

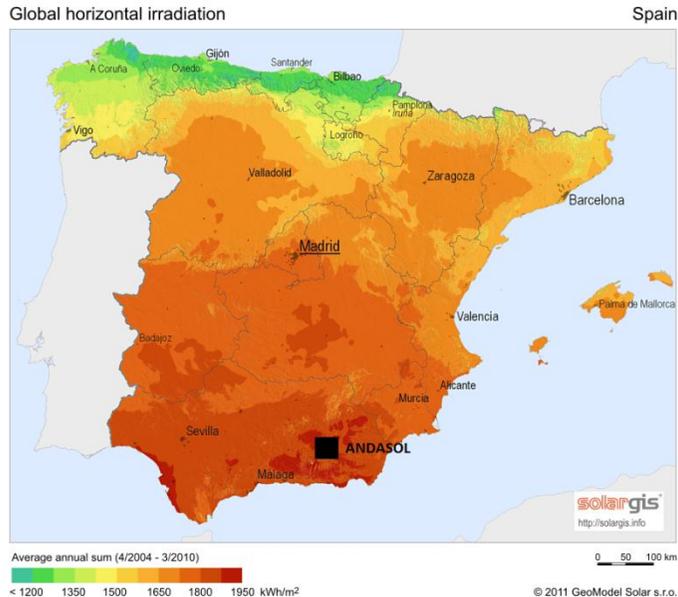
MEGAPROJECT Case Study

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Basic Project Information

Project Title	CSP Andasol Solar Power Station (Concentrating Solar Power CSP)
Location	Andalusia, in the southern of Spain. The site of the facility is on the plateau Guadix in the province of Granada. Its name is a combination of Andalusia and Sol (Sun in Spanish). Andasol is placed at 1100 m of altitude. This ground level and the semi-arid climate allows to achieving one of the best solar direct irradiance resources in Spain. The site has exceptionally high annual direct of 2200 kWh/m ² per year.



Basic Project Information

Purpose	Deploy two CSP plant. Each plant has a gross electricity output of 50 MWe and produces around 175 GWh per year. Each plant saves some 150.000 tonnes of CO2 per year when compared with a modern hard coal-fired power plant. The plants together provide electricity for approximately 300.000 people in southern Spain. They also contribute to Spain's peak electricity demand during summer caused by the energy consumption of air-conditioning units
Scope	Design , procurement, Realization and connection to the electric grid of two concentrated solar power plants. The CSP plants consist of three main parts: solar field with parabolic trough, storage tanks and power generation.
Total Project Value	300 M€ each one (600 M€ total)
Project Status	Operations
Contractual Framework	EPC contract Lump Sum Turn Key



MEGAPROJECT Case Study

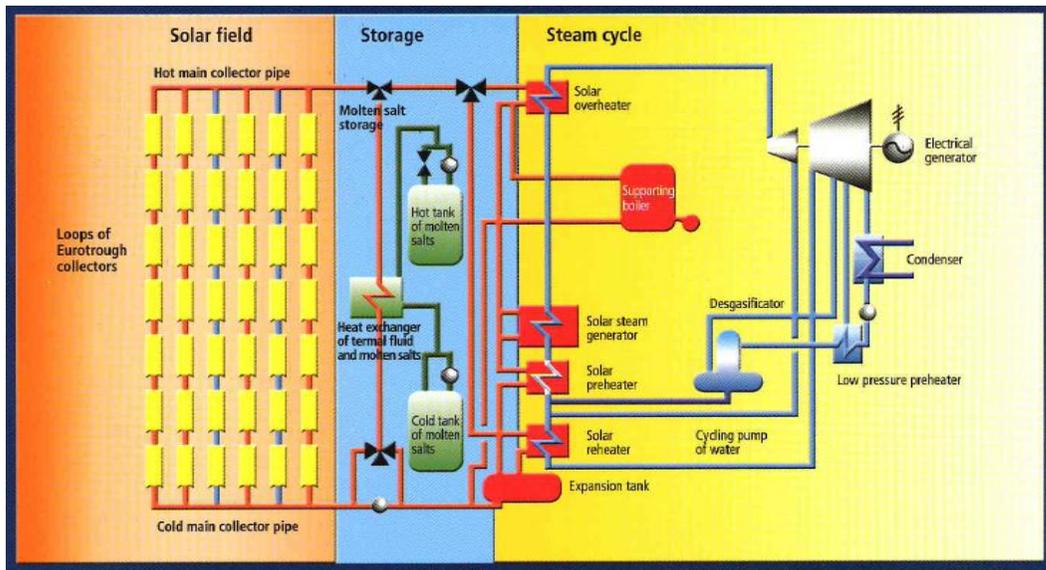
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Basic Project Information – Relevant Physical Dimensions

In each plant there are more than 600 parabolic trough collectors, distributed over a total surface area of about two square kilometres, each of which measures 150 metres in length and 5,7 metres in width. These mirrors have a total surface area in excess of 500.000 square metres.

