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Ausra acquisition

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AREVA to acquire the U.S. solar company Ausra

AREVA taps Ausra's management team and proven technology to become a world leader in concentrated solar thermal energy

Paris, February 8th, 2010

AREVA announced today the 100% acquisition of U.S.-based Ausra, a leading provider of large-scale concentrated solar power solutions for electricity generation and industrial steam production. This acquisition launches AREVA's new global solar energy business. It reflects AREVA's strategic objective to be the world leader in concentrated solar power (CSP) and will further strengthen and diversify its renewables portfolio.

Combining Ausra's proven technology and AREVA's world leading Engineering, Procurement and Construction (EPC) skills, the group is committed to building the most cost-effective CSP plants for utilities, independent power producers and industrial customers around the world.

The market for concentrated solar power plants is expected to grow substantially in the next decade with an average annual growth rate of 20% and should reach an estimated installed capacity of over 20 GW by 2020. With this acquisition, AREVA is poised to capture the leading position of this attractive and growing market.

Anil Srivastava, CEO of AREVA Renewables, said: "Deploying concentrated solar power technology at large-scale market requires a best-in-class technology, a strong balance sheet and the ability to deliver a reliable, cost-effective product. By acquiring Ausra, AREVA has taken a major step forward to achieve its strategic ambition to become the world leader in the CSP market. This will reinforce our ability to deliver cost-competitive renewable solutions worldwide".

Ausra's Chairman and CEO Dr. Robert E. Fishman declared: "Today is about making a strong company even stronger. With AREVA, Ausra is joining forces with one of the world's global energy leaders. Combining AREVA's financial and commercial strengths, and its energy expertise, with Ausra's proven technology and experienced management team will help position AREVA for even greater success in the renewable and carbon-free energy industry."

AREVA will leverage and reinforce Ausra's team to strengthen its Global Solar business unit, led by Dr. Robert E. Fishman. It will be operated out of Ausra's existing Mountain View, Calif. headquarters.

This acquisition is expected to close in the next few months, subject to customary regulatory approval.



I - AREVA, leader in carbon-free power generation solutions

All over the world, AREVA provides its customers with solutions for carbon-free power generation solutions and electricity transmission. With its knowledge and expertise in these fields, the group has a leading role to play in meeting the world's energy needs. Ranked first in the global nuclear industry, AREVA's unique integrated offering covers every stage of the fuel cycle, reactor design and construction, and related services. In line with its strategy, the group is developing a portfolio of operations in renewable energies. Sustainable development is a core component of the group's industrial strategy. Its 75,000 employees work every day to make AREVA a responsible industrial player that is helping to supply ever cleaner, safer and more economical energy to the greatest number of people.

The group is actively engaged in developing its renewable energy offering to take the lead in CO₂-free solutions, creating a worldwide reference for market leadership in renewables. In the face of global warming, increasing energy needs and the rarefaction and fluctuating prices of fossil fuels, the energy market is changing, demanding greater diversification to meet customer needs. As part of the new energy mix, renewable energies complement the overall CO₂-free generation solutions from the group.

II – Renewable Energies Business Group's activities

The Renewable Energies business offers a full portfolio of four renewable energy technologies: wind, bioenergy, hydrogen and storage solutions, four solutions that put AREVA at the forefront. The AREVA group's expertise and financial strength supports this technology portfolio and its commercial expansion.

Wind: Design for offshore

AREVA, via its German subsidiary Multi-brid, designs, manufactures, assembles and commissions five MW high-output wind turbines specially designed for the offshore market.

The group has reinforced its ability to bring value to its offshore wind customers with the recent acquisition of a German manufacturer of rotor blades for offshore wind turbines – PN Rotor – therefore securing the supply of a broader range of key components.

AREVA also offers five to ten-year service plans to ensure the performance of all components.





AREVA has been awarded a contract by the company Wetfeet Offshore Windenergy GmbH to supply 80, M5000 turbines for the offshore Global Tech 1 wind farm (400 MW).

