San Giorgio Group Case Study: Ouarzazate I CSP Update

This brief update of CPI's 2012 Report "San Giorgio Group Case Study: Ouarzazate I CSP" follows the announcement of a winning bid for a 160MW Concentrated Solar Power (CSP) facility in Ouarzazate, Central Morocco. We discuss the potential drivers of the final bid, its financial impact on the project costs and the public budget, and analyze implications for replicating and scaling up the project financial model and risk allocation structure.

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CLIMATE POLICY INITIATIVE

In August 2012, CPI published the San Giorgio Group Case Study: Ouarzazate I CSP,[1] which analyzed the financing and risk structure of a proposed 160MW Concentrated Solar Power (CSP) facility to be sited near the town of Ouarzazate in Central Morocco.

Our report noted five building blocks that helped the project attract bids: strong public support and the close alignment of partners, including the creation of the Moroccan Agency for Solar Energy (MASEN); significant financial and technical contributions from international financial institutions; strong engagement and coordination of donors; a carefully designed public-private partnership model; and a project design that incorporated lessons from other large-scale CSP projects.

In late September 2012, MASEN selected a winning consortium to develop Ouarzazate I based on a competitive bidding process. At 1.619 Moroccan dirhams per kWh (USD 0.184),[2] the tariff offered by the winning consortium[3] was 21% lower than the other offers, and 25% lower than initial cost projections (USD 0.243). Even accounting for the public subsidies for capital costs, the plant will be one of the least expensive large scale solar thermal plants built in the last three years (see Figure 2).

CPI examined this latest development for further insights on how the business model supported the financing of the project, prompted cost reductions and influenced its replicability and scalability. We conducted interviews with MASEN, the winning consortium leader (ACWA Power International), and a member of a competing consortium qualified to bid (Enel Green Power[4]). In this update, we discuss the potential drivers of the final bid, and its financial impact on the project costs and public budget, and analyze implications for replicating and scaling up the project financial model and risk allocation structure. This update also reflects on key points that emerged during a side event[5] of the Abu Dhabi World Energy Summit, a joint meeting organized by CPI, DECC (UAE), and Masdar on January 16th 2013.

CPI finds that the conclusion of the tender process and the selection of the final bid confirms the insights and findings of our original case study. In particular, we highlight that project costs are significantly lower than projected, a further positive indication on the replicability and scalability of the chosen financing model.

1 The report is available for download at http://climatepolicyinitiative.org/wp-content/uploads/2012/06/Ouarzazate.pdf

2 All exchange rates throughout this paper are based on the date of the Masen press release, Sep 24th 2012 (source ouanda.com). EUR/USD: 1.2977. EUR/MAD: 10.8235. MAD/USD: 0.1136.

3 The winning consortium is led by Acwa Power International (ACWA), with Spain's TSK Electrónica y Electricidad and Aries/Sener Ingeniería y Sistemas as investment partners and Acciona Infrastructuras and Ingeniería as Engineering and Procurement (EPC) contractor, and NOMAC, a subsidiary of ACWA as Operations and Maintenance provider.

4 However we note that Enel Green Power at the end decided not to submit a final bid.

5 The agenda of the meeting is available for download at http://climatepolicyinitiative.org/sgg/event/effective-solar-financing-what-have-we-learned/

The Lower Bid Was a Result of Higher Production Estimates, Lower Capital Costs, and Strategic Behavior

The tendering process for Ouarzazate I CSP ended with a final project cost 25% lower than the initial projections, due to higher production estimates, lower capital costs, and bidders' strategic behavior. This conclusion confirms that Ouarzazate I CSP's financing structure, bidding process, and risk allocation framework have been successful in attracting private capital within the expected costs and have fostered competition among interested investors.

