ORIGINAL

0000167507

ABENGOA YIELD

Arizona Solar One LLC

57750 S. Painted Rock Dam Rd. Phone: 602-282-8960
Gila Bend, AZ 85337 Fax: 928-683-9915

2016 JAN -8 P 12: 14

Docket No. L-00000GG-08-0407-00139, Decision No. 70638
Docket No. L-00000GG-08-0408-00140, Decision No. 70639

Solana Generating Facility

January 7th, 2016

Arizona Corporation Commission
DOCKETED
JAN 08 2016
DOCKETED BY

Docket Control
Arizona Corporation Commission
1200 West Washington
Phoenix, Arizona 85007

Compliance Section
Arizona Corporation Commission
1200 West Washington
Phoenix, Arizona 85007

Re: Docket No. L-00000GG-08-0407-00139, Decision No. 70638
Docket No. L-00000GG-08-0408-00140, Decision No. 70639

This letter updates Arizona Solar One LLC's compliance with Solana's Educational Program implemented to meet condition five of Certificate of Environmental Compatibility stated as follows:

"Applicant, or its assignee(s) and/or its customer, will work in good faith to develop and implement an education program to teach students about the science of solar electric technology."

Arizona Solar One LLC's progress for the 2015 Educational Program is the following:

The ramp up stage:

Educational Tours

- Solana welcomed several educational tours throughout the year inviting universities such as Arizona State University and Northern Arizona University. Also, promoting earth day in April with several participates across Arizona.

Educational Billboard

- The educational billboard concept has been downgraded to posting panel signs throughout the site near discussion points while on tour to maximize teaching methods of thermal solar technology. The marketing team is compiling the content to place on the signs with lucid material comprised of pictures, process diagrams, and fun facts to enhance learning.

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Official data, images and videos provided by institutions: Data, images and videos property of Abengoa.

- The team is working to improve the visibility of the program on Abengoa's website including documents, pictures to download, and videos.
- Based on the audience for the tour, specific PowerPoint presentations were created to increase understanding for their educational visit.

Research on educational institutions in the area

- A database for educational institutions has been created to identify potential partnerships and supporters for solar technology. In addition, a letter signed by the General Manager was mailed to local schools (included in the database) to introduce our program and invite them to journey with us on educating all of the benefits of solar technology and to visit our facility.

Also, attached in this letter is the following:

- (Attachment 1) Panel Sign Examples and Proposed Content for the signs, (Attachment 2) Educational Institutions Database, (Attachment 3) PowerPoint presentation described in the educational program.

Sincerely,

Emiliano Garcia Sanz
Solana – General Director
Arizona Solar One LLC - Treasurer

ABENGOA YIELD

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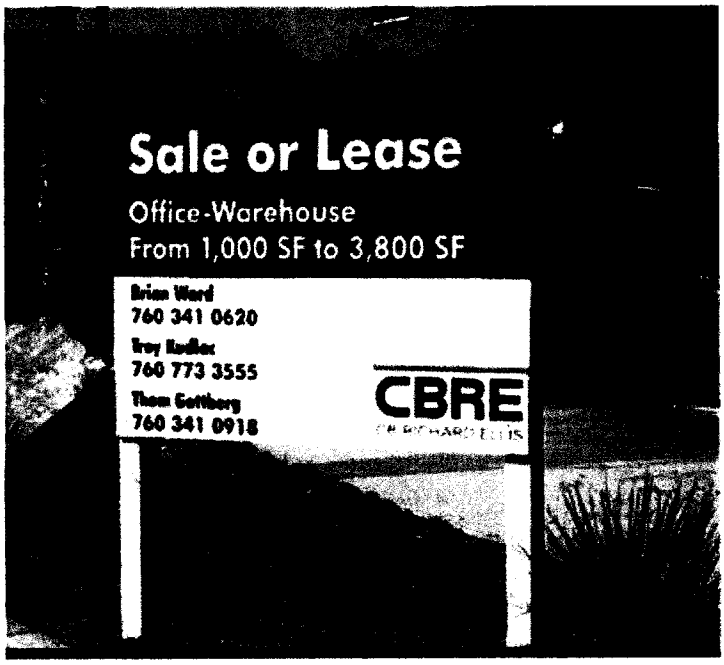
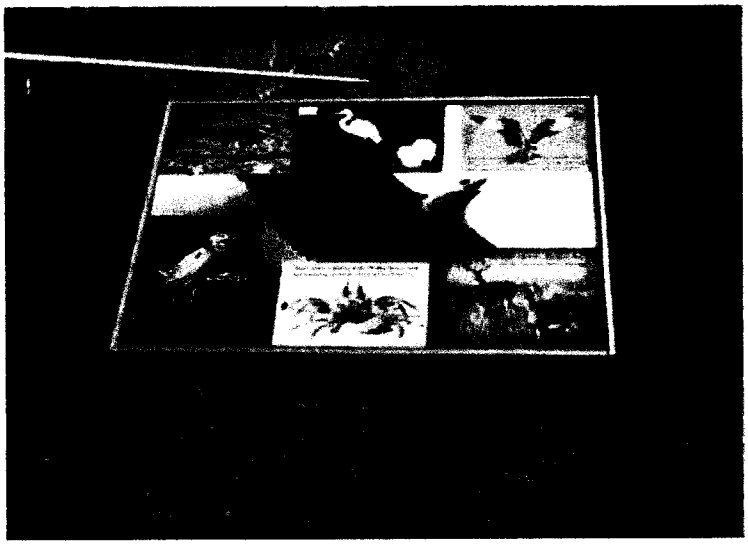
Attachment 1

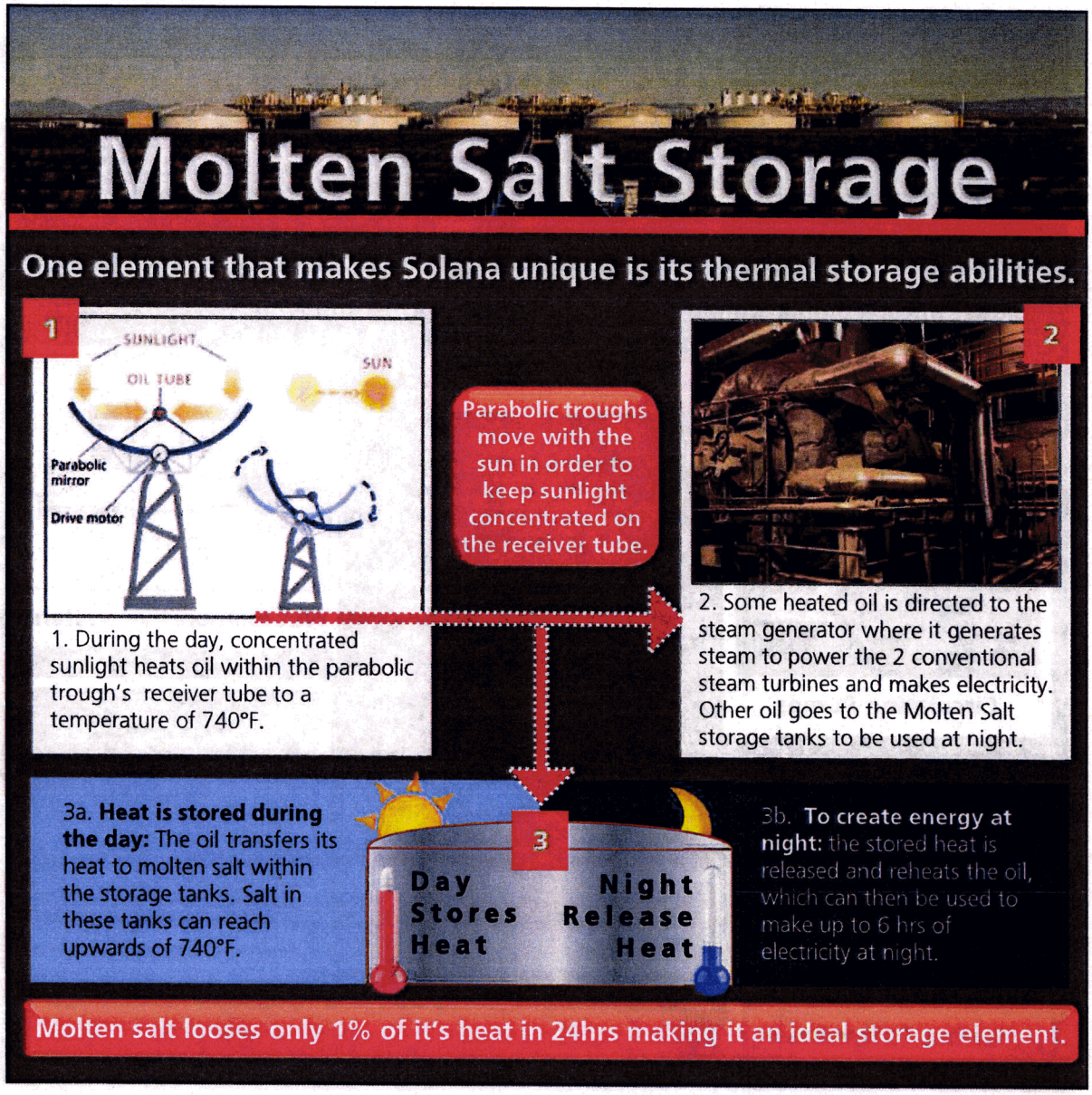
Panel sign examples and proposed content for the signs

