

#### THE VALUE OF CONCENTRATED SOLAR POWER FOR DEVELOPING COUNTRIES ANOTHER LOOK ON ENERGY TRANSITION

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### SUSTAINABLE DEVELOPMENT GOALS



- Adopted in Sept 2015 by the UN Assembly
- 17 goals underlying the 2030 Agenda for Sustainable Development
- Powerful framework for internat. efforts to achieve human develop. & climate objectives.
- Establish measureable and timebound objectives



Source: IRENA, 2016 Rethinking Energy

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### **ABOUT THE ENERGY & CLIMATE GOALS**

- Green growth based on an energy supply model designed as the most efficient combination of renewable sources.
- This will deliver reliability and affordability of a system, in which a centralized bulk energy supply to energy intensive industries will coexist with decentralized generation serving mostly local demand and "circular" or "participative" economy sectors.

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### WHAT IS CSP?

Concentrated Solar Power (CSP), also called Solar Thermal Electricity (STE) is a carbon-free source of electricity that is best suited to areas in the world with strong sun irradiation: Southern Europe, Northern Africa & the Middle East, South Africa, India, China, Southern USA and Australia.

CSP plants range between some MW and 400 MW. Their product is steam. To drive a turbine for electricity production. To enhance oil recovery. To drive industrial processes.

This is unique with solar: CSP can be stored – because it is thermal. It works at night and during sandstorms. CSP can boost local economies by creating jobs: The local content of work can reach more than 75%. Good news: It is bankable.

### **MEGA PROJECTS**



Morocco – Midelt

2 x 200 MWe CSP-PV-Hybrid-Power Plant (Further site at Tata is under development)

Egypt – West Nile: \$ 50-100 MWe CSP Power Plant

South Africa – Round 4.5: 200 MWe Several Projects (e.g. Redstone, Kathu II, Metsimatala)

Namibia – Arandis:

100-150 MWe CSP Power Plant

Saudi Arabia – New Issue of a 9.5 GWe RE (PV, CSP, Wind): Current Projects:

- ♦ (Waad al Shamal, ISCC (total 1,000 MWe) with 50 MWe
- CSP Solar Field)
- Duba, ISCC (total 600 GWe) with 50 MWe CSP Solar Field
- Taibah, ISCC (total 3 GWe) with 180 MWe CSP Solar Field

#### China

20 CSP Projects announced with a capacity of 1.4 GWe

## WHY CSP IS NEEDED IN ANY ENERGY TRANSITION?

It delivers CO<sub>2</sub>-free manageable energy ("on demand")

- CSP doesn't face the issue of "grid integration", but provides the current best (reliable and affordable) solution to integrate more variable RES in a power system (approx. beyond 30%)
- This means also it provides the necessary business case basis for adding variable RES in a given system beyond the initial deployment phase
- > As such it is highly complementary to variable RES
- Supraregional use of CSP (via cooperation mechanisms) would lead to a better use of RES resources
- In only 20 years, costs have been divided by 3 with only 1% of the market volume of wind and less than 2% of PV = already now competitive

### **2 WIDESPREAD CSP TECHNOLOGIES:**



### PARABOLIC TROUGH CENTRAL RECEIVER (TOWER)



Palma del Río II, Spain © Acciona EUROPEAN SOLAR THERMAL ELECTRICITY ASSOCIATION Gemasolar, Spain © SENER

# LOOKING AT THE CONTRIBUTION OF CSP TO SDG?

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- > What are the challenges of "energy transitions"?
- Why is the role of CSP crucial (different from other RES)?
- What are resulting basic policy recommendations?

### **1. ENERGY TRANSITION: A LONG PROCESS**



The energy transition towards renewables originally heralded by eu spreads out worldwide as an **irreversible process**, but energy investments need time:

- From decision to implementation,
- For effects on the system (rebalancing a generation portfolio) to be perceived,
- For effects on technology costs to get real (effects of scale and bankability of innovation),
- Until the behavior and interest of users (prosumers/consumers), and also voters change...
- > Long-term planning is key (the time metrics is at least a decade)

### 2. THE VALUE(S) OF ENERGY TRANSITION



**Business** (cost/return ratio) value (bank metrics)

- Macro-economic value (GDP metrics) up into "social welfare" understood as the well-being of the entire society, including the quality of life, quality of the environment (air, soil, water), availability of essential social services, even religious and spiritual aspects of life.
- Both result in a political value: The energy transition is already now an instrument for policy makers to offer their voters an active role in modelling their own future: the citizen has suddenly a "real say" about how energy needs shall be covered.

