



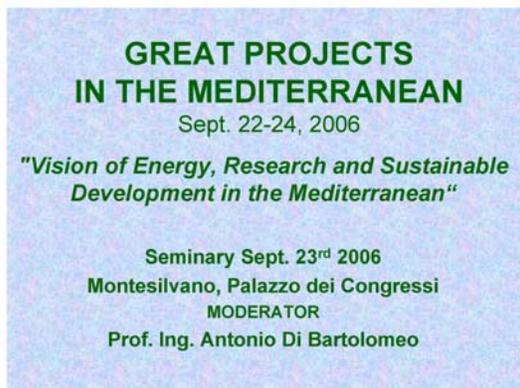
**1<sup>st</sup> INTERNATIONAL MEETING**  
**“Great Projects in the Mediterranean”**  
**22-24 September 2006**

**Speech from the Moderator**  
**Prof. Ing Antonio Di Bartolomeo**

**Energy and Technological Innovation - Renewable Energy  
Opportunities in the Mediterranean – Conference – Palacongressi-  
Montesilvano, Sat. Sept. 23<sup>rd</sup> , 2006, h 16.00**  
***Speech from the Moderator, Prof. Ing. Antonio Di Bartolomeo***

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**Greeting**

Ladies and gentlemen, regional, provincial, and municipal authorities, esteemed colleagues, foreign delegates, representatives of the media, I would like to welcome you and extend my sincere thanks to all of you for your presence and your contribution to the success of this meeting.

I thank particularly the SMS in the persons of Mr. and Mrs. Merlino who have conceived and made possible this event, which heralds a new era of certain growth in Abruzzo's role in sustainable development in the Mediterranean. In Abruzzo, research and new energy technologies are promoted by private institution and in Abruzzo's Athenaeums, particularly in the Faculties of Engineering in L'Aquila, Architecture and Economy in Chieti-Pescara (*scientific-economic field*), and Jurisprudence in Teramo (*international laws*).

**High ideals**

In this initial phase of the millennium, in which the most deleterious inclinations of the human mind seem to grow and prevail, a phase marked by hatreds, divisions, aggressions and global threats of returning to chaos and to the most dismal Middle Ages, I adjure all enlightened spirits and people of good will, every one of you, to aim high, to seek and always follow the road marked by the better interests of the whole of humanity, to work ever toward the affirmation of that which will help to build relationships and civilization rather than destroy them.

**To build a better world (It's not a simple slogan.)**

I would propose that the priorities in building a better world must be enlightened legislation, critical and constructive education, competent and unbiased information, and science and technology, united to a deep respect of cultures, creeds and a sincere cult of liberty, according to the laws of right and duty.

## Role of technology in the field of energy

Overcoming dependence on combustible fossils (oil, gas, coal) to create energy will depend on research and development of innovative technologies. Such change will be reached gradually and by stages.

- In the mid- to long-term, the objective is the substitution for fossils of the vector hydrogen both for its electrochemical use (fuel-cell), and for other applications, currently under research, that involve its atomic states. The role of computer technologies and telecommunication is critical to creating a free market of distributed generation.
- In the short-to mid-term, the use of technologies that can limit or eliminate the issues caused by the use of fossils as direct fuel (emissions).
- In the short term, I'd say soon, the use of direct solar energy. We do not speak here of wind farms, a consolidated technology very advantageous in countries and areas with constant flows of wind.

**We'll analyze the various stages today, beginning with those attainable soonest.**

## Solar energy exploitation

Exploitation of energy from the sun is creating an important series of world initiatives for creating less expensive and technologically reliable devices that are compatible with existing infrastructures. One can obtain energy from the sun to directly transform it into electricity (PhotoVoltaic, PV) or use the heat for direct use or for producing electricity through solar concentrators.