Sample 1: Panel sign to be installed at Solana



Sample 2: Panel sign to be installed at Solana




Molten Salt Storage
One element that makes Solana unique is its thermal storage abilities.
1
SUNLIGHT
OIL TUBE
SUN
Parabolic mirror
Drive motor
1. During the day, concentrated sunlight heats oil within the parabolic trough's receiver tube to a temperature of 740°F.
Parabolic troughs move with the sun in order to keep sunlight concentrated on the receiver tube.
2
2. Some heated oil is directed to the steam generator where it generates steam to power the 2 conventional steam turbines and makes electricity. Other oil goes to the Molten Salt storage tanks to be used at night.
3a. Heat is stored during the day: The oil transfers its heat to molten salt within the storage tanks. Salt in these tanks can reach upwards of 740°F.
3
Day Stores Heat
Night Release Heat
3b. To create energy at night: the stored heat is released and reheats the oil, which can then be used to make up to 6 hrs of electricity at night.
Molten salt looses only 1% of it's heat in 24hrs making it an ideal storage element.

The Cooling Tower & Water Recycling System

Solana uses wet counter flow cooling towers in an open cooling circuit to absorb heat from the steam condenser and release it into the atmosphere via evaporation.

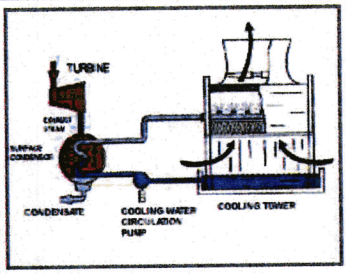
Solana recycles 90% of the plant's waste water while 10% is sent to evaporative ponds to be returned to the atmosphere.

Circulation Pumps

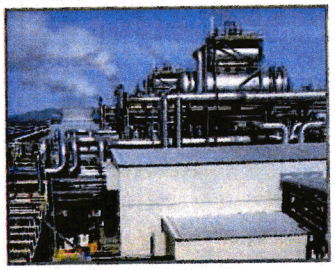
Cooling Tower Basin

Circulation pumps transfers water from the cooling tower basin to the steam condenser, where it is used to condense the steam from the turbine to water by absorbing heat, before is it is returned to the top of the cooling towers.

In the cooling towers, the water falls through packing while cooler ambient air passes in the opposite direction. The hot water transfers heat to the air by evaporation and this cools the water while heating the air, through the process of convection. The cooler water is returned to the basin to cooling tower basin, where it waits to begin the process over again.

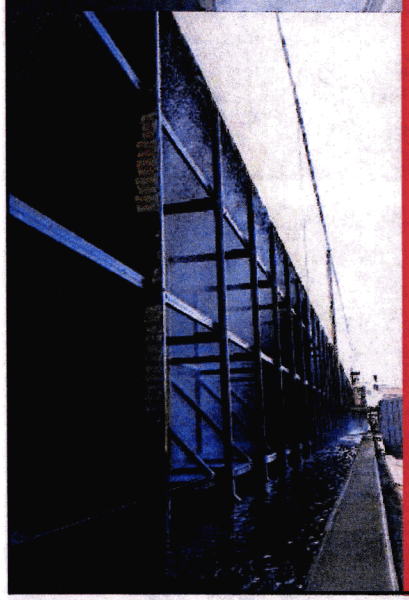


Wet Evaporative System



Cooling Tower Turbines

Solana uses 75% less water than previous agricultural use.



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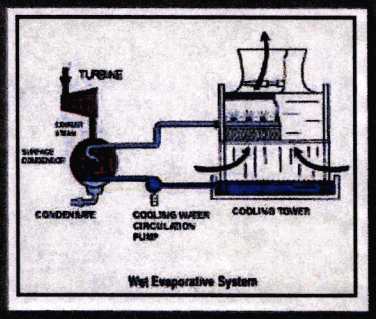

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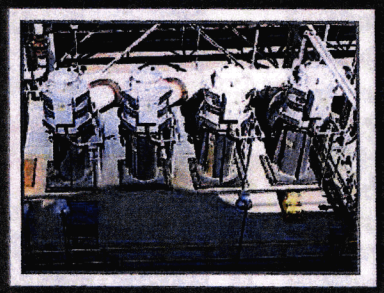

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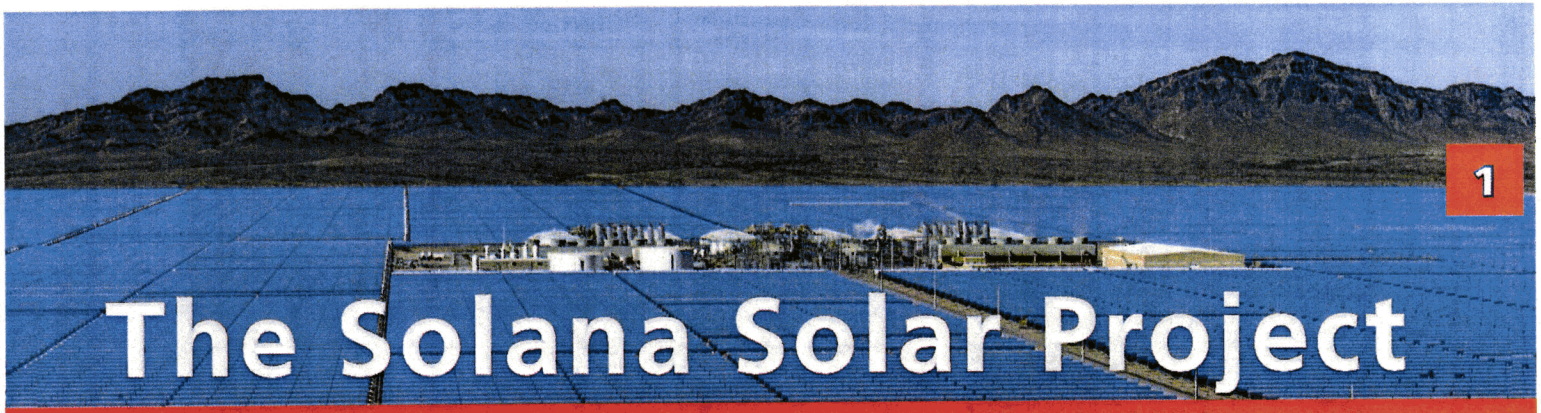
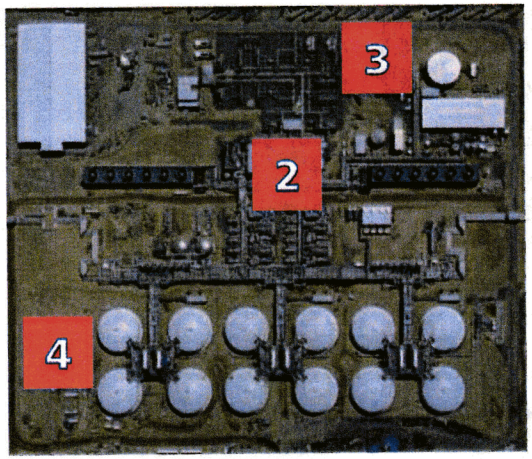
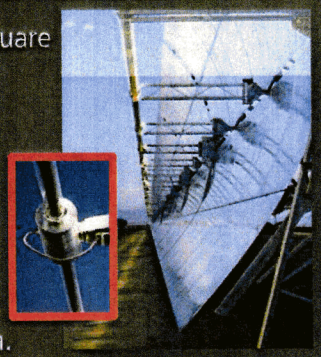


