7th European Conference on

PV-Hybrids and Mini-Grids

Thursday, April 10th, 2014
Friday, April 11th, 2014
Stadthalle Bad Hersfeld
Germany

OTTI

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Chairmen's Message

We gladly invite you to the "7th International Conference on PV-Hybrids and Mini-Grids". The conference will take part in Bad Hersfeld close to Kassel, Germany. It is a very encouraging sign for the members of the scientific committee and the organizer to note the larger participation from attendants outside of Europe too. The increasingly more international character of the conference broadens the topics discussed, bringing together all international experts acting in this field to discuss and present cost efficient and reliable solutions The "7th International Conference on PV-Hybrid and Mini-Grid" is one of the rare opportunities for end-users, industry, experts and academia to meet and discuss the latest developments, experiences and results, present the performance of the state of the art of the technology or business models and to share the insights gained by worldwide installations.

In recent years, hybrid mini-grid technology has matured and has deployed significantly more often around the world. This is caused mainly by the decreased prices of the PV equipment and the improvement of the systems' reliability and performance. Furthermore, significant expertise has been accumulated from past experience. Now hybrid mini-grids are about to push themselves around the world as a cost effective and attractive alternative to grid extension and diesel mini-grids.

For communities showing considerably higher power demand and access to sustainable finance, PV mini-grids are a good solution for overcoming the lack of access to electricity.

Hybrid solutions are also a convincing alternative for already existing diesel powered mini-grids. In 2011, approx. 47 GW worth of new diesel generators were sold worldwide. This figure shows how important the world's energy requirements are outside the public grids. Worldwide there are further high numbers of diesel-based isolated grids who are in need to be retrofitted with renewable energy technologies thus decreasing their high generation costs. These diesel mini-grids represent an enormous potential for the innovative PV Hybrid application and require sustainable system solutions and economically attractive business models.

These facts, combined with the international policy and the initiative by the United Nations SE4ALL (Sustainable Energy for All) around access to energy, local economic development and environmental considerations lead to significantly growing markets for PV-Hybrid and Mini-Grid solutions worldwide in the years to come.

We are looking forward to meeting you in Bad Hersfeld, Germany, to present and discuss the latest developments and trends in PV-Hybrids and Mini Grids.

Your chairmen tandem:

Dr. Henrik Bindner
DTU Electrical Engineering, Roskilde, Denmark

Michael Wollny
ARE, Alliance for Rural Electrification, Brussels, Belgium

Conference Chairmen Tandem

Dr. Henrik Bindner
DTU Electrical Engineering, Roskilde, Denmark

Michael Wollny
ARE, Alliance for Rural Electrification, Brussels, Belgium

Scientific Committee

Prof. Dr. Sabry Abdel Mottaleb,
Egypt

Dr. Houda Ben Jannet Allal
OME, Sophia Antipolis, France

Dr. Henrik Binder
Risø National Laboratory, Roskilde, Denmark

Georg Bopp
Fraunhofer-Institut für Solare Energiesysteme ISE, Freiburg, Germany

John Chadjivassiliadis
Nat. Delegate In MG/ EC PVTP, Glyfada-Athens, Greece

Prof. Nikos Hatziargyriou
NTUA National Technical University of Athens, Greece

Prof. Dr.-Ing. Werner Kleinkauf
University of Kassel, Germany

Klaus Knecht
GIZ, Berlin, Germany

Jean-Christian Marcel
MJC PV Consulting (On & Off Grid), SAS-RCS Lyon, France

Prof. Dr. Didier Mayer
Ecole des Mines de Paris, Sophia Antipolis, France

Bernard McNelis
IT Power Ltd., Chineham, Hampshire, United Kingdom

Pietro Menna
European Commission, DG TREN, Brussels, Belgium

Dr. Jens Merten
INES Institut National de l´Énergie Solaire, Le Bourget du lac, France

Dr. Wolfgang Palz
Chairman World Council, Renewable Energies, Brussels, Belgium

Gonzalo Piernavieja Izquierdo
Instituto Technológico de Canarias (ITC), Canary Islands, Spain

Dr. Christos Protogeropoulos
Phoenix Solar EPE, Athens, Greece

Dr.-Ing. Philipp Strauss
Fraunhofer-Institut für Windenergie und Energiesystemtechnik IWES, Kassel, Germany

Dr. Stathis Tselepis
CRES - Centre for Renewable Energy Sources, Athens, Greece

Xavier Vallvé
Trama TecnoAmbiental S.L., Barcelona, Spain

Michael Wollny
Alliance Rural Electrification, Brussels, Belgium

Clean Energy Hybrid Mini-grids in Remote Areas – an Investment Opportunity

April 9th, 2014, Stadthalle Bad Hersfeld, Germany,

Financial issues are critical to the long-term sustainability of mini-grids. Questions such as the role of the private sector, local tariffs and subsidies, and international financing are essential to consider when developing rural electrification programs or stimulate private investments.