The full thermal reservoir of heat allows to run the turbine for about 7,5 hours at full-load after sunset. (DLR, 2012). According to (EstelaSolar, 2012) each solar field with its parabolic trough has an average efficiency during the time in transforming the solar radiation to steam of 43%. According to (EIB, 2007) the plants have been designed for auxiliary firing with natural gas, which can be used as a back-up and will account for up to 15% of the electricity generated, as permitted under the applicable Spanish legislation. The Andasol plants share together the natural gas and water infrastructure. The Andasol plants together employ about 80 people as clerks, maintenance personnel, thermal central technicians and operators



MEGAPROJECT Internal Stakeholder Identification

(Stakeholders with a direct legally sanctioned relationship with the project)

	Stakeholder Category	Company	Comments
Internal - Demand Side	Client	Andasol-1 Central Termosolar Uno SA and Andasol-2 Central Termosolar Dos SA.	These Spanish companies created specifically to own and manage the plants. (Power Technology, 2012).
	Financiers	European Investment Bank (EIB), European Commission, BNP Paribas, Sabadell Bank Group, WestLB and Dexia.	These four banks have shared the risk of this new energy project (BNEF, 2006). The European Investment Bank (EIB) granted 60 million euro loan for each plant (EIB, 2006). Andasol 1 has been financed by the European Commission with a grant of 5 million euro. (EC, 2007). The plants received the 80% of their financing for the realization through borrowed capital by banks. (Solar Millennium, 2008/2009).
	Sponsors	Solar Millennium Group.	Solar Millennium is a German company in the sector of solar thermal power plants. The group covers all business sectors along the value chain from project development and financing to engineering and EPC contract of the plants. It also holds stakes in the power plants companies. (Solar Millennium, 2012). In the year 2009/2010 the total revenues of the group was 73,2 million euro. In 2010 Solar Millennium Group had about 300 employees. (Solar Millennium, 2009/2010).
		ACS Cobra, a subsidiary of ACS Group	Solar Millennium, that was trying to develop the project, didn't have the financial capacity to realize the plants and technical credibility with the Spanish authorities to create the proper legal framework. (ACS Cobra, 2010). So in 2003 Solar Millennium, agreeing by contract, convinced ACS Cobra to invest and play a crucial role in the construction process and the realization of the two power plants. (CESI, 2005). ACS Cobra is a subsidiary of the ACS group. Actividades de Construcción y Servicios, S.A. (ACS) is a Spanish company dedicated to civil and engineering construction, all types services and telecommunications. The group has a global presence, including developed countries in America and Europe and underdeveloped countries like India, Brazil and China.. Listed on the stock exchange of Madrid, the company's shares form part of the IBEX 35 stock market index. The group employs 138.500 people. The significant shareholders of ACS Group are: Corporacion Financiera Alba SA 18,3%, Corporacion Financiera Alcor SA 13,9%, Inversiones Vesan SA 12,5%, Iberostar Hoteles y Apartamentos SL 5,6%, Southeastern Asset Management 6,47%. The remaining of the shares, about 43%, is floating. There is not the presence of the Spanish State between the shareholders.
	Client's Customers	Endesa.	Endesa purchases electricity from Andasol 1 and 2 power plants (Solar Millennium, 2008). Endesa is the Spain's largest utility. In Spain it generates, transports, distributes and supplies electricity, in nine autonomous regions, to 11,8 million customers. Since the first quarter of 2009 Endesa is part of the Enel group. (Endesa, 2012). With the electricity produced in this plant Endesa supplies approximately 300.000 people in southern Spain (Power Technology, 2012).

