The Challenges and Expectations facing CSP

Expanding the Market for Concentrating Solar Power –
Moving Opportunities into Projects

BMU – GEF – KfW
International Executive Conference
Berlin, 19-20 June 2002

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The Californian Success Story in the late 1980‘ies

The Framework:

- Favourable FERC Regulation
- Tax Credits
- Attractive time-of-use tariffs:
  - 14 US cts. / kWh_e on the average
  - Up to 36 cts. for summer on-peak

The Result:

- 9 plants with accumulated 354 MW_e solar capacity built in only 7 years
- 1.2 billion US $ invested; all private capital (30-40% equity)
- 11 TWh_e (8 TWh_e pure solar) produced;
- Electricity sales: $ 1.5 billion until today

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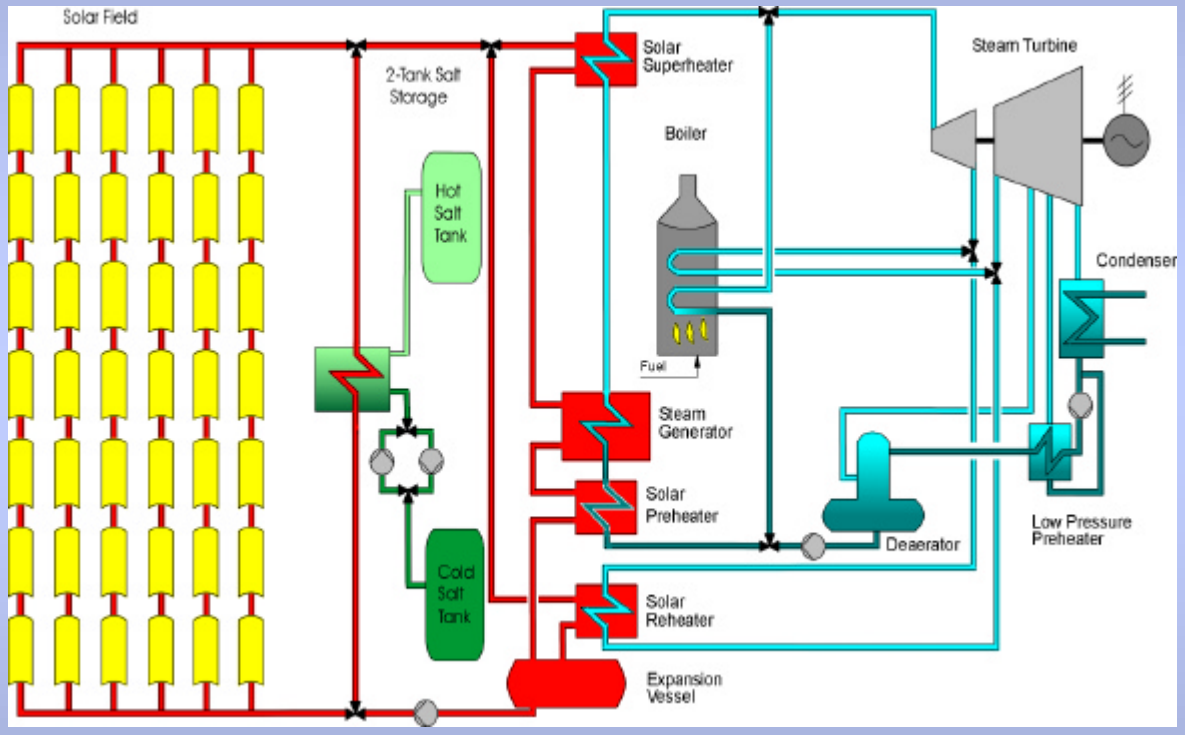
The Simple Economic Truth about CSP



- A CSP plant is a Rankine–cycle or CC power plant **aug-mented by a solar field**
- Thus, investments **must be higher** than for any of these base cases
- To-day‘s „Extra“ investments in solar fields are paid back through tomorrow‘s fuel cost savings
- Thus, if fuel costs are expected to be lower than today‘s solar field investment break-even costs of $ 35/bbl., CSP plants always will have higher power generation costs
- Therefore today, only environmen-tal attractivity is recocognized, but not awarded through higher tariffs

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Changed Market Environment for CSP Industry & Project Developers (1)

- **After** the sudden, dramatic **deterioration of the favourable Californian framework** conditions in the early 1990'ies, **CSP industry** and developers **faced a completely different situation**:

1. There was **not any longer attractive regulation available in OECD or DC countries** (no renewable portfolio, no specific tariffs, no tax incentives, even no permitting rules, norms or standards)
2. The **CSP players left** after the demise of LUZ **were pure component manufacturer** – no project developers and had to adapt to the new situation by gaining development experience

Changed Market Environment for CSP Industry & Project Developers (2)

3. The **power manufacturing industry**, long-awaited (specifically by Governments) to take over CSP business, was **facing extreme competition in** CC-technology and **emerging IPP markets** and therefore simply **not interested** to make its life more difficult with less competitive **solar field additions**
4. **Utility companies with** long-term, strategic **interest in CSP** were **facing deregulation** and market liberalization **obstacles, forcing them** to concentrate on defending their market share & core business and **not to afford CSP "toys"**
5. With rising environmental concern **R&D infrastructure grew faster than project opportunities and, hence, industry**. Today, there are about 200 - 300 scientist worldwide working on CSP, while there are not more than 50-100 full-time active in CSP industry. Researchers, naturally, have their own development priorities and sometimes even tend to justify their necessity by offering services which are typically industry tasks and which they are anyway not able to guarantee

