Two Times 50MWe in Southern Spain

- The AndaSol projects -

(Province Granada, Spain)

Solar 2004 - Portland / Oregon

Presented by Paul Nava / FLAGSOL

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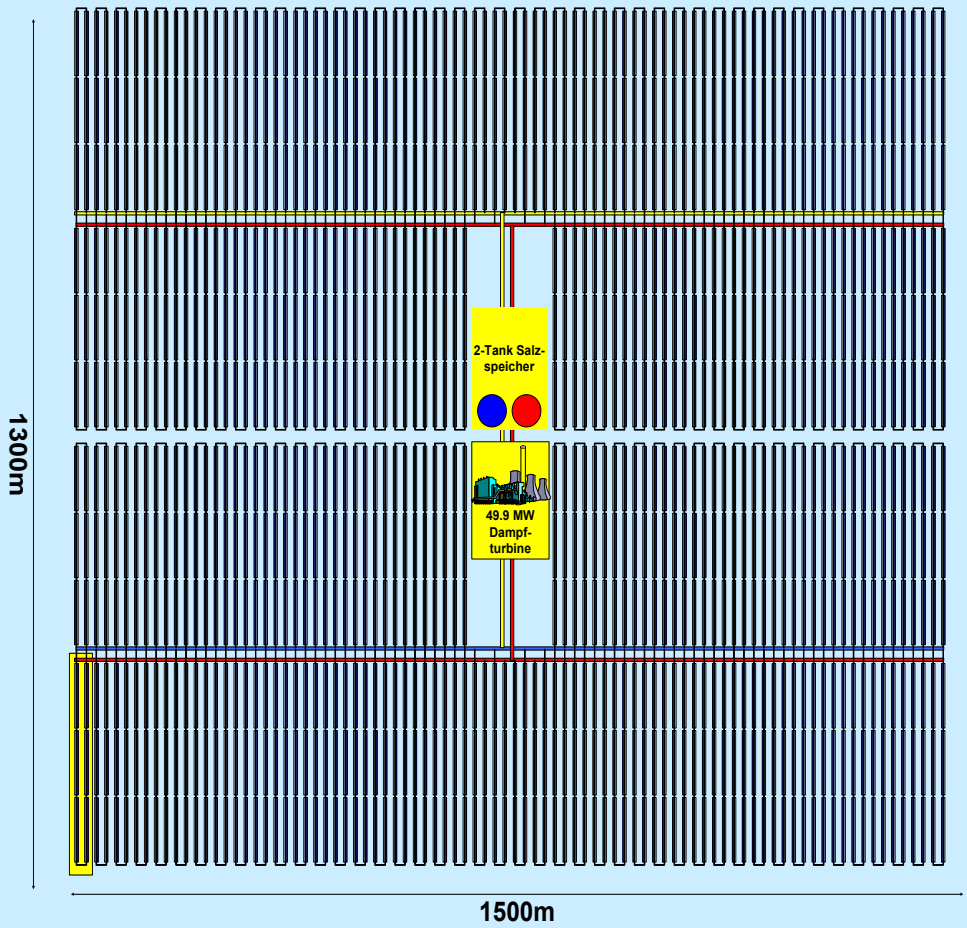
Projects in Spain: AndaSol I & II

- **Technology:** „Solar-only“ Parabolic Trough Power Plant
- **Installed Capacity:** 2 x 49,9 MW_{el}
- **Storage:** Two-tank molten salt storage for 7.7 full load hours
- **Project Site:** Plateau of Guadix, Province Granada
- **Net electricity production:** 2 x 179.1 GWh/a
- **EPC price:** 2 x 260 Million €