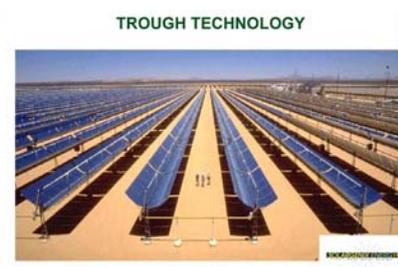
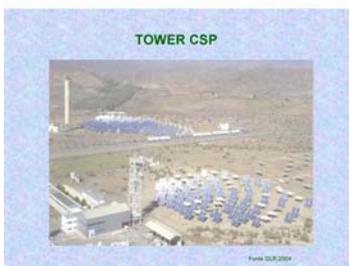
### *Photovoltaic*

Methods of PV transformation (i.e. PV solar panels) have efficiency almost independent from latitude (it is largely diffused in Germany, in Japan and other countries of average latitude) and it has the advantage of power scalability, from a few watts to megawatts. For this reason it is used primarily for integrating energy consumption in buildings, but also for small appliance.

The production of traditional technology, very expensive in terms of energy consumption (deoxidizing, and crystal growing for crystalline or amorphous poli-crystalline semiconductors) still doesn't succeed in fully satisfying the strong market demand, above all since important investors showed a strong interest. Therefore we wait for a cheaper mass production of this technology to come from the sector of advanced nanotechnologies.

Since their use is well adapted in architecture, above all for their integration in wrap design (walls and windows areas) and in coverage, one expects a dramatic reduction in price when newly conceived elements penetrate the market.

## Concentrated Solar Power (CSP)

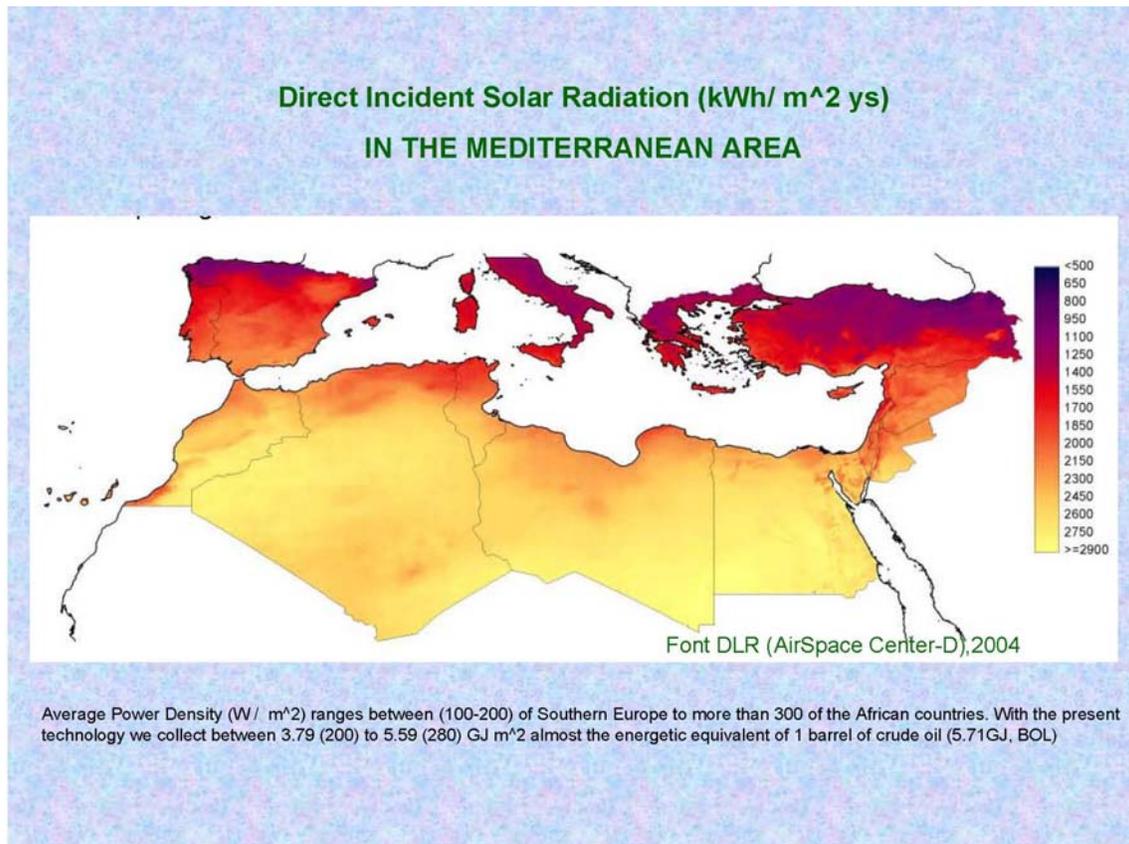


Among the main technologies of solar power concentration are (a) linear parabolic concentrators (trough) that use diathermic oil, (b) tower plants that use oil or molten salts, (c) parabolic circular concentrators (that generally use direct conversion with Stirling motors). The receiver for the trough

