

Latest joint efforts between Research and Industry for strengthening European CSP leadership



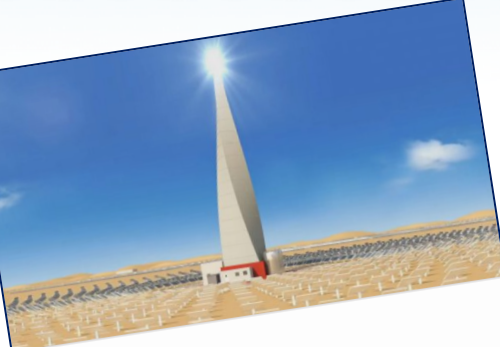
THE VIEWS OF THE INDUSTRY
DR. LUIS CRESPO
PRESIDENT OF ESTELA
PRESIDENT OF PROTERMOSOLAR

Brussels, 23 January 2018

A classical starting point: Two news to communicate




The good news is: The STE sector already achieved - and even surpassed - the cost goals stated in the SETPlan for 2020 and in the American SUNSHOT program as well



700 MW concentrated solar power plant in Dubai hits a new record bid with \$7.3 cents per KWh


19-09-2017 | Categories: BREAKING NEWS, Documents,

LIVE CAST*LIVE CAST*LIVE CAST*LIVE CAST



Live cast about the DEWA 700MW CSP project
Wednesday Oct 11th, 14:00 GST

Interviewed by:



Paddy Padmanathan, President & CEO
Jonathan Sintoni, Jonathan Walters, Belén Gallego

“CSP can do the same job as gas combined cycles and compete absolutely neck and neck and in fact, as it has been proven in Dubai, slightly cheaper there for dispatchable night time base load and throughout the day”

<http://cmimarseille.org/menacspkip/recording-live-cast-paddy-padmanathan-speaking-live-dewa-700mw-csp-project/>




SolarReserve Bids Concentrated Solar Power Under 5 Cents in Chilean Auction

SolarReserve this month issued bids in Chile's latest auction for 24-hour solar under 5 cents per kWh, according to CEO Kevin Smith in a [...]

AKING NEWS, NEWS, Sin categoria, Top News

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Australia to build a concentrated solar power plant at \$78 per MWh US\$ 60/MWh

17-08-2017 | Categories: BREAKING NEWS, NEWS, Sin

The reasons

- Tough competition / reduction of margins along the value chain
- Some specific aspects in all these projects
- Own efforts by the industry to increase performances and reduce cost - in some cases with the collaboration of research centres - but not relevant contributions from the ongoing R&D programs yet

The other news is not exactly a bad news



It is the **still pending good news** regarding the future implementation of some innovations of the publicly supported projects, mainly in the USA and Europe, which could contribute to further reduce the cost of the Solar Thermal Electricity. The sector is looking forward to seeing this happening.



As solar energy can heat every type of material (solids, liquids, gases, particles, etc) and the heated media can be managed - in a way or another - many nice ideas might convince the public program officials and indeed most of all these nice ideas will probably work.



The main question is whether these projects will effectively contribute to increase the performance and/or to reduce costs in **commercial STE plants**.

ESTELA has been continuously insisting on two points:

As the deployment of STE plants will be based on large size plants (100 – 200 MW) - smaller systems, wherever they might make sense due to special circumstances, can benefit from the trends for large ones but will not be the *driver* for the sector -.

1. New STE plant concepts, which might work at small scale, must show feasible, **scalable** characteristics.
2. The concepts must be **fully dispatchable**. That means: not being forced to generate electricity whenever the sun is shining in spite of having a storage system. The plants should have always the possibility either to deliver or to store the energy.

Another point which is increasingly deserving the attention of policy makers is the **seasonal balanced production**.

The Spanish TSO claims that STE “is not seen” in winter months as linear systems performs very poorly between 38 – 28° latitude during the winter season.

To remove “still” from the **still pending good news** and achieve an effective contribution from the SETPlan to the European leadership in the STE sector ...



