

# Solar Power, Day and Night. It's a New World.

SolarReserve's game-changing technology captures and stores the sun's power to reliably provide electricity whenever it's needed most. Powering 75,000 homes during peak demand periods, even after dark. With zero emissions.



**CRESCENT DUNES**

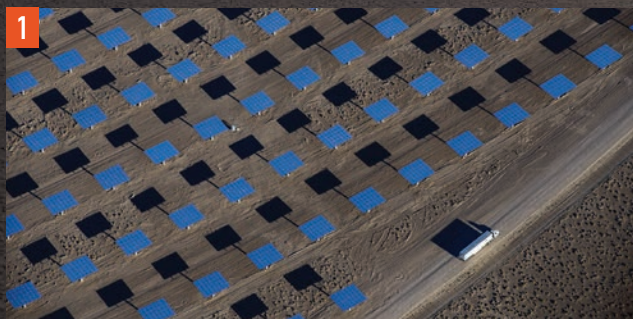
Project Developer | SolarReserve

# The Future of Renewable Energy is Here, Today.

## Crescent Dunes Solar Energy Facility



Within the black tube walls of the receiver, molten salt flows through the piping and absorbs the heat from the concentrated sunlight. The liquid salt is heated from 550 °F (288 °C) to over 1050 °F (566 °C). Unlike water, which at these temperatures would flash into steam, these salts maintain their liquid state for efficient storage.



Over 10,000 tracking mirrors, called heliostats, in a 1.75 mile (2800 meter) diameter mechanical solar reflection field follow the sun throughout the day and reflect and concentrate sunlight onto a large receiver (heat exchanger) on top of a concrete tower.



After passing through the receiver, the high temperature molten salt flows down the piping inside the tower at a rate of over 10,000 gallons per minute, and into an insulated thermal storage tank, where the energy is stored as high-temperature molten salt until electricity is needed.



When power is needed, day or night, the hot molten salt is passed through a steam generation system to heat water and produce high temperature and high pressure steam which in turn is used to drive a conventional power turbine, which generates electricity.



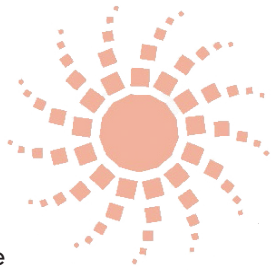
# Local Economic Benefits

- More than 1,000 construction workers were on site during the peak construction period
- 4,300 direct, indirect and induced jobs were created with products and services purchased from 26 states
- 38 permanent jobs are required for plant operation and maintenance
- More than 75 subcontractors were utilized from the state of Nevada alone
- All 1.2 million square meters of glass was U.S. sourced, with assembly completed in an on-site manufacturing facility that employed local workers
- Virtually all of the 90,000 cubic meters of concrete was provided from a local Tonopah supplier
- All 2,000 tons of structural steel was U.S. sourced as was the majority of the piping, cabling and valves
- During the 30+ year operating life, the project will expend more than \$10 million per year in salaries and operating costs, much of this spent in the region
- Project has generated in excess of \$750 million in capital investment in Nevada

## Quick Facts

- Location: Tonopah, Nevada
- Technology: SolarReserve's proprietary solar thermal energy storage technology that enables reliable, on-demand, energy production – 24/7
- Storage: 10 hours of full load electricity generation (1,100 megawatt-hours)
- Electricity Production: More than 500,000 megawatt hours of electricity per year, powering 75,000 Nevada homes with clean reliable electricity, day and night – twice the generation of an equivalent sized photovoltaic project (PV)
- Initial Equity Investment Partners: SolarReserve, Santander and ACS Cobra
- Power Purchaser: NV Energy is purchasing 100% of the electricity produced under a 25-year contract, and is then using this electricity for distribution to its customers in the state of Nevada
- Site: ~1,600 acres of land leased from U.S. Bureau of Land Management (BLM)
- Debt Financing: U.S. Department of Energy Loan Guarantee Program

# FACTS



## Concrete Tower

- A “slip-form” concrete structure with steel reinforced walls
- More than 1.7 million pounds (771 metric tons) of reinforcing rod are in the tower and tower foundation
- Tower Height: 640 feet (195 meters) including the receiver

## Molten Salt Receiver

- SolarReserve holds all rights to the U.S. developed, proprietary technology with over 100 patents and patents pending
- Height of Receiver: 100 feet (30.5 meters)
- Looks circular, but actually consists of 14 identical panels, each made up of 66 straight tubes
- Material: tubes are proprietary high nickel alloy steel
- Weight of Receiver: 2 million pounds (907 metric tons) empty; 2.7 million pounds (1,225 metric tons) when molten salt is being pumped through the receiver

## Heliostats

- Number of Heliostats: 10,347
- Weight (excluding foundation): 8,500 pounds (3,856 kg)
- Each heliostat is approximately 37 feet wide and 34 feet tall – 1,258 square feet or 116.9 square meters
- Each heliostat has a unique IP address and a Heliostat Control Unit (HCU) with sophisticated software for individual control and pointing precision
- Dual axis tracking optimizes solar energy collection

## Storage Tanks

- Storage enables the solar plant to operate just like a conventional fossil fuel or nuclear power plant, reliably generating electricity when it’s needed most
- Salt is circulated through the tower during the day, and held in storage tanks at night – no fossil fuels at all are required
- The tanks store the salt at atmospheric pressure
- “Cold” Salt Tank: holds the liquid molten salt at 550 °F (288 °C) before the salt is pumped up the tower to the receiver to capture the sun’s thermal energy
- “Hot” Salt Tank: after the molten salt has captured the sun’s thermal energy, it is then piped back down the tower, where it is stored at 1050 °F (566 °C) until electricity is needed

- Size of Tanks: each tank is 40 feet tall (12.2 meters) and 140 feet (42.7 meters) in diameter
- Capacity: each tank has a capacity of approximately 3.6 million gallons (13.6 million liters), and each tank is built to hold 70 million pounds (32 thousand metric tons) of molten salt
- Material of Tanks: the cold tank is made of carbon steel, the hot tank is made of stainless steel
- Storage allows the facility to produce more than twice as much net annual output (megawatt hours) than solar technology without storage

## Turbine/Generator

- A conventional steam turbine/generator is used, similar to any fossil fuel or nuclear power plant – except with no emissions or hazardous waste
- The generator allows the facility to deliver 110 megawatts (MW) of electricity
- Air cooled condenser for a low-water use hybrid cooling system saves millions of gallons of water; a limited amount of water cooling is used during peak electricity demand periods
- Able to provide non-intermittent and reliable power during peak demand periods – day and night

## How it Works

1. Sunlight is concentrated and directed from a large field of heliostats to a receiver on a 640 foot (195 meter) tower
2. Liquid salt from the cold salt tank is pumped through the receiver where it is heated to 1050 °F (566 °C)
3. The heated salt from the receiver is stored in the hot salt tank
4. Hot salt is pumped from the hot salt tank through a steam generator to create steam, which drives a steam turbine, generating electricity
5. Cold salt at 550 °F (288 °C) flows back to the cold salt tank
6. Condensed steam from the steam turbine is recirculated for reuse