The Solana Solar Project

The Facility



2x140 MW turbines produce 280MW of electricity



1. The Solar Field: Approximately 2.2 million square meters of reflective area and 3,200 parabolic Troughs make up Solana's solar field. These troughs concentrate sunlight on a receiver tube located at their center. Within the receiver tube runs an oil based heat transfer fluid that is the essence of this thermal process.

2. The Power Block: Heat exchangers transfer heat from oil to water where it generates steam. The steam powers two 140 MW turbines to produce electricity. A large cooling tower provides cold cooling water for the plant.

3. Water Treatment : All water used for electricity production is filtered, cleaned and recycled via the onsite water treatment plant.

4. These 12 tanks store heat produced during the day to use after the sun goes down. Storage is critical for any STE system and the electricity grid as a whole. Storage increases dispatchability and reliability.

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Attachment 2

Educational Institutions Database

School name	Type of educational institution (College, High School, primary school, etc)	Location	State	Number of students	Estimated number of students able to visit the plant	Complete address	Contact information	Have they requested a tour visit already? Yes/ No	Have they visited the plant already?	Other potential forms of collaboration/ engagement	Webpage	Comments
University of Arizona	College	Tucson	AZ			The University of Arizona Tucson AZ 85721	http://directory.arizona.edu/ Main Switchboard (520) 621-2211	No	No		http://www.arizona.edu/	
Arizona State University	College	Tempe	AZ		10	Arizona State University Tempe AZ 85281 480-965-2100	School of Sustainability 480-727-6963 https://schoolofsustainability.asu.edu/	No	Yes		http://www.asu.edu/	
Northern Arizona University	College	Flagstaff	AZ		40	S San Francisco St, Flagstaff, AZ 86001	(928) 523-9011 http://nau.edu/about/who-we-are/facts/#colleges	No	Yes		https://www.nau.edu/	
Grand Canyon University	College	Phoenix	AZ			3300 W Camelback Rd Phoenix, AZ 85017	(602) 639-7500	No	No		http://www.gcu.edu/	
Pima Community College	College	Tucson	AZ			1255 N Stone Ave Tucson, AZ 85709	(520) 206-7171	No	No		https://www.pima.edu/	
Chandler-Gilbert Community College	College	Chandler	AZ			2626 E Pecos Rd Chandler, AZ 85225	(480) 732-7000	No	No		http://www.cgc.maricopa.edu/Pages/Default.aspx	
Mesa Community College	College	Mesa	AZ			1833 W Southern Ave Mesa, AZ 85202	(480) 461-7000	No	No		http://www.mesacc.edu/	
Rio Salado College	College	Tempe	AZ			2323 W 14th St Tempe, AZ 85281	(480) 517-8000	No	No		http://www.riosalado.edu/Pages/default.aspx	
Universal Technical Institute	College	Scottsdale	AZ			16220 N Scottsdale Rd # 100 Scottsdale, AZ 85254	(623) 445-9500	No	No		http://www.uti.edu/	
Arizona Western College	College	Yuma	AZ			2020 S Ave 8 E Yuma AZ 85365	(928) 317-6000	No	No		https://www.azwestern.edu/	
Phoenix College	College	Phoenix	AZ			1202 W Thomas Rd Phoenix, AZ 85013	(602) 285-7800	No	No		http://www.phoenixcollege.edu/	
Scottsday Community College	College	Scottsdale	AZ			9000 E Chaparral Rd Scottsdale, AZ 85256	(480) 423-6000	No	No		http://www.scottsdalecc.edu/	
Glendale Community College	College	Glendale	AZ			6000 W Olive Ave Glendale, AZ 85302	(623) 845-3333	No	No		http://www2.gccaz.edu/	
Paradise Valley Community College	College	Phoenix	AZ			18401 N 32nd St Phoenix, AZ 85032	(602) 787-6500	No	No		http://www.paradisevalley.edu/	
Yavapai College	College	Prescott	AZ			1100 E Sheldon St Prescott, AZ 86301	(928) 445-7300	No	No		https://www.yc.edu/	
Northcentral University	College	Prescott Valley	AZ			10000 East University Drive Prescott Valley, AZ 86314	(928) 541-7777	No	No		http://www.ncu.edu/	
Gateway Community College	College	Phoenix	AZ			108 N 40th St Phoenix, AZ 85034	(602) 286-8000	No	No		http://www.gatewaycc.edu/	
Cochise College	College	Sierra Vista, Douglas, Benson, Willcox	AZ				800-966-7943	No	No		http://www.cochise.edu/	
South Mountain Community	College	Phoenix	AZ			7050 S 24th St Phoenix, AZ 85042	(602) 243-8000	No	No		http://www.southmountaincc.edu/	
Coconino County Community College	College	Flagstaff	AZ			2800 S Lone Tree Rd Flagstaff, AZ 86005	(928) 527-1222	No	No		https://www.coconino.edu/	
Arizona Christian University	College	Phoenix	AZ			2625 E Cactus Rd Phoenix AZ 85032	(602) 489-5300	No	No		http://arizonachristian.edu/	
Gila Bend High School	High School	Gila Bend	AZ			308 N Martin Ave Gila Bend AZ 85337	(928) 683-2225	No	No		http://gbusd.org/	
Buckeye High School	High School	Buckeye	AZ			1000 E, Narramore Ave Buckeye, AZ 85326	(623) 368-4423	No	No		http://gbusd.org/	
Youngker High School	High School	Buckeye	AZ			3000 S. Apache Road Buckeye, AZ 85326	(623) 474-0100	No	No		http://www.buhsd.org/youngker	
Ajo High School	High School	Ajo	AZ			111 N. Well Road Ajo, AZ 85321	(520) 387-7601	No	No		http://ajoschools.org/	
Desert Edge High School	High School	Goodyear	AZ			15778 W. Yuma Rd Goodyear, AZ 85338	(623) 932-7500	No	No		http://www.aquafria.org/dehs	
Estrella Foothills High School	High School	Goodyear	AZ			13033 S. Estrella Pkwy Goodyear, AZ 85338	(623) 327-2400	No	No		http://www.greatschools.org/arizona/goodyear/2866-Desert-Edge-High-School/	
Estrella High School	High School	Avondale	AZ			510 N Central Ave Avondale, AZ 85323	(623) 932-6561	No	No		http://www.estrellahs.com/	
Maricopa High School	High School	Maricopa	AZ			45012 W. Honeycutt Rd Maricopa, AZ 85138	(520) 568-8100	No	No		http://mhs.maricopausd.org/	
Millennium High School	High School	Goodyear	AZ			14802 W. Wigwam Blvd Goodyear, AZ 85395	(623) 932-7200	No	No		http://www.aquafria.org/Domain/10	
Tolleson Union High School	High School	Tolleson	AZ			9419 W. Van Buren St Tolleson, AZ 85353	(623) 478-4000	No	No		http://www.tuhsd.org/	
Tonopah High School	High School	Tonopah	AZ			38201 W. Indian School Rd Tonopah, AZ 85354	(623) 474-5201	No	No		http://twhs.smusd90.org/	
Verrado High School	High School	Buckeye	AZ			20050 W. Indian School Rd Buckeye, AZ 85326	(623) 932-7400	No	No		http://www.aquafria.org/Domain/11	
West View High School	High School	Avondale	AZ			10850 W. Garden Lakes Pkwy Avondale, AZ 85392	(623) 478-4600	No	No		http://westview.tuhsd.org/	
Kiser Elementary School	Elementary School	Gila Bend	AZ			38739 L8 Gila Bend, AZ 85337	(928) 683-2588	No	No		http://www.palomaesd.org/	
Gila Bend Elementary School	Elementary School	Gila Bend	AZ			308 N Martin Ave Gila Bend AZ 85337	(928) 683-2287	No	No		http://gbusd.org/	
West Park Elementary School	Elementary School	Goodyear	AZ			2700 S 257th Ave Buckeye, AZ 85326	(623) 435-3282	No	No		http://besd.k12.az.us/	
Sundance Elementary School	Elementary School	Buckeye	AZ			23800 W. Hadley St Buckeye, AZ 85326	(623) 847-8531	No	No		http://sundance.buckeye.schooldesk.net/	
Freedom Elementary School	Elementary School	Buckeye	AZ			22150 W. Sundance Pkwy S Buckeye, AZ 85326	(623) 327-2850	No	No		http://freedom.liberty.k12.az.us/cms/One.aspx	
Verrado Elementary School	Elementary School	Buckeye	AZ			20873 W Sunrise Ln, Buckeye, AZ 85396	(623) 547-1600	No	No		http://www.lesd.k12.az.us/VerradoHeritage.cfm?subpage=1871945	
Copper Trails Elementary School	Elementary School	Goodyear	AZ			16875 Canyon Trails Blvd, Goodyear, AZ 85338	(623) 772-4100	No	No		http://ct.avondale.k12.az.us/	
Mabel Padgett Elementary School	Elementary School	Goodyear	AZ			15430 W Turney Ave, Goodyear, AZ 85395	(623) 547-3200	No	No		http://www.lesd.k12.az.us/MabelPadgett.cfm	
Steven R Jasinski Elementary School	Elementary School	Buckeye	AZ			24499-24615 W Broadway Rd, Buckeye, AZ 85326	(623) 925-3100	No	No		http://srj.buckeye.schooldesk.net/	
Liberty Elementary School	Elementary School	Buckeye	AZ			19818 MC 85, Buckeye, AZ 85326	(623) 327-2810	No	No		http://www.liberty.k12.az.us/	

