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PV-Hybrid and Mini-Grid

Thursday, April 29th, 2010

Friday, April 30th, 2010

Palau Firal i Congressos de Tarragona

Tarragona, Spain



Conference Chairmen Tandem

Xavier Vallvé

Trama TecnoAmbiental (TTA), Barcelona, Spain

Gonzalo Piernavieja

Instituto Tecnológico de Canarias (ITC), Canary Islands, Spain

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Xavier Vallvé

Trama TecnoAmbiental S.L., Barcelona, Spain

Prof. Dr.

Rakwichian Wattanapong

School of Renewable Energy Technology Retention (SERT), Phitsanulok, Thailand

Chairmen's Message

The 5th European Conference on PV-Hybrid Systems and Mini-grids will be held in Tarragona, Spain, on April 29th/30th, 2010.

We have the pleasure to invite you to actively participate in this European Conference, which will take place at a crucial moment, where changes are shaping the electricity generation and distribution paradigm of the future. Among the major driving forces of this transition are the development of both PV Hybrid systems and their integration into micro- and mini-grids for high penetration of Renewable Energy Sources (RES).

One of the main assets of solar radiation as energy source is its universality, and the value of PV technology is its capacity to convert it into clean electricity anywhere at any size. For this technology, the tremendous opportunities and challenges are to provide electricity supply to rural villages and scattered population, to refurbish, with PV hybrids, diesel power plants operating in existing remote villages and islands as well as increasing the security of supply in interconnected mini-grids. This universality is further broadened by adequate hybridization with small wind, biomass and other renewable energy sources and by sharing a common approach in both industrialized and developing countries. In European insular regions, like the Greek Archipelagos or the Canary Islands, with weak electrical systems, territorial protections and other barriers to the development of conventional grids, these distributed generation technologies are already being taken into consideration by energy policy makers and constitute excellent laboratories for testing technological, social and regulatory aspects that can be transferred to developing areas around the world as well as to continental systems.

PV hybrids are a growing comprehensive field that involves scientists, engineers, sociologists, economists and entrepreneurs of the public as well as the private sector, the academics as well as the field experience. Moreover from the technological point of view it offers a unique opportunity of cross-fertilization with other emerging technologies like smart-grids, hydrogen, electricity storage, and grid-connected PV, etc.

After the success of the previous 4 events we encourage submission of papers that contribute to broaden and share the knowledge in this area. The topics of the conference include field experience and systems' technology based on PV as well as small wind hybrid generation and concepts for the implementation of mini-grids. Developments in system components, advanced storage and back-up will be addressed. Moreover, new strategic approaches for optimizing design and operation will be presented. Issues of special interest will include possible synergies that could arise from the combination of mini-grid schemes with numerical weather forecast models, demand management, communication (ICT) technologies and socio-economic issues.

High volatility of fossil fuel markets and the need to mitigate GHG emissions are stressing the need to look for ways to increase the use of indigenous clean renewable energy sources. PV-Hybrid systems and Mini-grids are a tool to contribute towards these objectives. We are looking forward to the opportunity to share with you all the exciting ongoing progresses in these fields and hope to meet you at the Conference.

Chairmen Tandem:

Xavier Vallvé, Trama TecnoAmbiental (TTA), Barcelona, Spain
Gonzalo Piernavieja, Instituto Tecnológico de Canarias (ITC), Canary Islands, Spain

Conference Focus

- Development and Application of Technologies
- Exchange of Results and Ideas
- Know-how Transfer
- Identification of R&D Needs
- Presentation of Field Experience

Your Advantage

- You gain comprehensive information about the **state of technology** as well as latest **results from research and development**.
- The scope of the conference is intended to encourage a hearty **open discussion of problems and future strategies to spread PV-HYBRID and MINI-GRID**.
- The speakers are leading scientific and business experts.
- The programme structure and the conference venue best ensure **exchange of views** between participants and presenters.
- The **detailed proceedings book and the CD-ROM** with all talks and poster contributions will be handed over at the start of the conference and will serve you well as reference works.

