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CTF Experience with Concentrated Solar Power

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Asian Development Bank
European Bank for Reconstruction and Development
Inter-American Development Bank
WORLD BANK GROUP

CTF Investments in CSP

- **Amount of CTF investments in CTP**
  - **USD 1.2 billion**
- **Co-financing leverage**
  - **USD 8.4 billion**
- **Installed capacity**
  - **1.36 GW**
- **GHG emissions avoided**
  - **>45 million tons of CO2-eq**

CSP Projects and Programs

Country / Region	Project Title	MDB	Public / Private
Chile	Concentrated Solar Power Project	IDB	Private
South Africa	ESKOM Renewable Support Project	AfDB/IBRD	Public
	Abengoa Ka Xu CSP	IFC	Private
	Abengoa CSP(Ikhi Tower)	IFC	Private
CSP-MENA	MENA-CSP: Technical Assistance (Algeria, Egypt, Jordan, Libya, Morocco, Tunisia)	AfDB/IBRD	Public
	Morocco Ouarzazate CSP (Noor I)	AfDB/IBRD	Public
	Morocco-Noor II and III CSP	AfDB	Public
	Morocco-Noor II and III CSP	IBRD	Public
	Egypt Kom Ombo CSP	AfDB/IBRD	Public
	Jordan CSP/CPV Project	IFC	Private
	Libya-CSP program	AfDB/IBRD	Public
	Tunisia Akarit	AfDB/IBRD	Public
	Morocco-Phase II of Midelt or Tata	AfDB/IBRD	Public
India	Integrated CSP Hybrid	ADB	Public

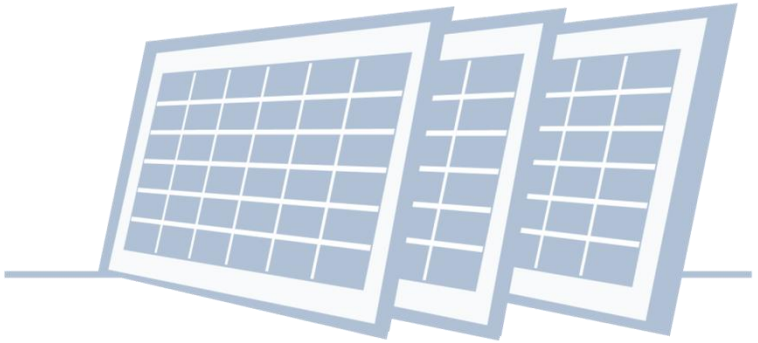
Rationale for CTF Involvement in CSP

- **CSP holds great promise for its ability to deliver base load power, spur the development of local industries, enhance energy security, and avoid GHG emissions.**
- **But high upfront cost of CSP remains a major barrier.**
- **CTF support for CSP aligns with CTF investment criteria:**
  - **Potential for GHG Emissions Savings**
  - **Cost-effectiveness**
  - **Demonstration Potential at Scale**
  - **Development Impact**
  - **Implementation Potential**
  - **Additional Costs and Risk Premium**

Photo: Jitendra Parihar/TRF

Global CSP Status

- 4 GW currently deployed globally (largely Spain and USA)
- India and United Arab Emirates have plants already synced to the grid
- Morocco and South Africa are finalizing their first plants
- Ambitious development plans in India, Israel, Jordan, Kuwait, Morocco, Saudi Arabia and South Africa, while in northern Chile development is taking place on a market basis.
- New CSP components and systems coming to commercial maturity
  → increased efficiency, declining costs and higher value through increased dispatchability



Global CSP Forecast

- Slow growth in next 10 years (11 GW of CSP plants by 2020) due to long lead times
- Cost of CSP expected to halve by 2030
- 30-40 GW of new-built plants per year after 2030
- CSP's share of global electricity: 11% by 2050 (or 1,000 GW of installed capacity)
- Middle East, India and the United States will be the largest contributors
- CSP will be the largest source of electricity in Africa and the Middle East by 2050

