Ouarzazate Solar Complex Phase 1 : Up to 160MW CSP Trough

the World Renewable Energy Forum

Colorado –May 13 to 17, 2012

masen
Moroccan Agency for Solar Energy

Sommaire

1. Brief on the Moroccan Solar Plan and the rationale behind

2. Ouarzazate Solar Complex: Various technologies with R&D Platform

3. Ouarzazate First Phase: The largest CSP Plant in the MENA region

4. Perspectives

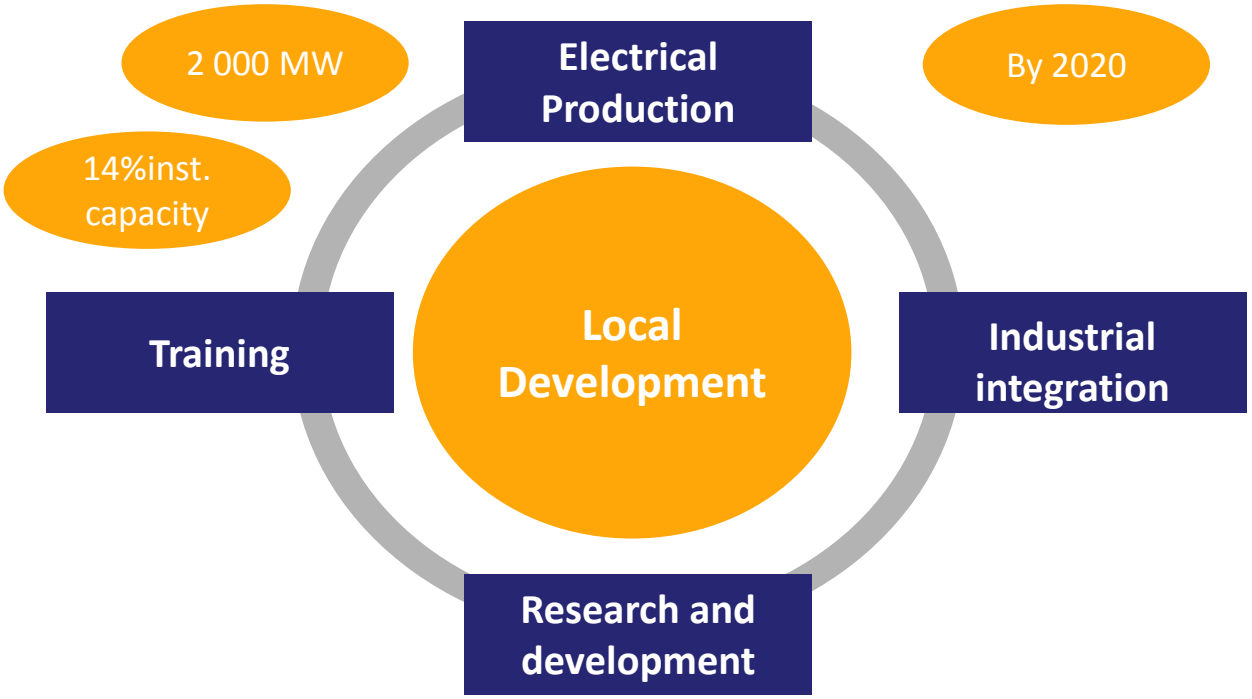
The Moroccan Solar Plan

An integrated Plan held by Masen

2 000 MW by 2020

An ongoing Plan based on a Strong Government Support

Taking advantage of Solar Resources



Well on Track

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Necessary means in place securing high standards' implementation

Government financial support materialized in a Convention signed on October 26, 2010

Each developed project should positively contribute to the achievement of the aforementioned objectives