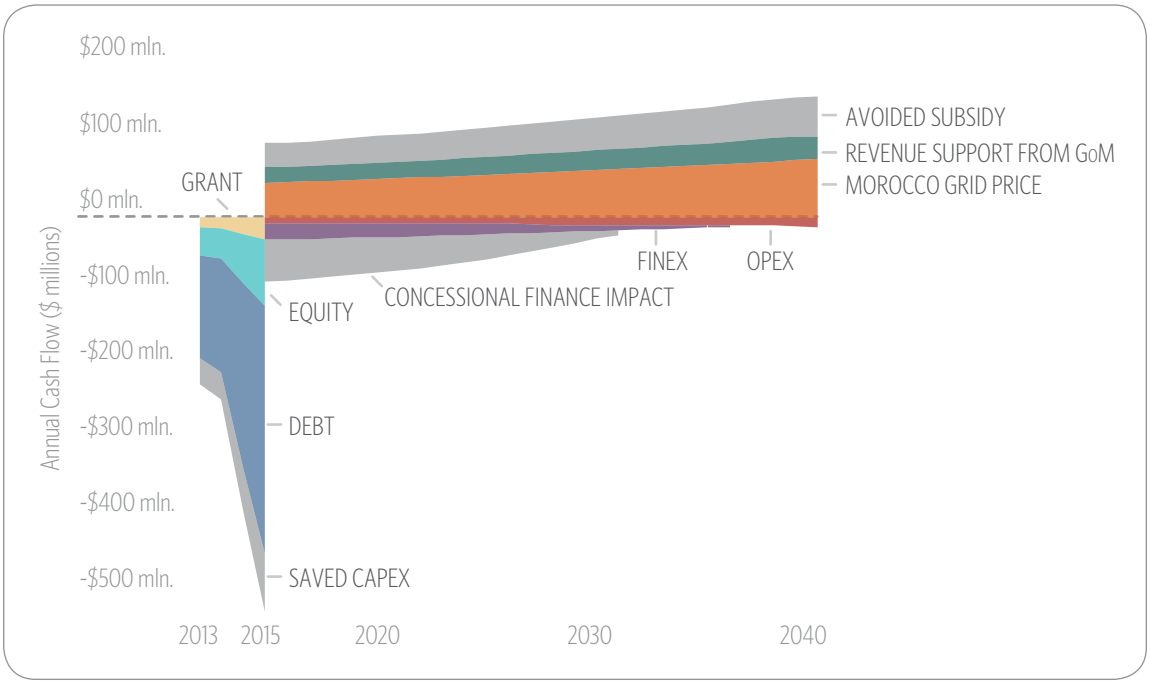
Figure 1 and Table 1 show, respectively, the project's cash flows and the financial metrics estimated from the final bid and compare them with the project's initial projections.

The winning bid demands a lower investment cost for the project. Even more importantly for the Moroccan government, the winning bid implies a substantial reduction of the required annual solar subsidy (SICS) from the forecasted USD 60 million to an estimated USD 20 million (shaded areas in Figure 1). The technology appears still far from being competitive with other sources of energy in the country — hence the need for the annual subsidy — however, the reduced costs have made the project more viable for the country's public finances.

The final bid also implies a reduction of equity and debt capital required from both public and private investors: estimated at USD 120 million of equity capital from the project developers, USD 40 million of equity capital from MASEN, and USD 635 million debt from the lenders. On the equity side, we note that, compared with the initial structure of the project, International Financial Institutions (IFIs) decided to offer a more favorable financing package to private investors, reducing the proportion of equity versus debt (20/80% instead of 30/70%). The increased leverage allowed by the new terms reduces the capital available to absorb first losses (equity). The final result is a further transfer of financial risks to the public sector lenders.