You will meet

Users of renewable energy systems and mini-grid, users involved in rural electrification, manufacturers and suppliers of renewable energy systems and energy storage technology, energy consultants, public utilities, users from developing countries, development programme specialists, energy policy makers, other attendees

Conference Location

Tarragona: the ancient Tarraco, a city with more than 2000 years of history, was one of the most important capitals of the Roman Empire. The UNESCO named Tarragona as World Heritage.



Pre-Conference Seminar

BASICS OF SMALL WIND TURBINES

Palau Firal i Congressos, Tarragona, Spain – April 28th, 2010

Small wind turbines can be combined with PV and other electricity generating components to provide electrical power in hybrid systems and mini-grids. The one-day seminar will give an introduction to small wind turbines, covering the following topics:

- potentials and challenges,
- state of technology, turbine concepts, system integration and optimisation,
- performance, costs, quality, safety and certification,
- planning, installation and operation,
- example projects and field experience.

The seminar will focus on small wind turbines with nominal power ranging from a few hundred watts up to about 30 kW.

Seminar Chairman: Paul Kühn, Fraunhofer-Institute for Wind Energy and Energy System Technology IWES, Germany

Seminar language: English

Programme:

- 09.45 **Registration/Welcome Coffee**
- 10.15 **Opening Address**
Eckardt Günther, OTTI e.V., Germany
- 10.30 **Introduction**
Speaker: Paul Kühn, Fraunhofer-Institute for Wind Energy and Energy System Technology IWES, Germany
Description: classification, potentials, market overview, costs, yield estimation, comparison of PV and small wind turbines
- 11.15 **Small Wind Turbine Technology**
Speaker: Holger Peters, INENSUS GmbH, Germany
Description: physical basics, rotor types, system components, applications for small wind turbines, wind site analysis
- 12.00 **Lunch Break**
- 13.30 **Small Wind Turbine Requirements, Tests und Quality**
Speaker: Ignacio Cruz, CIEMAT, Spain
Description: standards and certification, safety, product information and labelling, test and test procedures
- 14.15 **System Technology for Small Wind Turbines**
Speaker: N.N., SMA Solar Technology AG, Germany
Description: inverters for small wind turbines, overvoltage protection, integration in off-grid systems
- 15.00 **Coffee Break**
- 15.30 **Example Projects**
Description: planning, distribution, transport, siting, installation, operation and maintenance, performance, costs etc.
- 15.30 Speaker: Juande Bornay, Bornay Wind Turbines, Spain
- 16.00 Speaker: Balthasar Klimbie, Fortis Wind Energy, Netherlands
- 16.30 Speaker: N.N.
- 17.00 **General Discussion**
- 17.30 **End**
- 18.00 **Get Together** (self payment)



5th European Conference

PV-HYBRID AND MINI-GRID

Thursday, April 29th, 2010

- 09.00 **Opening Address**
Eckardt Günther, OTTI, Regensburg, Germany
Xavier Vallvé, TramaTecnambiental (TTA), Barcelona, Spain
Gonzalo Piernavieja, Instituto Tecnológico de Canarias (ITC), Canary Islands, Spain
- OPENING SESSION:
POLITICAL – ECONOMICAL FRAMEWORK**
- Chair:** Xavier Vallvé, TramaTecnambiental (TTA), Barcelona, Spain
Gonzalo Piernavieja, Instituto Tecnológico de Canarias (ITC), Canary Islands, Spain
- 09.25 Overview of IEA PVPS Task 11 PV-Hybrid Systems within Mini Grids
Konrad Mauch, IEA PVPS Task 11, Gabriola, Canada
- 09.40 Photovoltaic Revolution for Deployment in Developing Countries
Wolfgang Palz, World Council Renewable Energies, Brussels, Belgium
- 09.55 Legal and Financial Conditions for the Sustainable Operation of Mini-Grids
Guido Glania, Secretary General, Alliance Rural Electrification, Brussels, Belgium
- 10.10 EU Instruments to promote Renewable Energies in Developing Countries
Pablo Leunda Martiarena, Unit Water and Energy Facility, EuropeAid, European Commission, Brussels, Belgium
- 10.25 Questions
- 11.00 **Coffee Break and Visit to the Poster and Trade Exhibition**