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Attachment 3

PowerPoint presentation described in the educational program

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1 Solana introduction

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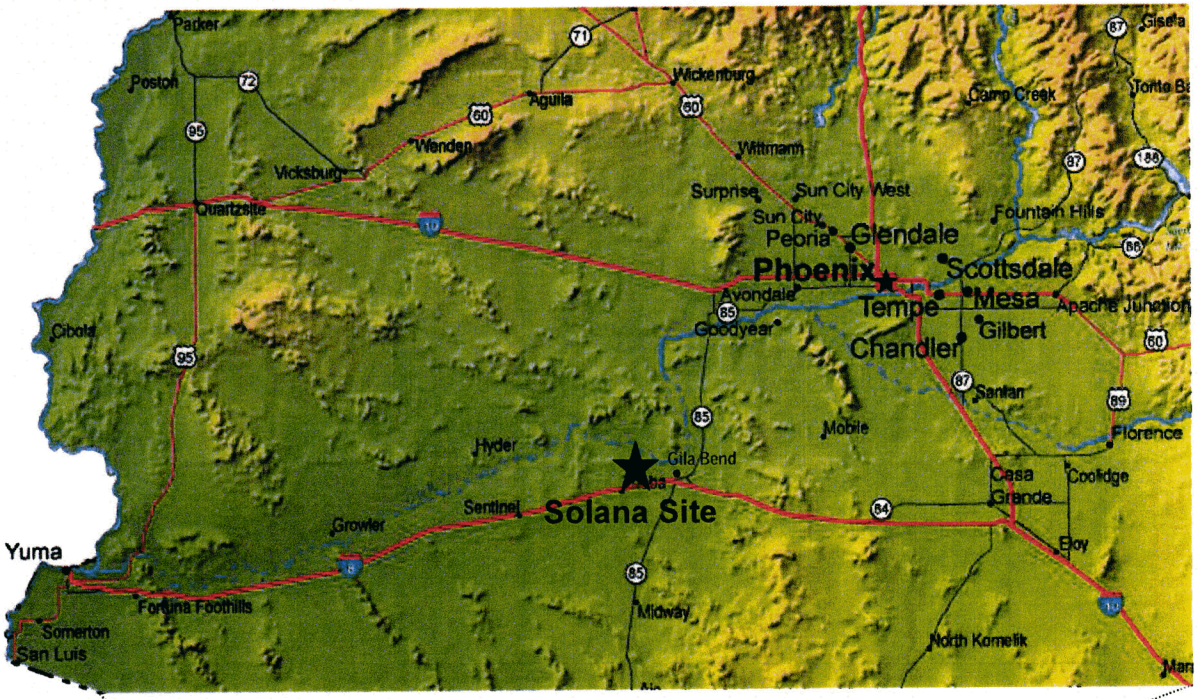
ABENGOA SOLAR

Solana site location:

The Solana site is located west of Gila Bend, AZ, approximately ~70 miles southwest of Phoenix.



Map extent

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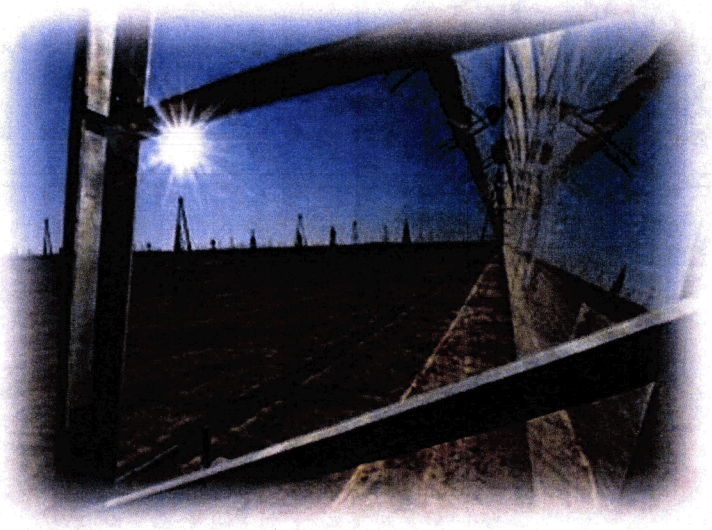
ABENGOA SOLAR



Solana project facts

- 280 MW gross output with conventional steam turbines
- Electricity for 70,000 households
- "Solar Field" covers ~1900 acres or 3 sq. miles and contains ~3,200 trough collectors
- Collectors are ~20 ft. wide, 450 ft. long, and over 20 ft. height
- Plant water consumption approximately 1/10th of former agricultural use
- Thermal storage tanks allow electricity to be produced on cloudy days and for 6 hours after sunset
- All of Solana's energy will be purchased by APS for 30 years and delivered to Arizona customers

