Introduction
The Global Concentrated Solar Power industry Report 2010-2011 provides you with the latest information on the thriving Concentrated Solar Power (CSP) industry, including essential cost and performance data on the four main CSP technologies: Parabolic Trough, Power Tower, Fresnel and Dish Stirling.

This independent report written by leading experienced CSP industry consultants combines the very latest market data and high-level analysis with captivating real life case studies of up and running CSP plants.

Research scope
In this latest 200 page report you’ll find:

- **Exclusive CSP industry growth forecasts until 2020** – find out how many MW of CSP will be installed of each technology in the next decade and the projected growth in three major markets: USA, Spain and Australia

- **Reliable data on the current costs of CSP** – get the breakdown per plant component including all four main technologies: Parabolic Trough, Power Tower, Fresnel and Dish Stirling

- **In-depth information on key performance indicators** – including annual electricity yield, operating temperature, efficiency, capacity factor and water consumption and land requirements

- **Unbiased insights into the key barriers and drivers to the CSP industry growth** – find out what factors underpin the growth of CSP in every market

- **Strategic overview of the CSP Market** – including the latest data on installed CSP capacity by developer and region

- **Detailed analysis of the CSP value chain** offering you a clear picture of the industry structure and the leading companies in this space

- **Up-to-date cost and performance comparisons** – discover which technology is more likely to dominate the CSP market in the next decade

- **Critical thermal storage integration data** – in-depth analysis on the merits of different storage technology options.

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Currently there are 679 MW of installed CSP capacity worldwide and more than 2000 MW under construction. The USA is the market leader in terms of installed capacity with 63% market share, followed by Spain with 32% of operating capacity. These two markets will continue to be crucial for the development of the industry into the next decade, with Spain accounting for the largest share of projects under construction with almost 89%. In terms of the technology employed, the market is dominated by Parabolic Trough technology, which accounts for 88% of operating plants and 97.5% of projects under construction.

The solar field represents the largest share of the cost of any CSP plant. Depending on the technology this cost could vary from around 43% for Tower and Fresnel technology, to almost 60% for Parabolic Trough and Dish Stirling CSP plants. The most significant cost reductions are likely to come about by innovations in solar field design, which could bring down the levelized cost of energy (LCOE) by 15 to 28% depending on the technology.

Experience in Spain has shown that the electricity demand curve almost matches the electricity production curve of a CSP plant. Seasonal variations in solar resources have an effect on the number of hours a CSP plant operates, reducing operating time by almost two hours in winter. This problem can be mitigated by using thermal storage technologies, which would allow CSP to generate electricity during cloudy periods and through the night.

**Report highlights**

Currently there are 679 MW of installed CSP capacity worldwide and more than 2000 MW under construction. The USA is the market leader in terms of installed capacity with 63% market share, followed by Spain with 32% of operating capacity. These two markets will continue to be crucial for the development of the industry into the next decade, with Spain accounting for the largest share of projects under construction with almost 89%. In terms of the technology employed, the market is dominated by Parabolic Trough technology, which accounts for 88% of operating plants and 97.5% of projects under construction.

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**Why buy the report**

- Identify the main opportunities and risks involved in investing in CSP
- Make informed decisions on which technologies and markets you'll invest in to achieve the highest returns
- 100% impartial, reliable and relevant information you need to turn your understanding of the market into action
- Written by engineering consultants with experience in real CSP projects
- Save time and money – All the data you need without the hard work of sourcing it
- Packed with relevant graphs, illustrations and tables for easy reading
- 200+ pages full of reliable information
- A vital guide to the CSP industry you can use at your convenience

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1. INTRODUCTION

2. THE BASICS OF CSP TECHNOLOGY:
   2.1 How CSP works: description of the technology
   2.2 Brief history of CSP and current state
   2.3 Brief description of four main configurations (Parabolic Trough, Power Tower, Fresnel and Dish)
   2.4 Storage (brief description of its workings and value – what’s good about storage)
   2.5 Requirements: solar (DNI) and land requirements (ft² and m² per MW)

3. THE CSP MARKET
   3.1 Introduction to the CSP market
      3.1.1 General Overview of the Industry: general commentary including where is the industry, why it is there, who the main players are and what is the installed capacity worldwide.
      3.1.2 Drivers: including but not limited to government incentives (FIT, Tax credits, Grants, etc.), government regulation (renewable energy targets/quotas), energy security and diversification, job creation, climate change
      3.1.3 Barriers: including but not limited to water scarcity in high DNI areas, relative high price, transmission costs, lengthy permitting processes, scarce financing, etc.
   3.2 CSP Companies and role in the Value Chain
      3.2.1 Explanation of the CSP value chain: what are the main functions, what are the main companies fulfilling these functions and how the whole business ties in together. Include: value chain graph, point out at how the value chain is slightly different in Spain and the US (in Spain the utilities are less involved as there’s no PPA).
   3.3 CSP Capacity and Projects worldwide (in MW)
      • Installed CSP capacity per Country
      • Announced/Planned capacity by Country
      • Installed CSP Capacity per technology
      • Installed CSP capacity by project developer (in MW)
      • Under Construction/Announced CSP capacity by project developer
      • List of CSP projects worldwide by developer including: Name of Developer, Plant name and location, Technology (trough, etc.), Power (MW), Storage integration (yes/no), Status (Operating since, Under Construction, Planning/Permitting)
   3.4 Forecast for the deployment of CSP
      These calculations should be original to the report and carried out by the Researcher specifically for this Report
      • Outline and Explanation of Assumptions
      • CSP installations worldwide total in MW
      • Breakdown per Country (worldwide)
      • Breakdown per technology