- ❑ More agile and flexible procedures for topic selection should be implemented.

The current ones might be enough for keeping the human and equipment capacities in the Research Centers and companies, which is very important. Some of the awarded projects will hopefully bring new solutions to the market in the medium term, but they don't properly fit with the competitiveness requirements of the Industry.

- ❑ Financing schemes with difficult governance and sharing issues among the MM.SS should be thought twice.

By aligning the budget with the research priorities of the MM.SS. Europe might be giving its role of supporting competition along the most likely research lines to have an impact in the sector and might provide inertial support to old research lines that are unlikely to be commercialized.

- ❑ The criteria for potential commercial success should be observed when awarding contracts.

- ❑ Filling the gap between innovation and markets should be an important priority. **Commercial-size demo projects** and/or mechanisms to alleviate the risk of incorporating innovations in commercial projects should be considered.

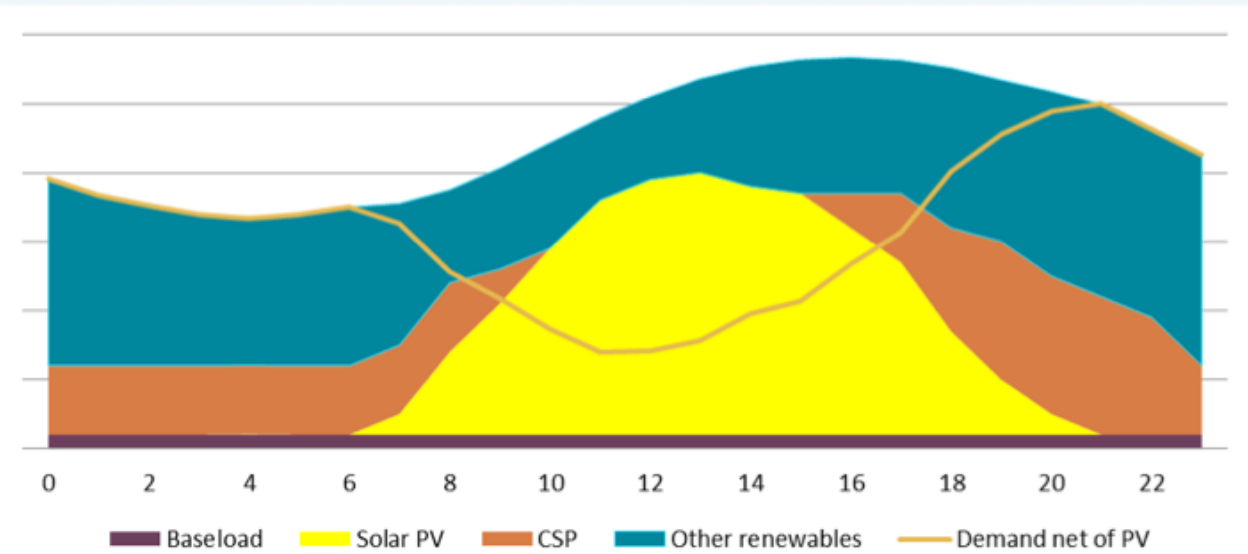
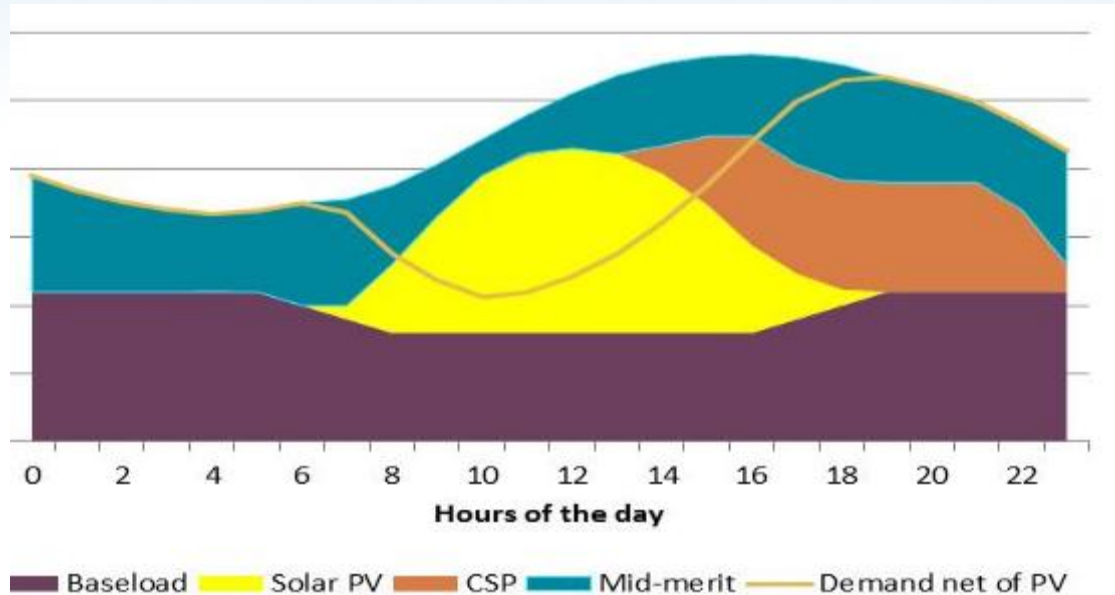
The role of STE plants in sunny countries