However, the private sector members of the consortium still provide complete mitigation of performance and construction risk to MASEN and IFIs (through a completion guarantee by the Engineering, Procurement and Construction (EPC) contractor and the option for MASEN to sell back its equity stake if construction costs and/or performance of the plant are below pre-defined standards). This allocation confirms the public-private nature of the project financing, with the public sector assuming the lion's share of the

Figure 1: Ouarzazate I CSP cash flow



Acronyms used in both Figure 1 and Table 1: CAPEX: Capital Expenditures; FINEX: Financial expenditures; GoM: Government of Morocco; IRR: internal rate of return; LCOE: Levelized Cost of Electricity; OPEX: Expenditures for Operations and Maitainance; PPA: Power Purchase Agreement

Table 1: Ouarzazate I CSP financial metrics, source CPI, WB 2011

	FINAL BID (CPI ASSUMPTIONS)	INITIAL PROJECTIONS[a]
ANNUAL GENERATION GWH	425	370
PPA TARIFF (PEAK)[b] USD/MWH	$184	$243
SOLAR SUBSIDY USD MLN/YEAR	$20.4	$60
INVESTMENT COST USD MLN	$850	$1,000
CAPEX USD MLN	$670	$960
DEBT FINANCING USD MLN	$634	$690
EQUITY FINANCING USD MLN	$160	$253
GRANT FINANCING USD MLN	$56	$56
PROJECT IRR (BEFORE TAX)	8.2%	9%
EQUITY IRR (LEVERAGED)	13.1%	13.6%
LCOE USD/MWH	$185	$245.7

a For more details on the initial projections please refer to (Falconer and Frisari, 2012).

b PPA in this case indicates the (peak) tariff at which the solar company will sell its power to the offtaker. In Ouarzazate I this has been set to approximately match the Levelized Cost of Electricity.

political, financial, and commercial risks, and the private sector assuming construction and performance risks.

The key question on observers' minds is how did ACWA Power manage to bid so low? Did the offer reflect lower than expected CSP technology costs or strategic bidding behaviour on ACWA's part? What do these prices imply for the next CSP projects in the MENA region and elsewhere?

Our analysis indicates that ACWA's offer was a combination of three different factors: increased production estimates, reduced capital costs, and an early-mover strategy. We discuss each factor in more detail below.

Increased production estimates

The final estimates on the technical performance of the plant have not been disclosed yet, though the project developers expect that a better optimization of the plant design will allow an annual generation higher than the forecasted 370 GWh (ACWA, 2013). Considering the overall capital expenditure — derived by the value of the construction contract reported by the EPC contractor in its regulatory filings (Acciona, 2012) — and the 8% expected rate of return communicated by the developer[6] (ACWA, 2012b), we estimate that the final bid results are consistent with an expected annual power generation between 420 and 430 GWh (for ease of computation, we use the mid-point 425 GWh in our calculations of the project's financial metrics). Interestingly, while on one hand the increased production would allow higher revenues for the project equity sponsors, on the other hand, it would increase the risks they bear as they are now committing to a higher performance threshold in the Power Purchase Agreement (PPA) obligations.

Table 2: Annual Generation and LCOE

ANNUAL GENERATION (GWH)	ESTIMATED LCOE (USD/MWH)
370	$210
410	$191
420	$187
425	$185
430	$183

Reduced capital costs

In an interview with CPI analysts, ACWA reflected that concessional financing provided by IFIs alone would have brought their offer to a level similar to that of other bidders — around USD 0.245/kWh.[7] Our analysis had already showed how the attractive financing package made available to all bidders before the closing of the tender reduced the project costs by approximately 25% when compared to the financing available from commercial banks in the market (Falconer, Frisari, 2012).

