

**Evolution of
Solar-Thermal Steam-Electric
Power Generation**

**Founded as Omnium-G
Which Transitioned into
CENICOM**

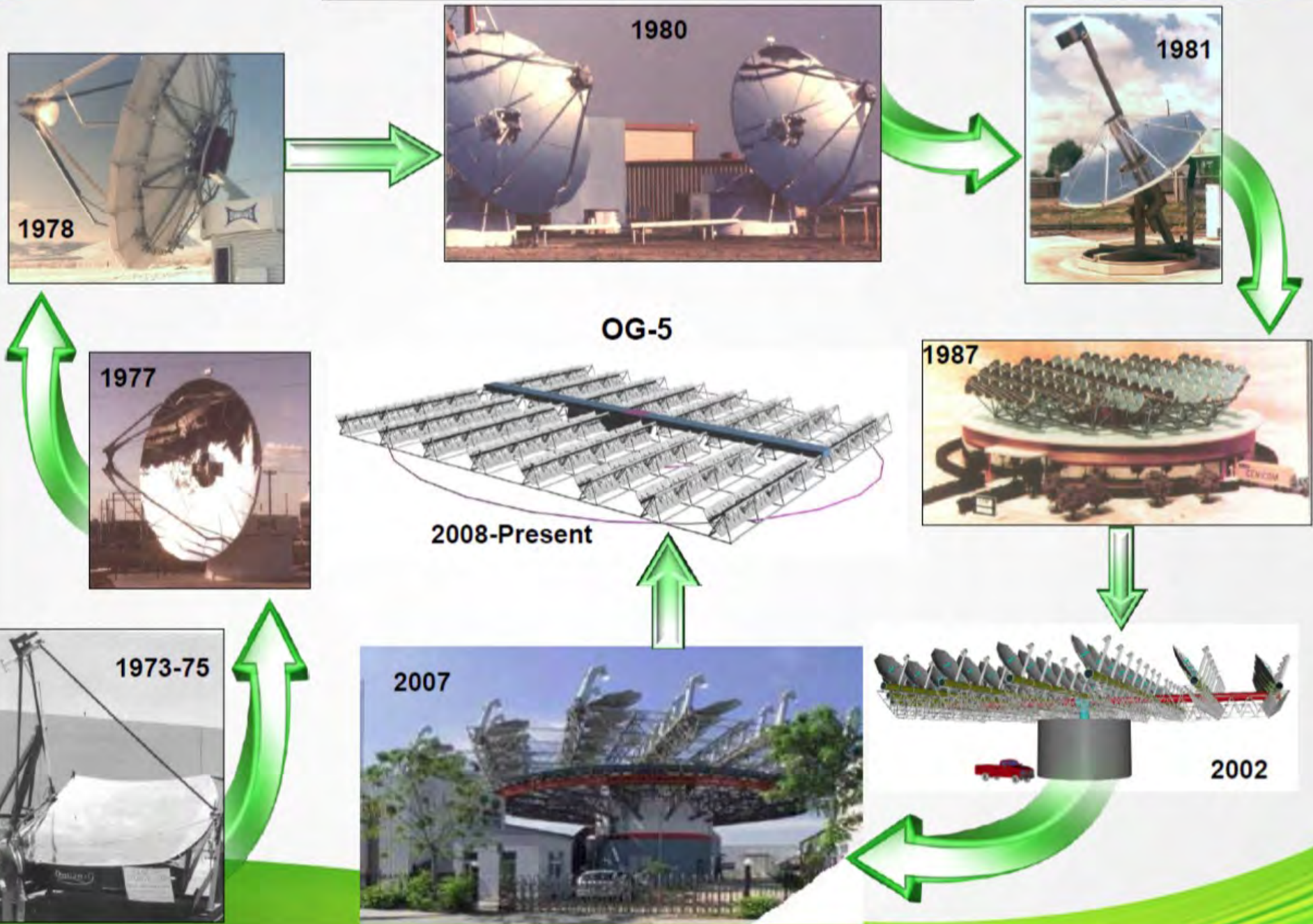
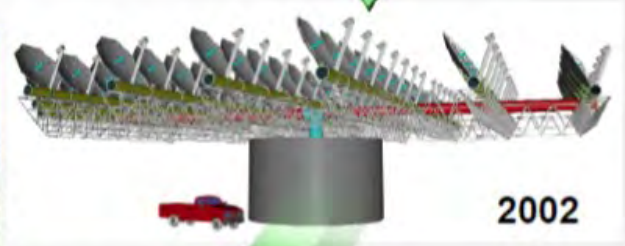
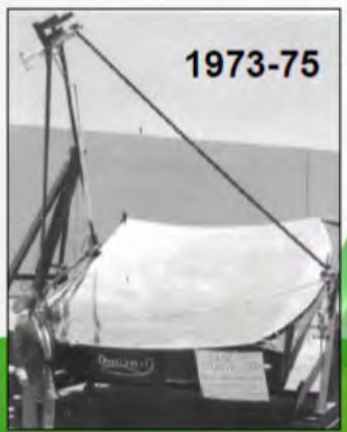
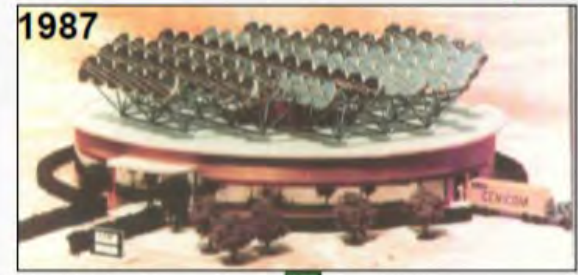
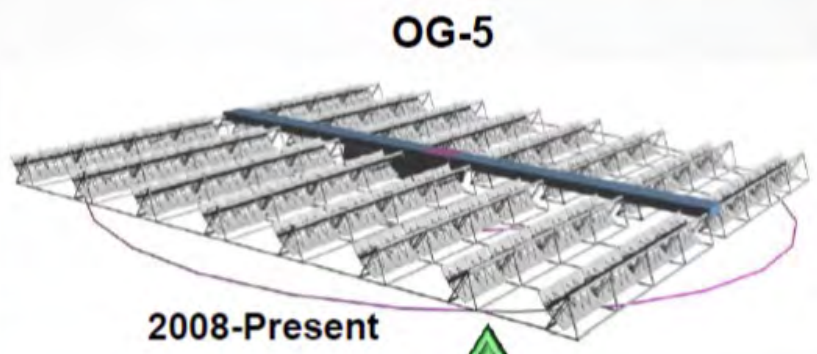
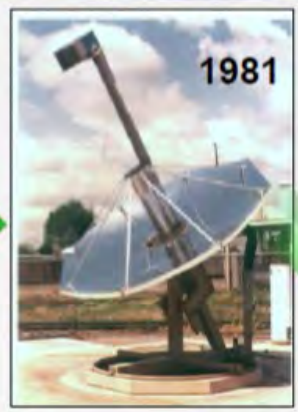
**and then engineered into the most
efficient solar-thermal system in the world
OG-5**