technology (more diffuse commercially) is a special pipe – widely produced only by the German Shott AG – in which flowing thermal-vector fluid transfers energy to water, which is in turn transformed into pressurized vapor used by the turbine generators. The diathermic oil generally reaches temperatures not higher than 400 °C, while the Archimede project by Professor Rubbia's group (ENEA), uses molten salts (sodium and potassium nitrates ) at higher temperature (550 °C) with a higher thermodynamic efficiency (around 44%).

Such salts allow, in a safe manner (they do not burn as oil does) and in high *charge/discharge* cycles, efficiency to store the energy in special tanks, allowing the optimized use of the intrinsic periodic solar energy. This latter technology, born in Italy and still in the experimental phase here (they are encountering problems in the receiver's technologies and in the freezing of salts) is growing rapidly in Spain,(U.S.,Germany). The presence there of Nobel Prize Professor Carlo Rubbia who has been ousted by political maneuvering in the last legislature, is contributing a lot.

### Area of the Mediterranean



In our longitudes, the places where energy is available in abundance and in a largely exploitable way are those in the band of the countries of the Mediterranean and Middle East, due to the presence also of vast extensions of unused land. Coincidentally, those are the places that hold the most conspicuous reserves of the fossils. The development of a competitive solar technology that guarantees the exploitation of this resource protects these countries, furnishing them stability and safety and incentive to a sustainable local development.

The available solar radiation on the earth has been estimated to be 10,000 times the whole planet's energy consumption. Each square meter of solar collector in optimal location may deliver yearly the energetic equivalent of about one barrel of crude oil.

### **Concentrated solar -- a strategic sector for Italy**

It's important that Italy not be cut out of the technology and related high economic flows in the huge market that is foreseen. It's desirable that the government take precise action to support the development of concentrated solar technology, clearly designating electric energy produced in this way "green energy", drawing the roadmap and the incentives. Such technology could work well in the latitudes of the centre and south of Italy, starting with a few MWe (electric megawatts). They don't require large expanses of land (two hectares of marginal land can produce one MWe). Their use is more suitable in those regions if combined with small turbogas (or biomass gas) plants.

### **Great solar-concentrated projects -- areas with the highest development**

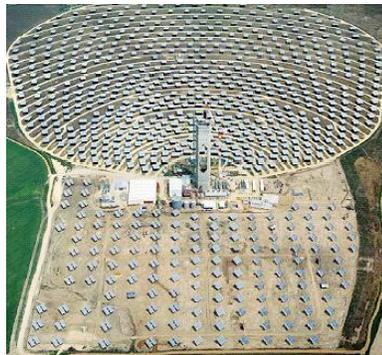
Great projects are underway in the USA -- in California, New Mexico, Arizona and Nevada. For example, Nevada Solar 1, of 64 MWe(p), Solargenix technology with dyathermic oil, initiated on February 2006, reached last August the 50% of the assemblage construction; its completion and the beginning of energy production are projected for April 2007 at the latest.



Dr. Gilbert Cohen patent. Such technology has an installation cost of between \$1200 and \$3500/kW; production cost 7 / 14 c\$/kwh.

### **Great CSP projects in Spain**

Spain targets a 29.4% share for renewable in electricity generation by 2010 and CSP has the main share.



PS10 Seville (Font:IEA)

With the Real Decree n. 436 of 2004, Spain introduced an incentive of 18 ¢cent/kWh, and 25 years' guarantee of energy purchasing to the first 500 MW of CSP plants. Here are the plants in construction:

- PS10, 11 MWe, Solar Tower (vapor direct generation;- 2 Towers PS20), 20MWe each;
- Solar Tower "Tres", 15 MWe, molten salt tech;
- EuroSEGS plant, 15 MWe;
- Another 12 parabolic plants, each one of 50 MWe, planned by different utilities.