MEGAPROJECT Internal Stakeholder Identification

(Stakeholders with a direct legally sanctioned relationship with the project)

	Stakeholder Category	Company	Comments
Internal - Demand Side	Client's Owners	100% by ACS Cobra	The companies of Andasol 1 e 2 at the beginning was owned by ACS Cobra Group (75%) and Solar Millennium (25%). (Power Technology, 2012). In July 2009, immediately after the realization of the two plants, all the stakes in the power plants companies of Solar Millennium were sold to ACS Cobra. (Solar Millennium, 2008/2009).
	Principal Contractor	ACS Cobra and Sener Group	ACS Cobra and Sener Group set up two joint-ventures with 80% of stake of ACS Cobra and 20% of Sener. The joint-ventures set up were UTE CT Andasol-1 and UTE CT Andasol-2. Sener Group, a Spanish company, develops engineering projects, production and construction activities and systems integration. (Sener, 2012). Sener developed the basic engineering (the FEED) and then the detailed engineering for the plants. For the realization of the plants the EPC contracts were Lump Sum Turn Key. (Sener, 2009). These companies, UTE CT Andasol 1 and 2, were set up only to come to an end the realization of the plants.
	First Tier Contractors	Flagsol, a technology subsidiary of Solar Millennium.	It provided the engineering, planning, basic and detailed design, construction supervision and the control system for the solar field of the two plants. (Solar Millennium, 2008). Flagsol for the design of the solar field, has ever had any previous experience in the design of this kind of plants, being the first CSP plant realized in Europe. (Power Technology, 2012).
		Sener	It provided the engineering, basic and detailed design for the conventional power generation section (steam turbine, electrical generator, condenser, boiler, feed-water heaters) (Solar Millennium, 2008) and the molten salt storage system (Solar thermal group , 2010) of the two power plants. Being of course the plants provided of a conventional steam cycle Sener has had previous experience in the design of this part (Sener, 2012). Sener has ever had any previous experience in the design of molten salt storage system for CSP plant, being the plant the first realized with this kind of system and technology (Power Technology, 2012).
ACS Cobra		The Spanish company, being a construction company, was primarily responsible for the construction work (civil and mechanical) in the two construction sites. (Solar Millennium, 2008). Being of course the plants provided of a conventional steam cycle ACS Cobra has had previous experience in the realization of this part (Grupo ACS, 2012). ACS Cobra has ever had any previous experience in the realization of the other two parts that compose the plant, solar field and storage system, being the first CSP plant in Europe and the first realized with the molten salt storage system (Power Technology, 2012).	

MEGAPROJECT Internal Stakeholder Identification

(Stakeholders with a direct legally sanctioned relationship with the project)