4. CSP PERFORMANCE (per technology)
   4.1 General Considerations
      4.1.1 Parameters of performance (Explain parameters used for assessing the performance of a CSP plant)
      4.1.2 Seasonal and hourly variations of electricity yield (Include Graph)
      4.1.3 Storage integration
   4.2 Parabolic Trough
      4.2.1 Description of the technology
      General description of Parabolic Trough Technology including: Performance (Facts)
      • Efficiency
      • Capacity Factor
      • Temperature of Operation
      • Annual Electricity Yield
      • Water Consumption per MWh
      • Land Requirements (per MW)
      • Storage (hrs and medium)
      • Integration with fossil fuel plants
      4.2.2 Status of the technology (technological maturity, share of the market by MW installed, etc.)
      4.2.3 Pros and Cons of Parabolic Troughs Performance (Facts)
      • Efficiency
      • Capacity Factor
      • Temperature of Operation
      • Annual Electricity Yield
      • Water Consumption per MWh
      • Land Requirements (per MW)
      • Storage (hrs and medium)

4.2.4 Case Study (Nevada Solar One, perhaps)
      General account of the construction of this plant including
      • Time to completion
      • Initial Investment Costs and LEC

4.3 Tower (Central Receiver)
   4.3.1 Description of the technology
   4.3.2 Status of the technology (technological maturity, share of the market by MW installed, etc.)
   4.3.3 Pros and Cons of Towers
   4.3.4 Performance (Facts)
   4.3.5 Case Study (PS10 or PS20 in Spain unless one is built in the USA before hand)

4.4 Fresnel (Same as Trough and Tower)

4.5 Dish (Same as Trough and Tower)

4.6 Performance Comparison between different CSP technologies
      Build a table with main variables and comment on this table. Include the following in your comments:
      • System Efficiency
      • Capacity Factor
      • Operating Temperature
      • Annual Electricity Yield
      • Power Capacity Range
      • Water Consumption per MWh (litres and gallons)
      • Land Requirements (per MW)
      • Storage integration (can it be integrated?)
      • Technological maturity
      • Possible performance improvements: Direct Steam Generation and Super Heated Steam for all technologies
      • Impact of a higher operating temperature
      • Impact of a simplification of the system brought about by Direct Steam Generation
      • Impact of higher efficiency

5. COSTS OF CSP PER TECHNOLOGY
   5.1 General Considerations
      What impacts on costs and how?
      • Definition of costs: Levelised Electricity Costs (brief explanation, lengthier explanation in appendix)
      • Scale of the project: do costs decrease proportionally to scale?
      • Performance of CSP plant: impact of higher efficiency on electricity yield and water consumption
      • Solar Resources
      • Terms of financing
      • Tax Credits and Regulations (impact of...)
   5.2 Current Costs per Technology (Parabolic Trough, Tower, Fresnel and Dish)
      • Initial Investment Cost (without storage)
      • Initial Investment Costs (with storage)
      • Initial Investment Costs Breakdown (Solar Field, Power Block, Heliostats, O&M, BOP, Storage, etc.)
      • Total Lifecycle Cost
      • Levelised Cost of Electricity at average NDIs different locations (Calif., & Nevada)
      • Cost comparison between different technologies
   4.3 Outlook of LEC through to 2020
      • What is the scope for cost reductions?
      • How could the main cost reductions be achieved?
      • Perspectives of different technologies

6. CONCLUSIONS
About the authors

The *Global Concentrated Solar Power industry Report 2010-2011* is the product of collaboration between CSP Today and Altran technologies, a leading consultancy with first hand experience of operating CSP projects.

**The authors**

- **Juan Manuel Martín Torres**
  Juan Manuel Martín Torres has been an Aeronautical Engineer since 2002 and working in Solar Energy for 6 years. His role at Altran Technologies is Technical Director of Solar, a branch of the firm devoted to the development of Solar Energy Projects. During these six years Juan Manuel has taken part in over 30 projects related to the research and development of various CSP technology such as solar trough and Stirling Dish frame driving systems. These projects have provided Juan Manuel with an in-depth knowledge of both the CSP market and CSP technology.

- **Nuria Garzas López**
  Nuria Garzas López is a Telecommunications Engineer who is expanding her expertise into the environmental sector by studying for an Environmental Sciences degree. She has focused her career on renewable energy, specifically solar, and now has over three years experience working on solar projects. She has first-hand experience working on photovoltaic energy, thermal energy, CSP and energy efficiency. In 2008, she developed a state of the art CSP project. Since then, she has continued to work on CSP technology and delve deep into nuances of the CSP market.

- **Carlos Márquez**
  Carlos Márquez is head editor and research manager at CSP Today. Carlos’s role involves analyzing the trends that have underpinned the growth of the CSP industry in major markets such as Spain and the USA. Carlos is also following with keen interest the development of emerging markets for solar energy in the Middle East, North Africa, India and China. These markets will be the subject of upcoming CSP Today reports. Carlos wrote his post-graduate dissertation on the Competitiveness of the Spanish CSP Market.

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