RENEWABLE ENERGY SOURCES

CORFU, GREECE, OCTOBER 26-28, 2008

Proceedings of the 2nd WSEAS/IASME International Conference on RENEWABLE ENERGY SOURCES (RES'08)

Energy and Environmental Engineering Series
A Series of Reference Books and Textbooks

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A.I.Zouboulis, GREECE

Preface

This book contains the proceedings of the 2nd WSEAS/IASME International Conference on RENEWABLE ENERGY SOURCES (RES'08) which was held in Corfu, Greece, October 26-28, 2008. This conference aims to disseminate the latest research and applications in Power Analysis, Aerodynamic and mechanical loads, Appiled Electrochemistry, Equipment manufacturers, Energy planners, Solar Power, Identification and assessment of geothermal resources and other relevant topics and applications.

The friendliness and openness of the WSEAS conferences, adds to their ability to grow by constantly attracting young researchers. The WSEAS Conferences attract a large number of well-established and leading researchers in various areas of Science and Engineering as you can see from **http://www.wseas.org/reports**. Your feedback encourages the society to go ahead as you can see in **http://www.worldses.org/feedback.htm**

The contents of this Book are also published in the CD-ROM Proceedings of the Conference. Both will be sent to the WSEAS collaborating indices after the conference: **www.worldses.org/indexes**

In addition, papers of this book are permanently available to all the scientific community via the WSEAS E-Library.

Expanded and enhanced versions of papers published in this conference proceedings are also going to be considered for possible publication in one of the WSEAS journals that participate in the major International Scientific Indices (Elsevier, Scopus, EI, ACM, Compendex, INSPEC, CSA .... see: www.worldses.org/indexes) these papers must be of high-quality (break-through work) and a new round of a very strict review will follow. (No additional fee will be required for the publication of the extended version in a journal). WSEAS has also collaboration with several other international publishers and all these excellent papers of this volume could be further improved, could be extended and could be enhanced for possible additional evaluation in one of the editions of these international publishers.

Finally, we cordially thank all the people of WSEAS for their efforts to maintain the high scientific level of conferences, proceedings and journals.

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Plenary Lecture I

The Threat of Desertification in the Island of Crete and the Possibility of Combatting by Vegetation Restoration

Professor Vassilis Gekas
Dept Environmental Engineering,
Technical University of Crete,
73100 Polytechnioupolis Chania,
GREECE
Email: drvgekas@yahoo.com

Abstract: Factors, both human and physical, including climatic conditions, hydrology, geomorphology and cropping practices are evaluated in terms of their contribution in desertification development. Particular emphasis is given on the effects of cultivation practices and the animal husbandry. The relation between local plants and desertification is also studied, emphasizing the role of the olive tree which is the dominant crop in the area.

The main causes which are found to favor the occurrence of desertification include population increase, the extent of areas with low or without plant coverage, overgrazing combined or with the occurrence of fires, and the increased content in salts of water resources, especially at the eastern part of the island. With regard to agricultural practices and especially these applied for olive oil trees environmental compacts are either positive or negative depending on the physical circumstances and the used cultivating practices. What is important is the way weeds are combated, the type of the soil, irrigation applied and the conservation of plant cover.

Vegetation restoration is considered one of the most effective ways to combat desertification. Native plant species suitable for such use include Ceratonia siliqua, Olea europea subsp.sylvestri and Pistacia lentiscus which are adapted to environmental conditions prevailing in the island of Crete. Additionally, findings from the international literature reveal an important role of AM fungi on the establishment of vegetation in degraded soils. Understanding the interrelationships between vegetation and soil microfauna is expected to contribute in the successful re-establishment of native shrub species in the degraded soils in Crete.

Brief Biography of the Speaker: Vassilis Gekas son of Christos and Dimitra was born in Gallini of Larissa the year 1948. His studies were as follows: elementary school in the Gallini village (1954-1960) , secondary school in Larissa και(1960-1966). Chemical Engineering School in the National Technical University of Athens, (1966-1971). Military Service 1971-1973. In the Greek Industry worked as a Chemical Engineer (1973-1983) Ph D studies in the Technical Institute of Lund (1983-1987). Post doc studies on an ELF AQUITAINE sponsorship in the PAUL SABATIER University in Toulouse of France. Coming back to Sweden he obtained the degree of DOCENT (Asssociate Professor) in 1992.