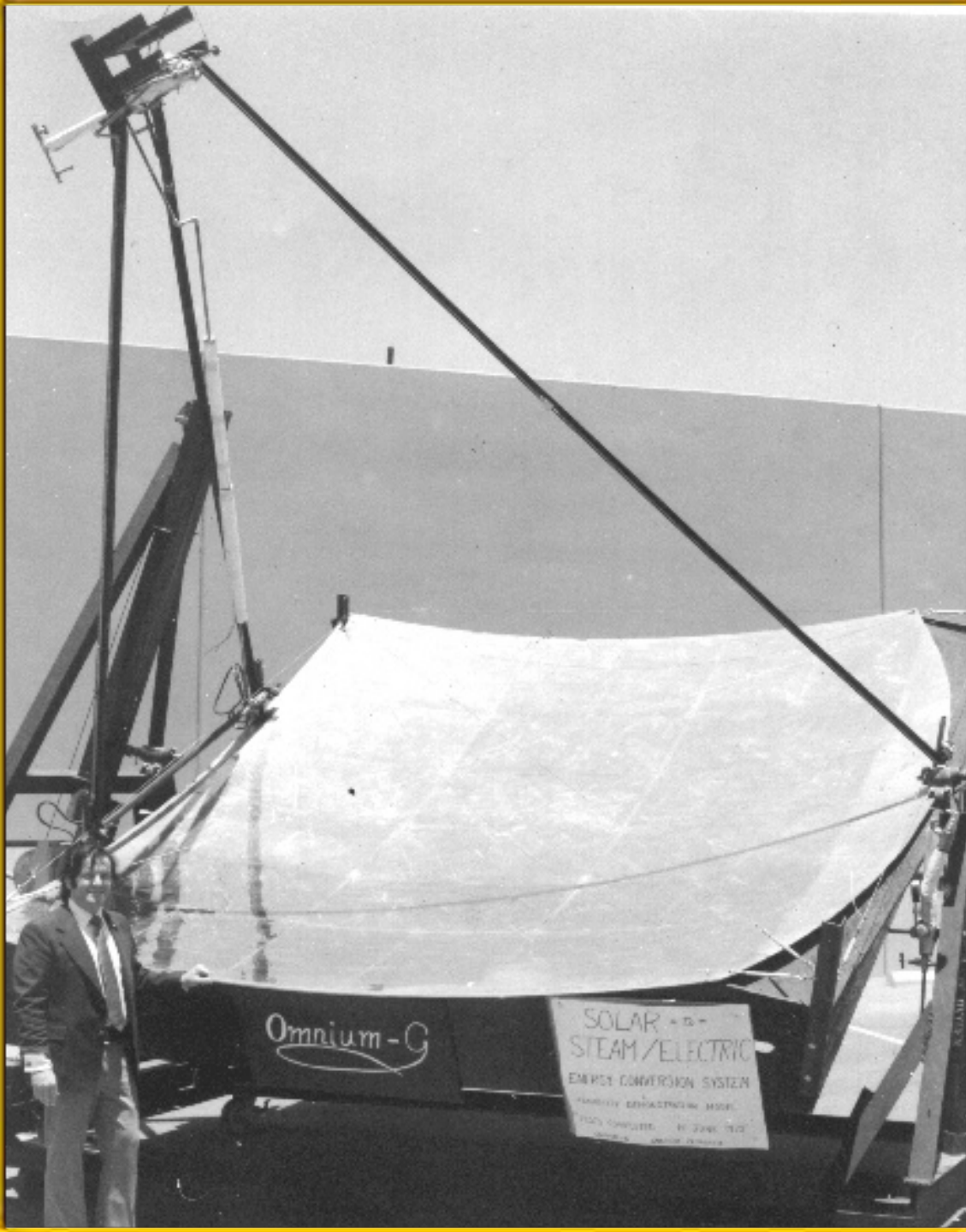
From 1973 to the Present Day



Now Offered by Golden State Energy

OG-5 Pathway of Development





OMNIUM-G

**4 meter Square Concentrating
Off-axis, Point-Focus,
Monolithic, Polished Aluminum
2-axis tracking,
Solar-Thermal
Steam-Electric Generator
-1974-**

Omnium-G 6 Meter Concentrators Configured For Use in High-Temperature Research



University of Houston 1977

Evaluation of Chemical Storage



University of Washington 1978