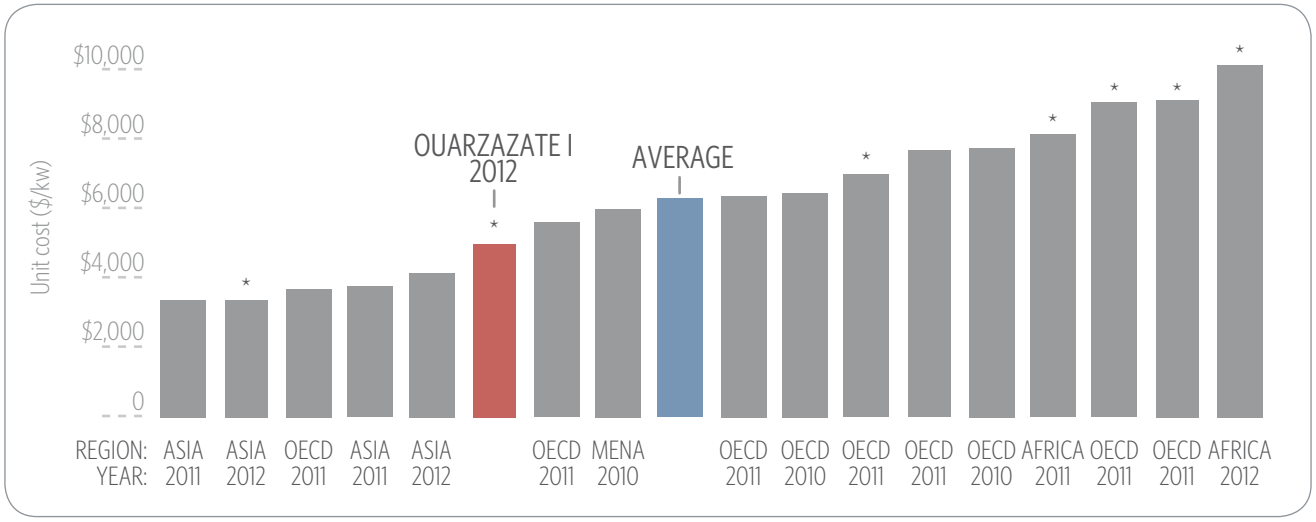
ACWA has stated that it was able to achieve further reductions by driving a competitive offer from their EPC contractors and maximising local manufacturing content. By manufacturing troughs and components in Morocco, the winning consortium managed to increase local content from the minimum 30% required in the bidding to approximately 65%. The overall investment costs from Table 1 result in estimated unit cost of USD 5,300/kw (of which USD 4,200/kw[8] is for the equipment and construction). This figure includes the grants received from European donors (EUR 45 million) towards the construction of the plant but, consistent with the project appraisal of the World Bank (WB, 2011) and CPI analysis, excludes the grant funding from the Moroccan Fonds de le Developpment de l'Energie (FDE). The latter is used to finance the "Associated Facilities" (infrastructures for the supply of water, power transmission, and road access to the plant site) that, while instrumental to Ouarzazate I, are not specific to this project and were not included in the IFIs' investment package.

6 This also equals to the discount rate used for the project's LCOE calculations.

7 Project Finance (2012).

8 The cost of equipment and construction derives from the value of the EPC contract of EUR 500 million stated in Acciona's regulatory filings (Acciona, 2012).

Figure 2: Investment unit costs (USD/kw)



* denotes the presence of a storage facility.
Source: BNEF.

Not only does this cost reduction mean that Ouarzazate I CSP will be roughly 25% cheaper than initial forecasts, it also implies that the plant will be one of the least expensive large scale solar thermal plants built in the last three years.[9] Figure 2 lists the investment costs per unit of installed power of large scale (100 MW or higher) plants financed globally from 2010 to 2012, based on data extracted from Bloomberg New Energy Finance (BNEF) database and estimated using cost projections in the media and in the literature.[10] Among the plants with the ability to store power,[11] only the KVK Chinnu Solar Thermal plant in the Indian state of Rajasthan is being built at lower investment costs (USD 3,400/kw).[12]

Early-mover strategy or reduced risk?

In addition to increased production and reduced capital costs, the winning bid also reflects the developer's early-mover strategy.

As per Table 1, we estimate the after-tax rate of return for the project (6.5%) is rather smaller than the lower end of the benchmark values for renewable energy in Morocco as projected by the country's financial sector: from 10% for power generation under concessional schemes with the national utility (ONE), to more than 12% for independent producers selling the power on the market (Attijari, 2011).