Functional diagram: AndaSol I & II



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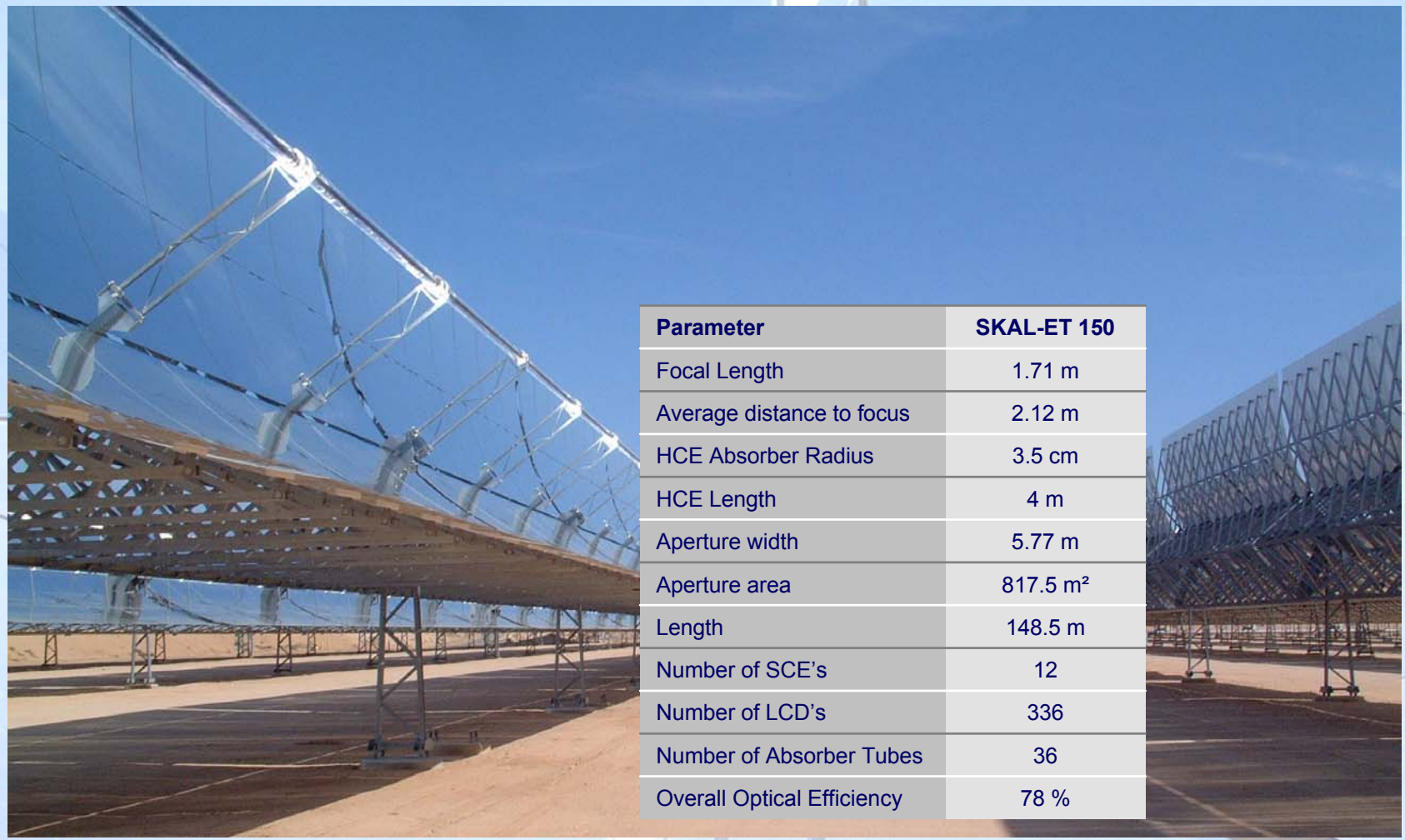
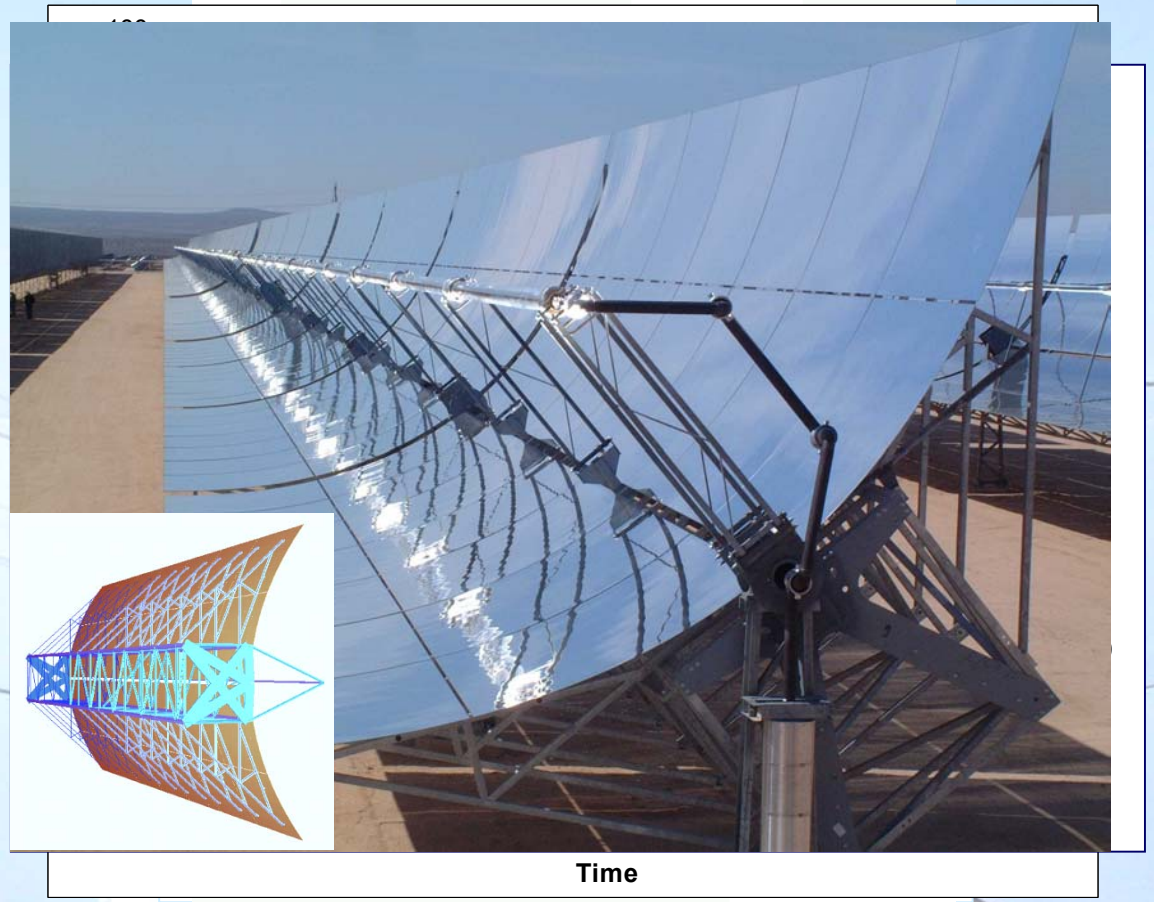
Parabolic Trough Collector „SKAL-ET“