Evaluation of Lasers & Satellite
Energy Transmission

Other Hi-Temp Research installations (not shown):

- **USAF Rocketdyne Laboratory, Edwards AFB, CA**
- **Martin-Marietta Corp., Orlando, FL**

Omnium-G Solar-Thermal-Steam-Electric Power Generating Systems



Fiat Factory Brindisi, Italy 1979

Power For Employee Canteen



SERI, Golden Colorado 1979

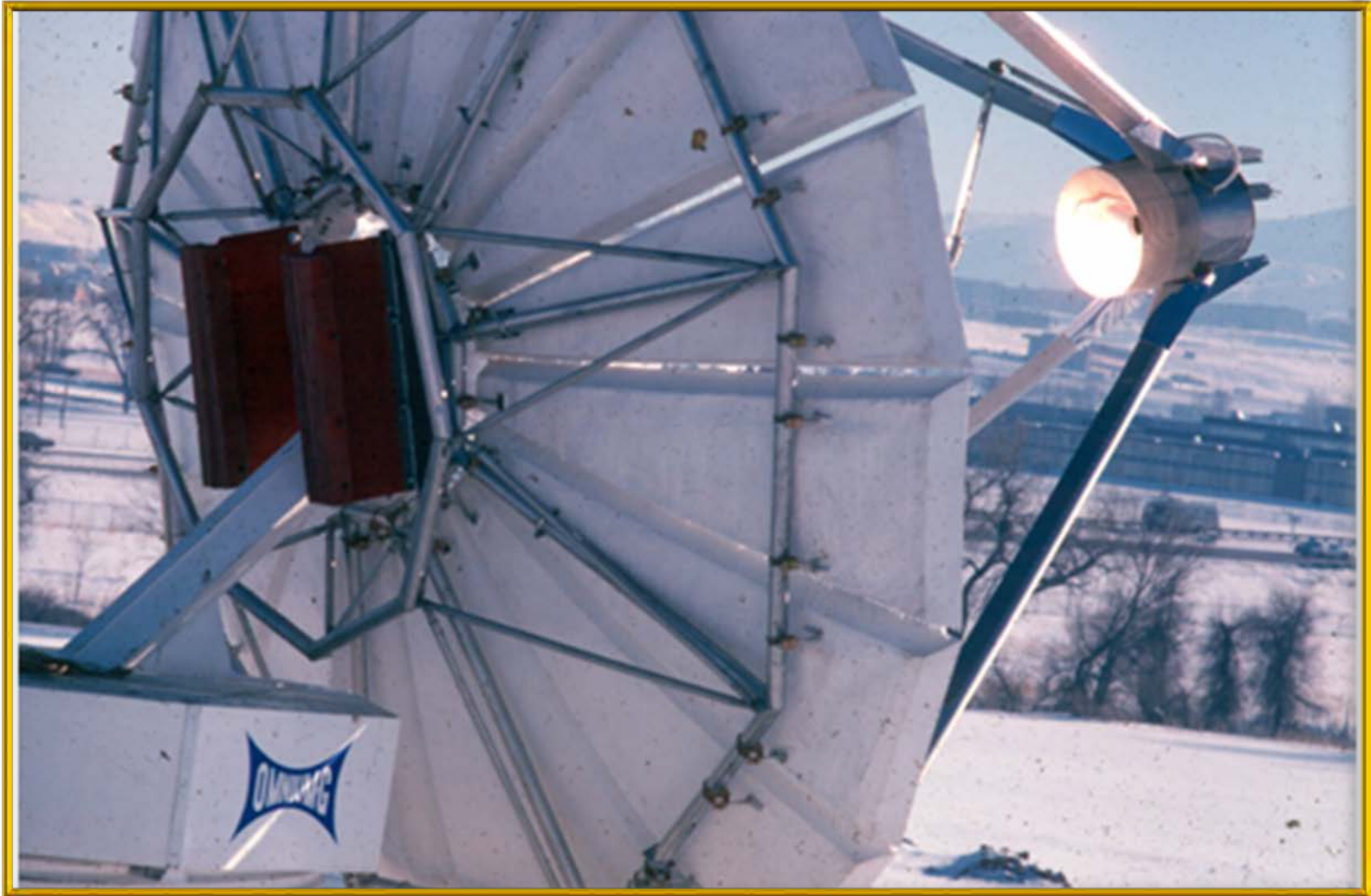
Evaluation for Industrial Processes

Other Installations Not shown:

- University Of Queensland, Brisbane, Australia
- C. Itoh, Kawasaki, Japan
- United Nations, Tangalle, Sri Lanka
- Hyderabad, India
- New England Telephone, New Haven, CT
- Al Marj, Libya
- Cal Tech/Jet Propulsion Laboratory, Edwards AFB, CA

Omniun-G Solar Thermal Steam Electric 5 kW Power Generator

Solar Energy Research Institute—Golden, Colorado 1979



Evaluation for Small Power System

Omnium-G Solar Thermal Steam Electric 5 kW Power Generator at the University of Queensland Brisbane, Australia 1978



Evaluation for Rural Power Use

Omnium-G

6-meter Point-Focus 2-Axis Tracking Solar Concentrator
May 7, 2007 Web Photo Still Operational 29 Years After
Installation In 1978



University of Queensland, Brisbane, Australia 1978

Omnium-G Solar Thermal Steam Electric Power Plant Supplying Electricity & Hot Water for Fishing Village on Island of Kayea, South Korea 1979





**Omnium-G Solar Thermal
Steam Electric Power Plant
Producing Electricity
& Hot Water
for Village on Island of
Kayea, South Korea**

Omniun-G Solar Thermal Steam Electric 5 kW
Generator Island Village Micro-Grid Power Plant
Kayeia, South Korea 1979



Omnium-G 6 Meter Dish
USAF Rocket Propulsion Laboratory, Edwards AFB, California
25 kW Solar Concentrator for Testing of Aerospace Metals at High Temperature



Evaluate Rocket Engine Nozzles 1979

Roof Mount Omnium-G 25 kW Dish

Martin-Marietta Aerospace Facility Orlando, Florida 1979

OG Dish Security Compound



Simulate Nuclear Flash Effects on Materials

Omnium-G Solar-Steam-Electric Generator Sri-Lanka

1978-1980



United Nations Demonstration Facility, Tangalle, Sri Lanka - 1978

Omniun-G

Dual-Collector Solar Thermal Steam Electric 10 kW Generator

New Deal, Texas



Texas Tech University Irrigation Pumping for Agriculture & Animals - 1979

Omnium-G Solar Thermal Steam Electric 5 kW Power Generator Jet Propulsion Laboratory Edwards AFB, California



Evaluation For Small Power System - 1980



Omniium-G

**Solar-Steam-Electric
Power Generator**

**Installation at
JPL/Edwards AFB**

Evaluation for Small Power System & Process Heat - 1978

Omnium-G Solar Thermal Steam Electric 5 kW Power Plant

Kawasaki, Japan



**Two Different Views of Installation
Evaluation for Chemical Process
Installed On Third Floor Roof - 1981**

Southern New England Telephone Company New Haven, CT

Standby Electric Power Source



Power/Heat for Telephone Switching Building - 1979

Omnium-G Solar Thermal Steam Electric Generating Systems Configured with 2-Concentrator Arrays Supplying a Common Steam Engine-Generator (SERI, Golden Colorado, and Texas Tech University, New Deal, TX)



**SERI Multi-Collector Evaluation For
Electricity & Process Heat – 1978**



**University Multi-Collector Evaluation For Electricity &
Process Heat - 1978**



**1st Generation
6 Meter Electrical Generator
System & Omnium-G Partners**

Anaheim, California

**Founders/Inventors
Recipients of Most Significant
New Product IR-100 Award - 1977**

**Left to Right: Sam Lazzara, Stan Zelinger,
Ron Derby, Bill Dampier**





...stitute. At right Director of SERI Paul Rappaport and an unidentified SERI official take shelter under an umbrella. (AP LASERPHOTO) (r41735rb) 1978

Solar Dish Provided the Only Solar Equipment as Back Drop for President's Dedication Ceremony



President Jimmy Carter
First National Sun Day
SERI Golden, Colorado
1978
(Omnium-G
Solar-Thermal-Steam-Electric
Generator)

Dedication and First Funding of SERI



Omnium-G 6-Meter & 3-Meter Concentrating Dishes

Factory, Anaheim, California



Staff of 40 Working in 16,000 SF Facility Produced Early Systems at a Rate of One System Per Month