Prospects of the IEA

2030

2050



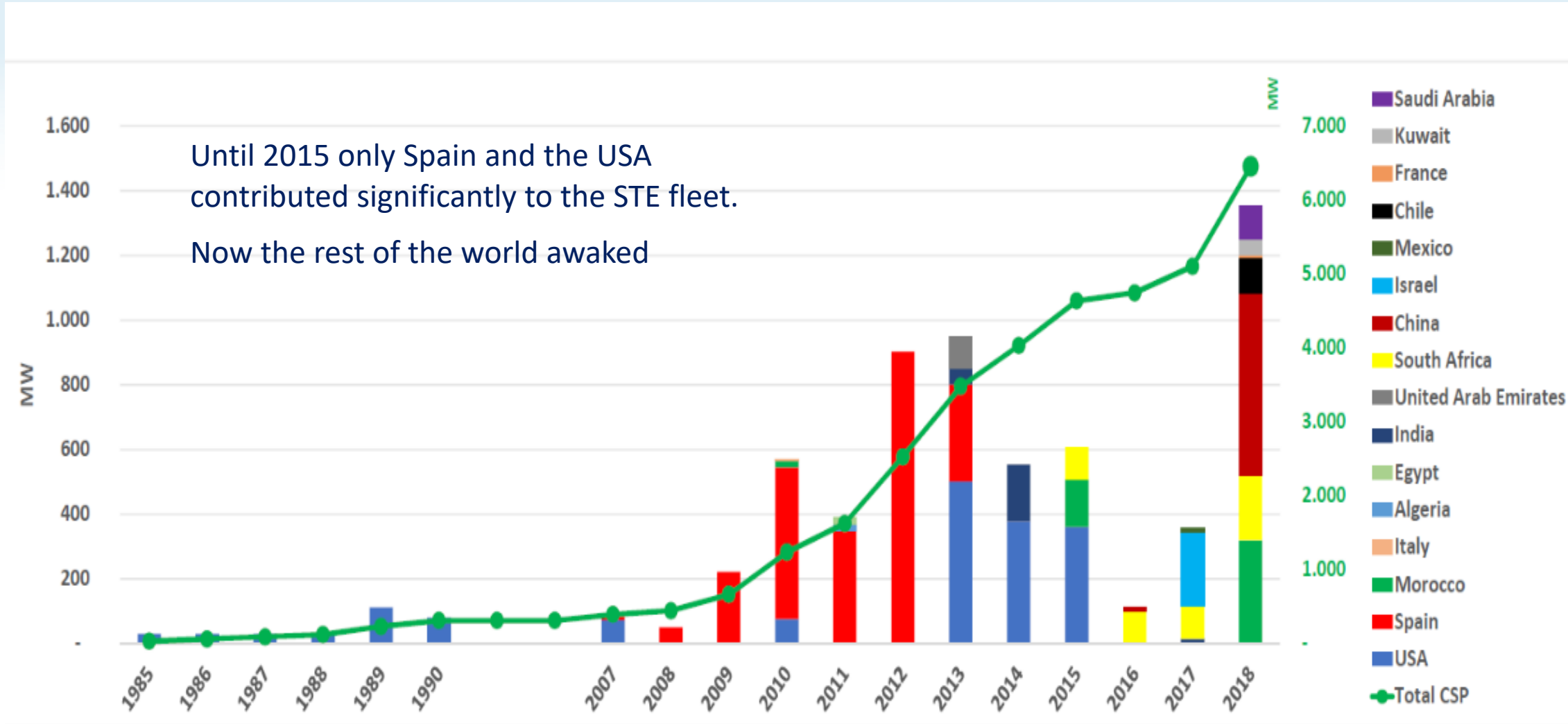
The “demand net of PV” is much sharper on a single-day base compared with the annual average (shown in the graph). The need to replace some thousands of MW every day at the sun set will be real issue.