The group has successfully installed and commissioned the first six M5000 turbines for the Alpha Ventus project, the first German offshore wind park located in the North Sea, operated by the customer Deutsche Offshore Testfeld und Infrastrukturgesellschaft, comprising E.ON, Vattenfall and EWE as shareholders.

This major achievement demonstrates the technical feasibility of AREVA's M5000 turbine design and confirms the relevance of the associated installation and servicing activities carried out by the group. This pioneering project will help set the standards for the offshore wind industry, thereby facilitating project bankability for its customers.

In total, 250 AREVA turbines have been chosen for use in European offshore wind parks.

Bioenergy: Standardization for scaling-up

AREVA provides its customers in Europe, North and South America, and South East Asia with integrated solutions for turnkey design and construction of carbon-neutral bioenergy plants that convert organic residues (wood, sugarcane bagasse, straw, industrial effluents, etc.) into energy. It offers a complete range of services from consulting to commissioning, including engineering, procurement, and construction (EPC), as well as project financing solutions. AREVA is one of the few industrial groups to offer services that help customers obtain carbon credits. The group provides a global offer to develop carbon assets throughout the life of a project, from the feasibility study to the acquisition and sale of credits.

AREVA is one of the industrial forerunners in bioenergy technology development. Its expertise confirms the group's position as the leading supplier of turnkey solutions for bioenergy plants with over 100 units built worldwide representing 3000 MWe of installed capacity and up to 500,000 tons of organic matter recycled every year.

Hydrogen and storage: Maximize renewable benefits

AREVA, via its subsidiary Helion, develops solutions for producing hydrogen by water electrolysis and for generating electricity with fuel cells. The fuel cell combines hydrogen and oxygen via a membrane, simultaneously creating water, heat and electricity. The reverse process is used in electrolysis. The business unit spearheads cutting-edge research into hydrogen technologies to offer its customers safe, dependable CO₂-free systems that enable power supply diversification.

AREVA maximizes the benefits of renewable energy via its "Green Box" process of storing energy and releasing it on-demand. Using water electrolysis and fuel cell technology, AREVA offers the ability to store energy to respond to consumption peaks. Using water electrolysis alone, AREVA



also offers hydrogen production for industrial or alternative uses. This hydrogen production process is, unlike most others, entirely CO₂-free.

Solar energy: simplicity for efficiency

The latest addition to our portfolio of renewable energy technologies is Concentrated Solar Thermal Power (CSP) technology with a focus on Compact Linear Fresnel Reflector (CLFR) technology as the platform, the most cost-effective, land-efficient and reliable CSP technology.

Among all renewable energy technologies, CSP has the strongest synergies relative to our nuclear field expertise:

- ◆ The production of electricity from nuclear energy uses the heat of the nuclear reaction to produce steam, which is used to generate electricity through the use of a turbine
- ◆ The production of electricity from concentrated solar power follows the same logic except that the source of heat is the sun, of which the heat has been concentrated many times to reach temperature of few hundred Celsius degrees. This heat is used to produce steam, which in turn produces electricity through the use of a turbine

Therefore, the nuclear and the CSP fields use a common set of expertise, which makes AREVA a first choice contributor to the acceleration of CSP technology development to grid-parity.

In addition, other competences of AREVA from its nuclear activities will be leveraged in the development of the CSP activity:

- ◆ Technical know-how and economies of scale that AREVA can leverage to reduce costs and improve the technology
- ◆ An experience in building nuclear power plants that AREVA can leverage to build concentrated solar power plants
- ◆ A similar customer base of utility customers

With the acquisition of AUSRA, AREVA is paving the way to become the world leader in solar energy technology.

In the field of solar energy, between solar CSP and solar Photovoltaic, the choice for AREVA is clear.