He taught in Lund and HELSINGBORG of Sweden, Oporto Portugal, Bahia Blanca and Rio Cuarto og Argentina, Celaya and Mexico City of Mexico and also he gave lectures in France, Italy, Spain and Germany. He speaks english, french, german, spanish, italian, portuguese and swedish. Since 1998 Professor of Transport Phenomana & Thermodynamics at the Environmental Department of the Technical University of Crete, Chania. He was the first Chairman of the Department (2000-2004). Author of several books and of chapters of books, in english and in greek. Author of >50 publications in cited journals with a Citation Index of approx. 1000. Know how in Membrane Technology, Food Engineering, Stirling cycles and active heliothermic systems. Current research topics: Desertification, Geometry & transport phenomena of biological structures such as the bronchic tree, sun-driven cars, BOLTZMANN equation. He participates in the Summer school of Delfi teaching on the connection between the modern knowledge with the Ancient Greek wisdom.

Plenary Lecture II

Southern Andes Volcanism (33°- 46°S): Geochemistry, Magma Genesis and Geothermal Resources

Professor Leopoldo López-Escobar
Instituto de Geología Económica Aplicada (GEA),
Unversidad de Concepción,
CHILE
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Abstract: Chile is an active seismic and volcanic country due to its location on an Active Continental Margin, where an oceanic plate subducts under a continental plate. Chilean Quaternary volcanism is part of the Andean Quaternary volcanism situated along the western margin of South America, which is segmented into four zones: the Northern Volcanic Zone (NVZ; 6°N- 2°S), Central Volcanic Zone (CVZ; 14°S - 27°S), South Volcanic Zone (SVZ; 33° - 46° and focus of this presentation) and Austral Volcanic Zone (AVZ; 49° 55°S) separated by three segments that lack of Quaternary volcanoes. The first three volcanic zones are the product of the subduction of the oceanic Nazca plate under the continental South American plate while the AVZ is a consequence of the subduction of the oceanic Antarctic plate under the continental plate. The northern limit of the SVZ coincides with the impingement of the Juan Fernàndez asismic ridge on the Chile trench (27°-33°; Pampean flat slab segment), and its southern limit is marked by the intersection of the active Chile Ridge with the Chile trench (46°-49°S; Patagonian Volcanic Gap). Petrologically, the SVZ has been subdivided in four provinces: Northern (NSVZ; 33° – 34.5°S), Transitional (TSVZ; 34.5° – 37°S), Central (CSVZ; 37° – 41.5°S) and Southern (SSVZ; 41.5° – 46°S). The continental crust decreases in thickness from the NSVZ (> 50 km) to the south, reaching a thickness of about 30-35 km along the CSVZ and SSVZ. The subduction angle is relatively steep along the SVZ (> 25° at depths > 90 km). The geohemical characteristics of the SVZ magmatism are controlled by a combination of processes occurring in the subducted oceanic crust, the overlying mantle and the continental crust. In the NSVZ, the effect of the continental crust is significant but is insignificant south of 37°S. Magmatism is initiated by variable fluxing from the subducted slab which interact with the overlying mantle wedge. In the NSVZ, continental crust is incorporated into magmas by a combination of both subduction of the crust into the subarc mantle and/or assimilation of the crust by mantle-derived magmas. In their ascent to the surface, the magmas evolve mainly by low-pressure crystallization, especially in the CSVZ and SSVZ. Other processes such as magma mixing are also important in some cases. Lava, pyroclastic and debris flows, tephra falls and lahars are all hazards associated with SVZ volcanoes. Nonetheless, geothermal waters are also associated with these active volcanoes. Actually, the same faults that control volcanism also control the source of these thermal waters. In the SVZ of the Andes the main sources of geothermal waters are controlled by the Pocuro fault in the north (33°-34.5°S) and the Liquiñe-Ofqui fault zone in the south (38°-45°S). The enthalpy of the northern sources is relatively low since the temperature of the waters is less than 40°C, but the enthalpy of the southern sources, where most active volcanoes are found, is higher where some reach up to 95°C. The chemical composition of the geothermal waters depends upon a series of factors including the temperature vs. solubility and meteoric components vs magmatic components ratios. Most of the low enthalpy waters are used in resorts spas. The few high enthalpy cases are currently being explored as sources of geothermal energy.