The “2050 contribution profile” will be achieved much earlier as the phase-out/dismantling of coal and nuclear plants may be accelerated.

Important to notice: large capacity factors for STE Plants will contribute to bring the costs down.

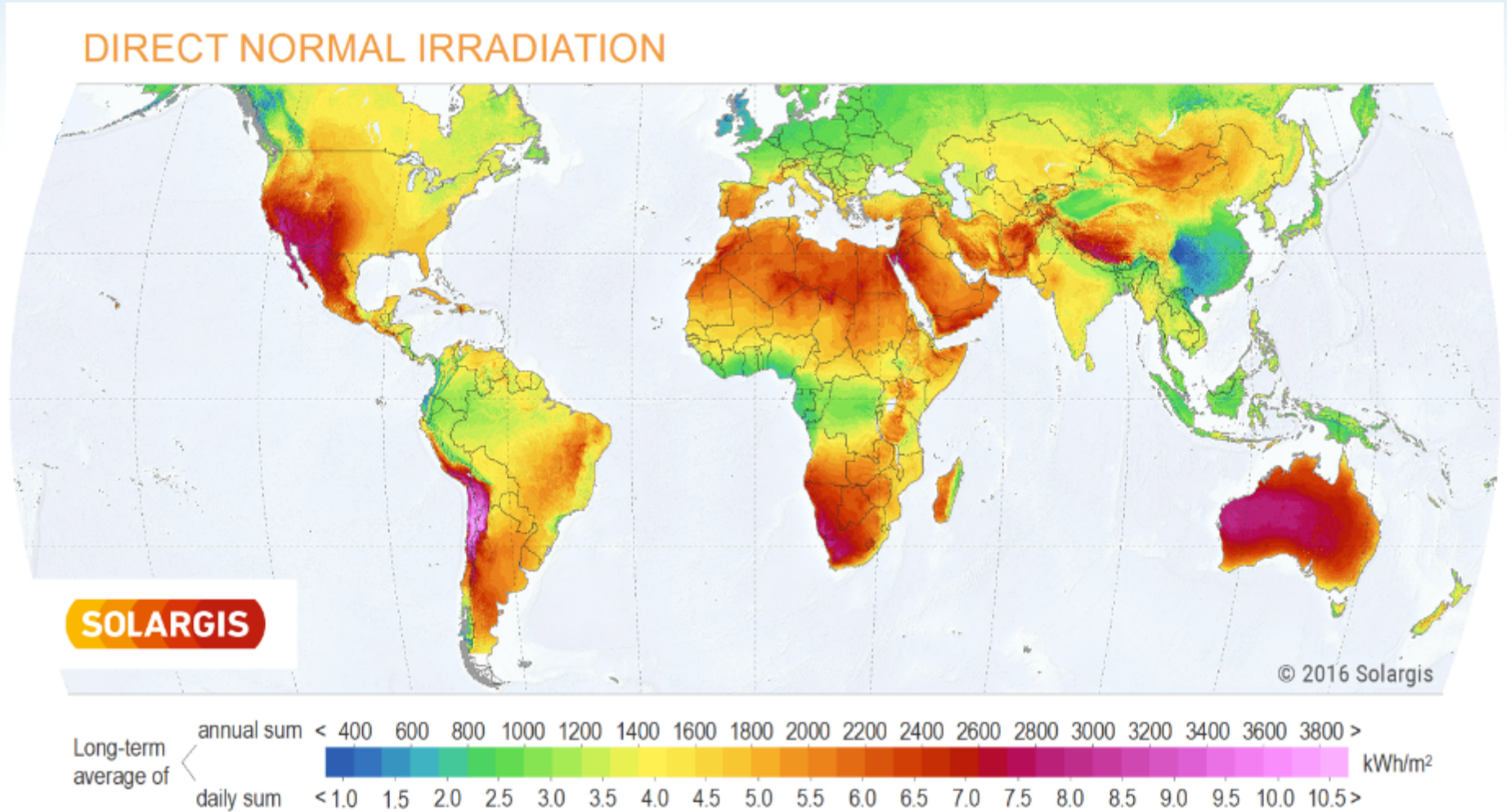


Breakdown of installed STE by country



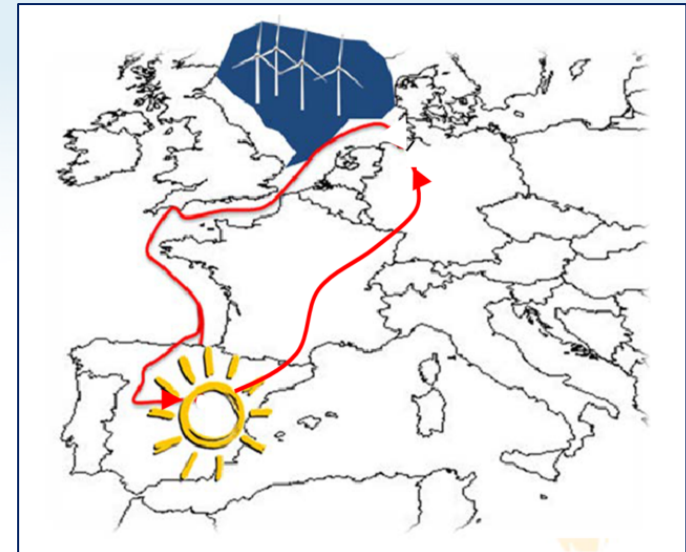
The attractiveness of different regions for STE deployment

- North America ★ ★ ★
- South America ★ ★
- MENA Region ★ ★ ★
- Gulf countries ★ ★
- South Africa cone ★ ★ ★
- China ★ ★
- Central Asia ★
- India ???
- Australia ★ ★ ★
- Europe ★ ★



Europe is also a place for STE growth, although the main market is outside

- ❑ Most, if not all, new capacity in Europe will be renewable.
- ❑ The phase-out/dismantling of old conventional plants - coal, nuclear and many gas combined cycles, which are reaching the end of their operational life – could be anticipated.
- ❑ Northern and central European countries have - apart from big hydro - few alternatives for dispatchable Renewable Energy power.
- ❑ The new RES Directive obliges for renewable energy interchanges pushing for making the investments where more resource is available.
- ❑ Furthermore, large European utilities and other RE investors would prefer to have own plants with related own off-taking agreements in more suitable locations, although they will be located in other European countries.
- ❑ More European interconnections are necessary but **the classical argument that the French-Spanish interconnection is an unsurpassable barrier for STE exports from Spain and Portugal to Europe is a myth.** The main flows are always North-South in the summer season and at the evening peaks in winter. Therefore STE exports to the North would not be limited by the current capacity but, in the contrary, they will even allow for more conventional electricity flow to the South.