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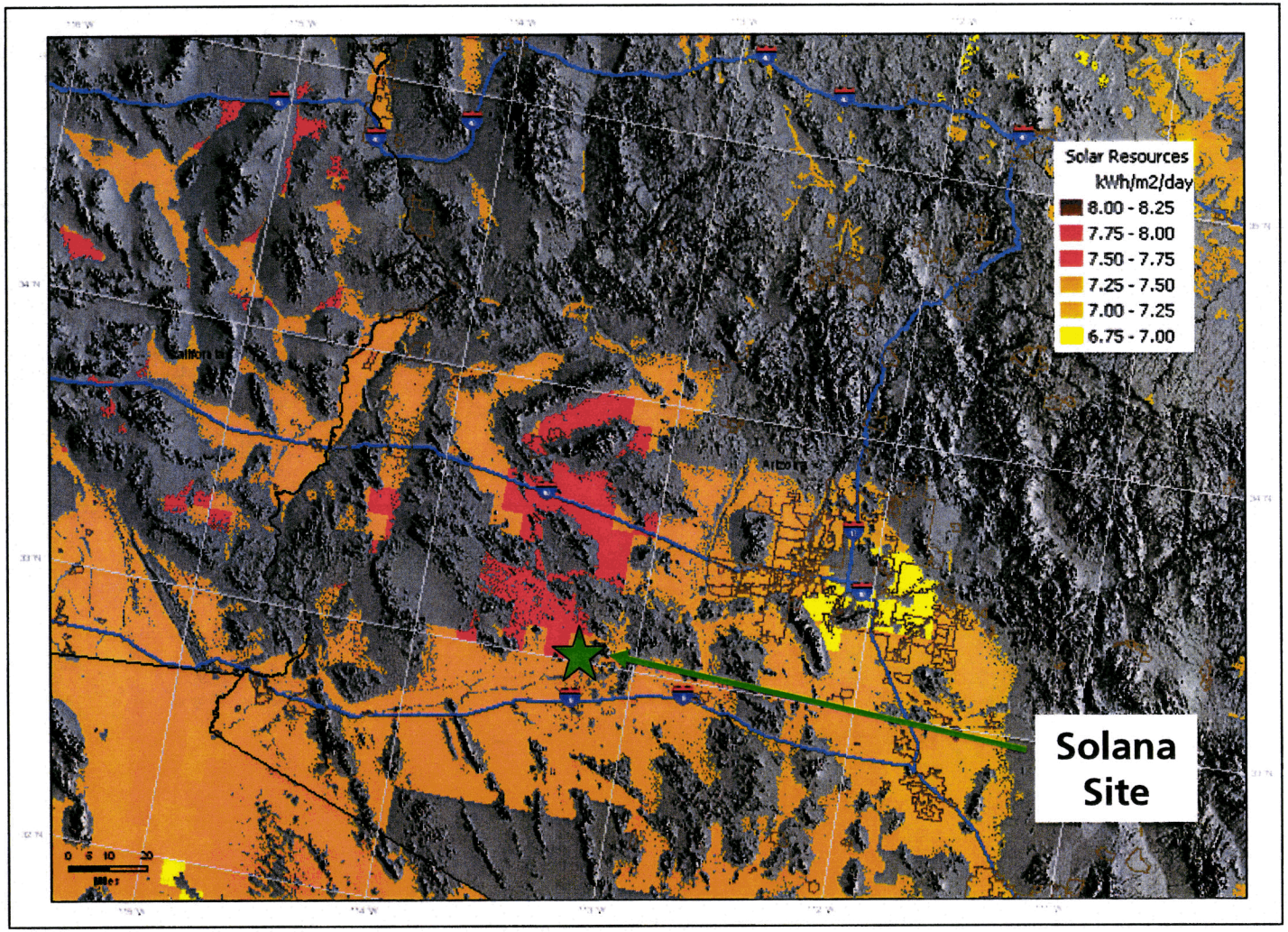
Siting considerations

- High solar resource
- Minimal slope
- Proximity to electric grid
- Proximity to transportation corridors
- Water availability
- Previously disturbed land



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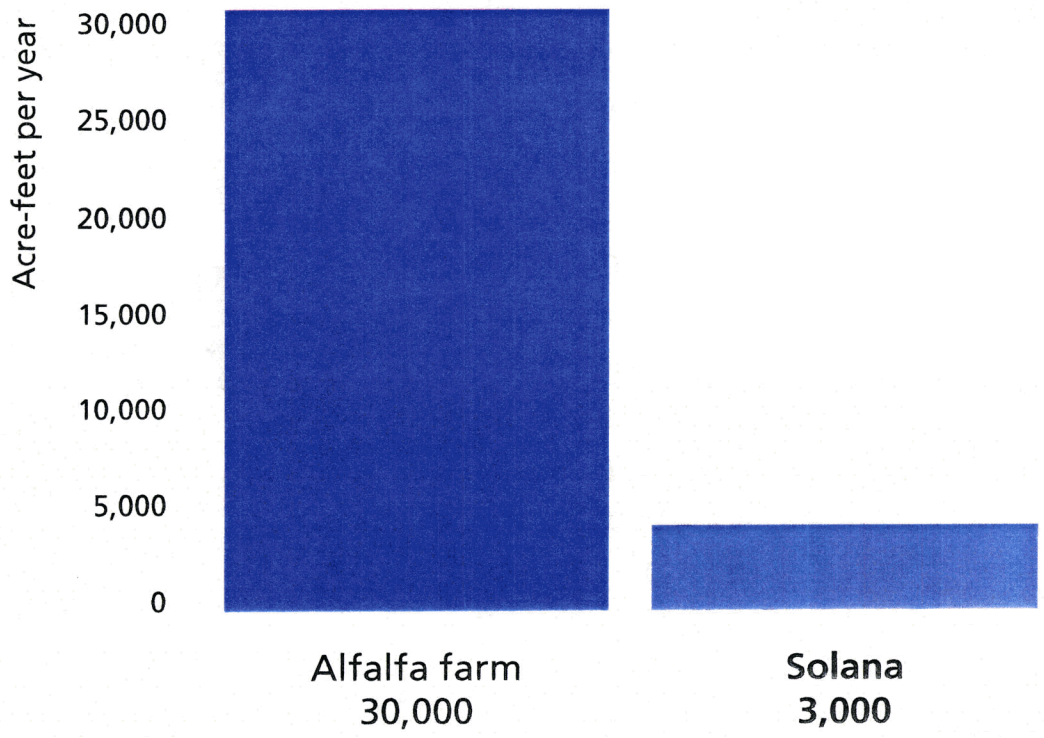
Previously disturbed farm land is an ideal choice.

Water use by land activity

The power plant is being built on developed land that was previously used for agriculture. Solana will replace an alfalfa farm, significantly reducing water consumption.



