



CONCENTRATED SOLAR POWER (CSP)

LATIN AMERICA'S FIRST CSP PLANT SYNCHRONISES WITH GRID

BRUSH synchronous generator at heart of Latin America's first Concentrated Solar Power plant.

Providing synchronous active power and supporting grid stability by providing real synchronous inertia, reactive power, short circuit contribution whilst supporting ambitious Net Zero targets



Main advantages of the BRUSH Synchronous generator



Decarbonisation



Synchronous
inertia support



Reactive Power



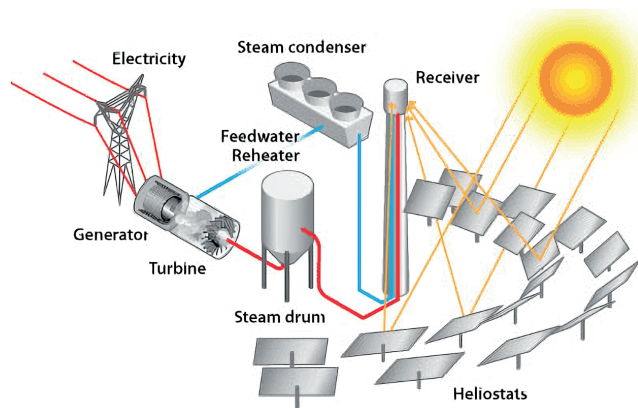
Short Circuit
Contribution

Concentrated Solar Power

Whilst inverter-based photovoltaic solar farms have captured a great deal of attention in recent years, CSP plants offer a unique solution to Carbon Net Zero power generation.

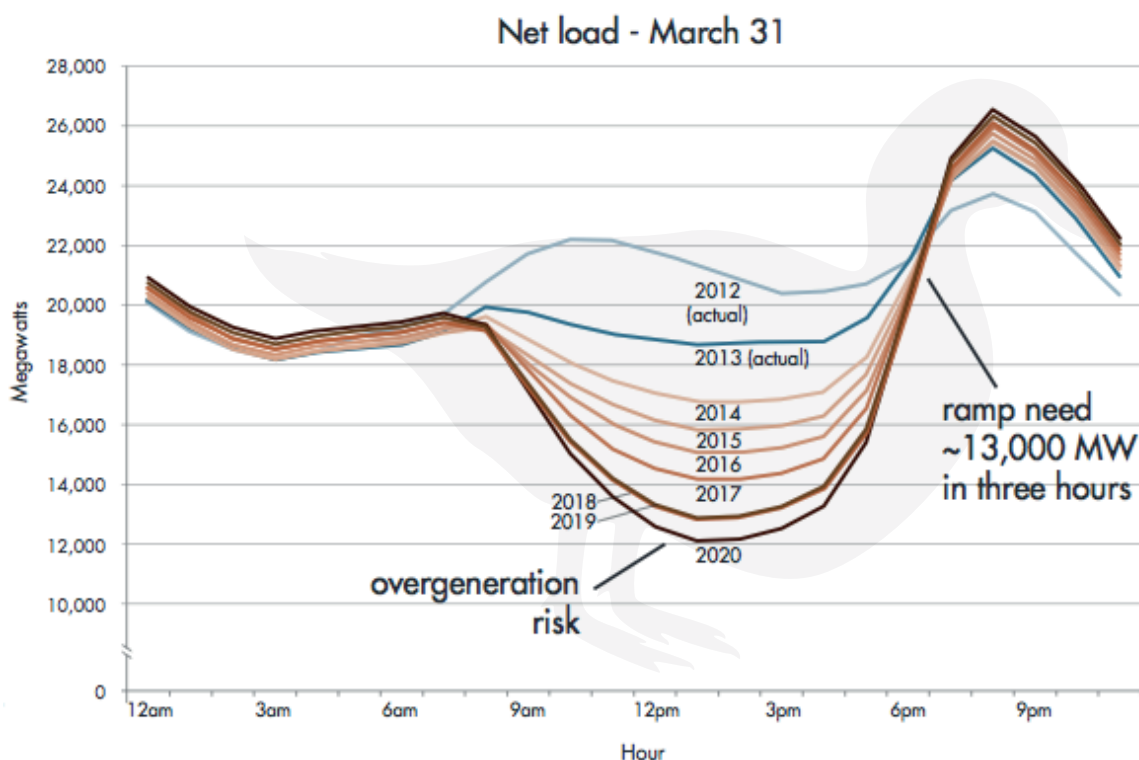
A common challenge for all renewable energy is that consumption requirements do not match power generation opportunities. Specific to locations with high solar penetration is poor grid stability as well as a phenomenon referred to as the “duck curve”.

Simply put, as the sun descends below the horizon, demand for electric power peaks just as PV capacity ramps down.



The power tower method. Credit: DOE.

