IFC’s Project Financing of Concentrated Solar Power Plants

Workshop on CSP Markets, System Value & Financing

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Chief Renewable Energy Specialist
Global Infrastructure & Natural Resources

Ouarzazate, Kingdom of Morocco
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## INTRODUCTION TO IFC

**IFC: A member of the World Bank Group with a private sector focus**

<table>
<thead>
<tr>
<th>Role</th>
<th>To promote institutional, legal and regulatory reform</th>
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<th>To promote private sector development</th>
<th>To reduce political investment risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clients</td>
<td>Governments of middle-income and creditworthy low-income countries</td>
<td>Governments of poorest countries</td>
<td>Private companies in member countries</td>
<td>Foreign investors in member countries</td>
</tr>
</tbody>
</table>
| Products | • Technical Assistance  
• Loans  
• Policy Advice | • Technical Assistance  
• Interest Free Loans  
• Policy Advice | • Early stage Equity  
• Equity / Loans  
• Risk Management  
• Advice | • Political Risk Insurance |

✓ Unparalleled access to governments, parliaments, consultants and other stakeholders;
✓ A broad range of products available to our clients (Partial Risk Guarantees, political risk coverage);
✓ Cooperation between public and private counterparties which is crucial to moving transactions forward.
IFC IN INFRASTRUCTURE

IFC intervenes along the entire project cycle and has a range of tools at its disposal

<table>
<thead>
<tr>
<th>IFC Advice</th>
<th>IFC Investment</th>
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<tbody>
<tr>
<td>Regulatory reform</td>
<td>Concession structuring</td>
</tr>
<tr>
<td>- Working with the World Bank and others to introduce sector reform and achieve sector sustainability</td>
<td>- Setting the conditions to attract private investment</td>
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<tr>
<td>- Strengthening utilities’ performance through private management contracts</td>
<td>- Advising governments on PPPs</td>
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<tr>
<td></td>
<td>- Negotiating key contracts</td>
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✓ IFC can effectively support projects through its multiple capabilities
### Overview of IFC’s financing products: development equity to long term debt

**Up to 25% (Greenfield) or 50% (Expansion) of Total Project Cost through a combination of:**

<table>
<thead>
<tr>
<th>Development Equity</th>
<th>Up to $8 million or 50% of development budget through IFC InfraVentures (IV)</th>
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<tbody>
<tr>
<td></td>
<td>IFC InfraVentures can act as co-developer: assist in negotiation of agreements, feasibility study evaluation, financial modeling</td>
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<tr>
<td>Project Equity</td>
<td>Typically up to 20% stake for IFC’s account; more if needed through IFC Asset Management Company</td>
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<td></td>
<td>Usually Long-term investor with no Board seat. Exit strategy to be agreed with key stakeholders</td>
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<tr>
<td>Mezzanine</td>
<td>Subordinated loans, Income participating loans</td>
</tr>
<tr>
<td></td>
<td>Convertibles and other hybrid instruments</td>
</tr>
<tr>
<td>Senior Debt and Structured Products</td>
<td>Senior Debt and Guarantees</td>
</tr>
<tr>
<td></td>
<td>Fixed or floating rates (US$ or Euro); can also finance in some local currencies</td>
</tr>
<tr>
<td></td>
<td>Commercial rates, structured loans</td>
</tr>
<tr>
<td></td>
<td>Long maturities (up to 20 years), grace periods and repayments commensurate with project cash flows</td>
</tr>
<tr>
<td></td>
<td>Swaps and risk management products</td>
</tr>
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<td></td>
<td>Tenor extension solutions for local commercial banks</td>
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</table>

**✓ IFC can play multiple roles and can invest at a very early stage**
IFC’S APPROACH TO FINANCING

**More than just a lender: IFC’s value add**

| Sector Expertise                  | Extensive knowledge gained from long-term sector engagement  
|                                  | In-house Engineers offer technical advice  
|                                  | In-house Market Experts assess and structure for merchant risk  
|                                  | In-house Regulatory Expertise: can assess and structure for regulatory risk  

| Country Risk Mitigation           | Government Relations  
|                                  | Honest Broker Role  
|                                  | World Bank Group Synergies  

| Environmental and Social Risk Management | Advice on Environmental and Social Best Practices  
|                                         | Equator Principles modeled after IFC Standards  

| Advice                               | Access to Donor Funding/Concessionary Support Coordination  
|                                      | Assistance programs, including Local Supplier Development, Corporate Governance, Community Development Funding  
|                                      | Carbon Finance and/or Renewable Energy Credits  