Brief Biography of the Speaker:

1. PERSONNEL ANTECEDENTS

Name: Leopoldo López-Escobar
Born: August 05, 1940
Nacionality: Chilean
Hierarchy: Full Professor
Working Unit: Instituto de Geología Económica Aplicada (GEA), Unversidad de Concepción. Chile

2. ACADEMIC DEGREES:

2.1 Bachelor in Biology and Chemistry. Universidad Católica de Chile. February, 1963

2.2 Master of Science in Chemistry. Massachusetts Institute of Technology (MIT), Cambridge, Massachusetts, USA. June, 1972. Thesis: Determination of trace mercury in organic matrices by flameless atomic absorption.

2.3 Master of Science in Earth and Planetary Sciences. Massachusetts Institute of Technology (MIT), Cambridge, Massachusetts, USA. June, 1972. Thesis: Appalachian rhyolites: Geochemical data concerning their origin.

2.4 Doctor of Philosophy (Ph.D) in Earth and Planetary Sciences. Massachusetts Institute of Technology (MIT), Cambridge, Massachusetts, USA. February, 1975. Thesis: Plutonic and volcanic rocks from central Chile (33° - 42°S): Geochemical evidences regarding their petrogenesis.

2.5 Science Doctor in Geology, July, 1976. Ratified by the Universidad de Chile, Santiago, Chile.

3. TEACHING ACTIVITIES AT THE UNIVERSIDAD DE CHILE AND UNIVERSIDAD DE CONCEPCION:

Thermodynamic for Geologists.
Geochemistry.
Volcanology.
Volcanic Petrology.
Doctoral and Magister thesis advisor.

4. RESEARCH EXPERIENCE (PROJECTS):

National Science Foundation.
Japan Ministry of Education.
ECOS – Chilean National Foundation (CONICYT).
Chilean National Foundation (FONDECYT).
Volkswagen Foundation.
University of Chile.
Andean Foundation.

5. NEAR 60 PUBLICATIONS IN BOOKS AND JOURNALS SUCH AS:

Analytical Letters.
Bulletin of Volcanology.
Compte Rendus de la Académie des Sciences, Paris.
Contributions to Mineralogy and Petrology.
Earth and Planetary Sciences Letters.
Geochimical Journal.
Geological Society of America Special Papers.
Geology.
Journal of Volcanology and Geothermal Research.
Journal of Chemical Technology and Biotechnology.
Journal of Geophysical Research.
Journal of Mineralogy, Petrology and Economic Geology.
Journal of Petrology.
Journal of South American Earth Sciences.
Journal of Volcanology and Geothermal Research.
Mineralium Deposita.
Pacific Geology.
Revista Geológica de Chile.
Zentralblatt für Geologie und Paläontologi.

6. HE HAS BEEN INVITED SPEAKER IN DIFFERENT INSTITUTIONS, SUCH AS:

MIT, USA.
Southern Methodist University, USA.
Tübingen Universität, Germany.
Heilderberg Universität, Germany.

Ibaraki University, Japan.
American Geophysical Union.
Universidad de Chile.
Universidad Católica de Chile.
Universidad de Concepción, Chile.
Universidad Católica del Norte, Chile.
Universidad Austral de Chile.
Comisión Chilena de Energía Nuclear, Chile.
Comisión Chilena del Cobre (CODELCO), Chile.
Servicio Nacional de Geología y Minería, Chile.

7. HE HAS BEEN MEMBER OF DIFFERENT SCIENTIFIC SOCIETIES, SUCH AS:

International Association of Volcanology and Chemistry of the Earth's Interior (IAVCEI).
Sociedad Geológica de Chile.
The American Association for the Advancement of Sciences.
The Geological Society of America.
The New York Academy of Sciences.
The Scientific Research Society of North-America (Sigma-Xi).