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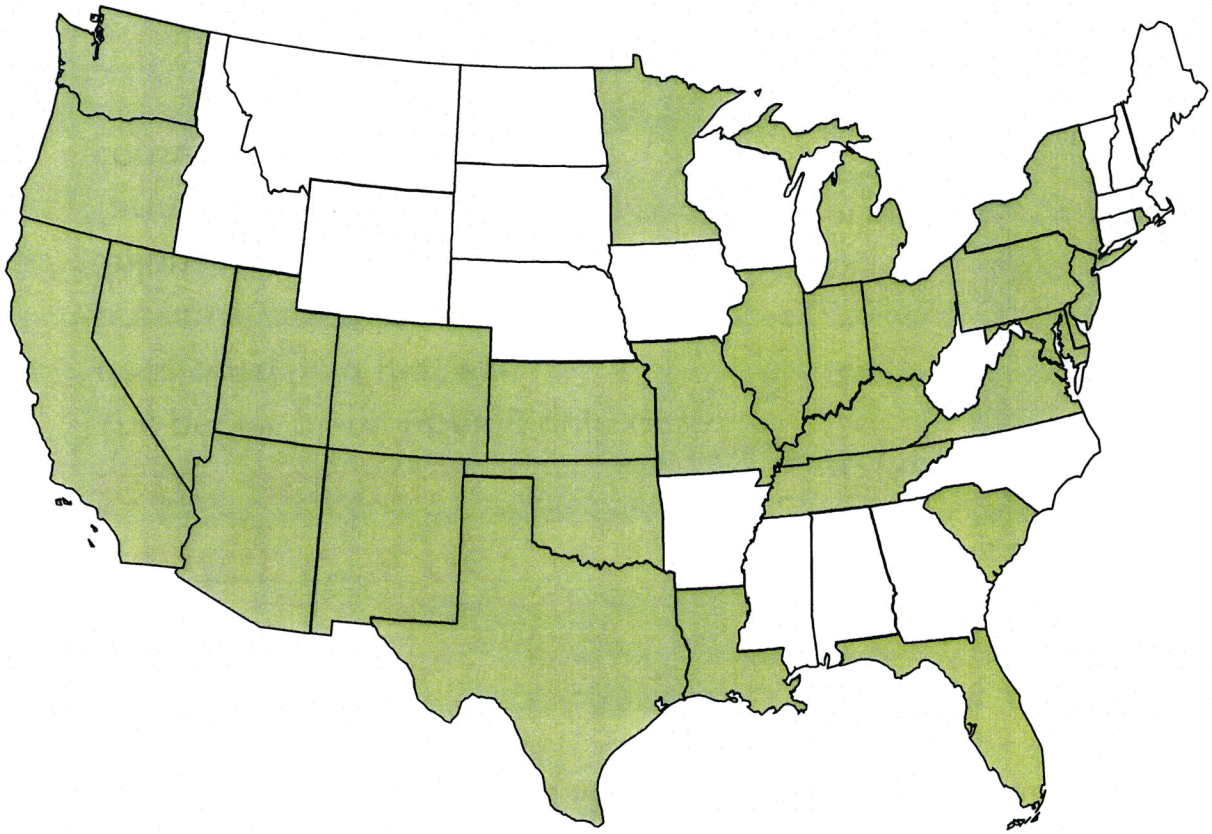
Abengoa supply chain spans the country



29 states and 165 companies

Components

Mirrors, collector assembly
Perimeter fence/grading, pond
Thermal Storage foundation
Steel tanks
Substation/transmission lines
IT controls
Feed water vessels
Pump motors
Heat Transfer Fluid and pumps
Pressure heaters
Thermal Storage Equipment
Receiver tubes
Ball joint assemblies
Water treatment equipment
Collector foundations
Cooling / condensing system
Night HTF pumps
Hydraulic drives
Piping/insulation

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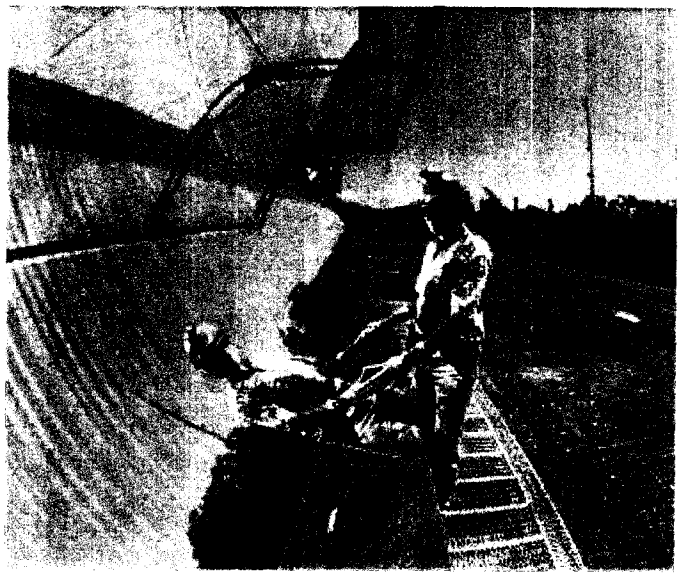
Solana's economic benefits



- Jobs
  - Over 2,000 jobs during construction phase
  - Over 85 skilled jobs during operation
- Total Arizona benefit
  - Over $1B in direct investment
- $300M to $400M in 30-year tax revenues
- Over 3,000 indirect jobs.
- Mirror factory in Surprise,
- Helps curb Arizona's annual $10B energy dollar outflow

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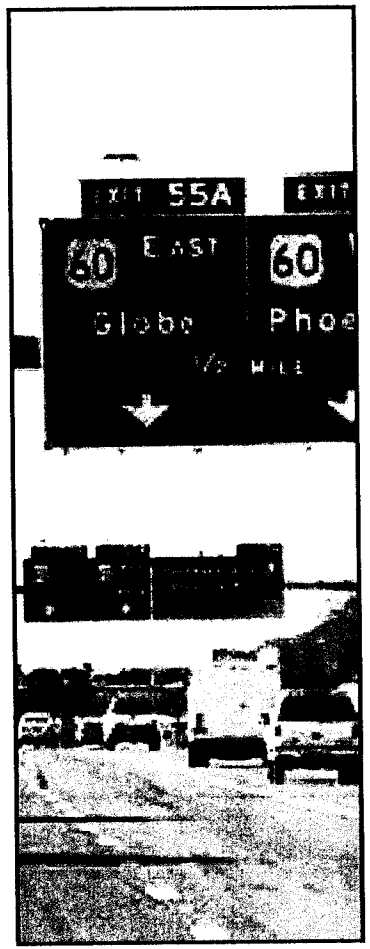
Environmental benefits

Annual emissions abated:

- Over 475,000 tons carbon dioxide
- 1,065 tons of nitrogen oxides
- 520 tons of sulfur dioxide

This is the equivalent to removing almost 80,000 cars from the road each year, or half the vehicles that travel on Phoenix's State Route 60 every day.



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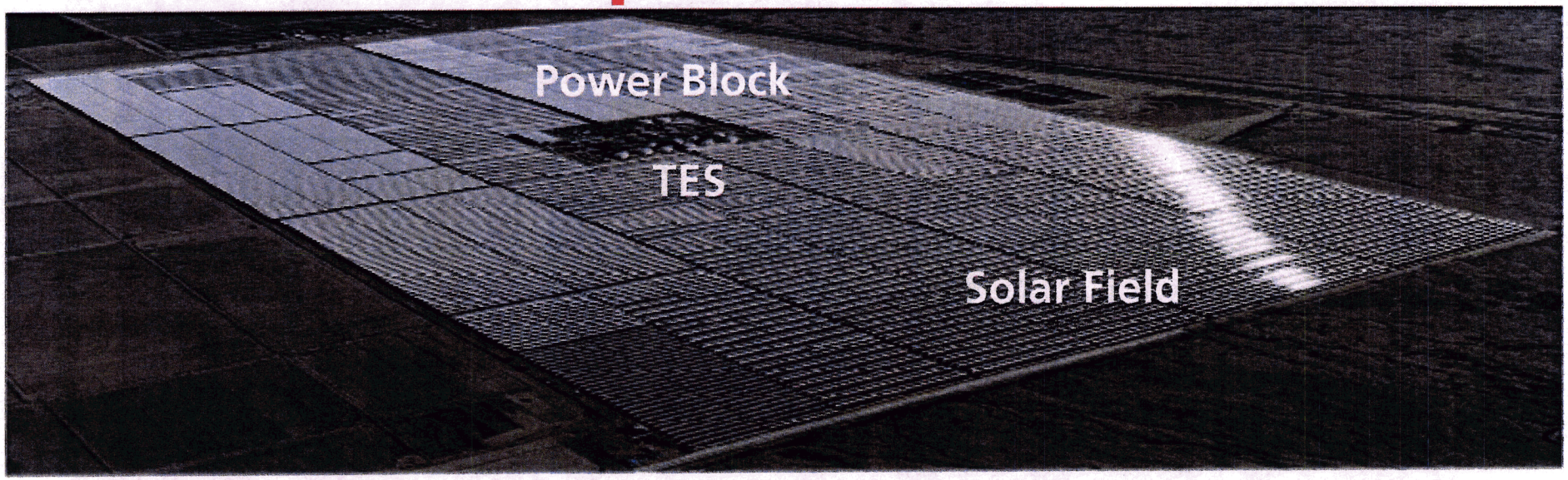
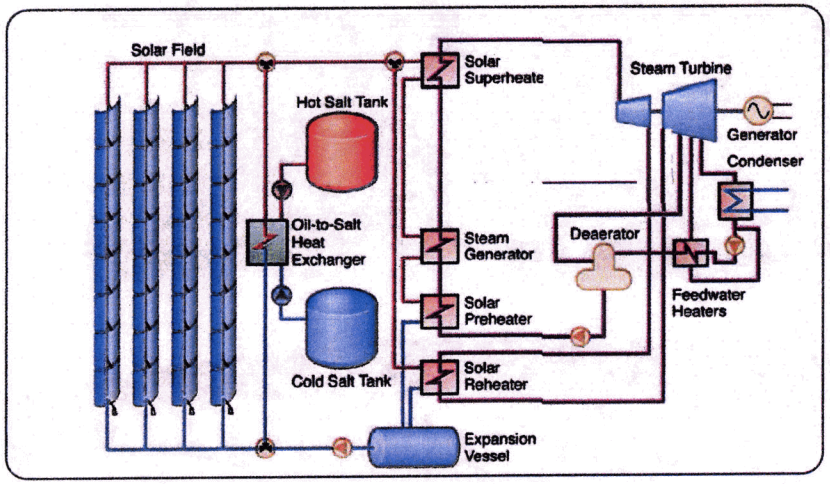
Solana solar power