The opportunity for STE FOAKs in Europe

- ❑ As in the most suitable Southern European countries the still existing conventional backup is hiding the capacity value of STE plants, the export markets within Europe are seen as the main driver to break the ice and to support European companies to show the most advanced references in their own market. Thus their position in the emerging world market could be enhanced.
- ❑ The RES Directive target goals and the new exchange requirements - along with the Cooperation Mechanisms, which will be kept in the new Directive - provide good reasons to large **European utilities to promote STE projects in the Southern European countries**, which would sell their dispatchable electricity to the Central and Northern European countries satisfying a real need.
- ❑ A project could be considered First-Of-A-Kind by its conceptual design, by the use of advanced equipment, by naming some off-taking schemes or by a combination of all these factors.
- ❑ The business plan to make it happen should be based on:
 - either a **support scheme in the recipient country** for imported renewable electricity;
 - or by **European, national or regional grants**, which will make unnecessary the a.m. support scheme to sell the electricity - or by a combination or both.
- ❑ New financing facilities would certainly help and they will be very much appreciated, but they can't spark the FOAK initiatives by themselves.

Are the auctions based on the kWh price a good example of fair competition in a level playing field?



The big paradox: The market distort the market

The newcomers acquire rights but reduce the revenues of the existing assets

As the capacity factor of the existing assets will be reduced by the new awarded projects, the price of their backup services will be increased

The non-dispatchable newcomers also reduce the value of future similar plants

The technology agnostic approach doesn't provide the best choice neither for the electrical system nor for the country

Fluent renewables reduce dramatically their value with their penetration share. They have certainly a penetration limit although it is the easiest and cheapest way to start "painting green" the electricity generation in a given country