### 3. ENERGY TRANSITIONS CANNOT BUILD ONLY ON DECENTRALIZED GENERATION

..Not only in industrialized countries with reduced power increase rates (small  $\Delta$  GNP, reduction of energy intensity, stable population...),

Replacement needs + increased electrification in industry and services

 $\geq$  Emission reduction commitments ( $\Delta$  higher RES "targets")

but especially in "emerging economies"

> Relatively large power increase requirements ( $\Delta$  GNP,  $\Delta$  population,  $\Delta$  standard of living, ...)

Power plant replacement / diversification of gen. mix/ industry policy considerations

# 4. WHICH PERSPECTIVES ABOUT POWER GENERATION?

- Since 2014 capacity additions from RES top those from conventional power plants - this trend is continuously increasing
- New fossil fired power plants will not be bankable sooner than later (CO2 costs, operational restrictions after COP"XX", societal changes...).
- New nuclear plants will also not make it in countries bound to cover quickly increasing demand (who knows how long it takes to finish a new nuclear plant and how much it will cost when finished?)

Diversifying a generation portfolio exclusively with variable renewables is unsustainable, from both a technical and an investor perspective

### 5. VALUE MATTERS, NOT PRICES ALONE CSP allows for:



- A balanced diversification into RES, paving the way to a > 30% penetration of variable RES
- > A reliable  $CO_2$ -free generation system at affordable cost (for dispatchability = grid stability)
- Boosting industrial partnerships and technology transfers between EU and developing countries
- Delivering a proven system reliability compared to the "mediamade buzz" about an energy future made by variable RES + combined cycles / "power to gas"
- And already now CSP costs are currently lower than PV with 6 hours of battery storage (it will remain lower at least for 2 decades)

### **6. THE "MARKET" CHALLENGES**



> However, energy markets are today largely financial markets.

> These cannot/will not cover value aspects.

They do not ensure that generators in the power system are remunerated for their respective effective global value proposition (system responsibility and macroeconomic impact)

They do not internalize societal costs such as industrialization effects, business opportunities along the full value chain, health effects, etc... when assessing investments potentials

Governments must take responsibility and "correct" what no market will deliver: a full-value approach of investments that leads to a better balanced ratio between generation investments in intermittent and non-intermittent sources.

### 7. A POLITICAL CHOICE BETWEEN POOR SCENARII..



- 1. Ambitions may simply end with a system with approx. 30% of renewables that a still fossil-fuel based system can more or less cope with, without incentive to go further. Coal, oil and gas industries will come back on stage and citizens will pay also with their health.
- 2. If going further, both system operators and demand side will sooner or later need clean energy to balance intermittent with non-intermittent generation sources.
- 3. This will be times when dispatchable generation will reach extreme price peaks due to not timely investments and the resulting scarcity; the danger is that energy transition comes to a hold possibly inverting the energy transition back to fossil fuels.

### 8. AND A BETTER ONE: USING CSP AS SOON AS POSSIBLE

- A smooth energy transition built on a balanced technology mix building on non-intermittent generation technologies incorporating commercially proven bulk storage solutions.
- However, these should be built now so to be available in larger volumes and at much lower costs demonstrating the complementarity of renewable technologies according to real needs towards development and carbon objectives



## 9. THE BASIC POLITICAL RECOMMENDATIONS

A strong **political leadership is needed** to open the way to adequate amounts of dispatchable renewable energy as **sustainable corollary to the increase of variable RES in a given own power systems** 

This consists in providing a balanced and **credible political program** (strategy) for an energy transition over time **adapted to the specific** conditions of a country / an area encompassing both the energy needs and the developments ambitions (industrialisation, technology transfers, bankability of projects

The a.m. program has a direct **effect on the financial conditions** of any project and are the basis for a development/deployment program for renewables



Thank you.

Any questions? Feel free to contact us: <u>contact@estelasolar.org</u> Or visit our website: <u>www.estelasolar.org</u>