Omnium-G 3 Meter Diameter Point-Focus Solar Concentrator

**Using Hot Air Energy Transport and
A Solid, Inert Material Thermal Storage Vault**



**Factory Test of Residential
Heating Unit**



Residential Heating Unit - 1982



**Single Dish
Installation
Clementon, NJ**

3 Meter System

Roof Mount

With Thermal Storage Vault

900° F Air to Heat



**OMNIUM-G CPF Dish
Supplying Heat To
Mass-Production Pizza
Oven In Elgin, Illinois**

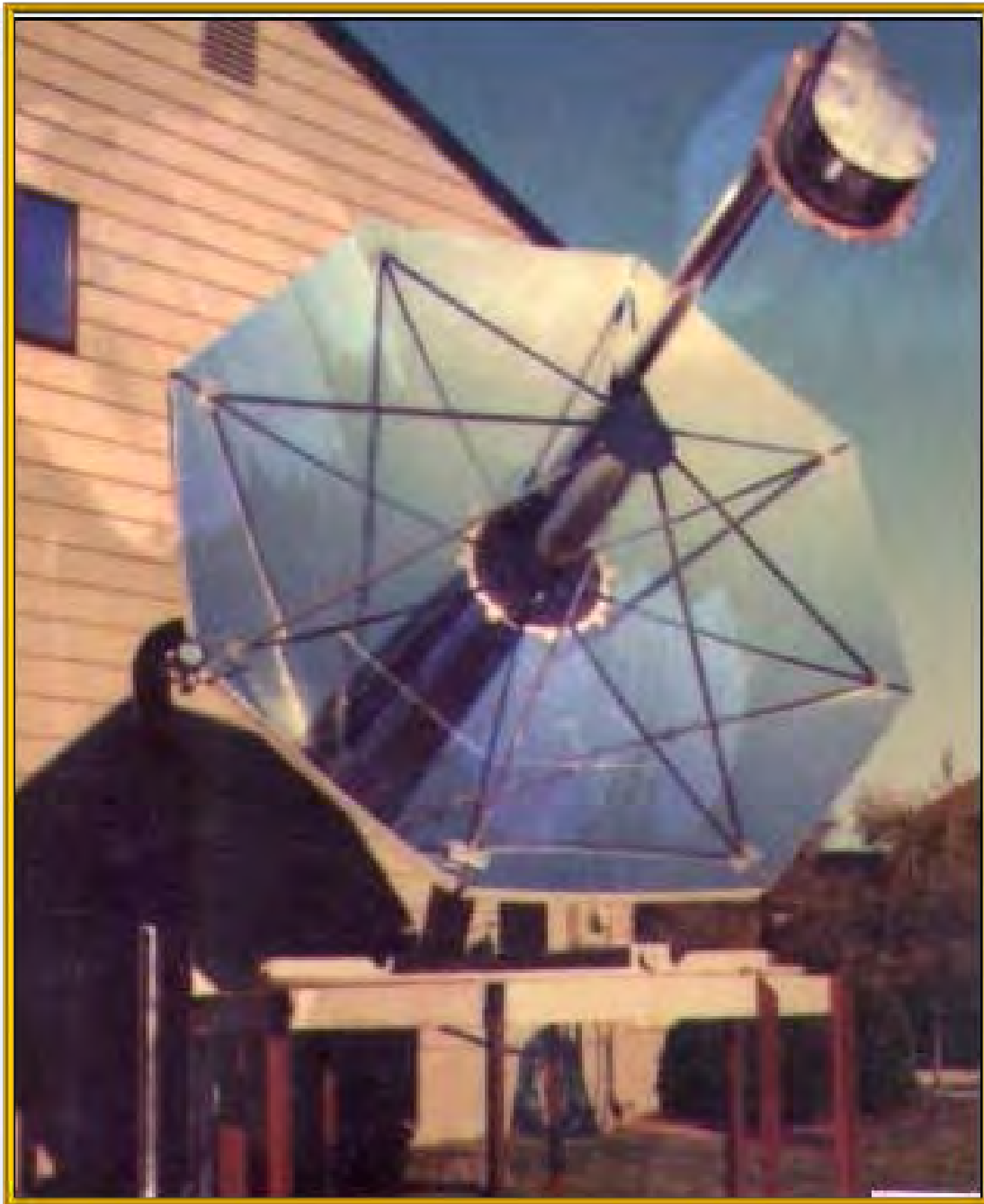
Still In Place in March 2002

Roof Top Commercial Installation - 1981

3-Meter Residential Unit For Integrated Water & Hot Air Space Heating



Monument, Colorado - 1980



3-Meter Residential

**Unit Integrated Water &
Space Heating for New
Jersey Home - 1980**

The Omnium-G 3 Meter Concentrator and Thermal Storage Vault Are the Two Main Building Blocks of the CENICOM Process