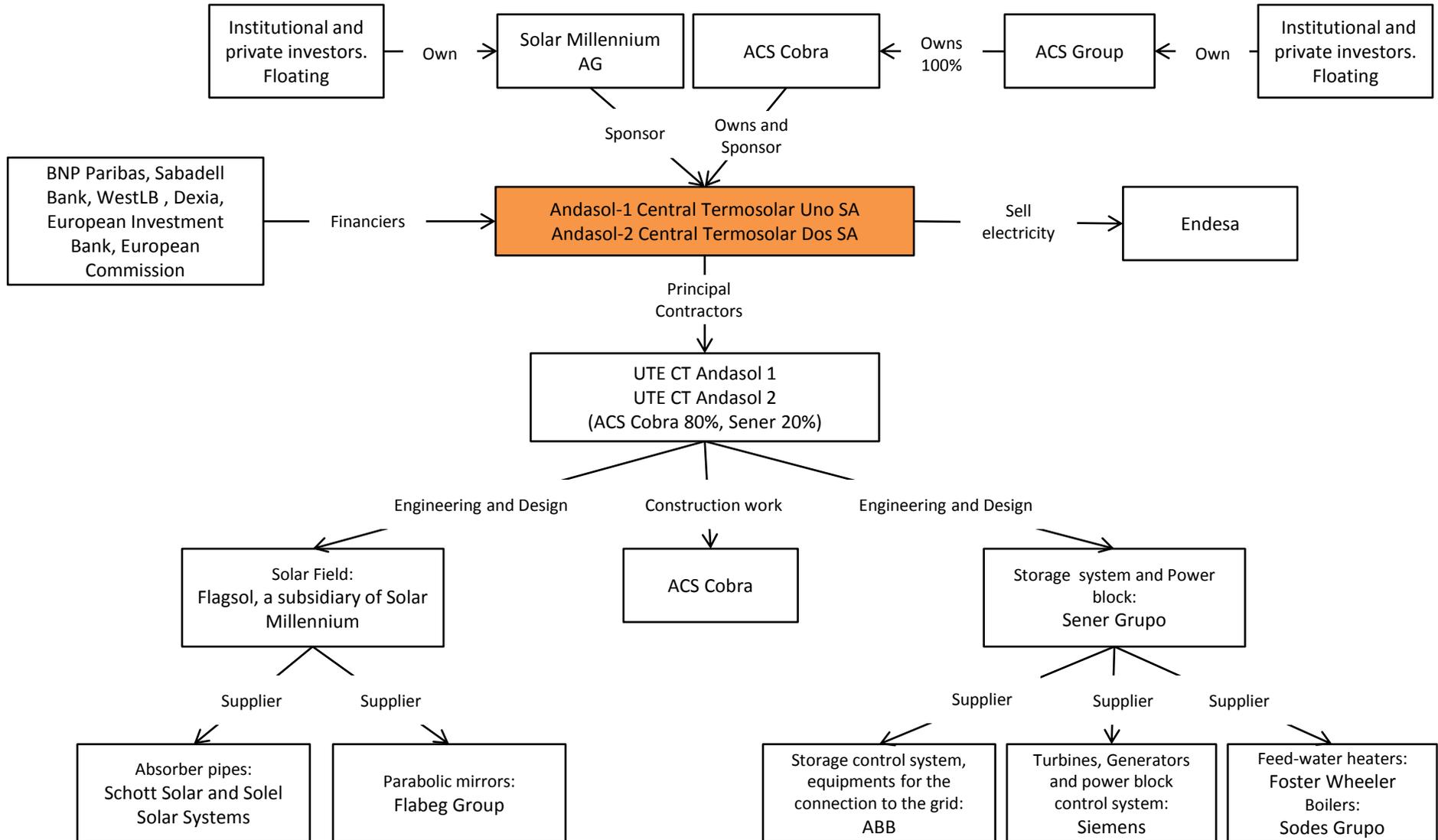
	Stakeholder Category	Company	Comments
	Second Tier Consultants	Schott Solar and Solel Solar Systems	They manufactured and supplied the absorption pipes for the two plants. (Power Info, 2012).
		Flabeg Group	It manufactured and supplied the parabolic mirrors for the two plants. (Power Info, 2012).
		ABB	It provided instrumentation and control systems for thermal storage tanks. It provided also instrumentation and electrical equipments (transformers, switchgear, circuit breakers) for the connection to the high voltage grid of the two power plants. (ABB, 2009).
		Siemens	It manufactured, at the manufacturing site of Finspang in Sweden, and supplied the turbines SST-700 and the generators SGen-100A-2P (Siemens, 2011). It provided also the instrumentation and control systems for the power block (DLR, 2009).
		Sodes Grupo	It manufactured the boilers of the steam cycle of the plants (Sodes, 2012).
		Foster Wheeler	It provided the feed-water heaters of the plants. These heaters are used to heat the feed-water using turbine steam extractions to increase the thermal cycle efficiency and to help the Steam Generation System. (Foster Wheeler, 2012).

MEGAPROJECT External Stakeholder Identification

(Stakeholders with a direct interest in the project but with no legal contract)

		Stakeholder Category	Name	Comments
External	Public	Regulatory Agencies	Red Eléctrica de Espana (REE).	Red Eléctrica is the manager of the transmission grid of the Spanish electricity system. It ensures the continuity of the electricity supply, maintaining the constant balance between generation and consumption in Spain. (REE, 2012).
		Local Government	Province of Granada	It issued the declaration of public utility for Andasol 1 (Vlex, 2006) and Andasol 2 (BOE, 2006).
		National Government	Ministry of Industry, Ministry of the Environment.	The Ministry of Industry issued the authorization to realize the Andasol 1 (Vlex, 2006) and Andasol 2 (BOE, 2006). The Ministry of the Environment issued the environmental impact assessment for Andasol 1 (Junta de Andalucia, 2005) and Andasol 2 (BOE, 2006).
	Private	Local residents	People resident near the plants.	No protests have been reported, being the plants environmentally friendly. The Andasol plants together employ about 80 people as clerks, maintenance personnel, thermal central technicians and operators. (Grupo ACS, 2012).
		Local Landowners	Farmers, represented by their association UPA-Andalucia (Union of small farmers).	Procedure of compulsory expropriation for public utility. There have been protests, demonstrations and strikes. (UPA, 2008).
		Environ-mentalists	Environmental groups.	No protests have been reported, being the plants environmentally friendly. Greenpeace praised the coming into operation of Andasol defining the electricity produced "climate-friendly" (Greenpeace, 2012).