	Solar Thermal Power (CSP)	Photovoltaic Power (PV)
Customer base synergies with nuclear activities	<ul style="list-style-type: none"> • Large-capacity power plants • Clients are mostly utilities companies, which is AREVA's current customer base 	<ul style="list-style-type: none"> • Small-capacity projects (some < 1MWc, some roof top projects) • Different customer base (commercial and residential actors)
Expertise sharing with nuclear activities	<ul style="list-style-type: none"> • Applicability of AREVA's historical expertise in thermal technology, fluid mechanics, heat transfer, etc. 	<ul style="list-style-type: none"> • Limited expertise on semiconductor devices and on refined silicium production line



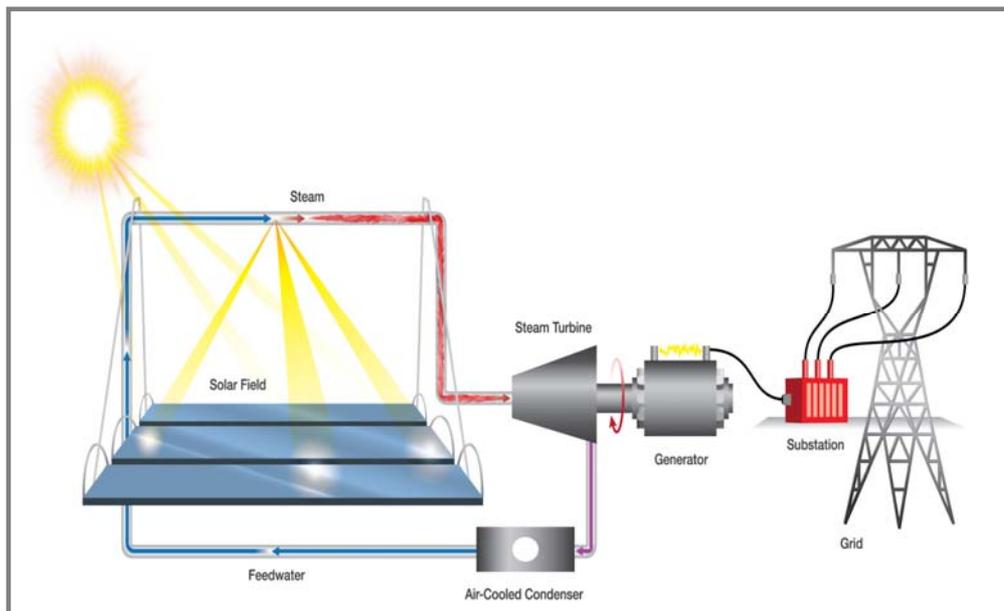
III – The AUSRA Acquisition: portfolio expansion into concentrated solar power

AUSRA is a privately held company, with headquarters in Mountain View, California, and operations in the United States and Australia. With a workforce of 70 people, the pioneering start-up designs, manufactures and is in a position to install solar steam generators for customers around the world. AUSRA provides reliable, scalable and cost-competitive renewable energy solutions for both power producers and industrial customers.

The company's core technology is the Compact Linear Fresnel Reflector (CLFR) solar collector and steam generation system. It uses modular, flat mirrors to focus the sun's heat onto long, elevated "receivers," which consist of a system of boiler tubes through which water flows. The concentrated sunlight boils the water in the tubes, generating high-pressure steam for use in power generation and industrial steam applications.

The CLFR technology has reached maturity and is now available on the market. Thanks to its energy conversion performance and cost, the technology is suited for different applications and plant sizes from 50 MW up to several hundred MW:

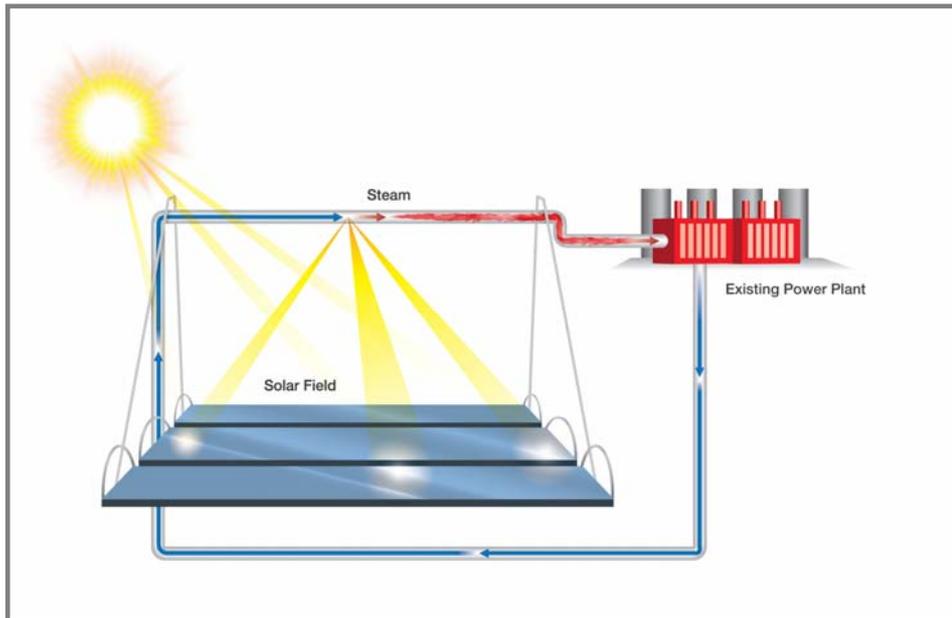
Standalone Power Plants



- The steam generated from concentrated solar power is used to drive steam turbines producing electricity.

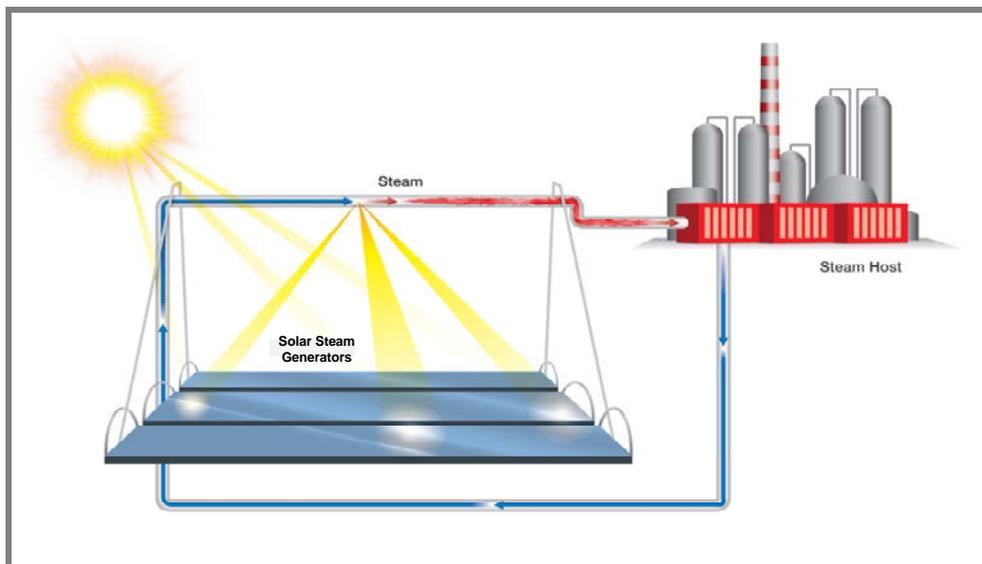


Solar power booster application



- **Solar steam generators provide steam augmentation for natural gas-fired and coal-fired power plants. This solar steam enables power customers to increase electricity production at peak periods and reduce plant emissions. This application can be used to extend plant life for biomass or geothermal facilities.**

Industrial steam



- **This offers industrial customers direct solar steam for diverse process steam applications, ranging from enhanced oil recovery and petrochemical refining, to food processing and desalination.**



A strong track record

AUSRA's **Kimberlina** solar thermal power plant in Bakersfield is a solar industry milestone: it was the first CSP plant to be built and come online in nearly 20 years. Kimberlina continues to perform well above expectations.