MARKETS, SOCIO – ECONOMICS AND EDUCATION

Chair: Christos Protogeropoulos, Phoenix Solar EPE, Athens, Greece
Petra Schweizer-Ries, Otto-von Guericke-Universität, Magdeburg, Germany

- 11.30 PV-Hybridization of Diesel Electricity Generators: Conditions for Profitability and Examples in Different Power and Storage Size Ranges
Martin Gorn, SCHOTT Solar AG, Alzenau, Germany
- 11.45 Educational Suit of Designing PV-Hybrid Systems
Kenji Otani, AIST, Tsukuba, Japan
- 12.00 Renewable Energy Sustainable Programme for Intelligent Rural Electrification in Laos, Cambodia and Vietnam.
Brisa Ortiz, Fraunhofer Institut für Solare Energiesysteme ISE, Freiburg, Germany
- 12.15 Techno-Economic Feasibility of Energy Supply of Remote Villages in Palestine by PV Systems, Diesel Generators and Electric Grid (Case studies: Emnazeil & Atouf villages)
Ibrik Imad, An-Najah National University, Nablus, Palestine
- 12.30 Operation and Sustainability Issues of a Solar PV Mini Grid as a Tool for Rural Electrification in Uganda
Geoffrey Bakkabulindi, Makerere University (CREEC), Kampala, Uganda
- 12.45 Discussion
- 13.10 **Presentation of Sponsors**
- **SMA** (Gold)
- **Studer Innotec** (Silver)
- **Ingeteam** (Bronze)
- **OutBack Power Systems** (Bronze)
- 13.25 **Lunch and Visit to the Trade and Poster Exhibition**

COMPONENTS: STORAGE, INVERTERS, BACKUPS

Chair: Georg Bopp, Fraunhofer Institut für Solare Energiesysteme ISE, Freiburg, Germany

- 14.30 Can we rate Inverters for Rural Electrification on the Basis of Energy Efficiency?
Xavier Vallvé, TramaTecnoambiental (TTA), Barcelona, Spain
- 14.45 Test Procedures for MPPT Charge Controllers Characterization
María Camino, Instituto de Energía Solar – UPM, Madrid, Spain
- 15.00 Energy Storage for Mini-Grid Stabilization
Bella Espinar, MINES ParisTech, Sophia Antipolis Cedex, France
- 15.15 Redox Flow Batteries – Already an Alternative Storage Solution for Hybrid PV Mini-Grids?
Matthias Vetter, Fraunhofer Institut für Solare Energiesysteme ISE, Freiburg, Germany
- 15.30 Discussion
- 15.50 **Poster Session**

A Components: Storage, Inverters, Backups

- A1 Performance of Conventional MPPT Techniques in the Presence of Multiple P-V Curve Local Maxima due to Partial Shading
Evagelia Paraskevadaki, National Technical University of Athens, Athens, Greece
- A2 Photovoltaic and Thermal Collector (PV/T) Hybrid System's Performance Analysis under the mild Climate Conditions of Izmir City
Dilsad Engin, Ege University Ege Tech., Izmir, Turkey
- A3 Influential Parameters on a building integrated Hybrid PVT Concentrator
Daniel Chemisana, University of Lleida, Lleida, Spain
- A4 Making Renewables dependable through Energy Storage
Martha Schreiber, Cellstrom GmbH, Eisenstadt, Austria
- A5 The Solution to Combine and Manage Renewable Energies in Hybrid Applications and Mini Grids
Anne Pieter Haytema, Nedap NV, Groenlo, The Netherlands

B Systems Technology

- B1 Control, Monitoring and Data Acquisition Architecture Design for Clean Production of Hydrogen from Mini-Wind Energy
Sebastián Villarroya, University of Santiago de Compostela, Santiago de Compostela, Spain
- B2 Remote Telecom System including Photovoltaic Energy and H2 Production by Electrolysis
Graciano Martínez, INTA, Torrejón de Ardoz, Madrid, Spain
- B3 Effective Combination of Solar and Wind Energy Systems
Yiannis Tripanagnostopoulos, University of Patras, Patras, Greece
- B4 Standardisation of Distributed Grid Support - An analogue Approach for the Smart Grid
Gunnar Kaestle, TU Clausthal, Clausthal-Zellerfeld, Germany
- 16.15 **Coffee Break and Visit to the Poster and Trade Exhibition**

