



ausra™

Solar Steam Generation For Existing Combined-Cycle Gas-Fired Power Plants



MARKET READY SOLUTION

In today's evolving carbon market, power producers are looking for energy solutions to decrease emissions while enhancing their competitive advantage. Ausra's innovative solar steam generators are designed to deliver reliable, emission-free solar steam to our customers' existing gas-fired power stations to increase plant output, lower carbon emissions and hedge against volatile fuel prices. The deployment of Ausra's technology at an existing gas-fired, combined-cycle facility enables the mixing of steam from Ausra's solar field with a power plant's intermediate pressure (IP) evaporator or cold reheat steam. The introduction of solar steam enables the steam turbine to produce additional electricity without additional fuel.

ENGINEERED FOR POWERFUL PERFORMANCE

The Ausra system produces more energy per acre of land than any other solar technology in operation. Generating steam from the sun, Ausra's solar field can lead to real improvement in overall plant performance. Additional thermal energy from steam leads to an increase in plant output. For mid- to large-scale gas-fired power stations the installation of an Ausra solar field can increase plant electrical output by approximately 5 percent during times of peak demand while providing a 200-to-250 Btu/kwh heat rate improvement at peak boost. Ausra is the first solar steam power boiler manufacturer to receive the American Society of Mechanical Engineers' (ASME) "S" Stamp Certificate of Authorization. Ausra has also received the National Board Certificate of Authorization "NB" to register its solar boilers.

REDUCED EMISSIONS

Our solar system provides real value – from avoided carbon costs to the generation of emission reduction credits. Adding steam from the sun provides more carbon-free electricity at peak times. The daily operational profile of Ausra's solar generator reduces a plant's air emissions when air quality improvements are needed most – during peak summer demand hours.

THE AUSRA™ ADVANTAGE

SIMPLE, DURABLE DESIGN

- Low wind profile
- Direct steam generation
- Steel-backed mirrors for long life

RELIABLE AND ROBUST

- Commercially proven technology
- Engineered for toughest environmental conditions
- (UV, rain, wind, hail, seismic)

RAPID DEPLOYMENT AND INSTALLATION

- High-volume automated production and standard materials help eliminate supply chain constraints
- Rapid field installation (6-18 months)

OPTIMIZED SITING

- Ease of permitting
- Maximum energy per acre
- 7080 MMBtu/acre⁽¹⁾ /yr



<http://www.ausra.com/technology/>

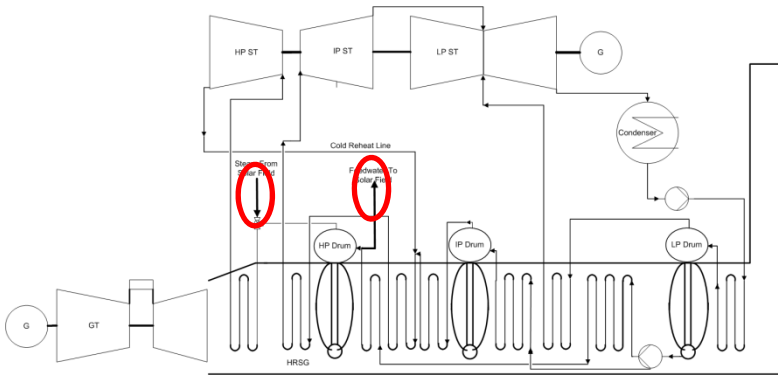
⁽¹⁾ Annual energy yield is based on typical annual sunshine in Phoenix, AZ (NREL TMY2 data), 120F/50C feedwater.

ADVANTAGES

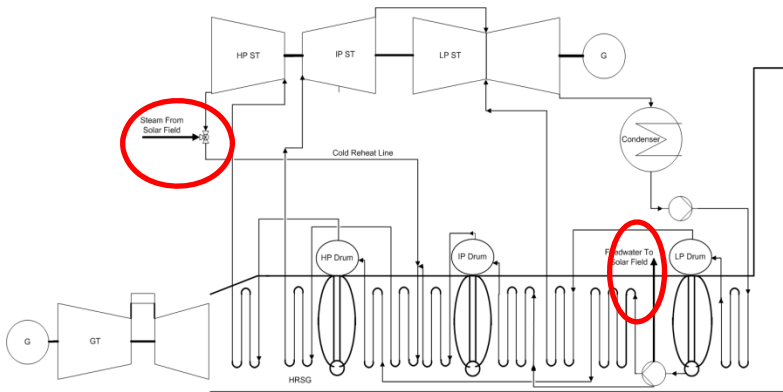
- Lower risk to cycle
- Existing facilities may have simplified integration due to steam turbine capacity
- Highest gross thermal efficiency conversion
- Best for new facilities where HRSG and steam turbine can be optimized

POWER AUGMENTATION SOLUTIONS

INTEGRATION CONCEPT: OPTION 1 HP BOOSTER SCHEMATIC



INTEGRATION CONCEPT: OPTION 2 CRH BOOSTER SCHEMATIC



AUSRA: YOUR SOLAR STEAM SOLUTION

Ausra's solar thermal technology can deploy quickly to provide solar generated steam to your operations reliably and cost effectively. Ausra's space-efficient, reliable, direct solar steam generators integrate simply with conventional power generation systems. Our technology is a hedge against rising fuel and emissions costs and can provide an added financial benefit in upcoming carbon market scenarios.

COMBINED-CYCLE PERFORMANCE⁽²⁾

(F-Class 2 on 1 configuration; 55-acre footprint; superheated steam to HP Drum Outlet)

Name Plate Rating	500	MWe
Steam Supply Pressure	1813	psia
Steam Supply Temperature	622.1	F
Steam Supply Enthalpy	1149.8	Btu/lb
Annual Thermal Energy	360,977	MMBtu
Gross Annual Electrical Energy	42,317	MWhe
Peak Gross Electricity Boost	30.4	MWe
Annual Avoided CO ₂ Emissions	21,500	Tons

⁽²⁾ 554F feedwater, Phoenix TMY2 weather and radiation data, 40% gross conversion efficiency

COMBINED-CYCLE PERFORMANCE⁽³⁾

(F-Class 2 on 1 configuration; 55-acre footprint; superheated steam to cold reheat (CRH) line)

Name Plate Rating	500	MWe
Steam Supply Pressure	725	psia
Steam Supply Temperature	698	F
Steam Supply Enthalpy	1,342	Btu/lb
Annual Thermal Energy	372,744	MMBtu
Gross Annual Electrical Energy	40,419	MWhe
Peak Gross Electricity Boost	28.5	MWe
Annual Avoided CO ₂ Emissions	20,200	Tons

⁽³⁾ 320F feedwater, Phoenix TMY2 weather and radiation data, 37% gross conversion efficiency

For More Information:

Ausra, Inc. - USA

T 650.424.9300

E sales@ausra.com

F 650.494.3893

W www.ausra.com