Good Practices: The push of the World Bank and the case of Morocco



The Middle East and North Africa Concentrated Solar Power

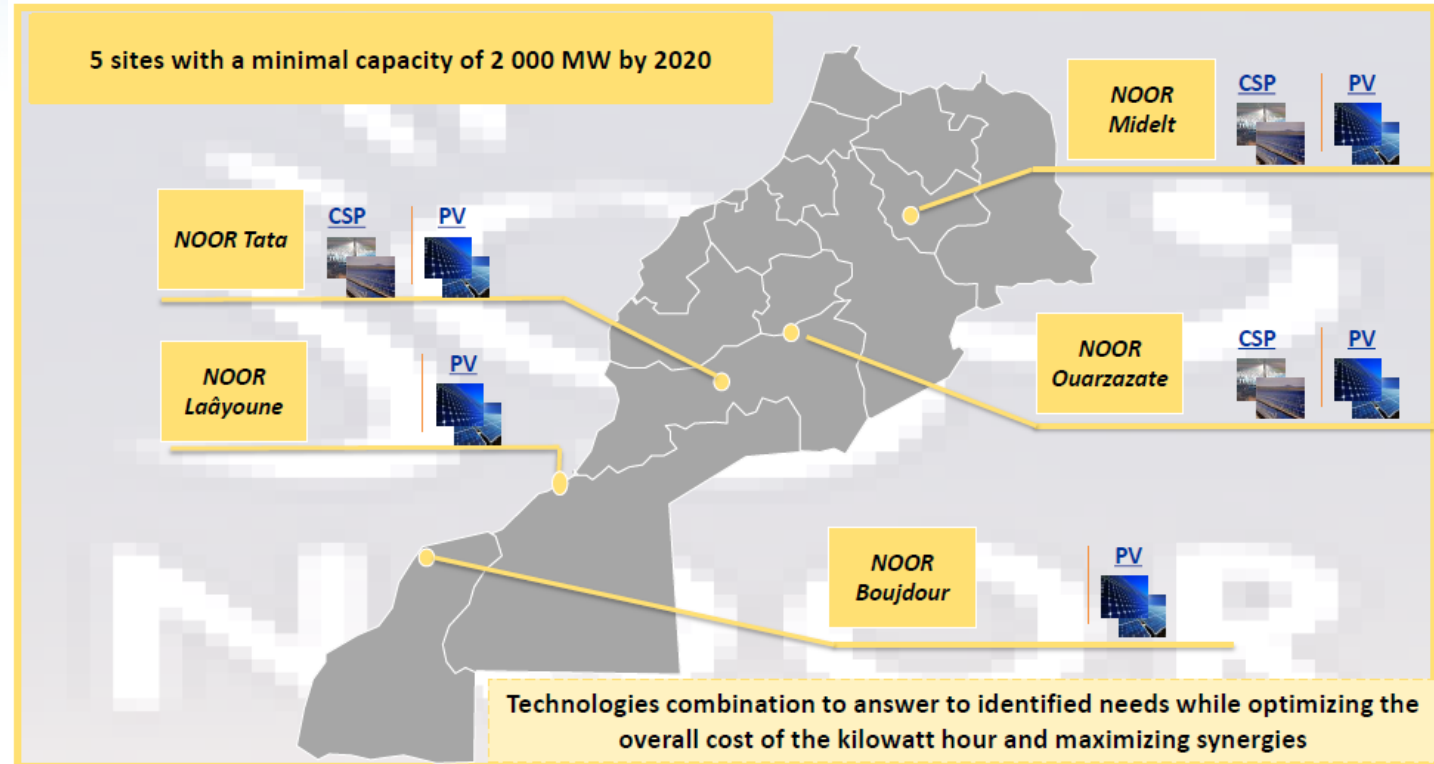
Knowledge and Innovation Program

From the World Bank and Clean Technology Fund



Concentrated solar power offers great potential to meet global and national goals for clean, secure and affordable energy. Like many new technologies, there are challenges in bringing it to market, so the World Bank, with support from the Clean Technology Fund, is launching a new Knowledge and Innovation Program to help lay the groundwork for new CSP investment projects in the Middle East and North Africa.

The Moroccan solar plan is very good conceived with a thoroughly balance between STE and PV for new centralized power capacity