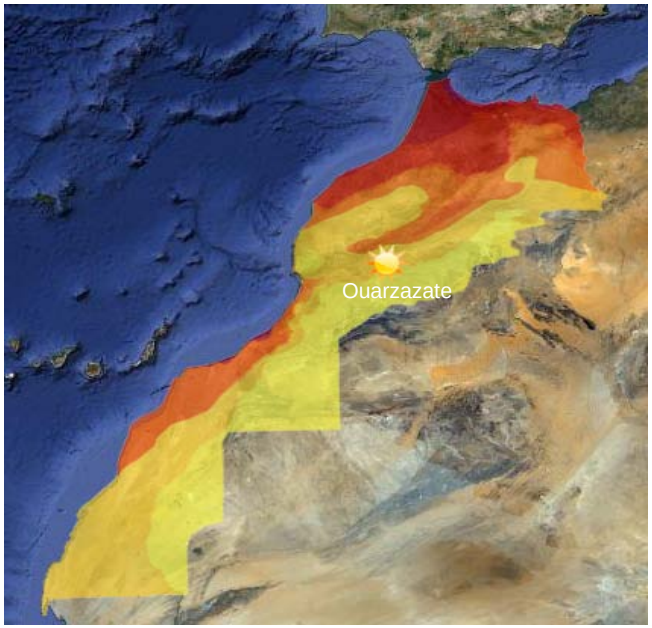
Ouarzazate Solar Complex

Operational priority

500 MW by 2015

Ouarzazate Complex (OZZ) : 500 MW by 2015

Ouarzazate Solar Complex	Operational priority
500MW	2015



Solar Direct normal rradiation

DNI of 6,5 kWh/m²/day

10 km North East Ouarzazate

2 500 hectares

Proximity to Mansour Dahbi dam 440 hm^3

Proximity to transmission lines 225 / 60 KV

Perfect site conditions for Solar Projects:
A result of multiple site studies

Ouarzazate Complex (OZZ) : multi-technologies + R&D

Multiple phases and technologies

Multiple phases	**Multiple technologies**
Phase 1 : between 125 MW et 160 MW	Solar thermal, (CSP)/parabolic trough
Phase 2	CSP (Parabolic Trough, Tower)
Phase …	Photovoltaic

Common infrastructure works for the site

financed through Masen equity (from USD 100 to 130 m)

+

Research &Development Platform dedicated to the Solar sector

Ouarzazate Complex : positive socio-economic impact

Definition of preliminary measures to help the optimization of the socio-economic benefits of the Ouarzazate solar power complex

Objectives

- Encourage the participation of local labor and contribute to the implementation of fair recruitment mechanisms and adapted trainings.
- Improve the existing infrastructure for the local communities and management of the additional traffic and extensions.
- Introduce new activities to encourage job creation in relation with the complex (R&D Platform , scientific tourism, …)

Estimated job creation

Construction : **Thousands**
O&M : **Hundreds**

For a local development promoting an optimized integration

OZZ 1 : CSP Plant

Largest in MENA region

Up to 160 MW by 2014

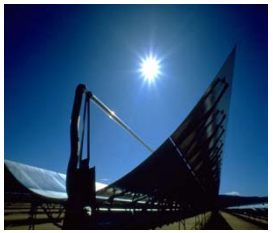
OZZ 1 : For a CSP Plant at Highest Standards

Maximize solar resource use

Address electrical grid operator requirements

Performant & competitive

CSP trough Plant



Deliver on time

Best applicable quality, security and environmental standards

Maximized Economic Value

OZZ 1 : Main Technical Specifications

First tier financial and technical consultants

Technology	CSP Trough
Gross Capacity	125 – 160 MW
Storage	3hours
Cooling	Wet / Dry
Land surface	450 ha maximum

- Adequate answer to predictable needs of ONE by 2014 (to serve peak hours)
- A guarantee for large competition during the RFP process
- A cross criteria between production level , LCOE and subsidy per kWh
- A maximized use of available resources on site (water, land, …)

Taking advantage of available local resource to maximize the value of the produced energy