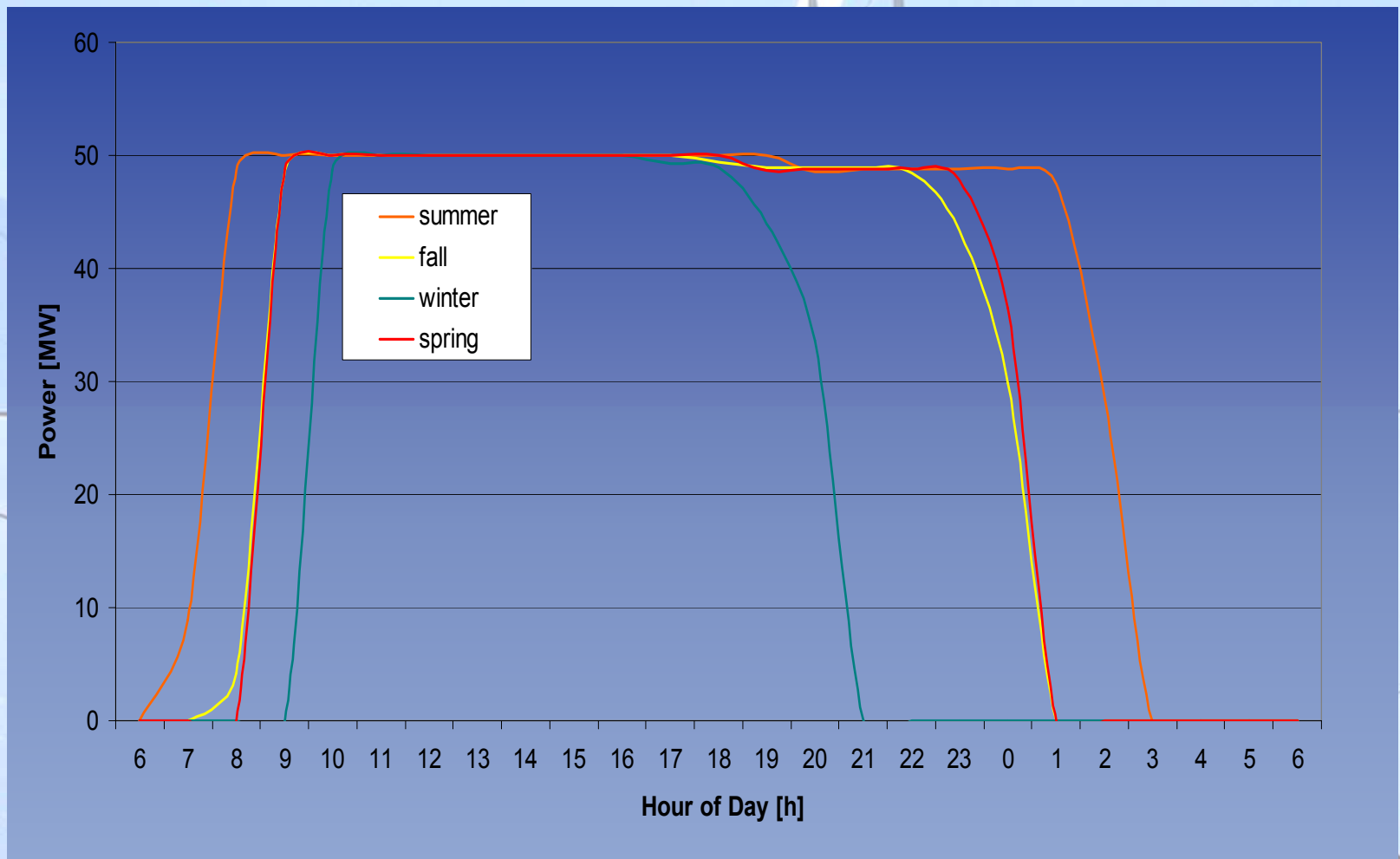
Parameter	SKAL-ET 150
Focal Length	1.71 m
Average distance to focus	2.12 m
HCE Absorber Radius	3.5 cm
HCE Length	4 m
Aperture width	5.77 m
Aperture area	817.5 m²
Length	148.5 m
Number of SCE’s	12
Number of LCD’s	336
Number of Absorber Tubes	36
Overall Optical Efficiency	78 %