MEGAPROJECT Stakeholder Relationship Maps



MEGAPROJECT External Stakeholder Attitude Analysis

External Stakeholder	External Stakeholder's Attitude to this Project	External Stakeholder's Influence on project	Impact of Project on External Stakeholder	Phase of Project of Greatest Interest (initiation, planning, construction, operation, dismantling)
Spanish government	It was favourable at the realization of the firsts CSP plants in Europe in its territory.	The various ministries issued all the authorization of competence. The Spanish government with the real decrees 2002 and 2004 gave a regulatory framework regulating the usage of this sector and with the incentives allowed the realization of the plants. (Real Decreto, 2004) and (Real Decreto, 2002).		Initiation and Planning
Local landowners	The CSP plants need large land around the power facility to put the solar collectors. The landowners of course didn't want to lose their cultivated lands (UPA, 2008) and in addition denounced the taking away of the water, used in the plants, necessary for irrigation of the land (Ideal, 2006).	There was negotiation with Andasol and demonstrations to obtain a satisfactory compensation for their lost lands. (UPA, 2008).	They were expropriated of their lands to realize the plants and share the use of the water with the plants. (UPA, 2008).	Initiation and Planning

MEGAPROJECT Project Management

Project Organisation

Client Project Team Size & Structure	
Contractor Project Team Size and Structure	
Sub-Contractor Project Team Involvement	

Project Tools and Techniques

Please ✓ if present, x if absent, leave blank if unknown

Life-Cycle Costing Approaches

Project Management Software

Lessons Learnt Transfers

Stakeholder Involvement

Relationship Management Tools

Team Building Tools

Building Information Modelling (BIM)

Project Knowledge Management Tools

Competency framework

Other Tools and Techniques or More Information
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Project Processes

Risk Management Processes	Present (<i>describe below</i>) <input type="checkbox"/> Not Present <input type="checkbox"/> No Information <input type="checkbox"/>
HR Management Processes	Present (<i>describe below</i>) <input type="checkbox"/> Not Present <input type="checkbox"/> No Information <input type="checkbox"/>
Procurement Management Processes	Present (<i>describe below</i>) <input type="checkbox"/> Not Present <input type="checkbox"/> No Information <input type="checkbox"/>
Integration Management Processes	Present (<i>describe below</i>) <input type="checkbox"/> Not Present <input type="checkbox"/> No Information <input type="checkbox"/>
Scope Management Processes	Present (<i>describe below</i>) <input type="checkbox"/> Not Present <input type="checkbox"/> No Information <input type="checkbox"/>
Time Management Processes	Present (<i>describe below</i>) <input type="checkbox"/> Not Present <input type="checkbox"/> No Information <input type="checkbox"/>
Cost Management Processes	Present (<i>describe below</i>) <input type="checkbox"/> Not Present <input type="checkbox"/> No Information <input type="checkbox"/>
Quality management Processes	Present (<i>describe below</i>) <input type="checkbox"/> Not Present <input type="checkbox"/> No Information <input type="checkbox"/>
Communications Management Processes	Present (<i>describe below</i>) <input type="checkbox"/> Not Present <input type="checkbox"/> No Information <input type="checkbox"/>