OZZ 1 : An IPP model in a Tri-Partite Scheme …

Independent Power Producer (IPP), in BOOT

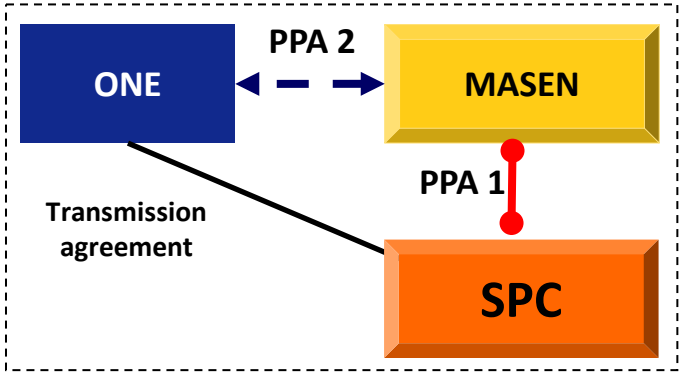
IPP

Design	Financing	Construction	Operation	Maintenance

BOOT

Build	Own	Operate	Transfer

Tri-partite scheme



Power Purchase Agreement (PPA)

- ✓ Take or Pay
- ✓ 25 years of Operation

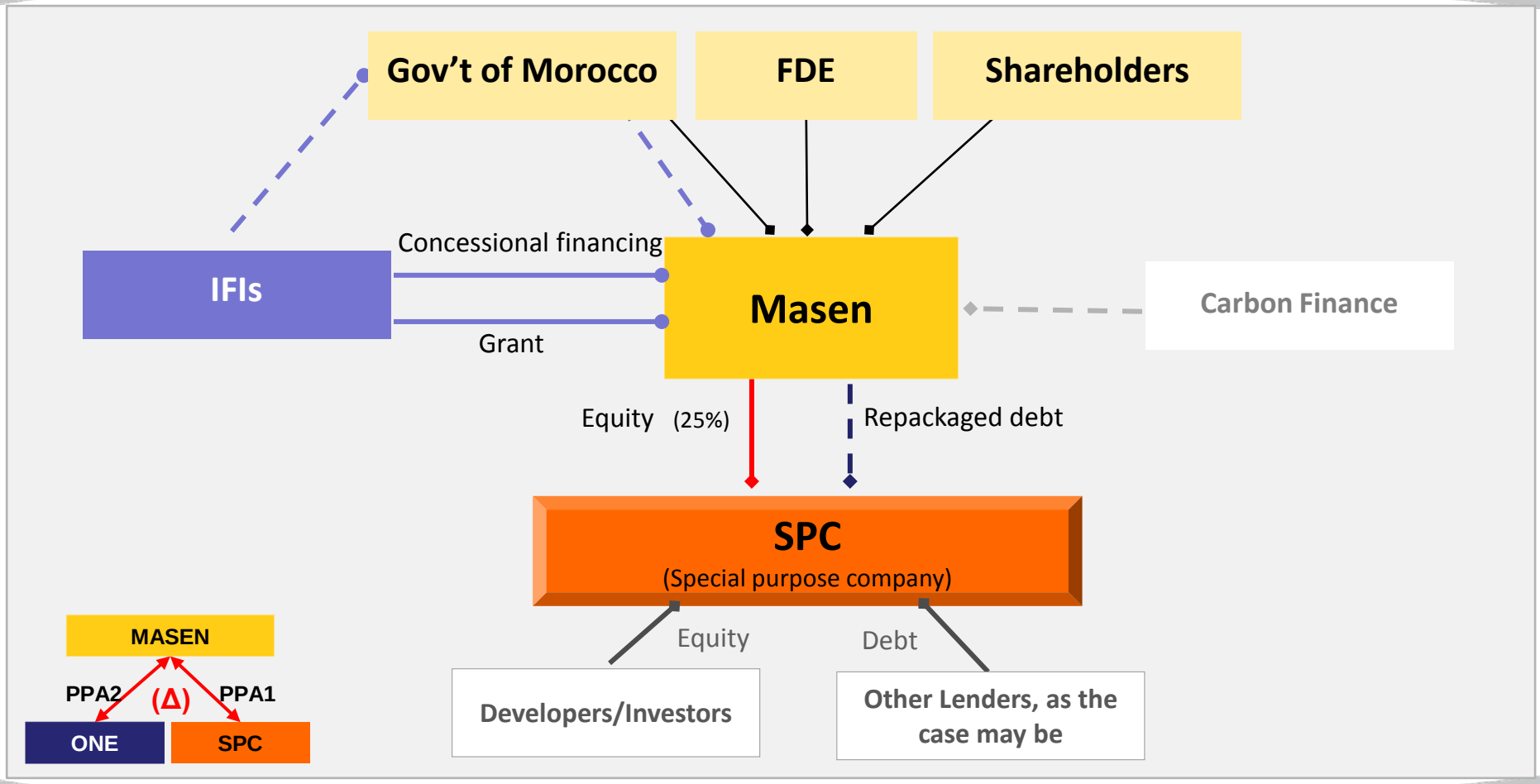
* Special Purpose Company

… towards an optimal risk allocation …

Public	Shared	Private
— Regulation change specific to the project — Change in the technical specification due to government's request — Environmental risk (preexisting) — Inflation / Foreign exchange risk	— Financing — Solar resource risk — Permits and authorizations — Regulation change non specific to the project — Force majeure	— Design / Planning — Technology — Construction (delays, cost overruns, under capacity) — Performance during operation (incl. O&M) — Operation over costs

… the aim being to transfer risks to the most appropriate actor to handle them

OZZ 1 : Financing structure



OZZ 1 : Estimated project cost

Assumptions

Technology	CSP Trough
Capacity (Trough)	160 MW (Gross)
Storage	3 hours
Site surface	450 Ha (max)
Cooling	Wet / Dry
Construction period	3 years
PPA duration	25 years

Output

CAPEX (split over 3 years) **USD 931m**

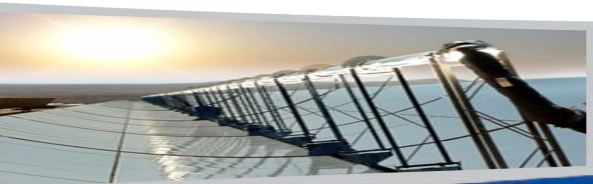
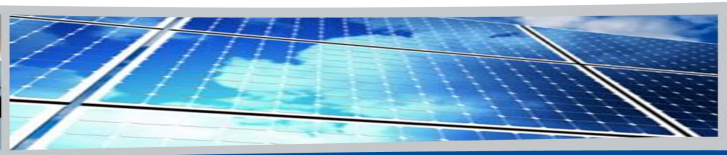
Per MW (gross) *USD 5,5m*

2012 e	2013 e	2014 e
204	242	485
22%	26%	52%

CAPEX split	USD m	%
Solar system*	578	60%
Power block	196	20%
Storage	123	15%
Site improvements	33	5%