**6 M and 3 M Concentrators
At Omnium-G Factory
Anaheim, CA
-1981-**



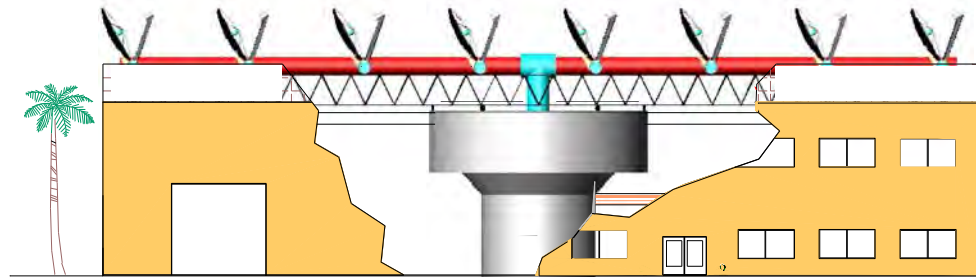
**3 M System with
Thermal Storage Vault
Supplying Domestic Heat
To a New Jersey Home
-1982-**



**3 M System with
Thermal Storage Vault
Supplying 900°F Air to a
Mass Production Pizza Oven
In Elgin, Illinois
-1981-**



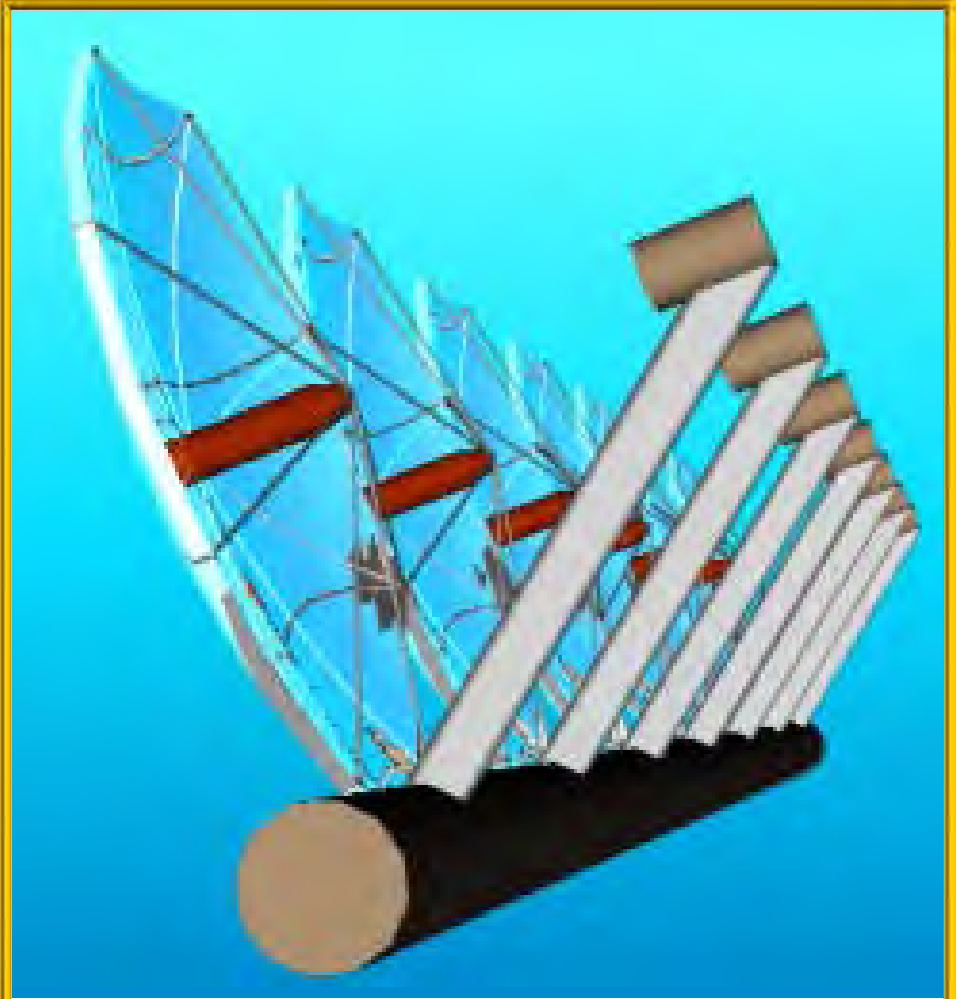
**CENICOM Scale Model
-1987-**



**CENICOM Integrated Into Its "User Community"
Light Industrial Complex
-1999-**



(1980)