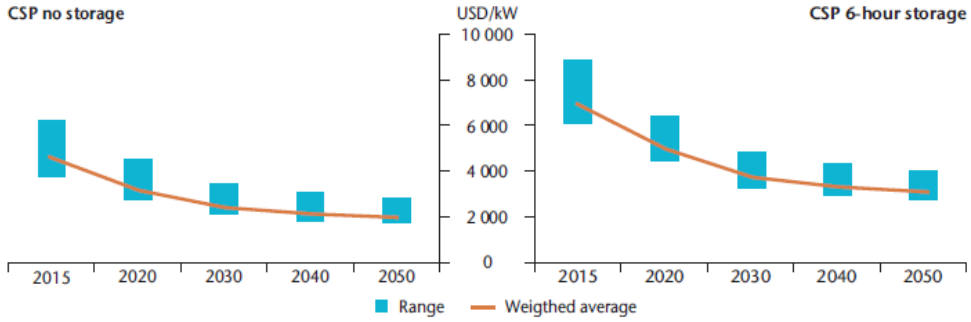
Global CSP Forecast

CSP capacities by region in 2030 and 2050

GW	United States	Other OECD Americas	European Union	Other OECD	China	India	Africa	Middle East	Other developing Asia	Non-OECD Americas	World
2013	1.3	0.01	2.31	0.01	0.02	0.06	0.06	0.10	0.02	0	4.1
2030	87	6	15	4	29	34	32	52	0.3	2	261
2040	174	18	23	12	88	103	106	131	3	7	664
2050	229	28	28	19	118	186	147	204	9	15	982

Source: IEA 2014 Technoogy Roadmap for Solar Thermal Electricity

CSP investment cost projections in the hi-Ren Scenario



KEY POINT: The cost of CSP plants is expected to halve by 2030 as technologies mature.

Value of CTF Financing for CSP

- Ouarzazate I: Low-cost debt provided by CTF and other IFIs reduced project costs by 25% → lower subsidy required from Government of Morocco ($20 mil p.a. vs $60 mil)
- Noor II/III: CTF contribution expected to reduce LCOE by 10%; CTF instrumental in bringing in other donors
- Eskom CSP: CTF was a catalyst to revisiting the viability of the highly ambitious project (9-12 hours storage); CTF attracted the interest of other IFIs and reassured national ministries to provide political backing
- Chile: CTF support was critical to launch bidding for South America's first CSP plant, attract long-term fixed-price PPA at competitive price

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Expected Benefits from CSP Projects

- **Chile Concentrated Solar Power Project (IDB, CTF $67mil):**
  - **5.7Mt CO2eq emissions reduced over life of the investment**
  - **1,125 jobs created during construction and 64 jobs created during operation phase**
- **South Africa ESKOM Renewable Support Project (AfDB/IBRD, CTF $250mil)**
  - **11.4Mt CO2eq emissions reduced over life of the investment**
  - **1,500 jobs created during construction and 50 jobs created during operation phase**
- **South Africa Abengoa Ka Xu CSP and Abengoa CSP (Ikhi Tower) (IFC, CTF $41.5mil)**
  - **8.84Mt CO2eq emissions reduced over life of the investment**
- **CSP-MENA Morocco Ouarzazate (Noor I) (AfDB/IBRD, CTF $197mil)**
  - **6Mt CO2eq emissions reduced over life of the investment**
  - **800 jobs created during construction and 50 jobs created during operation phase**
- **CSP-MENA Morocco Noor II and III (AfDB/IBRD, CTF $238mil)**
  - **$25mil in environmental benefits from avoided air pollution**

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Knowledge Management and Lessons

- **CIF concluded a year-long knowledge project with CPI to distil lessons on the effective use of public finance to scale up CSP. Results include:**
  - **Learning facilitated between and among CTF countries (Chile, India, Morocco, South Africa) and project developers, financiers and experts**
  - **Recommendations generated for governments and IFIs:**

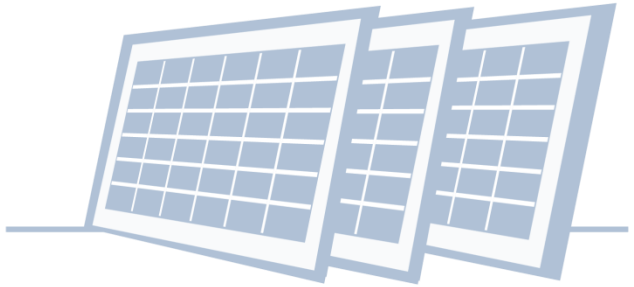
Governments

- **Design policy to ensure that the cost of support falls to reflect decreasing costs over time**
- **Ensure that support can be sustained over time to avoid boom and bust**
- **Remunerate flexible power supply from CSP to reflect its benefit to the energy system**

IFIs

- **Target public funding to mitigate risks for early stage CSP technologies with high investment risks but great potential for cost reductions or energy system benefits**
- **Harmonize loan and regulatory requirements among lenders**
- **Reduce foreign exchange hedging costs of IFI loans for developers**

- **MDBs also supporting S-S learning and knowledge on CSP**



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