MEGAPROJECT Project Performance

	Original Targets and changes to targets	Actual Achievements Against Targets									
<p>Performance relating to time</p>	<p>Into 2004 Milenio Solar had scheduled the construction start of the first plant Andasol 1 at the beginning of 2005 so immediately after the take-over of stakes of the two power plants companies by ACS Cobra. So the coming on line of this plant should have to be in the first quarter of 2007. The work of the second plant should have to start some month after the start construction of Andasol 1. (Warmdebate, 2004). The constrain of the Royal Decree of 2004, which limits the use of the natural gas, has forced designers to modify the project and to utilize a thermal energy storage system. This caused a delay of the realization start. When ACS Cobra purchased at the beginning of 2005 most of the shares of the two power plants companies the work didn't start immediately but it triggered a modification of the whole management of the contract. The project has so suffered a significant delay due to permit this process. (EC, 2006). There was a delay of about one year and half.</p> <p>The next year in May 2006 and December 2006, when there were the financial closures of the plants, it has been possible to know the date of the realization end of the two plants. According to the work scheduling Andasol 1 had to be connected to the grid and to come on line at the end of 2008 while Andasol 2 had to be connected to the grid and come on line in mid 2009. As explain before this two milestone was respected and Andasol 1 (Photofileit, 2012) and Andasol 2 (Solar Millennium, 2007/2008) came on line on schedule. So the realization work of the two plants didn't report any delay.</p>	<table border="1"> <thead> <tr> <th data-bbox="1411 354 1578 436">Years Of estimation</th> <th data-bbox="1578 354 1862 436">Connection to the grid</th> <th data-bbox="1862 354 2011 436">Respected</th> </tr> </thead> <tbody> <tr> <td data-bbox="1411 436 1578 582">2004</td> <td data-bbox="1578 436 1862 582">Andasol 1: 1°quarter 2007 Andasol 2: 3°quarter 2007</td> <td data-bbox="1862 436 2011 582">No</td> </tr> <tr> <td data-bbox="1411 582 1578 735">2006</td> <td data-bbox="1578 582 1862 735">Andasol 1: 4° quarter 2008 Andasol 2: 2°quarter 2009</td> <td data-bbox="1862 582 2011 735">YEs</td> </tr> </tbody> </table>	Years Of estimation	Connection to the grid	Respected	2004	Andasol 1: 1°quarter 2007 Andasol 2: 3°quarter 2007	No	2006	Andasol 1: 4° quarter 2008 Andasol 2: 2°quarter 2009	YEs
Years Of estimation	Connection to the grid	Respected									
2004	Andasol 1: 1°quarter 2007 Andasol 2: 3°quarter 2007	No									
2006	Andasol 1: 4° quarter 2008 Andasol 2: 2°quarter 2009	YEs									
<p>Performance relating to cost</p>	<p>It hasn't been possible reported any variation of the cost during the development of the mega project because the stakeholders involved didn't release any information about the cost estimated before the financial closure. However it has been possible to compare the cost of each CSP plant of Andasol with the other CSP plant realized in the same period in Spain. The investment of each Andasol plant has been in line with the other plants and any relevant cost difference has been reported.</p>										
<p>Performance related to achieving specification</p>	<p>The Scope respected</p>										

Aspects of Performance Concerned with Doing the Right Project

Stakeholder or Stakeholder Grouping	Original Aims of Project Involvement and Changes to these Aims	Achievement of these Aims
ACS Group	ACS decided to enter into the new market of the concentrated solar thermal power to positioning itself as one of the main players in all this sectors and to increase the revenues and profit.	ACS has now completed the first set of plants with total capacity of 350 MW (EstelaSolar, 2012). ACS Group is a worldwide leader in the development of thermal solar plants with thermal storage devices (Grupo ACS, 2012).
Solar Millennium	To realize the first CSP plants with its parabolic trough technology. To hold its position between the leaders of this sector investing in research and development (cost reduction and greater efficiency of the solar field) for the next plants.	It realized other CSP plants with the parabolic trough technology but in 2011 because of the crisis of this sector and the Chinese firms concurrence it went bankrupt. (DailyE, 2011).
Sener Group	Sener decided to enter into the new market of the concentrated solar power plants to learn the know-how and to positioning itself as one of the main EPC players in this sector.	The fulfilling experience with Andasol's plants gave Sener the opportunity to undertake other similar projects, winning 15 contracts in only six years. (Sener, 2012).

MEGAPROJECT Project Environment

Legal and Regulatory Environment

<p>Legal and Regulatory Project Environment (regionally, nationally and Europe wide)</p>	<p>The companies before to make investment decisions had to wait a regulatory framework regulating the usage of this area. The projects, being a new technology and for the first time applied on large plants in Spain and Europe, were carried out conforming to the directives of the law in order to obtain the necessary incentives.</p> <p>According to (Envent, 2009) Spain was the first country to introduce a feed in tariff for the energy generated by CSP technology through the Royal Decree n. 841 in 2002. This Royal Decree and the following defined the regulatory framework for the getting of the incentives so they have influenced the design choices of the project.</p>
<p>Specific Legal and Regulatory events impacting on the project</p>	<p>According to (World future council, 2004) the regulation in special scheme for the electric energy produced by renewable source was ratified in Spain for the first time in the Royal Decree n. 2818 in 1998 after the Electric Power Act 54/1997 that introduced the liberalisation of the electric sector in Spain. This Decree set up a special scheme, economically different from the ordinary scheme, and regulated the requirements and procedures able to recourse to the special scheme. This decree did not provide any division between the subcategory of photovoltaic and the CSP technology in the group that use as primary energy the sun.</p> <p>According to (Real Decreto, 2002) the plants to receive the incentives has to be with maximum size of 50 MW. For this reason the two Andasol power plants and all the CSP plant in Spain are projected and realized with size of 50 MW.</p> <p>According to (Real Decreto, 2004) two years later in 2004 was issued a new the Royal Decree. It has been imposed a limit, beyond to have a maximum size of 50 MW as defined in the previous Real Decreto, on the use of the natural gas or propane to the plants to receive the incentives. These facilities may use auxiliary equipments who consume natural gas or propane only to maintain the temperature of the accumulator of heat. The consumption of this fuel in annual calculation must be less than 12% of production of electricity and only during periods of interruption of the production of electric energy if the plants sell electricity with the option of fixed tariff for the entire scheduling. This percentage increases up to 15%, without temporal limitation, if the plants sell electricity in open bidding market, that is through negotiation.</p> <p>According to (CESI, 2005) this regulation is valid for the first 200 MW of CSP plants but because of the high number of request of permitting come at the Ministries this limit was increased to 500 MW in 2005. The constraint of this decree, which limits the usage of natural gas, has forced designers to replace the auxiliary gas boiler present in the U.S. CSP plants, with a thermal energy storage system that allows the usage of the facility beyond the hours of sunshine. The solar field has been oversized to charge the hot tank during the day. This heat is used during the cloudy days or during the evening or night. Because of the great heat capacity, the storage has been realized with the technique of the two tanks molten salt.</p> <p>This full thermal reservoir of heat allows to run the turbine for about 7,5 hours at full-load after sunset. (DLR, 2012).</p>