- Solana
  - 280 MWe
  - Parabolic trough solar field
  - 6 hours of thermal energy storage (TES)

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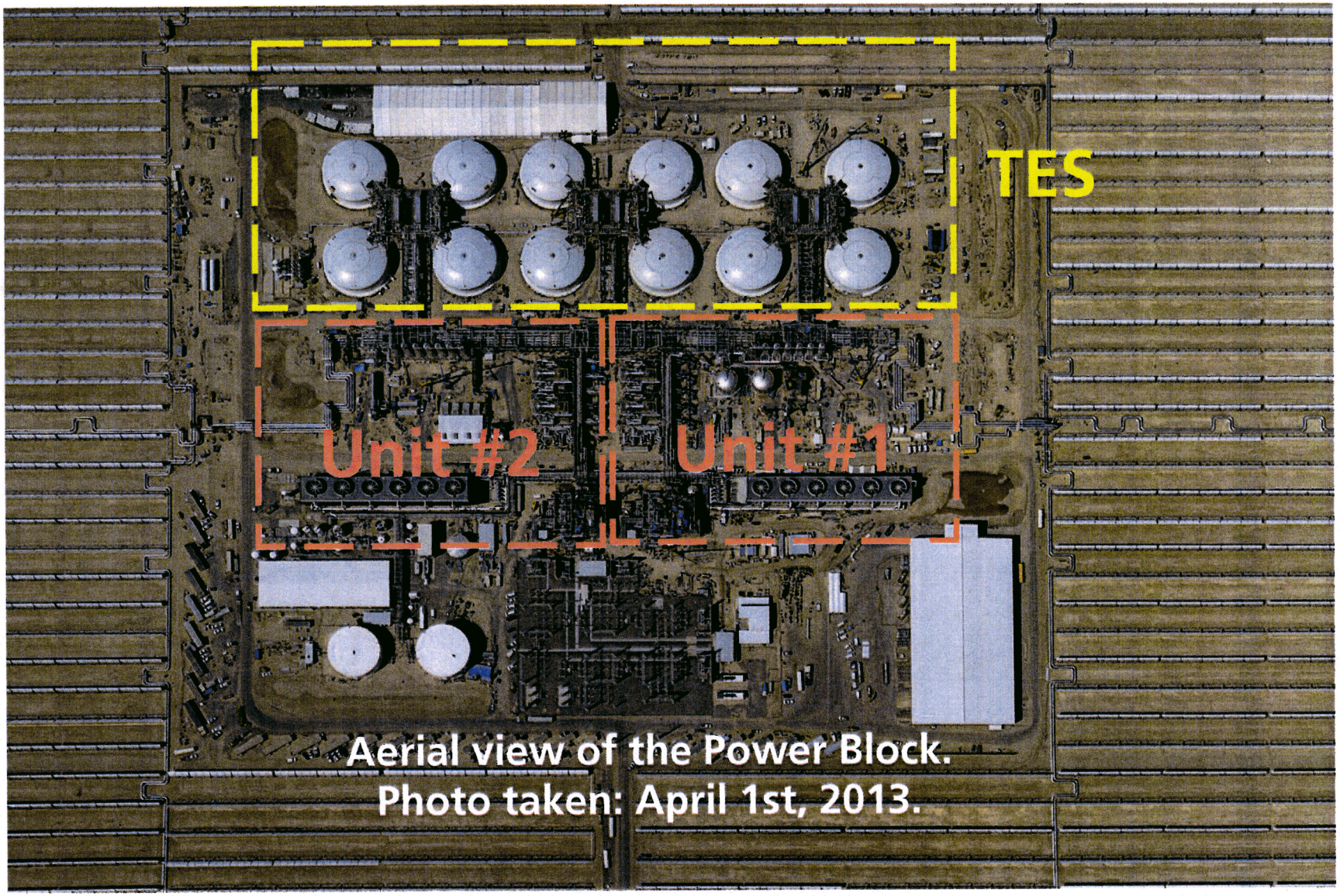
ABENGOA SOLAR



Aerial view of the Power Block.
Photo taken: April 1st, 2013.

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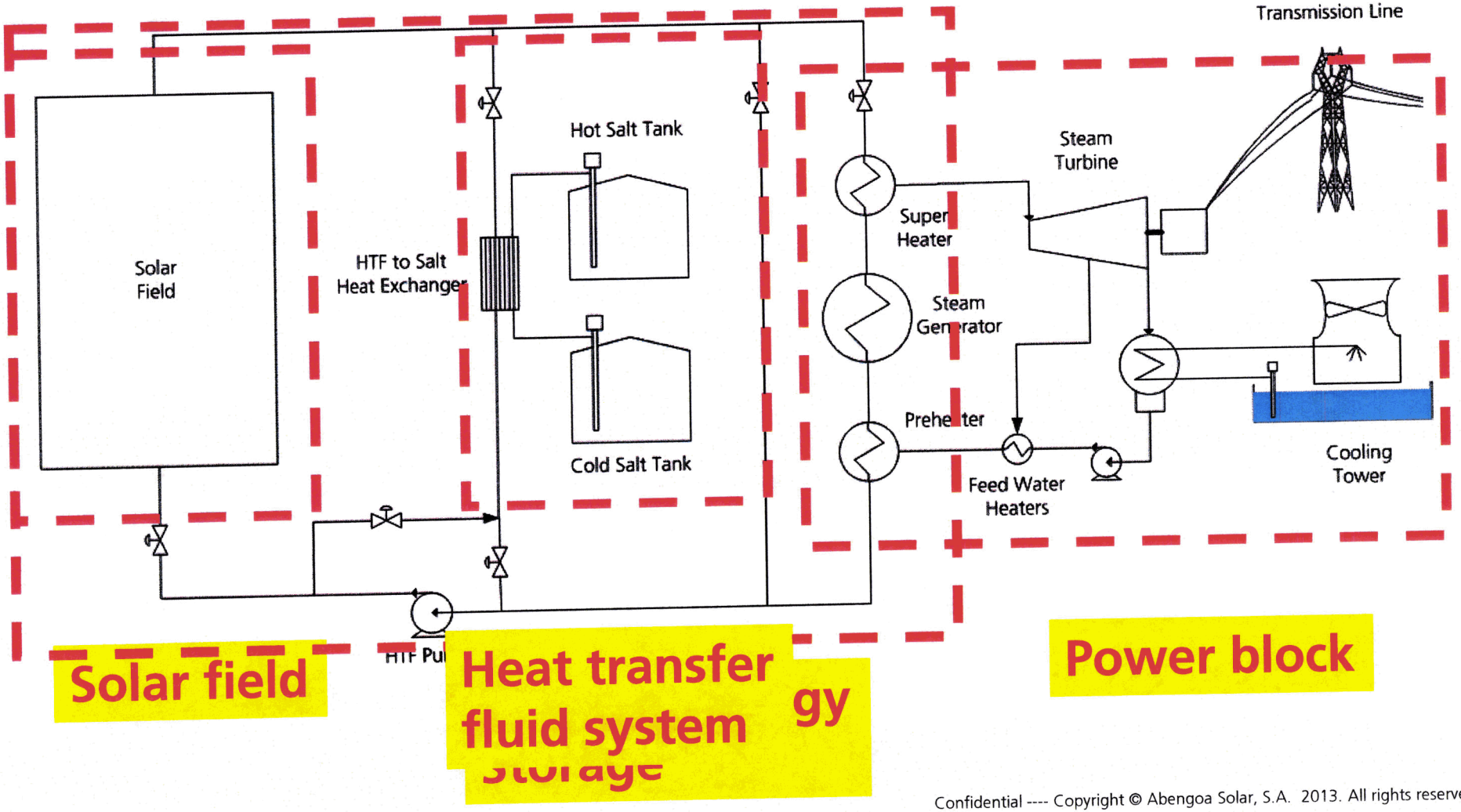
Parabolic trough process flow diagram with indirect Thermal Energy Storage