SYSTEMS TECHNOLOGY PART 1

Chair: Philipp Strauß, Fraunhofer-Institut für Windenergie und Energiesystemtechnik IWES, Kassel, Germany

- 17.00 Control Methods for PV Hybrid Mini-Grids
Luiz Lopes, Concordia University, Montreal, Quebec, Canada
- 17.15 Partial AC-Coupling in Minigrids
Pierre-Olivier Moix, Studer Innotec, Sion, Switzerland
- 17.30 Discussion
- 17.40 **Poster Session**

C Field Experience

- C1 Djungle Power – A More Remote AC Bus
Heinz-Wolfgang Boehnke, Technosol, Jork, Germany
- C2 Quality Control Tools Applied to a PV Microgrid in Ecuador
María Camino, Instituto de Energía Solar – UPM, Madrid, Spain
- C3 Integral Evaluation of Energy Supply Systems at Mountain Refuges
Hubert Deubler, Consultant, Marktschellenberg, Germany

- C4 Hyress Project: Study Case of Tunisia. Installation, Set-Up and First Results
Ana Linares, ITER, S.A., Sante Cruz de Tenerife, Spain
- C5 PV Hybrid Systems on Mountain Huts: Experience with the Project CAI ENERGIA 2000
Franco Filippi, E++, Dronero, Italy

D Simulation, Design and Testing

- D1 TRNSYS Simulation of a System consisted of PV Panels and H2 Production and Storage to feed a Remote Telecom Application (Hidrosolar_H2)
Físicas Guillermo Gómez Prada, INTA, Torrejón de Ardoz, Spain
- D2 Photovoltaic Forecasting: A State of the Art
Bella Espinar, MINES ParisTech, Sophia Antipolis Cedex, France
- D3 PV*SOL 5.0 standalone - Simulation of a Stand-Alone AC System
Miguel Carrasco, Dr. Valentin EnergieSoftware GmbH, Berlin, Germany
- D4 Effect of Wind Speed and Solar Irradiation on the Optimization of a PV-Wind-Battery System to Supply a Telecommunications Station
José L. Bernal-Agustín, Zaragoza University, Zaragoza, Spain
- D5 Polysun: PV, Wind and Power-Heat-Cogeneration in One Design Tool
Andreas Witzig, Vela Solaris AG, Winterthur, Switzerland
- D6 Comparative Study between Distributed and Centralised PV Generation in Island Power Systems under Variable Weather Conditions
Evangelos Rikos, C.R.E.S., Pikermi, Greece
- D7 Development of a Test Facility for PV-Wind Hybrid Energy Systems
Mustafa Engin, Ege University Ege Tech., Izmir, Turkey
- D8 Evaluation of a Micro PV-Wind Hybrid System in Nordic Climate Conditions
Frank Fiedler, SERC, Borlänge, Sweden
- D9 Primes: The INES Microgrid Platform
Franck Barruel, CEA-INES, Le Bourget du Lac, France
- D10 Estimation of Electric Energy Consumption for Northern Brazilian Communities Based on Socio-Economic Statistics
Achim Schreider, Lahmeyer International, Bad Vilbel, Germany
- 18.30 **End of the First Conference Day**
Guided City Tours will be provided from 18:30 – 20:00 hrs
- 20.00 **Dinner, Hotel Husa Imperial Tarraco, Tarragona**

Friday, April 30th, 2010

SYSTEM TECHNOLOGY PART 2

Chair: Stathis Tselepis, CRES - Centre for Renewable Energy Sources, Athens, Greece

- 08.30 Normative Issues of Small Wind Turbines in PV-Hybrid Systems
Ignacio Cruz, CIEMAT, Madrid, Spain
- 08.45 Communication Solutions for PV-Hybrid Systems
Michael Müller, Steca, Memmingen, Germany
- 09.00 Towards flexible control and communication of mini-grids
Henrik Bindner, Risø National Laboratory, Technical University of Denmark, Roskilde, Denmark
- 09.15 PV/Methanol Fuel Cell Hybrid System for Powering a Highway Security Variable Message Board
Mark Vervaart INES/CEA, Le Bourget-du-lac, France