Duck Curve: Daily net load cycle high solar regions



Net load curves for March 31, from 2012 to 2020 Credit: California ISO

With the dramatic increase in photovoltaic new builds and decline in costs associated with solar panels, CSP has taken something of a second place in the general media. However, in comparison to Photovoltaics, CSP is able to store solar energy and dispatch power when needed. Not only that, but as the system is based upon a steam turbine and synchronous generator, the associated synchronous inertia, reactive power and short circuit contribution provides grid stability in a way that no PV facility is able to match without supplementary infrastructure being added.

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Close up

The Atacama-1 solar plant in Chile was developed at a cost of €1.41 billion (\$1.7 billion) and is the first Concentrated Solar Plant in Latin America.

The plant, owned by EIG Global Energy Partners was built by a consortium led by Acciona S.A. and Abengoa. Synchronised with the grid in April 2021, the plant delivers 110MW of “dispatchable solar power” using CSP technology.

The system uses 10,600 mirrors (heliostats), each with a surface area of 140m², to reflect sunlight by concentrating the heat on a receiver at the top of a 250m tower.

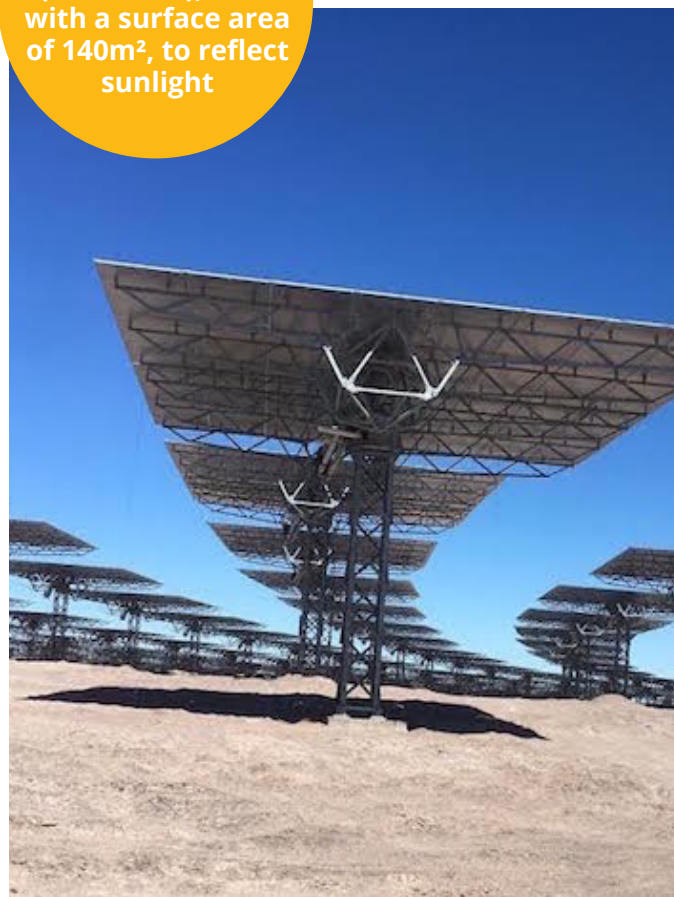
This tower, the second tallest structure in Chile, contains a highly efficient molten salt furnace. Solar salt, comprised of potassium nitrate KNO₃ and sodium nitrate NaNO₃, is heated to a molten state and circulates through the receiver at a temperature of 560°C.

Thanks to thermal storage in tanks, this molten salt conserves energy captured throughout the day.

The heat energy is stored for up to 18 extra hours and when required is released to power a steam turbine creating electricity using a BRUSH BDAX 9-450ERH.

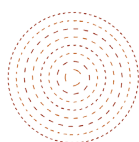
In this way, the daily cycle of power demand or “duck curve” is managed, using the benefits of solar power whilst supporting consumer requirements.

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“Chile has one of the best locations to take advantage of solar energy and CSP technology is ideal to provide clean and reliable energy 24 hours a day.”

Fernando Gonzalez,
CEO Cerro Dominador



**CERRO
DOMINADOR**
CONCENTRATED SOLAR POWER

Grid Decarbonisation

The Cerro Dominador project is part of the National Energy Policy 2050 started in 2015. This sees Chile decommissioning all coal powered plants by 2040, which has the knock on effect of removing the associated grid stability provided by the large rotating equipment used.

In comparison to standard PV power plants, CSP using steam turbine and BRUSH synchronous generators provides Synchronous Inertia, Reactive Power and Short Circuit Contribution. This contributes to the overall grid stability for the Northern Interconnected System which otherwise would be weakened as a result of the decommissioned plants.

With 45% of energy generated by renewables in 2020, Chile is on target of achieving 70% by 2030, establishing itself as “the Latin American champion of renewables energy” (IEA).