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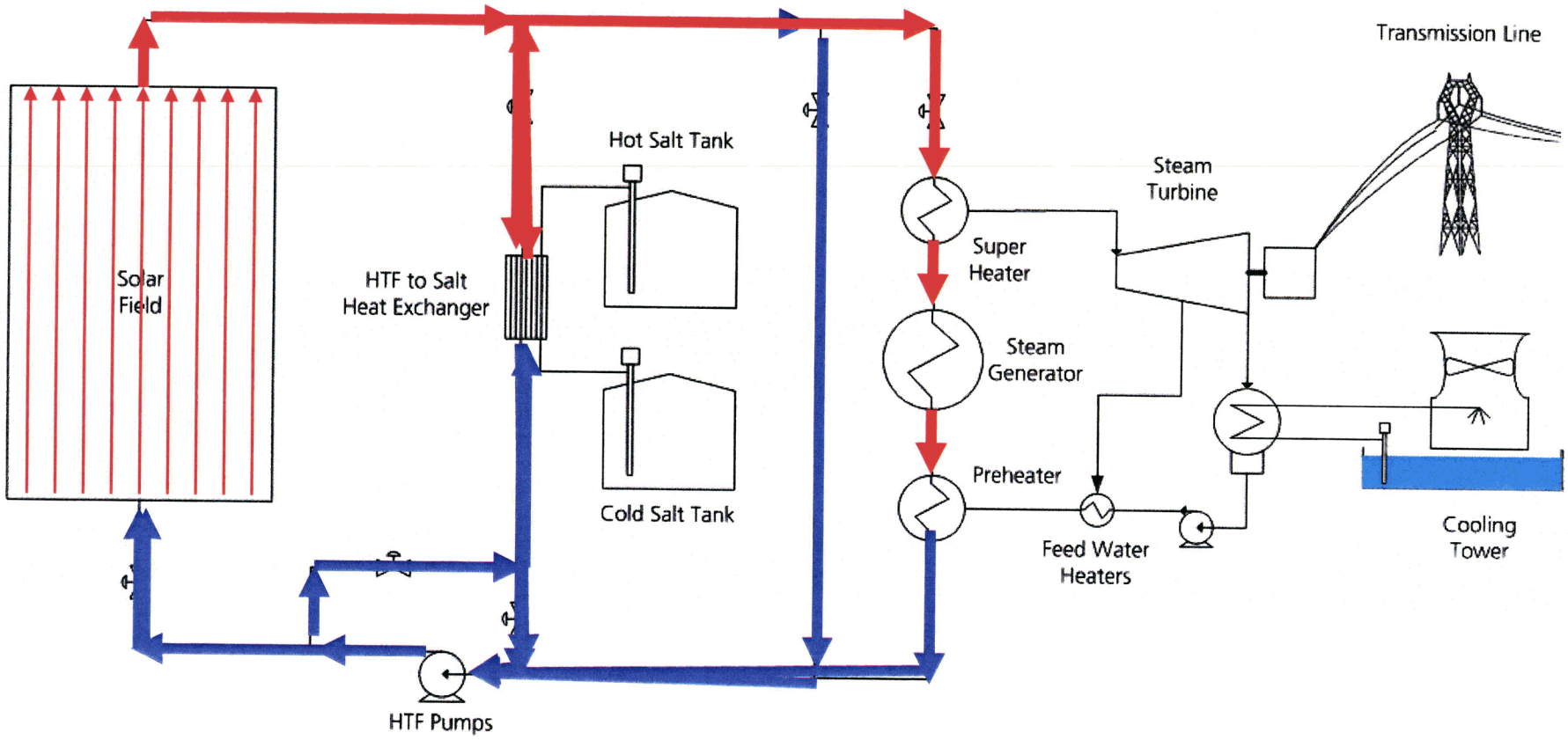
Parabolic trough process flow diagram with indirect Thermal Energy Storage

Heat Transfer Fluid System



Power Generation from TES on

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ABENGOA

Solar power for a sustainable world

Introduction to Corporate Social Responsibility (CSR) – Tour visits

CSR team - Abengoa Solar

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- Corporate Social Responsibility is a form of business management geared towards **increasing positive impacts,** taking into account all the stakeholders of the company and **lowering the potential negative impacts** associated with the company's operations.
- Social responsibility and sustainability play a key role at Abengoa. For the company, it means upholding a **commitment** to ensuring that the its performance contributes to **economic development and social progress** in the communities where Abengoa operates, while at the same time **mitigating impacts** on the environment.

Our signs of identity

We integrate responsible management into our strategy

- We ensure that our businesses are in keeping with our mission and vision.
- We **manage and reduce** the environmental impact of our activities.
- We seek joint progress between the company and society by **investing in the socioeconomic development** of local communities.
- **Talent and diversity** define our people.
- Our approach to communication revolves around **stakeholder dialog.**
- We convey our **commitment to sustainability** throughout the value chain.

Having a CSR management model in Abengoa includes:

- Periodic measuring on **Economic, Social and Environmental Performance**: It helps to measure our commitments and it also contributes in the decision making.
- **Permanent dialog** with our stakeholders.
- Publishing its **CSR Report annually** that includes the key information of the company: economic, social and environmental dimensions.
- Monitoring its **Environmental Footprint**: to improve our efficiency and reducing our negative impact in the local community.
- Establishing a **Strategic Plan 2020 for the whole company** to improve our responsible business model, that involves all the departments to make significant improvements in the whole working chain.
- Conducting **Ethical Risk Analysis in its facilities:** Annually, 27 ethical risks are analyzed in each facility to ensure the good practices; the health and Safety of the employees; the integrity of the supply chain; the local impact of our activity in the community, as well as our social commitment and the correct environmental management. The identified risks are combated with annual mitigation plans.
- Having a **Code of Conduct** for all its employees.
- **Responsible purchasing system** implemented. In addition, suppliers are annually audited by Abengoa.
- **Fraud Prevention and Detection Unit** was created.
- Getting **Certifications** from reputed organizations:

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