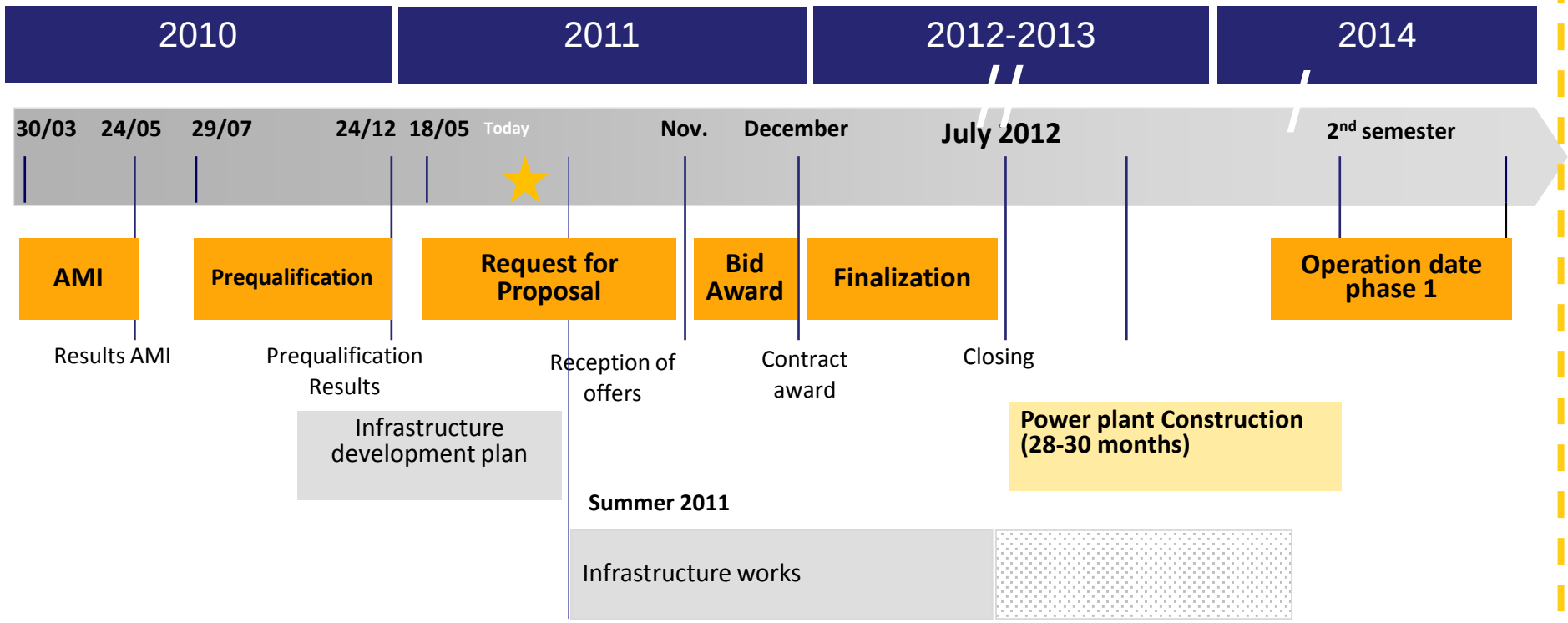
*** includes solar field and HTF system*

OZZ 1 next steps


Contemplated Project schedule

Project schedule



Perspectives

Short, medium and long term

For a Sustainable Replicability

2 key objectives

Environmental

Avoid CO2 emissions

Energy

Bring down solar energy cost to parity

3 levels

Immediately

Increased MDBs contribution through more and well-adapted instruments

+ MDBs contribution
+ Dedicated countries contribution in line with their double vision

Short and Medium Term

Electricity export in order to match environmental requirements and a viable economic balance

In parallel with Countries discussions, pilot project can pave the way (ex. Masen – Soitec)

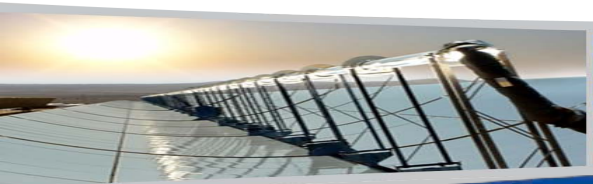
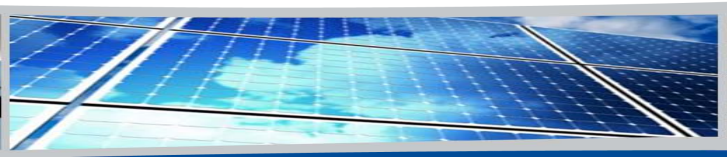
Long Term

Mismatching between where solar resources are and where high consumption level is

Implementation of instruments and mechanisms dematerializing energy trade WW

We welcome exchanging experiences in the solar energy development:

- ✓ Multiple IFIs cooperation
- ✓ Risk allocation and sharing
- ✓ Socio – Economic integration
- ✓ Implementation and Execution
- ✓ …


Thank you for your attention

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