On one hand this reflects the strategic decision to accept a lower profitability on some projects in order to ensure penetration in the market and, as per ACWA's CEO own words, make the tariff more acceptable over time in light of expected further cost reductions (CSP Today, 2013). On the other hand, this decision confirms that the risk mitigation efforts put in place by both the Moroccan public sector and the development banks[13] have successfully controlled and, possibly, reduced the level of risk perceived by the developers. In particular, ACWA has reported that the firm commitment by the Government of Morocco to develop the country's renewable energy sector, its credibility, and the presence of MASEN as shareholder in the project have all strongly mitigated the perception of policy risk – resulting in a two percent decrease of the project's required rate of return.

9 This statement holds true even if we include all the grants from the Moroccan government to finance the Associated Facilities. In that case, Ouarzazate I's unit costs would increase to USD 6,100/kw; it would still be the second cheapest plant if the storage component is included.

10 To reduce the uncertainty around project costs, we decided to limit the analysis to plants for which financing has already been secured and construction is under way. We highlight, however, that these cost estimates need to be treated with a grain of salt due to many plant-specific considerations and usual cost overruns. The small size of the sample and the high level data do not allow a precise assessment of the possible drivers of these cost differences (technical features, availability of resources, policy support, and allocation process), which will instead be investigated in forthcoming CPI research.

11 The power storage component usually increases significantly both the overall cost and the revenues of the plant as it allows it to dispatch power during the more profitable peak hours.

12 The project is a part of the Indian Jawaharlal Nehru National Solar Mission (JNNSM) program that is experiencing delays and construction difficulties due to issues in the value chain and lower than forecasted solar radiation levels (CSP Today, 2012) – the impact of these delays on the project costs is not yet clear.

13 A more detailed discussion of the risk allocation framework in Ouarzazate I is available in CPI, 2012.

Ouarzazate I Lays the Foundation for Replication and Scaling-up

The cost reductions from the initial projections are a good indication for the viability of the model and its replication in the country and region. Additionally, the learning resulting from the complex and lengthy tendering process to build Ouarzazate I could reduce costs for future projects and allow a much needed reduction of public support.

MASEN is already replicating the Ouarzazate I model. It has initiated a new financing process for the second phase of Ouarzazate that aims to install a further 300MW of solar thermal energy (200MW with parabolic-through mirrors and 100MW with solar tower technology), again with the ability to store power. For this second phase, MASEN will continue to adopt the public-private partnership model tested in phase I and continue to act, at the same time, as shareholder in the project company and off-taker for the power produced (MASEN, 2013; CSP World, 2013).

Furthermore, pulling Ouarzazate I CSP together has been a learning experience for its lenders, which have developed new procedures[14] that can serve to reduce costs for future projects. These cost reductions may, in turn, translate into a reduction in how much public support is necessary for these projects. At the same time, however, there is still further room for improvement, particularly on the time required to close the financing process.

From the experience of Ouarzazate I, we identify three key lessons for replication to similar projects.

1. **When public support is needed, project financing must blend private and public capital in a more balanced[15] way, even though this may present significant challenges.** Despite significant cost reductions, concentrated solar power will most probably remain a capital intensive technology for some time. Moving on from Ouarzazate I to subsequent projects to fulfil the ambitious investment plans for Morocco and for the MENA region will require significant financial resources that the public sector (governments and international finance institutions) may struggle to gather.

