANCE: AN INEFFICIENT SYSTEM

- Two tenders launched for large projects in 2011 (CRE1, 530 MW) and 2013 (CRE2, 400 MW)
- A system that has proved to be very inefficient
 - Small volumes
 - Unreliable timing and retroactive rule change on commissioning
 - Heavy administrative procedures and expensive bidding costs
 - Long decision processes
 - Non transparent allocation (with price counting for only 40%)
 - Very high prices (150 €/MWh for AO CRE2, or 2x T5 FiT)
 - High rate of project failure (technical, permitting and financing issues)

FRANCE'S NEW ENERGY LAW: A TRANSITION TOWARDS A MARKET-BASED MODEL

■ New European framework policy on renewable energies:

- Discontinuation of FITs
- Integration of mature renewables into power markets and grids

■ Objectives of Energy Transition law:

- To minimize costs and maximize competitiveness and affordability
- To empower communities

■ Principles and tools:

- New business model based on market + premium (complément de rémunération)
- Financing tools to reduce capital costs (green bonds and local government concessionary financing)

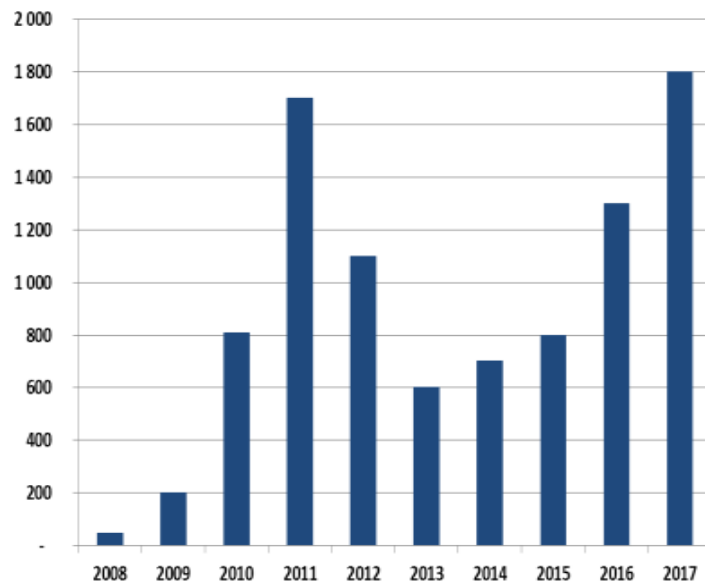
COMPETITIVE SOLAR IN FRANCE: MARKET DYNAMICS

Competitive solar market dynamics

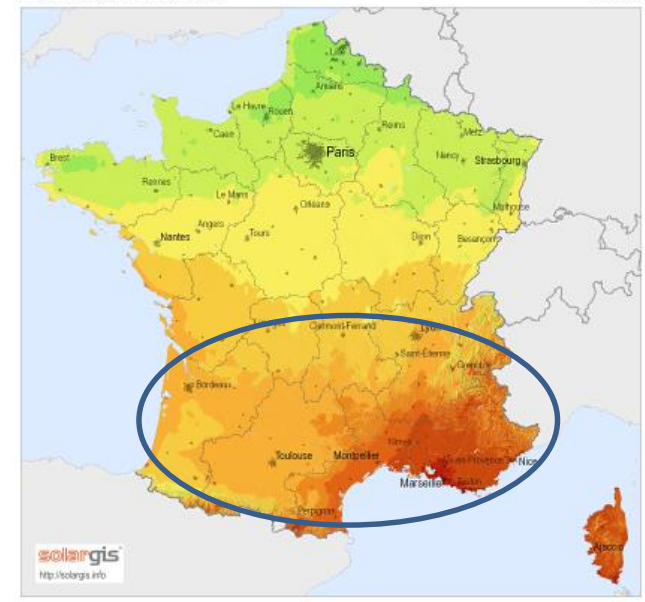
Competitive solar as the logical energy source displacing increasingly expensive nuclear power thanks to three factors:

- **Increasing nuclear power costs** (revamping of existing capacity, EPR reactors) and pressure to substantially increase retail power rates (+30% in 5 years according to CRE)
- **Deregulation** - End of regulated rates for non residential power users after 31/12/15
- **Energy transition** – government objective to increase renewable power production from 16% to 40% by 2030

French PV Market (in MW)