The company's **Liddell** also exemplifies Ausra's technology leadership. It's the world's first coal-fired facility with solar power augmentation, helping reduce emissions for Macquarie Generation's coal-fired station in Australia.

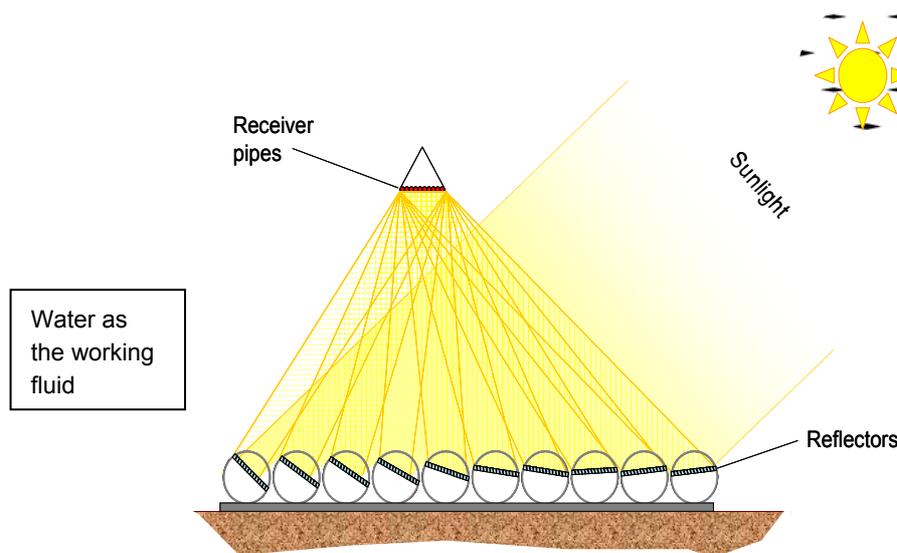


Kimberlina solar thermal power
1 Solar Steam Generator = 7.5 MW Thermal \approx 2.5 MW Power

IV- Evolutionary Technology

1 - Understanding CLFR technology

CLFR technology is a solar thermal technology in which rows of flat mirrors reflect the solar radiation on a linear receiver supported above the mirror field. Boiler tubes in the receiver absorb solar energy, which is transferred to produce saturated or superheated steam, depending on the application. The steam can be used to power a steam turbine, thereby generating electricity, or for industrial steam production.



Principles of Compact Linear Fresnel Reflector (CLFR): An array of optically shaped reflector mirrors concentrate over 50 “suns” of energy on a set of thermal receiver tubes in which water circulates to create high temperature and pressure steam.



2 - A simple and robust design

Amongst other reasons, AUSRA CLFR technology is attractive due to its simple, robust and resistant design

- **design simplicity**
 - ◆ Slightly curved mirrors
 - ◆ Fixed receiver and simple no vacuum receiver tubes
 - ◆ Direct steam generation using water avoiding the use of a heat exchanger
 - ◆ Simple 1-axis and multiplexed tracking system
 - ◆ Very close to the ground structure enabling easy erection and maintenance
 - ◆ Larger span and fewer foundations per support
 - ◆ Enough distance from ground to mirrors allows vehicles underneath for efficient cleaning
- **robust and resistant**
 - ◆ A 30-year design life
 - ◆ Metallic structure design to withstand high wind speeds (90 mph). The field can be operated in up to 40 mph winds, beyond that is turned to safe stow position.

3 – Most reliable CSP technology

ASME “S” Stamp. Ausra is the first solar steam power boiler manufacturer to receive the American Society of Mechanical Engineers’ (ASME) “S” Stamp Certificate of Authorization. Ausra has also received the National Board Certificate of Authorization "NB" to register its solar boilers. The ASME “S” Stamp is recognized in more than 100 countries as a means of meeting government safety regulations, and complies with all safety laws and regulations in the United States and Canada.