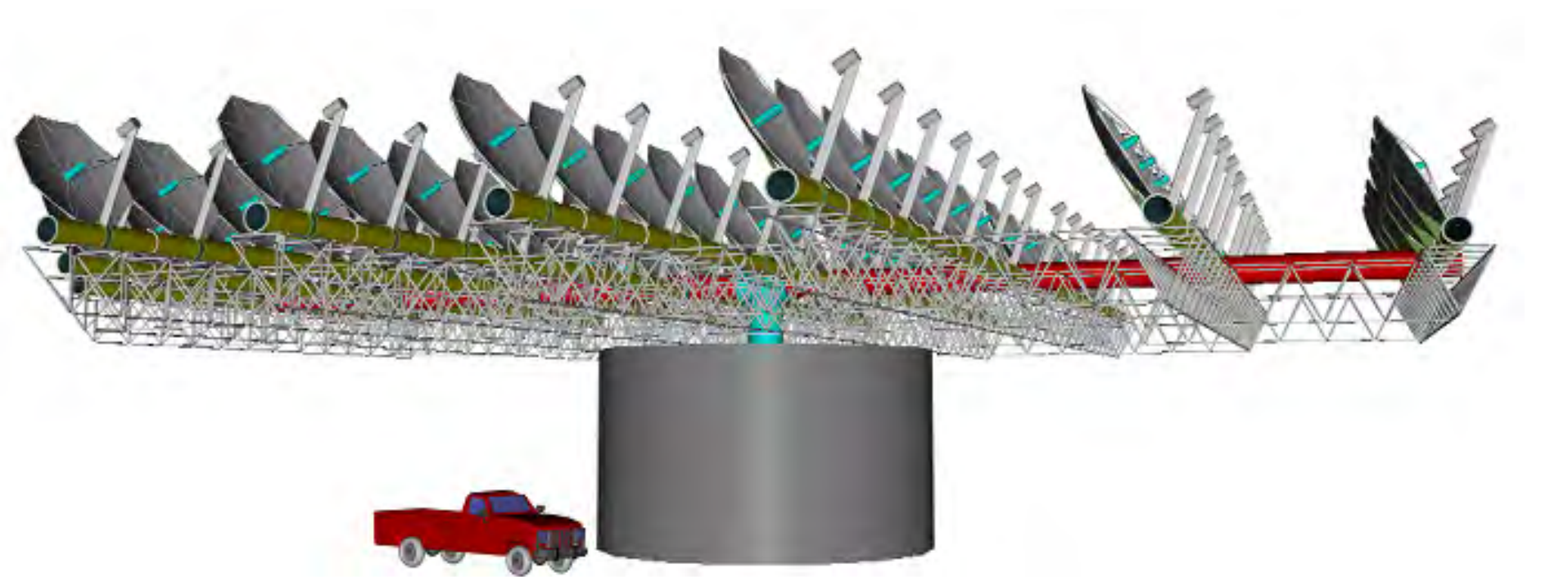
(2002)



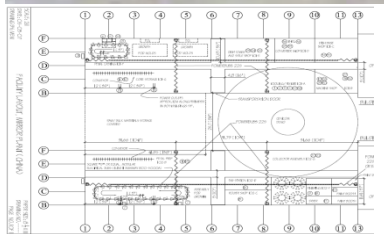
CENICOM 3-Meter Dish (2010 Version Cast in Anaheim, CA)

CENICOM

Solar-Thermal Steam-Electric Power Generator - 2005



China Demo in 2011 Verified CENICOM Limited to Small-Scale (200 kW) Industrial Applications Per 1987 Design