Plenary Lecture III

Water Management and Flooding Phenomenon in PEM Fuel Cell

Professor Hyung Hee Cho
Yonsei University, Seoul,
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Abstract: The water management in Proton Exchange Membrane Fuel Cell (PEMFC) has been regarded as one of the crucial effects on its performance. It is due to use of humidified hydrogen and air as fuels as well as production of H2O during chemical reactions in PEMFC. Such conditions lead to excess H2O remaining in PEMFC, resulting flooding phenomena which may block air flow channels. Therefore, in order to enhance the performance of PEMFC especially under concentration loss region, it should be necessary to understand and manage the flooding phenomenon in proper manner. This lecture deals with these two critical subjects in terms of qualitative analysis of the flooding phenomenon and introduction of modified channel design for improved water management.

Brief Biography of the Speaker: Professor Hyung Hee Cho received the B.S. (1982) and M.S. (1985) degrees in mechanical engineering from Seoul National University, Korea and the Ph.D. degree (1992) from University of Minnesota, USA. He has been the faculty of Department of Mechanical Engineering, Yonsei University, Seoul, Korea since 1995. He has served for a chairman of Department of ME and an associate dean of College of Engineering, Yonsei University. He has published more than 150 papers in journals, about 200 papers in conference presentations/proceedings, and more than 15 patents. He is currently vice president of KSME Energy and Power Division, a committee member of Gas Turbine Heat Transfer Committee (ASME), a scientific council member of International Center for Heat and Mass Transfer (ICHMT), and in editorial board of three international journals; JP Journal of Heat and Mass Transfer, Advances in Mechanical Engineering and International Journal of Fluid Machinery and Systems.

Plenary Lecture IV

Large Scale Integration of Wind Power and the Impact on Power Systems

Professor Terje Gjengedal
Statkraft/ NTNU,
NORWAY
Email: Terje.Gjengedal@statkraft.com

Abstract: In many countries of the world wind power expands and covers a steadily increasing part of these countries' power demand. When considering development of large wind power plants in power systems, several questions must be clarified. These include e.g. the practical connection to the network, integration with the network system, system stability, sub-synchronous oscillations within the power plant, necessary installations and extensions of the network etc. In small scale wind farms, turbines normally do not take part in voltage and frequency control and if a disturbance occurs, the wind turbines are usually disconnected and later reconnected when normal operation has resumed.

However, when the amount of wind power is increasing, the wind turbines may begin to influence overall power system behavior, making it increasingly difficult to operate a power system by only controlling other large scale power plants. Obviously, the level of wind power that can be integrated into the system without influencing overall power system behavior depends heavily on the type of system, i.e. short circuit levels, fast active/reactive power control capabilities, concentrated or distributed generation, grid congestions, etc. Therefore, when developing large scale wind farms, due consideration must be given to detailed system and design studies in order to find the best technical-economical solution for dealing with these issues.

When the percentage of wind power penetration was small compared to total power production requirements for Wind Turbines (WT) or Wind Farms (WF) were originally not included in grid codes. As wind power started to develop and becoming a larger portion of the generation, some network companies that were facing the increasing amount of WF developed their own connection rules. The rapid development of wind turbine technology and the increasing wind power penetration result in continuous reformulation of the connection requirements. Having wind turbines participating actively in system control may be important to ensure a safe and reliable operation of the power system.

This paper will discuss important issues related to integration of large scale wind power and the impact on power systems. Issues such as power system stability, imbalance management, active and reactive control and the need for reserve management will be discussed and examples will be presented.

Brief Biography of the Speaker: Terje Gjengedal received a MSc and a PhD in electrical engineering from The Norwegian Institute of Technology in 1983 and 1987 respectively. Since then he has had a broad range of working experiences within the energy sector ranging from R&D, transmission system, electricity markets, hydro scheduling and hydro operation, and during the last 10 years also with integration of large scale wind power into the power system.