Global horizontal irradiation France

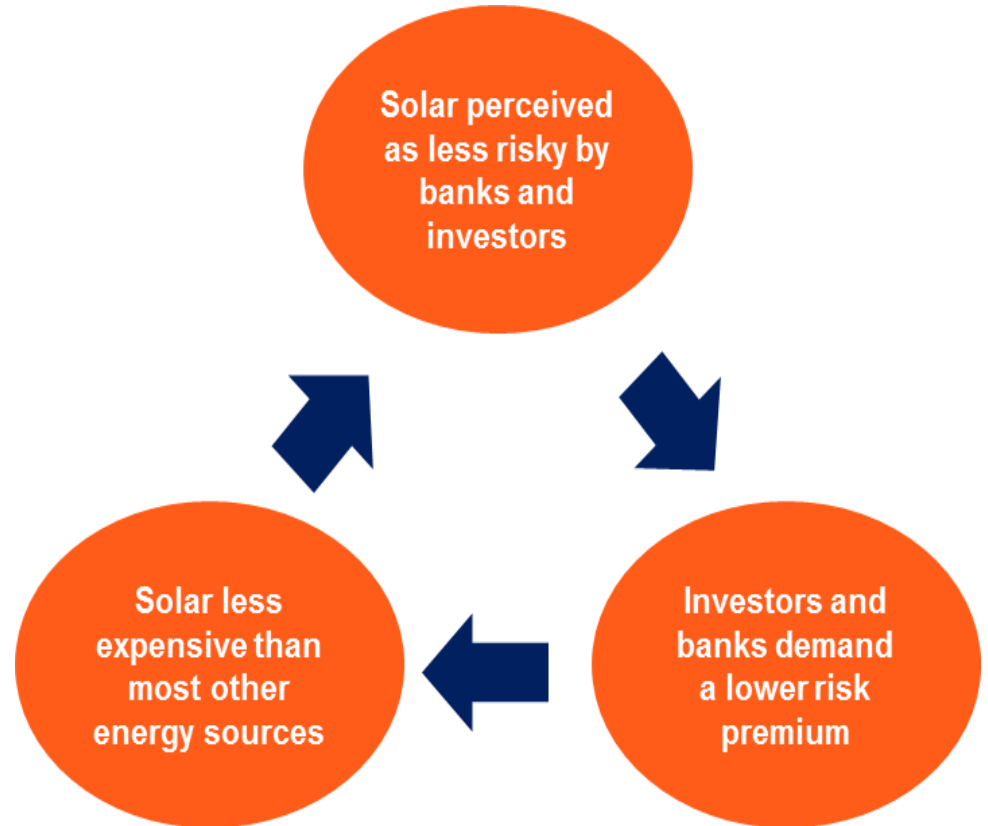
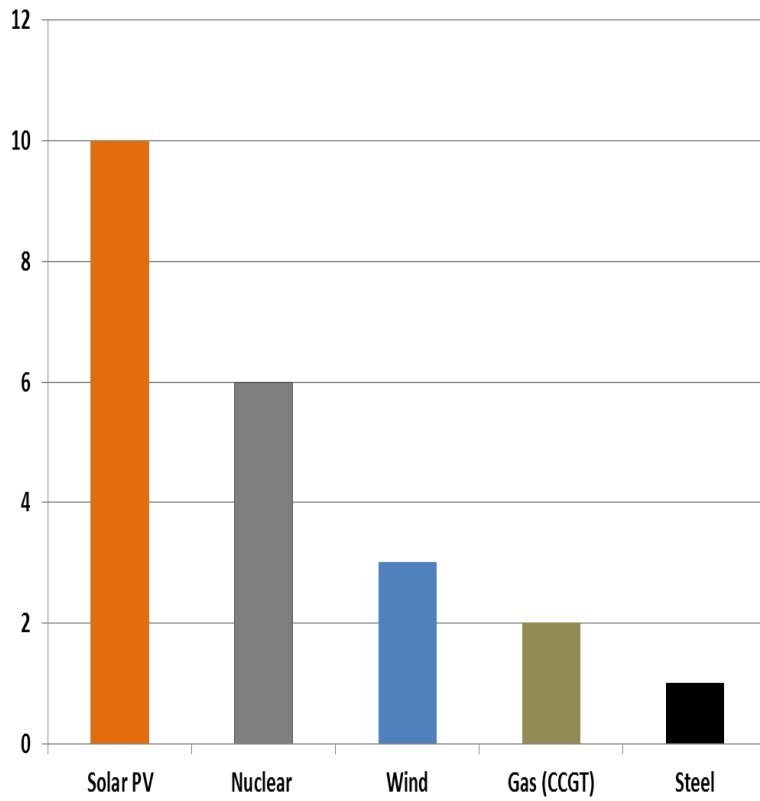


COMPETITIVE SOLAR IN FRANCE: THE NEW BUSINESS MODELS

Segments	Operational levers	Major players
T5 Feed-in tariff (and market + premium from 2016) <ul style="list-style-type: none"> • 70 to 90 €/MWh • Est. 300 MW/year 	<ul style="list-style-type: none"> • Access to prime development land and projects • Lowest EPC cost • Capacity to attract low cost financing 	<ul style="list-style-type: none"> • Solairedirect • Neoen • Sonnedix • GP Joule
CRE government tenders (ground-mounted) <ul style="list-style-type: none"> • 90 to 150 €/MWh • Est. 200 MW/year 	<ul style="list-style-type: none"> • Non standard sites • Integration of non mainstream technologies (CPV, storage...) • Lobbying with certain government agencies 	<ul style="list-style-type: none"> • Solairedirect • CNR (GDF Suez) • Valeco • Urbasolar • Quadran • Akuo
PPAs with utilities and end customers <ul style="list-style-type: none"> • 60 to 70 €/MWh (from 2016 onwards) • Est. 30 MW/year huge potential 	<ul style="list-style-type: none"> • Capacity to generate power at very competitive rates • Capacity to structure long term PPAs • Partnerships with local governments 	<ul style="list-style-type: none"> • Solairedirect

HOW COMPETITIVE SOLAR PARADOXICALLY FACILITATES INVESTMENT DECISIONS

Capital intensity of certain industries



CVES: A BANKABLE MODEL FOR SOLAR IN A MARKET-BASED ENVIRONMENT