MEGAPROJECT Project Environment

Political Environment

<p>Political Project Environment</p>	<p>According to (EuroMetrex, 2009) the project was supported by the European Commission because of these reasons:</p> <ol style="list-style-type: none">(1) It is a first-of-its-kind and utility-scale demonstration of the solar thermal technology, parabolic trough of the type EuroTrough (developed in community projects) and thermal storage, developments.(2) The European Commission pushes for the realization in Europe of power plants that use renewable source to reduce the CO₂ emission for the next years in agreement with the climate-energy package. <p>This kind of projects has been strongly desired by the Spanish government. They are projects for the generation of electricity by renewable sources, the sun, and they have been realized also in other parts of south of Spain. So the project did not find any bureaucratic difficulty or problem to be realized. The most important authorizations were the environmental impact assessment issued by the Spanish's Ministry of the Environment and the permission for the construction of the plants issued by the Spanish's Ministry of Industry, all obtained between 2004 and 2006.</p>
<p>Specific Political Events impacting on the project</p>	<p>Both the national government of Aznar (1996 – 2004) and Zapatero (2004 – 2011) supported the usage of renewable energy as well as the local governments.</p> <p>The regulation in special scheme for the electric energy produced by renewable source was ratified in Spain for the first time in the Royal Decree n. 2818 in 1998 after the Electric Power Act 54/1997 that introduced the liberalisation of the electric sector in Spain. This Decree set up a special scheme, economically different from the ordinary scheme, and regulated the requirements and procedures able to recourse to the special scheme. This decree did not provide any division between the subcategory of photovoltaic and the CSP technology in the group that use as primary energy the sun.</p> <p>According to (Real Decreto, 2002) the plants to receive the incentives has to be with maximum size of 50 MW. For this reason the two Andasol power plants and all the CSP plant in Spain are projected and realized with size of 50 MW.</p> <p>According to (Real Decreto, 2004) two years later in 2004 was issued a new the Royal Decree. It has been imposed a limit, beyond to have a maximum size of 50 MW as defined in the previous Real Decreto, on the use of the natural gas or propane to the plants to receive the incentives. These facilities may use auxiliary equipments who consume natural gas or propane only to maintain the temperature of the accumulator of heat.</p>

MEGAPROJECT Project Environment

Economic Environment

Economic Project Environment	<p>Because of their bad technological efficiency and their high costs, CSP plants are still not competitive enough on the energetic market of the technology and need a framework of regulations that provide specific support to encourage their development.</p> <p>According to (Envent, 2009) in several states have been created mechanisms to encourage the development of this technology mainly in the form of feed in tariff and investment tax credits.</p>
Specific Economic Events impacting on the project	<p>According to (Envent, 2009) Spain was the first country to introduce a feed in tariff for the energy generated by CSP technology through the Royal Decree n. 841 in 2002. The feed in tariff corresponds to market price + premium.</p> <p>According to (Real Decreto, 2002) this decree introduced a feed in tariff of 0,12 euro/kWh.</p> <p>According to (Titano, 2011) in the Royal Decree of 2004 the feed in tariff was increased. For the option of fixed tariff it was provided 0,216 euro/kWh for the first 25 years from the coming into operation and then 0,17 euro/kWh for the remaining period. According to (World future council, 2004) for the option of sell in open bidding market the premium was 0,187 euro/kWh plus the market price.</p> <p>According to (Real Decreto, 2007) in 2007 was issued the Royal Decree that actually regulates the feed in tariff. In this Royal Decree the feed in tariff was increased. For the option of fixed tariff, where the grid demand is not considered, it was provided 0,269 euro/kWh for the first 25 years from the coming into operation. For the remaining period was provided 0,215 euro/kWh. The tariffs grows at an annual rate equal to the inflation rate decreased by 0,5%. For the option of sell in open bidding market, where the grid demand is required and a fixed quantity of electricity is required, was fixed the lower limit = 0,25404 euro/kWh, the upper limit = 0,344 euro/kWh and the reference premium = 0,254 euro/kWh for the first 25 years and for the remaining period 0,203 euro/kWh.</p>