„SKAL-ET“ Demo Loop in SEGS V

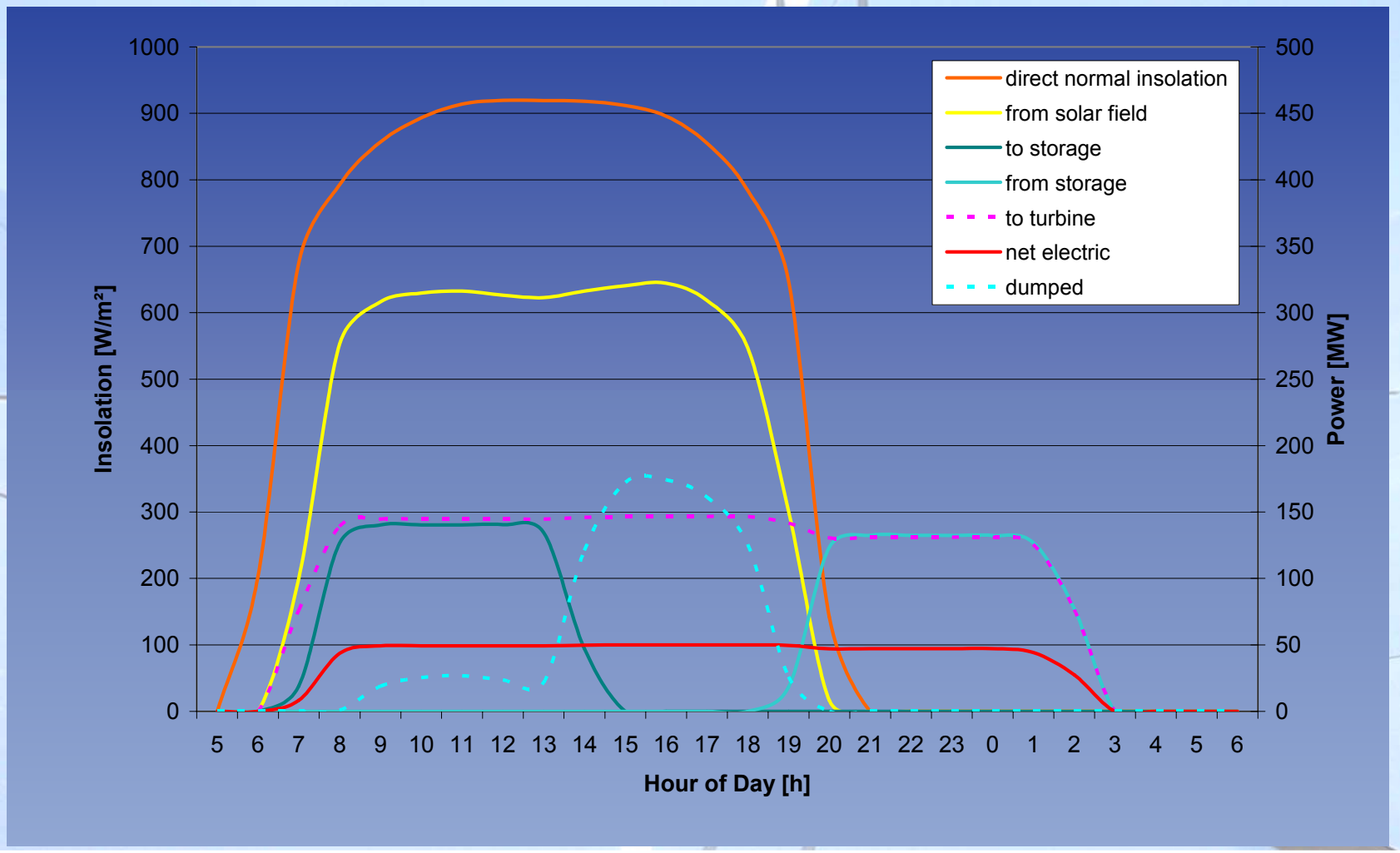
- **Demo Loop in operation Kramer Junction since April 2003**
  - 800 m LS3 replaced by SKAL-ET collectors
  - 5 x 100 m and 2 x 150 m collectors
  - Torque box design
  - Hydraulic drive system
  - SOLEL and SCHOTT Receivers under test
  - Local controller with Ethernet communication
  - Different sensor types under investigation



