

# PROJECT facts

Advanced Turbine  
and Engine Systems

05/2000

U.S. DEPARTMENT OF ENERGY  
NATIONAL ENERGY TECHNOLOGY LABORATORY  
OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY  
OFFICE OF INDUSTRIAL TECHNOLOGIES

## DEVELOPING POWER SYSTEMS FOR THE 21ST CENTURY — THE SOLAR TURBINES INCORPORATED PROJECT

### PRIMARY PARTNER

**Solar Turbines, Incorporated**  
San Diego, CA

### MAIN SITES

San Diego, CA  
Peoria, IL

### TOTAL ESTIMATED COST

\$222,600,000

### COST SHARING

DOE	\$67,680,370
Non-DOE	\$97,328,070

### Description

Solar's approach takes advantage of a wide variety of demonstrated technological advances, each providing sufficient margin to ensure the superior durability and availability that are required by industrial gas turbine users. Within each selected technology, a combination of innovative primary and backup design solutions have been carefully blended to offer maximum cycle efficiency and emissions reductions with minimal risks.

The Solar Mercury™ 50 is a rugged, compact, single-shaft, recuperated 5-megawatt (MW) (maximum) turbine system for power generation applications. Solar's Mercury™ 50 is a highly flexible combustion system that can be configured for either ultra-lean premixed or catalytic combustion. The system is fired on natural gas without the need for add-on post-combustion pollution control devices.

The synergistic layout of the core engine incorporates recuperation equipment. This unique design offers significant advantages in terms of cost, performance, and maintainability. The Solar concept takes advantage of their proprietary primary-surface recuperator, which has an effectiveness exceeding 90 percent and has demonstrated long-term performance and reliability. Solar's recuperation cycle provides 40 percent efficiency as measured at the generator terminals on an 80°F day at a 2,125°F turbine rotor inlet temperature and pressure ratio of 9:1.

The Mercury™ 50 incorporates Solar's latest generation of compressors, the ACE compressor. The low emissions of the Mercury™ 50 have been validated, and rig testing of a catalyst module has been completed. Fabrication of a half-scale turbine test rig has been completed and testing has been initiated to validate turbine performance.

Solar Turbines is also involved in installing and testing ceramic materials in currently available engine models. Solar is testing a Centaur 50S engine that incorporates monolithic ceramic first-stage blades and a ceramic composite combustion liner. Although a higher-risk technology, ceramic materials offer the advantage of increased turbine inlet temperature without the need for blade and vane cooling air, thus improving system efficiency.

### Duration

Start Date	September 1995
Projected End Date	August 2001



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## Goal

The goal of the Solar Turbines ATS Project is to design, develop, and test an industrial-scale gas turbine featuring a 4.2-MWe (on an 80°F day) optimized, recuperated-cycle that is designed to provide high thermal efficiency, ultra-low emissions, reduced electrical power costs, and high reliability and availability.

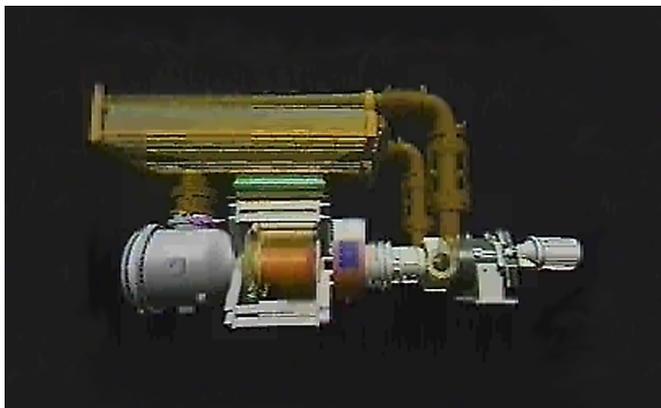
The Mercury™ 50 gas turbine utilizes innovative design concepts and advanced technical features to meet the challenging marketplace requirements of the 21st century.

## Benefits

Solar's gas turbine is targeted to meet the rapidly expanding demand for high-efficiency, environmentally superior, turbine-based power systems in power generation markets. The Mercury™ 50 gas turbine system will be an important technology tool for electric utilities and other energy service providers. This new generation of advanced turbines will enable utilities to incrementally expand their generating capabilities quickly for highly reliable, low-cost power service to satisfy the new trend in distributed generation.

## Key Milestones

- |         |                                     |
|---------|-------------------------------------|
| 10/1998 | Initiate testing of the Mercury™ 50 |
| 09/1999 | Launch of first Mercury™ 50         |



*The Solar Mercury™ 50 Turbine System*

## CONTACT POINTS

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## PROJECT PARTNER

### ROCHELLE MUNICIPAL UTILITIES

(host site demonstration)