MEGAPROJECT Project Key Events and Activities Timeline

	23.12.1998	In 1999	31.05.2002	02.08.2002	Sep-03	12.03.2004	30.09.2004	19.01.2005	Beginning 2005	In 2005
Events and activities relating to project stakeholders					ACS Cobra, agreeing by contract with Solar Millennium, committed to play a crucial role in the realization of the Andasol plants. (CESI, 2005).		Issued of the environmental impact assessment for the two power plants. (Junta de Andalucia, 2005) and (BOE, 2006).	Issued of the authorization to realize the power plants, Andasol 1 (Vlex, 2006) and Andasol 2 (BOE, 2006).	The two power plants companies, Andasol-1 Central Termosolar Uno SA and Andasol-2 Central Termosolar Dos SA were created. They are the owners of the two plants. (Solar Millennium, 2008).	Solar Millennium, as agreed in 2003, sold the 75% stake of both plants companies to ACS Cobra and held the remaining 25%. (Solar Millennium, 2008).
Events and activities relating to project management										
Events and activities relating to project performance		Milenio Solar was set up by Solar Millenium to carry out the development and the negotiations required for the power plant realization. (Solar Millennium, 2007/2008).								
Events and activities relating to project environment	Issued of the Royal Decree that set up special scheme for the electricity produced by renewable source.		The EU ratified the Kyoto Protocol.	Issued of the Royal Decree about the regulation of the CSP plant.		Issued of the Royal Decree about the regulation of the CSP plant.				

MEGAPROJECT Project Key Events and Activities Timeline

	In 2005	30.01.2006	Spring 2006	31.05.2006	Jun-06	03.11.2006	Dec-06	Dec-06	Feb-07	26.05.2007	Dec-08	Mar-09	Jun-09	Jul-09	Sep-09
Events and activities relating to project stakeholders		Declaration of public utility for the plant Andasol 1.	End of Procedure of compulsory expropriation for Andasol 1.			Declaration of public utility for the plant Andasol 2.	End of Procedure of compulsory expropriation for Andasol 2.							All the stakes in the plants companies of Solar Millennium were sold to ACS Cobra.	
Events and activities relating to project management	Sener developed the basic engineering (the FEED) and then the detailed engineering for the plants.			The company has signed the financing contracts with the banks and the EPC contract with the principal contractor for Andasol 1.				The company has signed the financing contracts with the banks and the EPC contract with the principal contractor for Andasol 2. (Solar Millennium, 2006/2007).							
Events and activities relating to project performance					Start of the construction work of CSP plant Andasol 1				Start of the construction work of the CSP plant Andasol 2		Andasol 1 was completed It was connected to the grid and it began the operation start-up	Andasol 1, after the operation start-up and the commissioning phase, started the commercial operation	Andasol 2 was completed. It was connected to the grid and it began the operation start-up		Andasol 2, after the operation start-up and the commissioning phase, started the commercial operation.
Events and activities relating to project environment										Issued of the Royal Decree about the regulation of the CSP plant.					

MEGAPROJECT Bottom-line (including LNG regasification)

The development of these two megaprojects has many points in common.

- In the concept phase a company deals with the national government. Such companies aim to obtain all the authorizations necessary to realize the project.
- Before to obtain all the authorizations the sponsor companies, that in this two cases analysed did not have enough financial resources, agreed with other companies, willing to share the risks, to take part in the realization of the projects.
- The companies that manage and own the terminal and the sub-power plants were set up at the end of the bureaucratic procedures.
- These ad hoc-companies include as major shareholders the large companies that took part in the realization of the project and as minor shareholders the sponsors which initiated the project. After their creation these new ad hoc-companies are able to face the large financial effort having as shareholders these large companies and their financial resources.

The international situation, the laws enacted by the national governments and their political behaviour have been fundamental for the real realization of the work for these two kind of mega projects in the energy sector.