He is currently working with Statkraft where he has had several management positions covering the above mentioned fields. His present position is Vice President of Wind Power with responsibility of wind integration projects.

He is also holding a full professor degree in energy systems and a full professor degree in transmission operation and control. In addition to his work with Statkraft, he is holding Professor positions at the Norwegian University of Science and Technology in Trondheim, and at Narvik College.

Terje Gjengedal is an active participant in international projects and co-operations, and he has represented Norway in several international committees and meetings. He has received several national and international awards for his contributions.

Plenary Lecture V

Role of Electrical Machines in Wind Energy Conversion- Operational Aspects

Professor Kanwarjit Singh Sandhu
Department of Electrical Engineering,
National Institute of Technology Kurukshetra-136119
Haryana, INDIA
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Abstract: Ever since alternating current became entrenched as the preferred form of power supply; synchronous generator has become the main attraction for its utility to extract the power from conventional sources of energy. Generally it is used in hydro and thermal power stations. These generators have undergone an impressive evolution in terms of their ratings, cooling methods and parameters. But the increasing rate of depletion of conventional sources of energy as well as growing power demand has diverted the attention of scientists towards the non-conventional sources of energy such as wind energy, solar energy, tidal energy, geothermal energy etc. Out of these wind energy is the fastest growing area of all renewable energy resources and is attractive and viable. It is observed that winds carry enormous amount of energy and could meet sufficient energy needs of the world. The regions in which strong winds prevail for a sufficient time during the year may use wind energy profitably for different purposes. It has been found that cost of wind generation is comparable to that from hydro and thermal plants. There is a little doubt that while the cost of wind generation would be even low in the coming years, the prices of fossil fuels used by thermal plants would definitely go up. In addition to this wind energy generation provides a clean and pollution free environment. It does not lead to global warming and ozone depletion. No hazardous waste is created. There is a considerable interest in the choice of electrical machines for the wind energy conversion and several views prevail. However most of the researchers are in the favour of induction generators in self- excited mode due to its ability to convert mechanical power over a wide range of rotor speeds in addition to many other advantages.

Brief Biography of the Speaker: Kanwarjit Singh Sandhu was born in Haryana, India on 21 December 1957. He received the B.Sc. Engg. (Electrical), M. Sc. (Electrical) and PhD (Electrical Machines) degrees from Regional Engineering College, Kurukshetra University, Kurukshetra, India in 1981, 1985 and 2001, respectively. He joined the Electrical Engineering Department of Regional Engineering College, Kurukshetra, as Lecturer in January 1983. Currently, he is Professor in Electrical Engineering Department, National Institute of Technology, Kurukshetra India. He has more than 50 numbers of publications in the area of electrical machines & induction generators. His areas of interest include electrical machines, wind energy conversion, power quality, power systems and artificial intelligence. At present he is supervising ten research scholars in the area of electrical machines/induction generators. He has already chaired many technical sessions in conferences in India. He is a regular reviewer of IEEE, Energy Conversion & IEE, EPA.

Plenary Lecture VI

Air Pollution from Four Stroke Engine that Use Gasoline – Ethanol Blends

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Department of Production and Management Engineering
Democritus University of Thrace
V. Sofias Street, 67100, Xanthi
GREECE
Email: xarapat@agro.duth.gr

Abstract: Ethanol is an alcohol, the same found in beer and wine. It is made by fermenting any biomass high in carbohydrates (starches, sugars, or celluloses) through a process similar to brewing beer. Ethanol is mostly used as a fuel additive to cut down a vehicle's carbon monoxide and other smog-causing emissions. But flexible-fuel vehicles, which run on mixtures of gasoline and up to 85% ethanol, are now available. This paper deals with the use of gasoline-ethanol mixtures at a small four-stroke engine of internal combustion that is used for the movement of a small alternative generator. The mixtures that were used are: gasoline, gasoline-10%ethanol, gasoline-20%ethanol, gasoline-30%ethanol, gasoline-40%ethanol, gasoline-50%ethanol, gasoline-60%ethanol, gasoline-70%ethanol gasoline-80%ethanol gasoline-90%ethanol and 100% ethanol. During the use of these mixtures it was observed CO and HC emissions decrease when the percentage of ethanol in the fuel was increased, without any engine malfunction and under different load conditions (without load conditions and under full electrical load conditions). There was an exception with the mixtures: gasoline-90%ethanol and 100%ethanol for which the engine malfunctioned and the HC emissions were increased. It is important to mention that the ethanol that was used was 95o alcoholic degrees and not 100% pure ethanol. Furthermore, during the use of the mixtures of gasoline-ethanol there was a small increase of fuel consumption when the percentage of the ethanol in the fuel was increased.