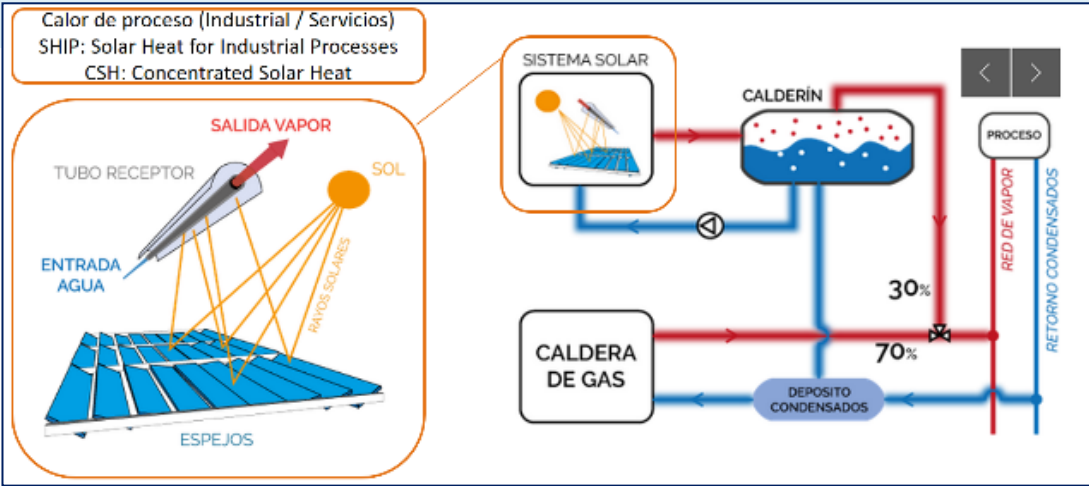
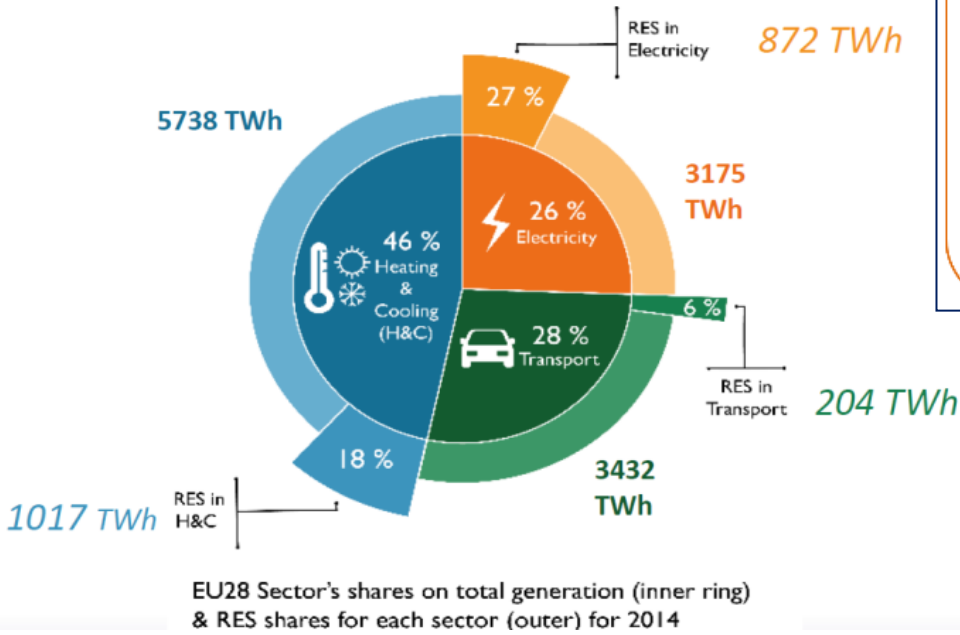


Concentrated Solar Heat



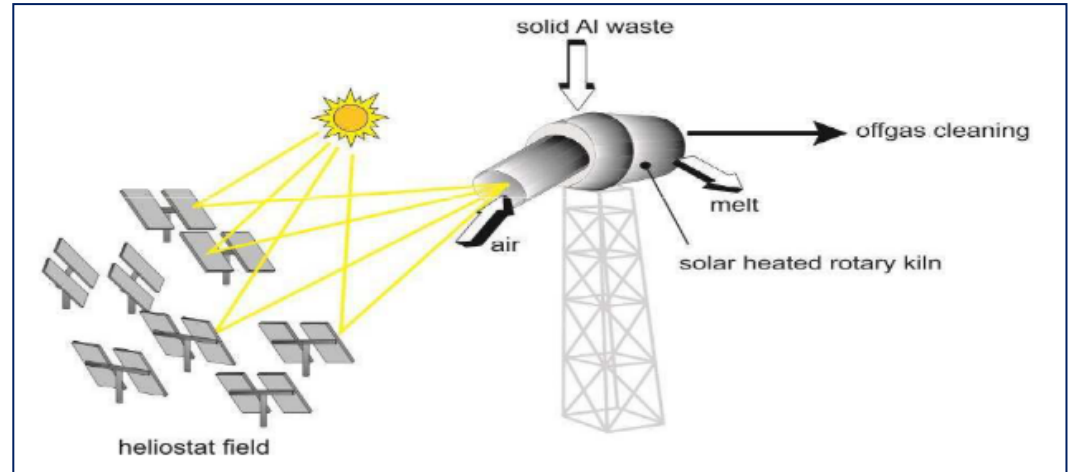
European Solar Thermal Industry Federation

The EU Energy sector: overview



Steam for industrial processes and heating and cooling networks for residential and service buildings

High temperature receivers for metal melting, chemical reactions and solar fuels



The principle of **scalability** to become commercial also applies to all nice ideas to use high solar concentration for receivers and reactors

Come on! STE is taking-off



Thank you for your attention
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