Seasonal Variation



Production Curve during a Typical Summer Day



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AndaSol Project Location

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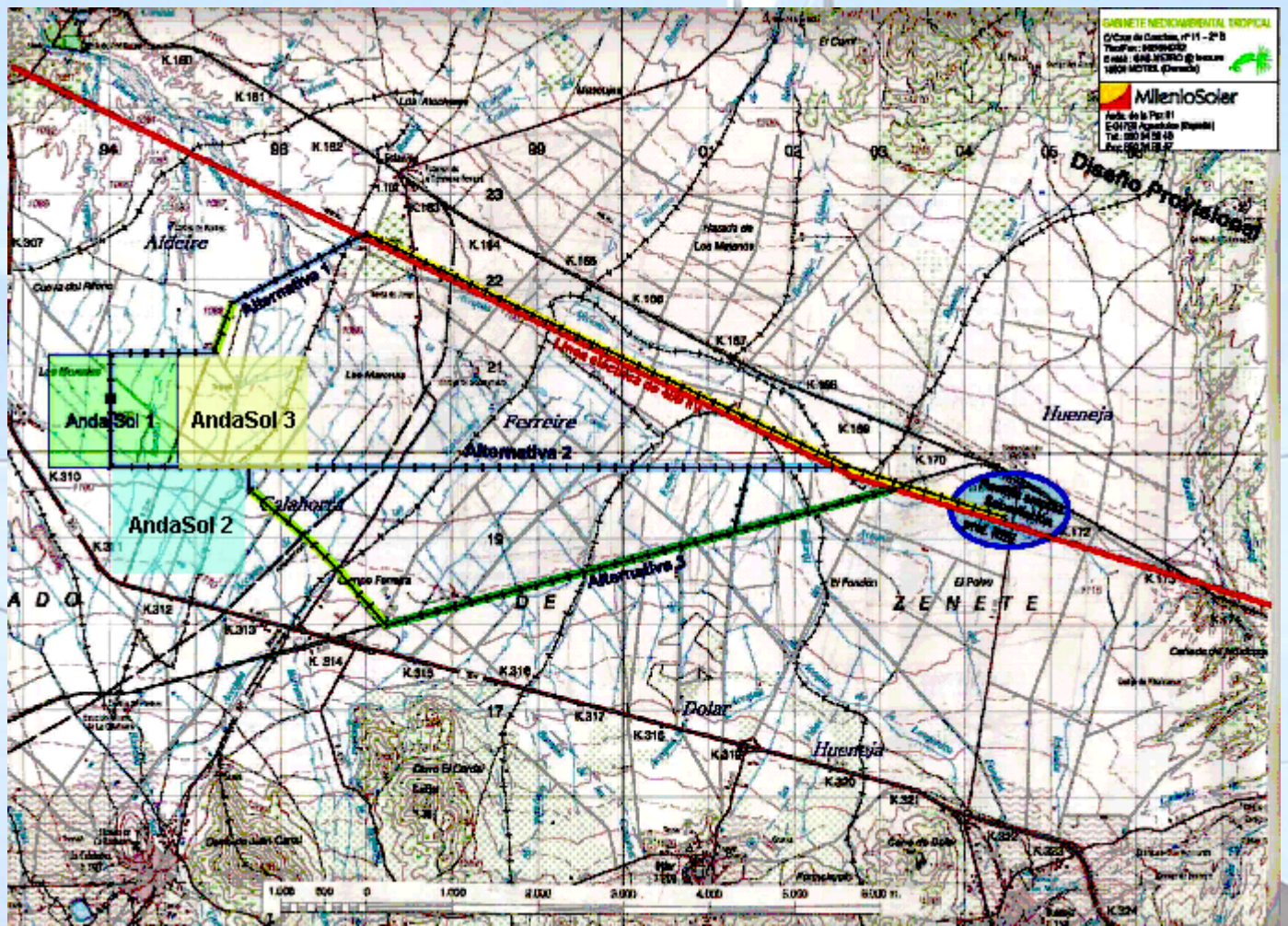
Project site of the AndaSol Projects



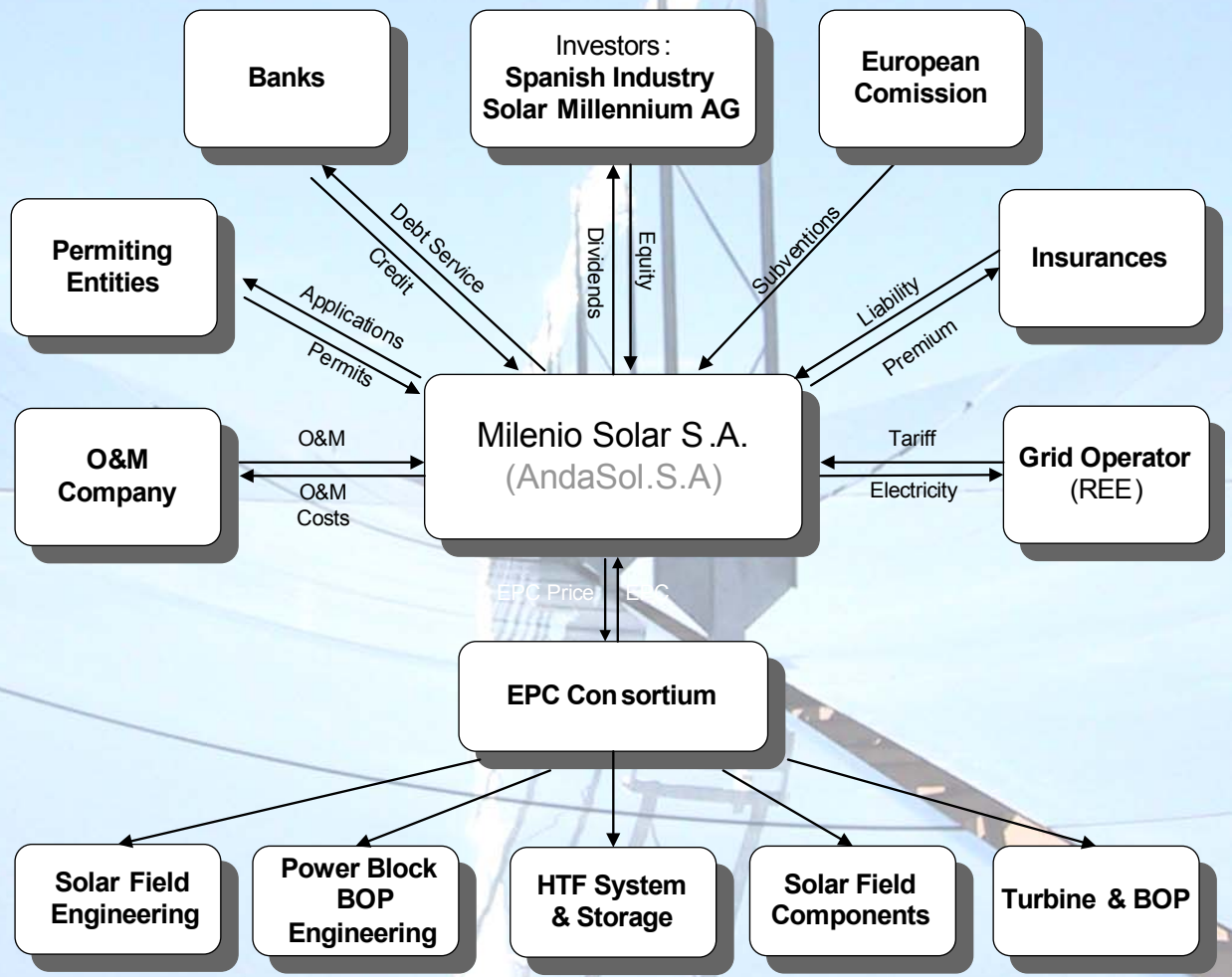
AndaSol I & II: Status of Project (1)

