

# **Energy: Activities of the Energy Committee of the Academy of Athens**

**Prof. Loucas G. Christophorou**  
*Chair of Academy's Energy Committee*

*Academy of Athens-EASAC Workshop  
on **Solar Energy (CSP)**, Athens, Dec. 9, 2011*

- In 2005 the Academy of Athens established the Academy's **Energy Committee**, comprised of Academicians and Greek experts on energy.
- Principal **purpose**:
  - Provide sound knowledge and information on energy issues and disseminate it broadly
  - Serve as a catalyst for enhancing efforts in the area of energy
  - Offer independent advice to the Government and the political leadership of the country on energy matters.

# **Symposia and Working Groups on Energy Issues**

## **Symposia**

- Each organized jointly with one or more universities, and/or research centers;
- attended broadly by members of the Academy, professors, researchers, representatives of government and industry, experts on energy and the environment.

## **Working Groups**

Composed of 15-17 **Greek experts living in Greece or Abroad.**

So far, the Energy Committee has organized:

**Symposia** (attendance: ~300) on:

- Energy Conservation
- Energy and the Environment
- Materials for Energy Applications
- Search for Greek Hydrocarbons (**pending**)

**Working Groups** on:

- Nuclear Power and Energy Needs of Greece
- Electricity Generation in Greece: Fossil Fuels, Renewable Energy Sources, and Perspective of Energy Supply.

## **The product of each of these efforts has been:**

- Comprehensive Report
- Press Release
- Broad Dissemination of the Report
- Follow-up lectures.

# Symposium on Energy Conservation

- **Purpose:** Energy conservation in the generation, transport, distribution, and use of energy
- **Major Findings:**
  - Greece lacks comprehensive energy conservation programs, needs energy conservation policy and education
  - There is scientific/technical competence in Greece for energy conservation initiatives.
- **Recommendations:**
  - Make energy conservation integral part of national energy policy
  - Focus on areas of potentially big and immediate energy-savings (e.g., buildings, appliances and transportation)
  - Use effectively existing scientific/technical resource.

# Symposium on Energy and the Environment

**Purpose: Environmental impact of energy production and use in Greece; measures to minimize the effects of energy production**

## **Major Findings:**

- Greece continues to rely heavily on fossil fuels, and electricity production on lignite, with adverse environmental impact
- Pace of Renewable Energy is slow and its scale small; political, regulatory and social obstacles hinder development
- There are efforts to increase use of natural gas and to replace old thermoelectric generators.

## **Recommendations:**

- Optimize energy mix, accelerate Renewable Energy, promote energy conservation
- Invest broadly in energy infrastructure
- Couple government's policy on energy to that on environment.

# Symposium on Materials for Energy Applications

**Purpose:** Demonstrate the critical role of materials in the transformation of primary energy to electricity and heat, and energy storage, transmission and use

## **Major Findings:**

- The poor performance of the country in increasing **energy efficiency and energy conservation** is largely due to its inability to use effectively new materials
- The country has broad technical competence in materials science

## **Recommendations:**

- Strengthen materials science and technology **and focus it on energy**; make effective use of new materials to optimize energy efficiency and conservation.

# Nuclear Power and Energy Needs of Greece

**Purpose:** Provide technical knowledge and facts on nuclear power and the energy needs of Greece to facilitate a sound debate as to the possible role of nuclear power in the energy needs of Greece

## **Major Findings:**

- Nuclear power has unique advantages and disadvantages; the crucial problem is safety and nuclear waste
- Considering the slow pace of Renewable Energy, additional energy needs can be covered by imports of electricity, or coal, or nuclear power
- Greek society does not support nuclear power.

## **Major Recommendation:**

- Start a serious dialogue about the introduction or not of the nuclear option in Greece
- Maintain competence in the field.

# Electricity Production in Greece: Fossil Fuels, Renewable Energy Sources, and Perspective of Energy Supply

**Purpose: Assess Present Energy Situation and Future Projections**  
(role of lignite, natural gas, oil, and renewable energy)

## **Major Findings:**

- 2009-2010: lignite: 49%, RE: 17% (~ 3% from Wind and PV), NG: 17%, Oil: ~9 %, Imports: ~ 8%
- Use of lignite anticipated to continue, use of natural gas to increase and use of oil to decrease
- The RE sources have not been developed satisfactory. The estimated penetration of 40% in RE electricity by 2020 is considered expensive and difficult to achieve.

## **Recommendations:**

- **Diversify energy sources, conserve energy, expand reversible Hydro plants.**
- **Improve electricity grid, group that of islands, and connect to that of mainland**
- **Consider Solar Thermal Power.**

# CONCENTRATING SOLAR POWER (CSP)

- Of the three principal Renewable Energy technologies (**Wind, PV, and CSP**), only the first two are used in Greece today.
- CSP concentrates solar radiation and transforms solar energy into thermal (at high temperature), and subsequently into electrical.
- As a rule, the CSP systems incorporate Thermal Storage and can work as hybrid systems making them especially suitable for the Greek islands.
- CSP provides dispatchable power and helps match grid supply and demand. This is very important in allowing the grid to accept electricity from highly varying renewable energy sources (Wind and PV).  
**Other advantages** include process steam for industry, water desalination, alternative energy carriers such as H<sub>2</sub> and syngas.

# Concentrating Solar Power in Greece

- **Currently NONE, although conditions are suitable, especially in Southern Greek Islands (e.g., Crete and Rhodes), but also in other areas across the country.**
- **Parabolic Trough Systems are especially appropriate and they can provide base load electricity working as hybrids with fossil fuels and using thermal energy storage.**
- **The islands of Crete and Rhodes have total annual solar energy (horizontal): ~1900 kWh/m<sup>2</sup>/y; Sunshine: ~ 3000 h/y) and electricity demand ideal for CSP.**
- **Two 50 MW CSP plants on each Crete and Rhodes may be advisable (Each 50 MW parabolic trough plant may cost ~ 200 million Euro and requires ~ 1.5 km<sup>2</sup> of land).**
- **The potential of CSP Technologies (of small and big size) in Greece is favorable and detailed studies and pilot plants are indicated (The Greek Regulatory Authority for Energy, RAE, in 2011 has reported having issued licenses for CSP technology as follows: Small (< 3 MW) units across the country of total power ~ 125 MW and large (25-70 MW) units (Parabolic Trough and Tower) in Crete of total power ~ 243 MW).**
- **CSP is important to our country, and we are grateful to EASAC and the expert colleagues who will bring us up-to-date on the latest developments in this technology.**