This one-day workshop introduces investment initiatives and finding mechanisms for energy access from different stakeholders, gives recommendation about financing Mini-Grids and up-to-date developments.

Seminar Chairmen: Marcus Wiemann and Michael Wollny, Alliance for Rural Electrification (ARE), Brussels

09.00 **Registration**

09.30 **Opening Address**
Gabriele Struthoff-Müller, OTTI e.V., Regensburg, Germany

Sustainable Energy for All (SE4All) Initiative, High-impact Initiative on Mini-Grids
Sujeesh Krishnan, UN Secretary General's High-Level Group on Sustainable Energy for All

Management and Banking, Financing Instruments and Challenges for Mini Grids
Silvia Kreibiehl, Frankfurt School of Finance, Germany

Questions and answers moderated by ARE

Coffee Break

Findings Renewables 2013 Global Status Report
Rana Adib, REN21 France

Financing mini grids in emerging markets
Matthias Schmidt, KfW Development Bank

Panel discussion

Lunch Break

Investment Opportunities of the UNEP-Clean Energy Mini-Grid Programme
Dean Cooper, UNEP

The Mini-grid Policy Toolkit
Michael Franz, EUEI PDF

Questions and answers moderated by ARE

Coffee break

Centralized mini-grids with decentralized micro-financing- a paradox
Noara Kebir, Micro-energy International

Roadmap towards 2020 targets on access, energy security and renewable energy
Davide Otieno, Africa-EU Energy Partnership (AEEP)

Panel discussion

Closing remarks
Marcus Wiemann (ARE); Michael Wollny, (ARE)

16.30 **End of the Workshop**

Please register online via https://www.otti.de/registration/IPV-4314/

7th European Conference on PV-HYBRIDS AND MINI GRIDS

Thursday, April 10th, 2014

09.00 **Opening Address**
Bernd Porzelius, OTTI e.V., Germany
Henrik Bindner, DTU Electrical Engineering, Roskilde, Denmark
Michael Wollny, ARE, Alliance for Rural Electrification, Brussels, Belgium

A tribute to Prof. Dr. Jürgen Schmid
John Chadjivassiliadis, Chairman of IENE, Athens, Greece

OPENING SESSION: ECONOMICAL FRAMEWORK

Chair: Henrik Bindner, DTU Electrical Engineering, Roskilde, Denmark
Michael Wollny, ARE, Alliance for Rural Electrification, Brussels, Belgium

09.30 **Design of pv hybrid plants with lower environmental impact**
Xavier Vallvé , Trama TecnoAmbiental, Barcelona, Spain

09.45 **Where is the optimum?**
Comparison of system topologies for small PV-hybrid systems
Frank Thim, SMA Solar Technology AG, Niestetal, Germany

10.00 **Solar beats diesel!**
Willi Ernst, CentroSolar Group AG, Paderborn, Germany

10.15 **Discussion**

10.30 **Coffee break and visit to the trade exhibition**

BUSINESS MODELS

Chair: Nikos Hatziargyriou, NTUA National Technical University of Athens, Greece (tbc)

11.15 **Village utilities**
Wolfgang Hofstätter, KAITO Energie AG, München, Germany

11.30 **Business models and field experience on MW-sized PV-diesel hybrid systems**
Enrique Garralaga, SMA Solar Technology AG, Niestetal, Germany

11.45 **Decentralized renewable off-grid solutions versus grid extension in developing regions – spatial analysis of key drivers of costs and benefits**
Catherina Cader, Reiner Lemoine gGmbH, Berlin, Germany

12.00 **Discussion**

12.15 **Poster Presentations**

A1 **New risk-reduced financing concepts for PV-hybrids allow faster project development and higher implementation rate**
Martin Baart, OneShore Energy GmbH OneShore Energy GmbH, Berlin, Germany

A2 **Global PV and wind power potential of small island hybrid mini-grids**
Philipp Blechinger, Reiner Lemoine Institute gGmbH Berlin Institute of Technology, Berlin, Germany