- **Meteo-Data:** Measurement at three potential site since three years, Guadix: 2.200 kWh/m²a
- **Site Selection:** Completed for two 50 MW plants
- **Configuration and Economic Analysis:** Completed for two plant configurations
- **Project Companies:** Milenio Solar S.A. + AndaSol-2 S.A.
- **Pot. Industry Partners:** Spanish construction companies, Spanish engineering companies, Absorber tube manufacturer, Mirror Supplier
- **Subvention:** 5 Mio. € Grant from European Commission

AndaSol I & II: Status of Project (2)

- **Permitting**
  - all applications have been submitted
  - problem: “first of it‘s kind“ project
- **Land securement**
  - 80 % of land secured
  - problem: hundreds of small land lots / time consuming process
  - Expropriation process initiated
- **Financing**
  - comprehensive risk analysis completed
  - loan negotiations with bank ongoing

Project Implementation



REAL DECRETO 436/2004, del 12 de marzo de 2004
- The PPA -

For selling its production or excess, the owners of the installations to which the current Real Decreto may be applied, must choose one of the following to options:

- Sell the electricity to the power distribution company. In this case, the sales price of the electricity will be expressed in the form of the regulated TARIFF, constant for all periods of programming, expressed in Euro cents per kilowatt hour.

  *The TARIFF is 3 * 7.2072 = 21,6216 EuroCent/kWh. It is allowed to burn 12% gas(*) as long as no electricity is generated. After 25 years the installation will receive 80% of that value.*
- Sell the electricity freely in the market, through the offering framework managed by the market operator, through the framework of bilateral contracting, longterm or in a combination of all of thesse. In this case, the sales price will be the price obtained in the organized market or the price freely negotiated by the owner or representative of the installation, complemented by an INCENTIVE and, in its case, by a “PRIMA”, both expressed in Euro cents per kilowatt hour.

  *The PRIMA is 2.5 * 7.2072 = 18,018 EuroCents/kWh plus an INCENTIVE of 0.1 * 7.2072 = 0,72072 EuroCent/kWh. It is allowed to burn 15% gas(*) without time restriction.*

(*) Burning gas is only allowed to maintain the temperature of a storage

EPC Time Schedule ANDASOL 1

ID	Task Name	2004		2005				2006				2007
		Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
1	Pre-ENGINEERING											
2	FINANCIAL CLOSURE											
3	ENGINEERING											
4	PROCUREMENT											
5	MANUFACTURING AND SUPPLYING											
6	CONSTRUCTION											
7	COMMISSIONING											
8	START UP AND TESTS											
9	PROVISSIONAL ACCEPTANCE											

... and the Valley of the Marquesado in Guadix will look similar to this in the year 2006 ...

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