IFC’s CSP Project Investments
IFC WORKS ACROSS THE CSP VALUE CHAIN

- IFC finances projects across the CSP value chain from upstream equipment and component manufacturers to downstream power projects.
- IFC has expertise in clean tech, manufacturing, services and power investments.
- In addition to its investment teams, it has in-house industry experts, as well as legal and Environment & Social staff.
IFC INVESTMENTS IN THE CSP SUPPLY CHAIN

- Comemsa (Mexico, FY11): US$24 million in debt to finance expansion of Abengoa S.A. manufacturing capacity for CSP steel support structures and transmission towers - provides structural support steel for Solana & Mojave CSP projects of Abengoa Solar

- Inabensa Bharat (India, FY12): US$14 million to finance Abengoa S.A. production facility in India to provide manufacturing capacity for CSP steel support structures and transmission towers

- Finance of leading global glass manufacturers (eg Pilkington Glass, Saint Gobain, Sise ve Cam)
The SA REIPPP is a flagship Public-Private Partnership model for South Africa, and the rest of the world.

The program received its first bids in late 2011, and to date 102 projects have been procured, with 3.1GW of power already connected to the grid.

The highly competitive process has brought power prices down across all technologies, with solar PV tariffs falling ~75%.

All projects have 20 year PPAs with inflation linked, local currency tariffs.

Technologies: Wind, Solar PV, CSP, Biomass and Small hydro.

Prominent Global Developers include:

- ACWA Power
- Enel Green Power
- Abengoa
- Scatec Solar
- Acciona
- Mainstream Renewable Power
- Groupe Globale
- BioTherm Energy
- IFC
WHY DO CSP IN SOUTH AFRICA?

- Perfect conditions - high insolation & reliable water supply
- Plenty of cheap coal (45GW system) to blend higher RE costs
- Base-load power for industries matches well with CSP + storage
- Support for job creation & role of Black Economic Empowerment (BEE) entities
- Initial commitment - 200MW of CSP
- IFC financing three Abengoa Solar CSP projects totaling 250 MW
- IFC to finance ACWA Power 100 MW MS tower CSP following PPA execution by ESKOM

Northern Cape Province:
- High and regular irradiance 2,800 Kwh/m2/annum
- Close access to river water
## CSP TECHNOLOGY COMPARISON

<table>
<thead>
<tr>
<th></th>
<th>Molten salt towers</th>
<th>Direct steam towers</th>
<th>Parabolic trough</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Storage</strong></td>
<td>Inherent to molten salt</td>
<td>Complex, costly and not fully commercially proven</td>
<td>Comparably higher cost of storage due to lower temperatures and separate heat transfer fluid</td>
</tr>
<tr>
<td><strong>Efficiency</strong></td>
<td>Highly efficient steam cycle</td>
<td>Highly efficient steam cycle</td>
<td>Less efficient steam cycle</td>
</tr>
<tr>
<td><strong>Flexibility</strong></td>
<td>Dispatchable, on-demand generation in many weather conditions</td>
<td>Dispatchable; currently lacks commercial storage technology</td>
<td>Dispatchable if thermal storage in configuration</td>
</tr>
<tr>
<td><strong>Pressure / Stability</strong></td>
<td>Low-pressure receiver salt HTF system Storage adds to stability during inclement weather</td>
<td>High pressure receiver steam-water system with phase-change Less stable during inclement weather</td>
<td>Low-pressure thermal storage salt system Storage adds to stability during inclement weather</td>
</tr>
<tr>
<td><strong>Maintenance / Gas requirement</strong></td>
<td>Dry cooling implemented efficiently No or minimal natural gas required for operations or steam consistency</td>
<td>Dry cooling implemented efficiently Some natural gas may be occasionally required for operations or steam consistency</td>
<td>Dry cooling implemented efficiently Some natural gas may be occasionally required for system startup and HTF freeze protection in solar field</td>
</tr>
<tr>
<td><strong>Scale</strong></td>
<td>Limited economies of scale in core collector geometry</td>
<td>Limited economies of scale in core collector geometry</td>
<td>Scale economies achieved in core collector geometry</td>
</tr>
<tr>
<td><strong>Track record</strong></td>
<td>Minimal track record</td>
<td>Minimal track record</td>
<td>Larger installed / operational base</td>
</tr>
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</table>
Spanish energy developer Abengoa Solar has developed the first 3 CSP projects in RSA:

### Project Details

<table>
<thead>
<tr>
<th>Project</th>
<th>MW</th>
<th>Technology</th>
<th>Storage</th>
<th>Stage</th>
<th>Round</th>
</tr>
</thead>
<tbody>
<tr>
<td>KaXu Solar One</td>
<td>100</td>
<td>Parabolic trough</td>
<td>2.5 hours</td>
<td>Operational</td>
<td>1</td>
</tr>
<tr>
<td>Khi Solar One</td>
<td>50</td>
<td>Thermal tower</td>
<td>2.0 hours</td>
<td>Operational</td>
<td>1</td>
</tr>
<tr>
<td>Xina Solar One</td>
<td>100</td>
<td>Parabolic trough</td>
<td>5.0 hours</td>
<td>Construction</td>
<td>3</td>
</tr>
</tbody>
</table>
REIPPP – REDSTONE AND IFC’S ROLE

- A flagship project for South Africa (and Africa) – providing baseload power
- Co-developed by ACWA Power and SolarReserve, the 100MW CSP tower project will boast 9 hours of molten salt storage
- **IFC is the mandated lead technical bank/co-ordinating bank** and has vast experience when working with new technologies
- The project will power more than 200,000 homes during peak demand, day and night
- SolarReserve’s Crescent Dunes in Nevada is reference project, with the same design & capacity
- The project is nearing financial close

**Key Facts:**

- 9 hours of molten salt storage
- Power to >200,000 homes during peak demand
- Local and international financiers
- 29 month construction period
- EPC contractor: Acciona Infraestructuras
- O&M contractor: NOMAC (wholly owned by ACWA)
CSP FINANCING CONSIDERATIONS

- Comparably high total project costs - need club loans (DFI’s and commercial banks) which require significant co-ordination and can add some complications;
- Blended Financing with Clean Technology Fund (CTF) and / or other concessional financing sources mobilized to lower tariffs;
- An experienced EPC contractor with a strong balance sheet is vital, together with local support, strong supervision and watertight contracts

Completion Risks:

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<tr>
<th>Delay</th>
<th>Mitigants include: EPC delay LDs, a strong insurance package, stringent construction supervision &amp; progress reporting, EPC contractor with experience including local experience</th>
</tr>
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<tbody>
<tr>
<td>Performance / Technology</td>
<td>Mitigants include: Demystifying the technology risk associated with these complex projects, EPC performance LDs, extended performance measuring period (2-3 years), performance ramp-up, experienced &amp; solid EPC contractor, sponsor completion support, stringent performance testing protocol for provisional &amp; final acceptance under EPC</td>
</tr>
<tr>
<td>Cost Over-run</td>
<td>Mitigants include: Fully wrapped all-in EPC contracts, fully back to back with the PPA, adequate contingencies, stringent construction supervision &amp; progress reporting</td>
</tr>
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</table>
IFC’S FINANCING ROLE IN KAXU & KHI CSP PROJECTS

US$145 million in IFC senior “A” loans at market interest rates and long tenors

Mobilized US$224 million -- “B” loans from other lenders

Mobilized US$41.5 million in concessional loan funds from the World Bank-administered CTF

Funds to meet project costs of >US$1.3 billion fully committed: KaXu & Khi have both reached COD

Khi receives *Infrastructure Journal* “Deal of the Year”

IFC also financed Abengoa Solar Xina 100 MW trough CSP (up to US$47M loan + US$20M Canadian soft loan) & ACWA Power’s Redstone 100 MW MS tower CSP (up to US$72M loan + US$50M CTF soft loan)
THANK YOU!
dyounger@ifc.org