12.20 **Presentation of Sponsors**
- SMA (Gold)
- Studer Innotec (Silver)
- renewables - Made in Germany (Bronze)

12.40 **Lunch and visit to the trade exhibition**

SYSTEMS TECHNOLOGY PART 1

Chair: Georg Bopp, Fraunhofer ISE, Freiburg, Germany

14.00 **On the path to large renewable-only hybrid systems**
Luis Arribas, CIEMAT, Madrid, Spain

14.15 **Methodology for designing stand-alone wind-PV community electrification projects considering technical and social constraints**
Matteo Ranaboldo, Technical University of Catalonia, Barcelona, Spain

14.30 **Financial optimum and technical feasibility for the integration of PV-systems in isolated diesel-grids**
Thomas Meyer, Fichtner GmbH & Co. KG, Stuttgart, Germany

14.45 **Discussion**

15.00 **Poster Session**

B1 **Diesel price and battery costs: the major factors for the feasibility of PV-battery-diesel hybrid systems**
Georg Dielmann, SMA Solar Technology AG, Niestetal, Germany

B2 **Development of an optimization method/A tool for RE applications in intermittent grids**
Elie Abou Jaoudeh, LCEC-UNDP, Ministry of Energy and Water, Lebanon

B3 **Potential and limitation of the standardized power supply system "compact energy box; ceb"**
Hubert Deubler, Consultant, Marktschellenberg, Germany

B4 **Techno-economic optimization of a hybrid mini-grid using a one-minute time step approach**
Hendrik Huyskens, Reiner Lemoine gGmbH, Berlin, Germany

B5 **Feasibility analysis of solar photovoltaic- wind battery storage systems in Western Himalayan region of India**
S.S. Chandel, Centre for Energy and Environment, National Institute of Technology, Hamirpur, India

C1 E**NEL triangle-based omni-purpose building (TOB): an integrated system to provide energy and services to population living in rural areas**
Matteo Masotti, Enel Engineering & Research S.p.A., Pisa, Italy

C2 **Pico - hydro system**
B K Gangadhar, SJCE, Mysore, India

C3 **Design, construction and cost minimization of a coreless axial flux permanent magnet generator for small wind turbine applications**
Giorgios Messinis, National Technical University of Athens (NTUA), Athens, Greece

15.25 **Coffee break and visit to the trade and poster exhibition**

SYSTEM TECHNOLOGY PART 2

Chair: Jens Merten, INES Institut National de l´Energie Solaire, Le Bourget du lac, France

16.10 **PV-hybrid and mini-grid in Bambadinca, Guiné-Bissau**
Jorge Maia Alves, Faculdade de Ciências da Universidade de Lisboa, Lisboa, Portugal

16.25 **Hybrid solar photovoltaic system for self-consumption**
Bin-Juine Huang, National Taiwan University, Taipei, Taiwan

16.40 **Storage for larger PV-hybrid systems: technology selection and feedback from the field**
Marion Perrin, Institute National de l'Energie Solaire (INES), Le Bourget du Lac Cedex, France

16.55 **Discussion**

17.10 **Poster Session**

D1 **The sizing of grid connected PV-storage systems for domestic applications for southern Europe - Using the example of Italy**
Nico Kreutzer, SMA Solar Technology AG, Niestetal, Germany

D2 **Simple strategies for end-users to make smarter decisions on operating hybrid system through performance analytics and energy dashboards**
Dhaval Shah, Schneider Electric Canada, Burnaby, Canada

D3 **Comparison of algorithms for control of loads for voltage regulation**
Philip Douglass, Technical University of Denmark Center for Electric Power and Energy, Kgs. Lyngby, Denmark

D4 **Hybrid modeling of a DC power line communication channel for remote battery management**
Jérémie Jousse, CEA INES, Le Bourget-du-Lac, France

D5 **Energy management strategies for autonomous and connected microgrids**
Pablo Diaz, Universidad de Alcala, Alcala de Henares, Spain

D6 **Forecast based energy management for trigeneration subnets in smart grids**
Jesus da Costa Fernandes, Hochschule Offenburg - Offenburg University of Applied Sciences INES - Institut für Energiesystemtechnik, Offenburg, Germany

D7 **Intelligent demand side management as a tool for optimal techno-economic design of autonomous polygeneration microgrids**
George Kyriakarakos, Agricultural University of Athens, Athens, Greece