- 09.30 Polygeneration Smartgrids: A Solution for the Supply of Electricity, potable Water and Hydrogen as Fuel for Transportation in Remote Areas
George Kyriakarakos, Agricultural University of Athens, Athens, Greece
- 09.45 Implementation of the Bronsbergen Microgrid using FACDS
Jackie Lava, Eindhoven University of Technology, Eindhoven, Netherlands
- 10.00 Discussion
- 10.30 **Coffee Break and Visit to the Poster and Trade Exhibition**

SIMULATION, DESIGN AND TESTING

Chair: Henrik Bindner, Risø National Laboratory, Technical University of Denmark, Roskilde, Denmark

- 11.15 A revisited Approach for the Design of PV-Wind Hybrid Systems
Luis Arribas, CIEMAT, Madrid, Spain
- 11.30 Optimization of a Wind/Diesel Hybrid Configuration in a Remote Grid with Battery Implementation: Case Study of Melinka Island
Alexandra Romàn, Lahmeyer International GmbH, Bad Vilbel, Germany
- 11.45 Provisional Acceptance Methodology of Installations and Online Data Submission of PV & Hybrid Kits in Remote Areas of Latin-America under the EC's EURO-SOLAR Programme
Luis López-Mazaneres, ITER, S.A., Sante Cruz de Tenerife, Spain
- 12.00 Discussion
- 12.15 **Lunch and Visit to the Trade and Poster Exhibition**

POSTER AWARD

**Committee: Georg Bopp, Fraunhofer Institut für Solare Energiesysteme ISE, Freiburg, Germany
John Chadjivassiliadis, Nat. Delegate IN MG/EC / PVTP, Glyfada, Greece
Sener Oktik, Mugla University, Turkey**

- 13.45 Award Ceremony
Two Winners

FIELD EXPERIENCE PART 1

Chair: Jean-Christian Marcel, TENESOL, La tour de Salvagny, France

- 13.55 Experience of the Canary Islands in the Development of Insular 100% RES Systems and Micro-Grids
Gonzalo Piernavieja, Tecnológico de Canarias (ITC), Canary Islands, Spain
- 14.10 Assessment of Photovoltaic Hybrid Power Systems in the United States
Gregory Martin, National Renewable Energy Lab., Golden, USA
- 14.25 Solar Hybrid School Project in East Malaysia
Wolfgang Fürst, Kombinasi Solar Sdn. Bhd., Selangor, Malaysia
- 14.40 Questions
- 15.15 **Coffee Break**

FIELD EXPERIENCE PART 2

Chair: Philippe Jacquin, PhK Consultants, Ecully, France

- 15.45 Egg Island – Electrification of a British Island by a Unique PV-Wind-Hydro-Diesel Hybrid System
Frank Thim, SMA Solar Technology AG, Niestetal, Germany
- 16.00 A Pragmatic Performance Indication Framework for describing PV Hybrid Systems within Mini-Grids: Results from IEA PVPS Task 11 Activity 31
Andrew Swingler, Xantrex Technology Inc., Burnaby, Canada
- 16.15 Hybrid Renewable Energy Systems for the Supply of Services in rural Settlements of Mediterranean Partner Countries: The HYRESS Project – The Case Study of the Hybrid System – Microgrid in Egypt
George Papadakis, Agricultural University of Athens, Athens, Greece
- 16.30 Discussion
- 16.45 **Closing Remarks**
Xavier Vallvé, TramaTecnambiental (TTA), Barcelona, Spain
Gonzalo Piernaveja, Instituto Tecnológico de Canarias (ITC), Canary Islands, Spain
- 17.00 **End of the Conference**

Organisation

Organisation Committee

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Conference Venue

Palau Firal i de Congressos
de Tarragona
Tarragona Trade-Fair and
Congress Centre
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Accommodation

Please book your accommodation as soon as possible by yourself.
www.booking.com/tarragona

Conference Fee

Basic Seminar Small Wind Turbines:

If registered until March 14th, 2010 | after March 14th, 2010
Per Person: € 250,- | 300,-

PV-Hybrid and Mini-Grid conference:

If registered until March 14th, 2010 | after March 14th, 2010
Per Person: € 700,- | 780,-
Member of OTTI and
Supporting Organisations:
Per Person: € 600,- | 650,-
Reduced fee for presenters:
Per Person: € 360,-

From third participant on, every other participant of your company profits from our 15% discount on the conference fee.