June 07 Factory



June 08 Tower



Nov. 08 Frame



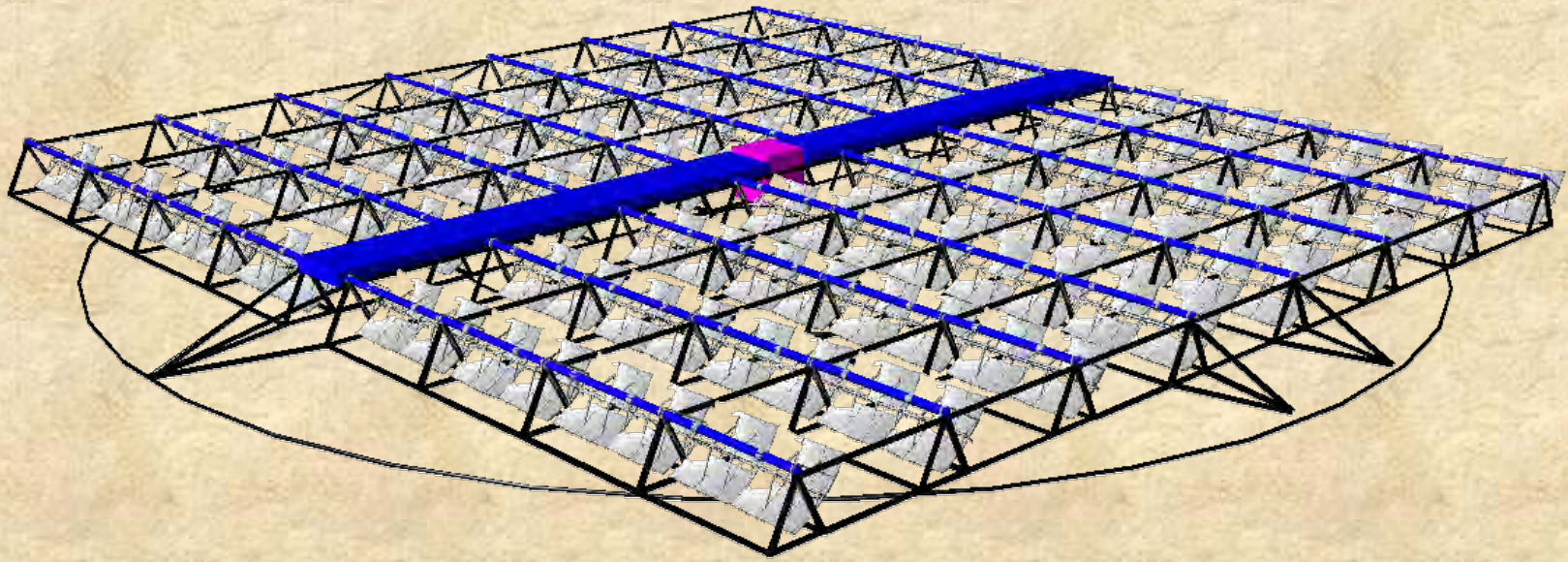
Nov 09 Dishes



Sept. 2011 Demo

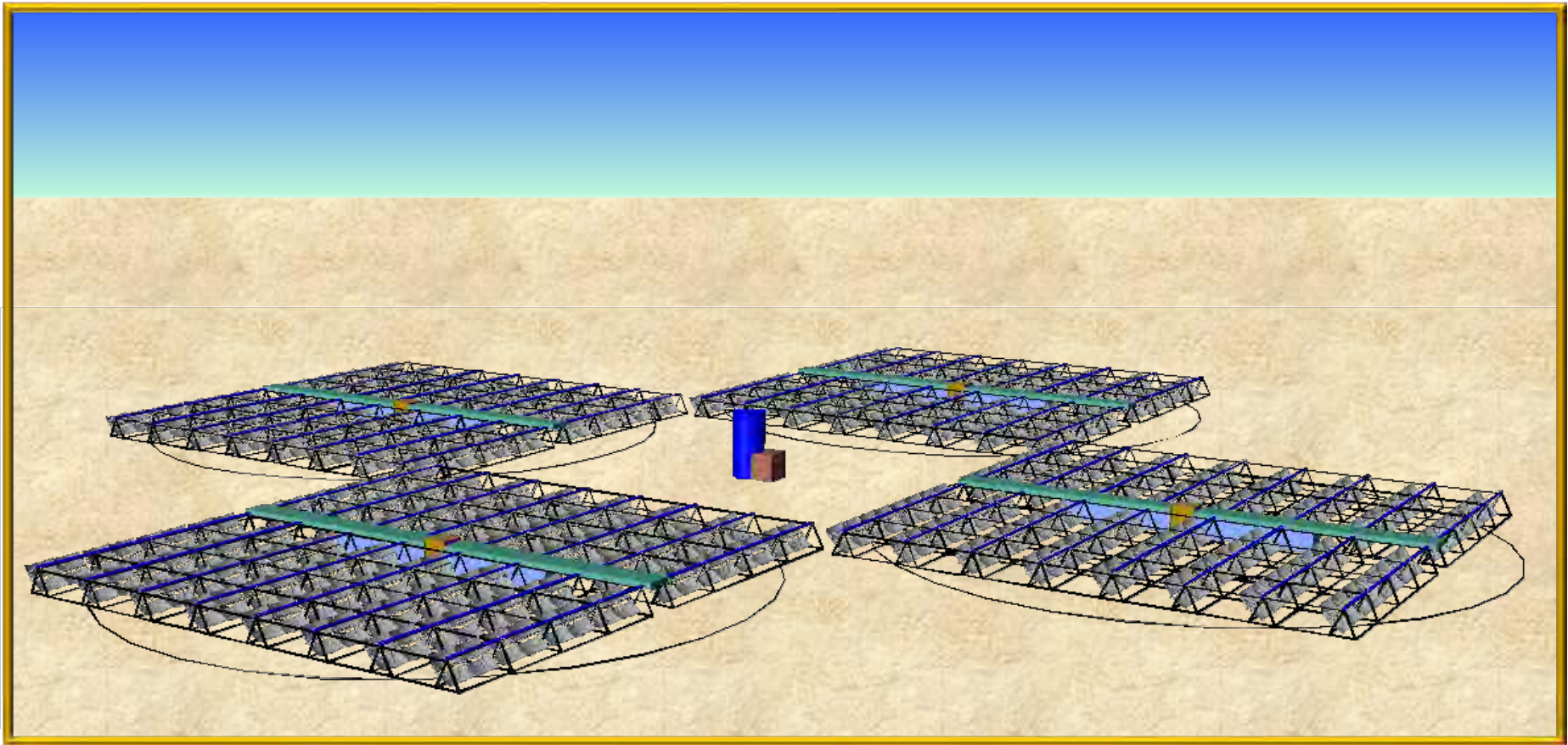
OG-5 Array Carriage Frame

Operates in Harsh Environments & Wind Loads
(85 mph Non-Gusting; 120 mph Survival)



OG-5 Quad Array is a Centralized Steam Generation System

Supplementing Existing Coal-Fired Power Plants - 2010



* 4,304 Square Meters of CPF Dishes & One Steam Generator Producing 1,050^o F, 1,000 PSI Steam

Coal Fired Power Plant

**BOILERS
& T-G'S**



OG-5 QUAD

