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Coordinates: 37°13′42.70″N 3°4′6.73″W﻿ / ﻿

# Andasol Solar Power Station

The **Andasol solar power station** is a 150-megawatt (MW) concentrated solar power station and Europe's first commercial plant to use parabolic troughs. It is located near Guadix in Andalusia, Spain, and its name is a portmanteau of **Andalusia** and **Sol** (Sun in Spanish). The Andasol plant uses tanks of molten salt as thermal energy storage to continue generating electricity, irrespective of whether the sun is shining or not.

## Contents

**Description**

**Rationale**

**Developers**

**See also**

**References**

**External links**

## Description

Andasol is the first parabolic trough power plant in Europe, and Andasol 1 went online in March 2009. Because of the high altitude (1,100 m) and the semi-arid climate, the site has exceptionally high annual direct insolation of 2,200 kWh/m<sup>2</sup> per year.<sup>[4]</sup> Each plant has a gross electricity output of 50 megawatts (MW<sub>e</sub>) and 49.9 MW<sub>e</sub> net, producing around 165 gigawatt-hours (GW·h) per year. The collectors installed have a combined surface area of 51 hectares (equal to 70 soccer fields); it occupies about 200 ha of land.<sup>[4]</sup>

Andasol has a thermal storage system which absorbs part of the heat produced in the solar field during the day. This heat is then stored in a molten salt mixture of 60% sodium nitrate and

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Andasol Solar Power Station

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<b>Country</b>	Spain
<b>Location</b>	near Guadix, Granada
<b>Coordinates</b>	<span><span><span><span><span>37°13′42.70″N</span> <span>3°4′6.73″W</span></span></span><span><span>﻿</span> / <span>﻿</span></span><span><span></span></span></span></span>
<b>Status</b>	Operational
<b>Commission date</b>	2009
<b>Owner(s)</b>	ACS Group (Andasol 1&2) Stadtwerke München MAN Ferrostaal Innogy
	<b>Solar farm</b>
<b>Type</b>	CSP
<b>CSP technology</b>	Parabolic trough
<b>Site resource</b>	2,136 kWh/m <sup>2</sup> /yr <sup>[1]</sup>
<b>Site area</b>	600 hectares (1,483 acres)

40% potassium nitrate. This process almost doubles the number of operational hours at the solar thermal power plant per year.<sup>[5]</sup> Each unit fully loaded storage system holds 1,010 MW·h<sub>t</sub> of heat, enough to run the turbine and produce electricity for about 7.5 hours at full-load, in case of overcast skies or after sunset. The heat reservoirs each consist of two tanks measuring 14 m in height and 36 m in diameter and containing molten salt. Andasol 1 is able to supply environmentally friendly solar electricity for up to 200,000 people.<sup>[5][6]</sup>

Power generation	
<b>Nameplate capacity</b>	149.7 MW
<b>Capacity factor</b>	37.7% <sup>[2]</sup>
<b>Annual net output</b>	495 GWh <sup>[3]</sup>
<b>Storage capacity</b>	1,123 MW·h <sub>e</sub>
External links	
<b>Commons</b>	Related media on Commons

Andasol consists of 3 projects: Andasol-1<sup>[1]</sup> (completed 2008), Andasol-2<sup>[7]</sup> (completed 2009) and Andasol-3<sup>[8]</sup> (completed 2011). Each project generates approximately 165 GW-h each per year (a total of 495 GW-h for all three combined).<sup>[3]</sup> The total cost of building the three projects was estimated to €900 million.<sup>[9]</sup>

## Rationale

Andasol 1 cost around €300 million (US\$380 million) to build.<sup>[10]</sup> Thermal energy storage costs roughly US\$50 per kWh of capacity (150 lbs of salt per kWh at a storage temperature of 400 °C), according to Greg Glatzmaier of the U.S. National Renewable Energy Laboratory (NREL), totaling about 13% of Andasol's initial cost.<sup>[10]</sup>

The developers say Andasol's electricity will cost €0.271 per kilowatt-hour (kW·h) to produce.<sup>[11]</sup> Under current government policy in Spain, solar-thermal electricity will receive a feed-in tariff of just under €0.27/kW·h for the next 25 years.<sup>[6]</sup>

Like every power plant with a thermal engine, cooling is needed for the working fluid. As Andasol is built in the warm middle of the south of Spain, every Andasol unit vaporizes 870.000 m<sup>3</sup> water per year (according to the developer), or 5 l/kWh (1.3 USgal/kWh). Most power plants vaporize less water (typically less than 2.5 l/kWh), or close to none if they are cooled by river or sea water.<sup>[12][13]</sup> Although water supply is generally a problem in Spain, Andasol has ample supply due to its location near the Sierra Nevada mountain range.

## Developers

The developer of the Andasol 1 and Andasol 2 plants are Solar Millennium (25%) and ACS Cobra (75%). After planning, engineering and construction Solar Millennium sold their shares to ACS Group. Andasol 3 is developed by the consortium of Solar Millennium and MAN Ferrostaal. Marquesado Solar SL is the investor consortium which is going to commission and operate Andasol 3. Shareholders of Marquesado Solar SL are:

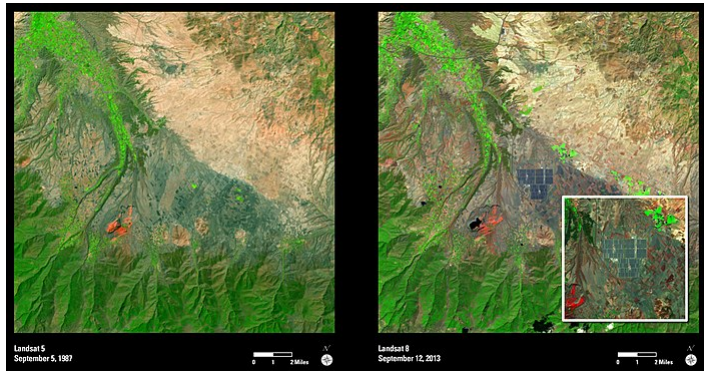
- Stadtwerke München (48.9%)
- MAN Ferrostaal AG (26%)
- Innogy & RheinEnergie AG (25.1%)<sup>[14]</sup>

## See also

- [List of solar thermal power stations](#)
- [Renewable energy in the European Union](#)
- [Sener Aeronáutica](#)
- [Solar power in Spain](#)
- [Solar thermal energy](#)
- [Wind power in Spain](#)

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