-9 CSP (50 MWe each) plants planned by Iberdrola, total 450 MWe;  
-Two 50 MWe solar trough power plants –AndaSol-1 and AndaSol-2 – being promoted jointly by ACS Cobra and the Solar Millennium group in the region of Andalucia, each with a 510,120 m<sup>2</sup> SKAL ET solar collector field and six hours' thermal storage. The AndaSol-1 project obtained financial closure in May 2006 and has received a €5 million grant from the European Commission's (EC) Fifth Framework Programme, along with financial support from the German Federal Ministry for Environment. Construction started in July 2006 and will be completed in 2008. A third plant, AndaSol-3, is under joint development by Solar Millennium and the Spanish electric utility Hidrocantabrico. ACS Cobra and Solar Millennium have begun development of 50 MW follow-up plants in southern Spain.

### **International initiatives in the CSP sector**

SolarPACES ([www.solarpaces.org](http://www.solarpaces.org)) is a cooperative program founded by the IEA (International Energy Agency) that is implemented with various TASKs, from the production of electricity, to solar chemistry.

The CSP program of the Global Environment Facility (GEF) <http://www.thegef.org/> is an independent financial organization connected to the World Bank and to the Environmental Program of the United Nations. Countries such as Egypt, India, Iran, Jordan, Mexico, and Morocco have requested the support of the GEF.

The international initiative CSP-GMI (Concentrating Solar Power-Global Market Initiative) <http://www.solarpaces.org/GMI.HTM> established at the 2002 Johannesburg Summit, coordinated within the Task I of the SolarPACES, has been undertaken by public and private interests with the objective of facilitating and accelerating the realization of 5000 MWe of CSP plants worldwide by 2015. Italy has signed an agreement with Germany, Spain, Algeria, Morocco, and Israel.

### **Transfer of solar energy from the Mediterranean area**

In the research MED-CSP Concentrating Solar Power for the Mediterranean Region <http://www.dlr.de/tt/med-csp> completed by the German DLR Airspace Institute, an advanced vision of the future use of special super-conductive cables (direct current high voltage) is traced. The technology (from Germany) has very low losses (10% in 3000Km). The study foresees for 2020 the transfer into Europe by North African countries of 60 TWh/ys (millions of Kwh) of solar energy; that figure will become 700 TWh/ys in 2050 at the price of approximately 0.05 €/kWhs. This south-north transfer is independent of the “horizontal” MED-RING connection in AC of the said countries to the European grid, foreseen for 2015.

### **Production of solar hydrogen and solar chemistry**

Solar concentrators are directly used for the production of hydrogen via thermal-chemical reaction. In this case, the concentrators are tower or sun tracking parabolic mirrors, that reach the elevated temperatures suited to these trials (a compromise between materials' technologies and the types of reduction processes, brings to operate with temperatures between 800 and 1500 °C, even if with new materials temperatures of some thousand of °C can also be more proficiently used). The production of hydrogen via solar electrochemistry has a very high efficiency (46%). If it has to pass through electric solar conversion and hydrolysis (the water's division in hydrogen and oxygen), it can reach at the most 27%. Using the PV electric conversion, the outputs are still less (12%) with the traditional panels. Still to be studied is a possible use of pipelines for the transport of hydrogen, as it is used with the methane, from the North African coast to Europe. Consider that until some decades ago the so-called “city gas” in Europe was composed of H<sub>2</sub> and CO/CO<sub>2</sub> and was transmitted directly to the houses at low pressure in the pipelines.

**An example, a small step originating in Abruzzo**

An example could be given by the PERT proposal that integrates the biomass plant that should be built near the Burgo papermill, Chieti, with a solar CSP. The solar technologies, united to opportune technologies of sequestration of CO2 (PERT and/or GreenFuel) produced by the biomass plant and to the elimination of flying cinders through plasma technology, would completely reset emissions – to zero. Moreover, the produced heat could be used for the tele-heating and the tele-cooling of the nearby (and still to be built) Village of the Mediterranean and future University Campus.

