After brief cooling off period, solar thermal power heats up

THE SOLAR thermal power market is seeing growth after a period of uncertainty. At the end of 2013 there was approximately 3.8 GW of installed CSP capacity globally, and newly installed capacity increased more than 60% to roughly 1.17 GW last year.

The solar thermal market appears to be expanding at a fairly steady rate since a dip in newly installed capacity in 2011. A milestone in 2013 was the commissioning of the 377 MW (net) Ivanpah Solar Electric Generating System in California, USA. Upon completion, the facility became the largest solar thermal power station in the world and one of the first to commercially apply power tower technology.

Another large project was the Solana 250 MW (net) parabolic trough plant in Arizona — the second largest solar parabolic trough power plant, after the SEGS plants.

On a commercial level, parabolic trough and power tower technology remain the primary solutions for energy production. Installed capacity is roughly 85% parabolic trough; however, the current trend is shifting towards power tower technology, with around 20% of projects under construction and 45% of all projects in development and planning featuring power tower technology [41].

Concentrated solar power projects currently under construction, in development or in the planning stages are as follows: US (1.4 GW), 'MENA' Region (1.4 GW), South Africa (1.3 GW), Italy (0.3 GW), Chile (0.1 GW), Australia (0.1 GW), China (0.6 GW), and India (0.5 GW).

The largest installed capacity currently exists in Spain. During the boom period of CSP in Spain the feed-in tariff scheme was viewed optimistically. Due to the current situation projects are now typically under an IPP (independent power producer) set-up, where companies compete against one another in a bidding process to be allowed to build plants under a PPA. This increases competition in the market and forces companies to minimise cost, whereas the feed-in tariff did not have such a strong incentive for optimisation.

High levelised cost of energy (LCOE) is also restricting more rapid expansion of solar thermal power plants. Another factor is the extensive development and construction periods required for solar thermal plants. For example, a large-scale (>50 MW) CSP plant may need three years of development and permitting and two to three more years for construction. For CSP, this means that newer technology (i.e., power tower) would need five to six years to bring the technology into operation. In PV for large projects (>50 MW) one year of development is often enough and one to two years of construction (~5 MW/month) are possible. This has allowed PV to rapidly grow in a way that is currently not possible for CSP.

Concentrated solar power has demonstrated its potential for use in other applications, namely process heat, enhanced oil recovery, and cooling, as well as broader technical solutions, such as Fresnel, Dish, and Integrated Solar Combined Cycle (see Table 7). These solutions are still proving to need more time to fully shift from the research and development phase into the commercial stage. Research is also expanding in CSP, but the applicability of solutions will take time to achieve the goal of bringing down overall cost [42].

Region	Cumulated installed capacity 2013		Installed capacity 2013		Estimated electricity generation 2013
	[GW]		[GW]		[TWh/y]
North American	1.2		0.7		2.5
South American	0.0		0.0		0.0
Europe	2.3		0.4		4.2
Asia	0.2		0.2		0.0
Oceania	0.0		0.0		0.0
Africa	0.1		0.0		0.1
World Total	**3.8**		**1.2**		**6.8**
Largest national market	Spain	2.3	USA	0.7	

Table 6. Summary of global solar thermal power market at the end of 2013.

Capacity [GW]	Operation	Construction	Development	Planning
Parabolic Trough	3.53	0.70	1.18	1.06
Tower	0.50	0.21	1.05	1.22
Dish	0.00	0.00	0.03	0.04
Fresnel	0.05	0.06	0.10	0.33

Table 7. Summary of development trends in solar thermal power.

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