4 - Performance and competitiveness

➤ Performance

The new design and operating mode developed by Ausra increases capacity factor and produces **stable superheated steam** which allows higher “solar to electricity” efficiency, both points inducing a further decrease in cost of electricity. **For the first time in the global CLFR technology domain, AUSRA technology has reached a new threshold by producing sustained superheated steam.**

Stable thermal conditions can also be achieved under cloud transients due to an appropriate process control, steam storage and thermal inertia.

Specifications:

- ◆ Output superheated steam: 370°C, 100 bar
- ◆ Power output/Boiler (6-Pack): 6 x 7,5 MW thermal
- ◆ Design life: 30 years

➤ Cost Competitiveness

Ausra’s CLFR is the most competitive CSP technology due to its lower up front capital cost and lower recurring operating costs, making the overall cost of electricity of the CLFR technology lower significantly lower than the competing parabolic trough CSP technology.



Low Upfront Capital Costs

Ausra's CLFR technology has significantly lower upfront capital cost than other CSP technologies.

- ◆ Direct steam generation using water instead of oil, and avoiding a secondary heat exchange circuit
- ◆ Lower manufacturing cost of slightly curved mirrors as opposed to parabolic curved mirrors
- ◆ A structure close to the ground with a fixed receiver enabling lighter structure (which also allows rapid erection)
- ◆ Does not require expensive vacuum pipes
- ◆ 1-axis tracking system and multiplexed system reducing number of motors
- ◆ Reduced construction costs linked to rapid erection of close to the ground structure

Low Operating Costs

Ausra's technology has an important operating cost advantage compared to other CSP technologies, due to its ease of operation (safety, tracking control), the reduced maintenance due to simpler structure and the low cost spare parts ("flat" mirrors and no expensive vacuum tubes).

A low water consumption technology

CLFR technology uses air cooling as opposed to water cooling. That reduces water consumption by a factor of more than 90% over dry cooling, which is a tremendous advantage in desert areas or for water resources preservation in general.

While air cooling reduces by a few percent the "heat to electricity" efficiency of the turbine, the overall energy performance and low cost of the technology still maintains a lower cost of electricity than other CSP technology with the advantage of low water consumption.

Most land efficient CSP technology on the market

AUSRA's CLFR technology has the lowest land use requirement in acres/peakMW installed as compared to other solar technologies (Parabolic Trough, Tower, PV). This compactness is explained by the number of mirrors/receiver, and the close-to-the-ground design, reducing shading and allowing a higher density of mirrors.

Therefore AUSRA technology presents a lower environmental impact, namely minimized Natural Habitat Mitigation, lower land and grading cost as well as other numerous advantages such as faster permitting.

4 - AREVA expertise accelerating technology development

AREVA already has a Renewable energy Research & Innovation center in France and places innovation at the very heart of its industrial development with an allocated budget representing 7% of its revenues. AREVA will even boost its R&D effort to dedicate significant R&D efforts and investments, leveraging AUSRA's engineering expertise.

AREVA will emphasize improved technology performance namely:

- Improve solar-to-heat efficiency by increasing superheated steam temperature
- Increase capacity factor by developing energy storage solutions through its hydrogen and storage activity and expertise
- Hybridization of solar with biomass or gas power plants



V - Strong growth perspectives for concentrated solar energy

1 - The Solar CSP technology renaissance

CSP technology was developed after the oil crisis of 1973 and 1979. Many prototypes were built in California (SEGS). Low energy prices in the 1990s prevented any further CSP commercial development; however, many research projects and a few prototypes have remained in operation.