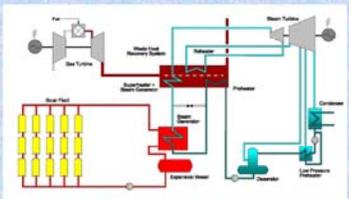


**ZERO EMISSION PLANT  
(ZEP)  
CSC- Solar Combined Cycle  
CHIETI-SCALO, ABRUZZO (Italy)**



**LAYOUT OF THE HYBRID SOLAR PLANT  
in CHIETI  
SCCS (solar combined Cycle System)**

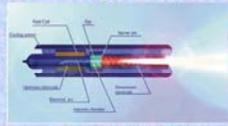
Solar Collector Area Requirement: 2 Ha per MW – Water consumption, as for turbogas plants. Heat Recovery gives the Projects very attractive requisites regarding the economic feasibility.




**THE GENERATOR USES TROUGH TECHNOLOGY (2-3 MWe) in order to integrate via solar the Syngas or Biogas from BIOMASS generator (ab. 12 MWe) that will be built near the Burgo papermill in Chieti (utilization of its waste).**

**RESET OF EMISSIONS, TAR AND CINDERS AND FEEDBACK**

- The Turbogas CO2 are reduced (up to 87%) con arrows of BIOREACTORS by GreenFuel Technologies. They produce Biomass (Algae) utilized in input.
- Tar and cinders are reduced to ceramic glass via plasma torch.

Bioreactors (GreenFuel Technologies)      Plasma Torch (Europlasma)



**SAT MAP OF THE AREA (Salvaezzi)-Plant-Solar Collectors-Bioreactors- University-CAMPUS**




**The Green Energy and the produced heat will be used for the tele-heating and the tele-cooling of the nearby (and still to be built) Village of the Mediterranean Games Pescara 2009 and future University Campus. .**



### **Stage of temporary use of the fossils up to the conversion of technologies**

Various technologies have been studied to limit or eliminate CO<sub>2</sub> emission, particularly for the next “carbon tax” introduction, in order to attain the limits of the protocol of Kyoto. Some methods concern the sequestration of CO<sub>2</sub> deep in the terrestrial crust, inducing stable chemical reaction of the gas. Others concern use and exploitation of CO<sub>2</sub>. For example:

*The catalytic process* of fuel synthesis -- oxygenated ethanol-methanol production starting from hydrogen -- as exemplified by the microreactor modules by PERT

*The electrochemical process* -- for example the use of inverse fuel-cell combined to direct fuel-cell that works in an optimized way to produce fuels (oxygenated or also synthesized methane) through the use of the fuel-cell electric energy not utilized by other loads (idle state). The fuel is then utilized in a feedback way. In other cases, the electric energy necessary to the electrochemical trial and furnished by the sun using special membranes (in the PEMs) endowed -- with use of nanotechnology -- with photovoltaic effect (semiconductors).

*The biochemical process* (photosynthesis) -- with use of colonies of algae in batteries of photo-reactors that in water-circle are daily harvested with the production of biomass (GreenFuel Tech). From the dried biomass this process produces biodiesel, protein flour, ethanol. PERT has proposed this technology to ASM-Abruzzo Energia for the Plant (800 MWe) in construction in Gissi.

*The use of biomasses for the production of hydrogen* -- Professor Jader of Professor Foscolo's group will speak at greater length about this project, which is currently in progress at the University of L'Aquila.

To touch on the third point of the indicated stages, the Hydrogen Civilization will affirm itself as soon as technologies will be transferred to the world of vehicles and mobility, with the substitution of the internal combustion engine with the fuel-cell electric engine. Professor Croce would have reported on the new membranes and nanotechnologies for fuel-cells and on the various types of fuel-cells; unfortunately, he is absent due to illness, and we wish him a speedy recovery.

Computer science technology and relevant software will have the role of protagonist in this phase of penetration of fuel-cell technologies, especially in the control and coordination of new systems of diffused microgenerators with the system of centralized production. A theoretical approach of advanced architecture software for territorial web control will be given by Dr. Guglielmo Nigri of the Glasic srl. (<http://www.glasic.it>)

After the speeches, we'll open the floor to debate.

Prof. Ing. Antonio Di Bartolomeo

Email: [pe.dibart@usa.net](mailto:pe.dibart@usa.net)

Site: <http://www.pert-group.com>