Fees cover the admission to all sessions, invitation to all coffee breaks, two conference lunches, a dinner, the conference proceedings and CD-Rom.

Information about OTTI

OTTI (Ostbayerisches Technologie-Transfer-Institut e. V.) is a non profit organisation founded in 1977. Its aim is the stimulation of the industrial economy and the support of the co-operation between science and industry. OTTI has a 34-person strong team who proffer seminars, specialist forums and conferences. About 6200 specialists and managerial personnel from business, administration and science take part every year.

OTTI is one of the leading European conference organisers of purpose-oriented seminars and conferences in the field of renewable energies. Furthermore, we offer courses in the fields of building, construction and the efficient use of energy. Our conferences with the accompanying specialist exhibitions in Kloster Banz belong to the definitive meetings of the solar energy sector in the German-speaking area.

For more detailed information please visit www.otti.de

Conditions of participation and cancellation

You will receive your registration documents with receipt of your registration. The participation fee is VAT-exempt and due net with receipt of the invoice. Please transfer the invoice amount not later than 14 days before the conference starts. Otherwise a copy of the transfer order must be presented at the conference desk. All bank charges have to be covered by the transmitter. Entrance to the conference can only be permitted if OTTI has received the payment. OTTI reserves the right to make modification and amendments of any kind for urgent reasons. In the case of a cancellation of your registration up to 30 days before the seminar takes place, we do not raise a cancellation fee. For cancellations made within a period of 30 to 15 days before the start of the seminar, we charge a service fee of € 120. In the event of cancellations made later than 15 days before the seminar, or in the case of absenteeism, the total participation fee will be charged, unless you are able to provide evidence of a deviating amount of damages or expenses. The cancellation must be in written form. The person representing the contracting party may be replaced at any time but a written notice is necessary not later than 4 days before the conference starts. Irrespective of legal basis, OTTI shall only be liable for property damage and pecuniary loss which occurred due to intent or gross negligence. The place of fulfilment and jurisdiction is Regensburg, Germany.

Seminar
BASICS OF SMALL WIND TURBINES (SWT 3592)
 April 28th, 2010

5th European Conference
PV-HYBRID AND MINI-GRID (IPV 3222)
 April 29th – April 30th, 2010

OTTI e.V.

Headword: PV-Hybrid and Mini-Grid

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- I will participate in the conference (IPV 3222).
- I will participate in the guided city tour - free of charge
- I will participate in the basic seminar Small Wind Turbines (SWT 3592).
- We are interested in sponsorship. Please send us information and the registration form.
- I cannot participate but wish to order the conference proceedings at the price of € 160,00 (incl. VAT) plus postage and packing – delivery after the conference.
- We would like to present our products in the exhibition. Please send us information and the registration form.

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Seminar: Basics of Small Wind Turbines

European Conference PV-Hybrid and Mini-Grid

	April 28 th , 2010	April 29 th , 2010	April 30 th , 2010
08:30			
09:00		Opening Address	Systems Technology Part 2
09:30			
10:00		Political – Economical Framework	
10:30	Basic Seminar		
11:00	Introduction		
11:30	Small Wind Turbine Technology		Simulation, Design and Testing
12:00		Markets, Socio – Economics and Education	
12:30			
13:00			
13:30			
14:00	Requirements, Tests und Quality		Poster Award
14:30	System Technology		Field Experience Part 1
15:00		Components: Storage, Inverters, Backups	
15:30			
16:00	Example Projects		Field Experience Part 2
16:30			
17:00			Closing Remarks
17:30	Discussion	Systems Technology Part 1	
18:00			
18:30			
19:00		Guided City Tour	
19:30			
20:00		Dinner	