   One alternative could be blending concessional and commercial financing. However, this will be challenging as it opens a new range of complexities relating to the many requirements of concessional lenders, which are hard for private investors to digest. For instance, IFIs typically prefer to negotiate their terms individually (as was the case for Ouarzazate I), instead of lending together in a single package (for example through a syndicated loan) to which each of them participates proportionally. Another route could be the provision of guarantees from the public sector (by development banks typically) that would de-risk the project and support privately funded capital investments. We note that, at the moment, neither approach has been tried for concentrated solar power plants in the MENA region for which financing has been secured.[16]

2. **Exports could significantly increase revenues for future projects but still seem a remote possibility.** At the moment, MENA CSP must reduce costs much further in order to be competitive in the European markets. Though some prices for renewable energy in Europe – such as those resulting from feed-in tariffs in Spain and Italy[17] (between 0.27-0.32 EUR/KWh (CSP Today, 2011)) – are above CSP production costs, national grid prices for industrial energy users remain lower than CSP production costs, ranging between 0.13 and 0.11 EUR/KWh (Eurostat, 2013), making CSP imports from MENA uneconomical.

14 IFIs coordinated their efforts during the realization of Ouarzazate I and tried to streamline and harmonize approval, compliance and monitoring requirements for the borrower, aiming at keeping transaction costs as low as possible.

15 In Ouarzazate I CSP the public sector has financed more than 85% of the overall project costs.

16 Both Ouarzazate I CSP and the Egyptian Kom Ombo have been financed with mostly public sector capital from IFIs. Shams I in Abu Dhabi, on the other end, has been financed with commercial money only, supported by a subsidized Power Purchase Agreement provided by the State-owned utility (BNEF, 2013).

17 Spain is a potential importer of CSP power from MENA given its physical proximity and existing connection; Italy is among the few countries that require substantial renewable electricity to fulfill its target under the Renewable Energy Directive (Falconer, Frisari, 2012). However, both countries are currently reviewing these incentivizing policies, hence the figures reported will most probably be subject to change.

If EU prices increased substantially above the unsubsidized[18] cost of CSP in MENA, this would ensure demand from Member States, and raise revenues for future CSP projects. This process would in turn facilitate development of required transmission infrastructure and legal frameworks. If prices remain stable, however, **significant political support from EU member countries will be necessary to secure demand for renewable power generated in MENA and to broker the specific agreements and investments (on transmission infrastructures in particular) that could make exports a reality.**[19] (Falconer, Frisari, 2012).

3. **Competitive tenders to allocate subsidies have the potential to stimulate competition and drive prices down.** The subsidies and competitive tender process seemed to reduce costs in the Ouarzazate I project. Still, it's important to note that these project-specific interventions imply significant transaction costs and lengthy procedures that can be onerous for developers. Alternative policy instruments, like feed-in tariffs, can increase revenue certainty for projects and have already spurred significant installations (as in the case of Spain, for example). However, project developers who attended the CPI-DECC-MASDAR event last January reflected that these alternative policy instruments seem to have been less effective in driving down technology costs. Overall, it is still debatable which policy instruments are best suited to promote CSP while driving down its costs so that the technology as a whole moves toward greater commercial viability.

In conclusion, several elements from the Ouarzazate I financing structure and public support structure bode well for replication and scaling up, and could make its financing and risk allocation model a benchmark for future installations. The project is off to a promising start but efficiency in delivering and managing the plant, actual plant performance, and reliability of the public support, will determine if, over the years, Ouarzazate I will develop into a successful and profitable plant for both its public and private stakeholders.

18 The EU Renewables Directive 2009/28/EC - Article 9, outlaws domestic operational support (such as a feed-in tariff) for electricity that is exported, to avoid double subsidization. However, upfront support (concessional finance, investment grants, etc.) is permitted. In this case, the presence of a heavily subsidized PPA rules out the ability to export power generated by Ouarzazate I (Falconer, Frisari, 2012).

19 The European Commission's assessment of Member State National Renewable Action Plans (NREAP) indicated that the 27 EU Member States expected to exceed the 20 percent renewable energy target for 2020 in the "additional energy efficiency scenario" (20.6 percent) and only slightly miss it in the reference scenario (19 percent) (Falconer, Frisari, 2012).

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