Brief Biography of the Speaker:

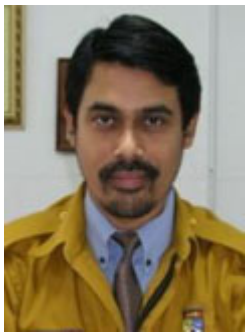
Born in Athens, Greece
Citizenship: Greek
e-mail: xarapat@agro.duth.gr
Titles

- Mechanical Engineer, Ph.D. (Democitus University of Thrace-Greece), Assoc. Professor on University of Thrace-Greece
  Present Responsibilities
- Member of Technical Chamber of Greece
- Member of Electrical and Mechanical Engineering Association.
- Member of Combustion Institute of Greece
  Participations

Took part in many research programs, which referred to biofuels, gas emissions, antipollution technology.
Research domains
Biofuels and their use in internal combustion engines, power variation from the use of biofuels, gas emissions and mechanical damages.

Plenary Lecture VII

Renewable Energy Application in Some Selected Islamic Countries



Professor Kamaruzzaman Sopian
Solar Energy Research Institute
Universiti Kebangsaan Malaysia
43600 Bangi Selangor
MALAYSIA
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Abstract: They are over 57 Islamic countries spread over four continents with population over than 1.5 billion. Presently, the demand of energy is met by fossil fuels. Combustion of fossil fuels has caused negative impacts to the environment globally. To overcome it, sustainable, clean and safe energy policies that would satisfy the energy demand of the 21st century have to be implemented. Renewable energy resources should therefore be key energy sources for the future in the Islamic countries. This paper is to study the renewable energy and its implementation strategies for some of the selected Islamic countries. The present status on the renewable energy applications will be presented. Several strategies will be discussed including (a) establishment of renewable technology information services, awareness and capacity building programs (b) development of renewable technology market enhancement, infrastructure development and demo projects (c) improvement of policy and financial frameworks supportive for solar technology market sustainability (d) establishment of competitive local solar technology manufacturing industries, enforcement of international standards for solar technology components and enhancement R&D program. Moreover, these strategies should be addressed in an integrated manner.

Brief Biography of the Speaker: Prof. Dr. Kamaruzzaman Bin Sopian obtained his BSc in Mechanical Engineering from the University of Wisconsin-Madison in 1985, MSc in Energy Resources from the University of Pittsburgh in 1989 and PhD. in Mechanical Engineering from the Dorgan Solar Laboratory, University of Miami in 1997. He is presently the Professor in Renewable Energy at the Department of Mechanical and Material Engineering, Universiti Kebangsaan Malaysia. Currently, he is the Director of the Solar Energy Research Institute, a center of excellence for the research and development in solar energy technology. He has been involved in the field of solar energy for more than twenty years. His main contributions are in solar radiation modeling, alternative material for solar absorber, solar water heating system with integrated storage system, solar desalination, solar cooling, daylighting using solar light pipes, solar assisted drying systems, grid-connected photovoltaic system, thin film silicon solar cells, combined photovoltaic thermal or hybrid collector and solar hydrogen production system.

He has published over 400 research papers in journals and conferences. He has delivered keynotes speeches at national and international conferences on renewable energy. He is the founding member of the Malaysian Institute of Energy, member of the World Renewable Energy Network based in the United Kingdom and is an associate editor of the Renewable Energy published by Elsevier Ltd. He heads several national subcommittees on renewable energy by the Malaysian government to promote awareness, market enhancement, policy studies and the applications renewable energy.

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