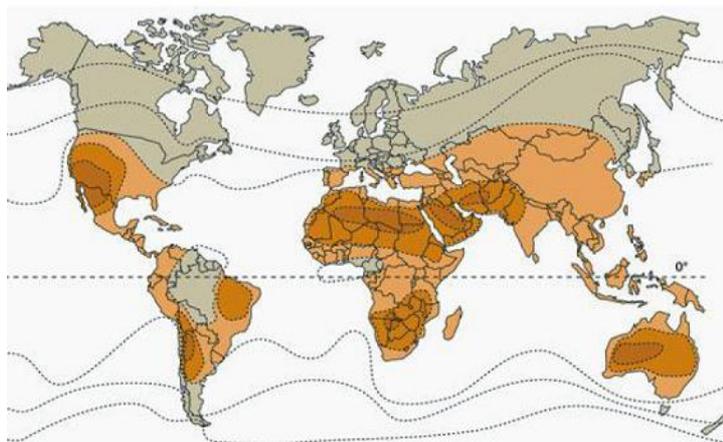
A boosted interest in CSP started early 2000: the early prototypes demonstrated long-term durability and, from 1980 to 2000, had not run into any major issues. New projects have been launched since 2005.

2 - 2009-2020 project forecast

Supported by governmental incentives, the Concentrated Solar Power market is expected to experience one of the strongest growths of all renewable segments over the coming decades. With an average annual growth rate of 20%, CSP should reach an estimated installed capacity of over 20 GW by 2020.

Today, the most important markets for solar CSP are Spain and the US. Other regions present a high CSP potential such as the Mediterranean area, Middle East, India, South Africa, North of Africa, China, and Australia.

Most appropriate areas for Solar thermal



- Appropriate for solar thermal power plants:
- Excellent (>2300 kWh/m²/year)
 - Very good (between 1900 and 2300 kWh/m²/year)
 - Good (between 1500 à 1900 kWh/m²/year)
 - Not appropriate (<1500 kWh/m²/year)



Current development in key markets

- With fast-paced CSP growth, **Spain** plans to have close to 1 GW online by 2011. Further development plans depend on the renegotiation of the 25-year, 500 MW feed-in tariff. Continuing at the current growth rate of 46 MW per project, Spain plans to up to 139 projects on-line by 2020 producing 5.5GW.
- **In the United States**, legislation passed in more than half of the states calls for renewable energy sources to contribute to at least 12% of total power generation by 2020. This quota – referred to as Renewable Portfolio Standard (RPS) - requires utilities and other power generators to search for new sources of renewable energy. This RPS drives the growth of renewable energies in the United States, which should be a major player in the solar thermal market, since it enjoys more than 50% of solar reserve.

The **US** has the potential to become the largest CSP market in the world around 2015 to surpass Spain with 4 GW of CSP projects in operation. Long-term high-growth predictions put US annual additions of CSP generated energy at an average of 800 MW through 2020.

Emerging Markets

Great potential exists as sunny regions throughout the world look to make CSP a part of their energy mix.

Major plans have been launched in different regions, such as the “**Mediterranean Solar Plan**” (“Plan Solaire Méditerranéen”), which accounts for over 3 GW of concentrated solar power projects, or the Desertec project in the **Middle East** and **North Africa**, which is a 2 GW concentrated solar thermal project. This trend is also an undercurrent in other regions with political initiatives such as in China or Australia. In India, CSP solar projects are expected to reach 1.2 GW expected by 2020, followed by adapting energy policy and grid upgrades to sustain growth into the future.

All over the world, AREVA provides its customers with solutions for carbon-free power generation and electricity transmission. With its knowledge and expertise in these fields, the group has a leading role to play in meeting the world's energy needs.

Ranked first in the global nuclear power industry, AREVA's unique integrated offering covers every stage of the fuel cycle, reactor design and construction, and related services.

In addition, the group is developing a portfolio of operations in renewable energies. AREVA is also a world leader in electricity transmission and distribution and offers its customers a complete range of solutions for greater grid stability and energy efficiency.

Sustainable development is a core component of the group's industrial strategy. Its 75,000 employees work every day to make AREVA a responsible industrial player that is helping to supply ever cleaner, safer and more economical energy to the greatest number of people.

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