Particularities of CSP Industry & Developers

1. **The ones who survived** 10 years of absence of implemented projects **have built-up** an excellent, **professional know how basis**, both, **in technology** (ISCCS concept, thermal storage, receiver material, collector design) **and project development expertise** (site selection, automated measurement campaigns, regulatory issues, permitting procedures, economic & financial evaluation tools)
2. Mostly, **they are SME‘s**. A typical project implementation cycle with lead times of 3-5 years already stresses their financial capabilities. **Wrap-up warranties and guarantees** for components, subsystems and services beyond their own scope of supply **exceeds their financial strength** – but, this is not very different to conventional power plant business!
3. Consequently, it can be observed that **CSP industry today is teaming-up** to wrap-up at least what is their joint scope of supply

Regulatory Inconsistencies for STP in Europe

- In high value markets (attractive compensation for clean power) **S**olar **T**hermal **P**ower is either:

  - **not regulated** in the national legislation (e.g. in Greece, Italy and Spain) and by this not eligible for favorable tariffs

  - or **forced** to produce its output **purely solar** (e.g. in Germany, Greece and Spain) which creates additional need for subsidies although the solar output would be the same and hybrid operation would much better comfort load requirements

- **Solar power import** from European member states is principally possible but not eligible for compensation under the prevailing national regulation (i.e., most cost effective solution not allowed)
- **Renewable regulation is miles behind current power market liberalization!**

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Regulatory Shortcomings in GEF- supported Countries

- **Most** current **GEF- sponsored project implementations are significantly delayed** as these countries either don‘t have established mechanisms for independent privately owned and financed power schemes or their regulation lacks provisions accomodating the specific needs of renewable power
- In most cases, these **solar project developments need regulatory or tariff scheme improvements,** e.g. subsidies on fossil fuel increase the competitivity gap of CSP, no award for valuable peaking power, no mechanism foreseen so far for rewarding clean power
- The **GEF grant financing** offer – created to buy-down the extra cost of the clean, but capital-intensive solar field investment – **might create** other **expectations within the recipient organizations** which are not primarily focused on the investment buy-down
- **Why only project host country governments can receive** the GEF **support?** Won‘t a devoted developer be not more effective?

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CDM : New Market-Oriented Financing Instruments

Innovative financing is definitively the key to successful CSP market introduction

- Some initial buy-down, blended loans at preferred conditions, bolstering country-, currency- and non-technical operational risks is essential to overcome the stall and vicious cycle of new, however proven technology, new, more technology-driven market players and conservative clients, demanding fully proven and totally wrapped-up, guaranteed technology
- Here, CMD, managed by a financing organization executing public interest, might act as a clearing house, to secure pre-financing and controlling of the still not fully established mechanisms
- Thus, a market-driven instrument (although initially still on a self-committing basis of the emission off-writing player) might finally be able to award the environmental benefits of CSP

The CSP Industry Commitment

- **Today, solar thermal power is competitive with**
- - fossil fuel prices of about $ 35 per barrel of crude oil
- - or with a tariff of 13 cents per kWh_e, in solar only or 8-10 cents per kWh_e in hybrid mode (under Mojave desert radiation conditions)
- **We don‘t want subsidies**, **we want fair compensation for clean and dispatchable peaking power!**
- Regulation should **offer long-term PPA‘s** (15 years or so) starting with **13 US cts/kWh_e for the initial 200 MW_e**, 10 cts. for the next 200 MW_e, **decreasing to 6 cts/kWh_e** when reaching 5,000 MW_e
- This would be a **strategic, consistent industry and environmental policy programme** – European and American CSP companies are ready to join and support

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Governments and Industry Expected CSP Market Growth

Concentrating Solar Power (CSP)	2,001		2,006		2,010		2,020	
	MW Solar	MW Total	MW Solar	MW Total	MW Solar	MW Total	MW Solar	MW Total
Current Values and National Targets for Installed Capacity Growth Rates								
CSP Capacity Worldwide (MW)	354*)	354	1,028	1,918	2,178	4,498	15,000	30,000
Solar Only CSP Capacity in Europe (MW)	2	2	236	236	366	366	3,000	3,000
CSP Market Growth Expectations of Industry								
CSP Capacity Worldwide (MW)	354*)	354	1,028	1,918	2,578	4,898	15,000	30,000
Solar Only CSP Capacity in Europe	2	2	236	236	766	766	7,000	7,000
CSP Growth Rates MW/year in Europe	0	0	47		106		623	
Current Values and Targets for CSP Production / Consumption								
CSP Production Worldwide (GWh/a)	675	900	2,000	7,340	13,003	26,923	39,000	129,000
CSP Production Europe (GWh/a)	1	1	737	737	1,915	1,915	17,500	17,500
Current Values and Targets for CSP Technology Costs								
€/kWh solar only for Southern Europe with 2000kWh	0.20		0.16		0.12		0.09	
€/kWh solar only for Deserts with 2700kWh/m²a	0.16		0.11		0.09		0.06	
€/kW solar only	3,000		2,300		1,500		1,200	

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