D8 **Direct driven (battery-less) photovoltaic/wind turbine reverse osmosis desalination system employing computational intelligence techniques**
George Kyriakarakos, Agricultural University of Athens, Athens, Greece

E1 **Field feedback on lead-acid batteries in PV systems: What is the state of health of a 24 years old battery?**
Marion Perrin, Institute National de l'Energie Solaire (INES), Le Bourget du Lac Cedex, France

E2 **Tokelau case study - All islands now using 90% renewable energy for electricity generation through solar-diesel hybrid technology**
Herbert Wade, Independent Renewable Energy Consultant (EPC), Bangkok, Thailand

E3 **Education and training on renewable energy usage**
B K Gangadhar, SJCE, Mysore, India

17.45 **Visit to the trade and poster exhibition A and D**

18.15 **End of the first conference day**

19.00 **Dinner in Bad Hersfeld**

Friday, April 11th, 2014

SYSTEM COMPONENTS

Chair: Philipp Strauss, Fraunhofer IWES, Kassel, Germany

08.30 **A comprehensive performance analysis of state-of-the-art MPPT charge controllers**
Roland Bründlinger, AIT Austrian Institute of Technology GmbH, Wien, Austria

08.45 **Isolated dual channel high voltage MPPT (HVI-MPPT) versus single channel "standard" buck MPPT**
Claude Ruchet, Studer Innotec, Switzerland

09.00 **Safety considerations of solar charge controllers according to IEC62109**
Michael Müller, Steca GmbH, Memmingen, Germany

09.15 **Optimal operation and sizing of battery storage systems in microgrids concerning peak shaving application**
Mohsen Nemati, University of Stuttgart, Stuttgart, Germany

09.30 **Flywheel energy storage system (FESS) contribution for ancillary services**
Cédric Abbezzot, University of Corsica CEA (INES), AJACCIO, France

09.45 **Discussion**

10.10 **Coffee break and visit to the trade and poster exhibition B,C and D**

ENERGY MANAGEMENT AND GRID CONTROL

Chair: Gonzalo Piernavieja Izquierdo, Instituto Technológico de Canarias (ITC), Canary Islands, Spain

10.50 **Fuel saving potential in PV diesel systems with different strategies**
Alexander Schies, Fraunhofer Institut für Solare Energiesysteme ISE, Freiburg, Germany

11.05 **Optimal dispatch of an industrial microgrid with a mixed portfolio of distributed energy resources**
Shi You, Technical University of Denmark, Kgs. Lyngby, Denmark

11.20 **Optimal microgrid energy management strategies concerning uncertainties of renewable energy generation**
Mohsen Nemati, University of Stuttgart, Stuttgart, Germany

11.35 **Local use of PV surplus – load control and thermal storage in a LV grid cell**
Mike Vogt, Fraunhofer IWES, Kassel, Germany

11.50 **Discussion**

POSTER AWARD

Committee: **Jean Christian Marcel,** MJC Consulting (On & Off Grid), Lyon, France
Dr. Strathis Tselepsis, CRES – Centre for Renewable Energy Sources, Athens, Greece
John Chadjivassiliadis, Chairman of IENE, Athens, Greece

12.10 **Award Ceremony: Two Winners**

12.20 **Lunch and Visit to the Poster and Trade Exhibition**

FIELD EXPERIENCE AND LESSONS LEARNT PART 1

Chair: Christos Protogeropoulos, Phoenix Solar EPE, Athens, Greece

13.45 **PV Hybrid success stories thanks to pure private partnership**
Jean-Christian Marcel, MJC PV Consulting, Lyon, France

14.00 **Towards energy sustainability in ecolodges for Latin America: A case in the Bolivian Amazon**
Egido Aguilera Miguel, Instituto de Energía Solar Universidad Politécnica de Madrid, Madrid, Spain

14.15 **Implementation of a 7.5 MW PV-diesel hybrid system as pilot project on an island in the bay of Bengal, Bangladesh**
Fabian Kuhn, Fichtner GmbH & Co.KG, Stuttgart, Germany

14.30 **Discussion**

14.45 **Coffee Break**

FIELD EXPERIENCE AND LESSONS LEARNT PART 2

Chair: Xavier Vallvé, Trama TecnoAmbiental S.L., Barcelona, Spain

15.15 **System technology**
Sharath Kumar, SJCE, Mysore, India

15.30 **The benefits and risks of photovoltaic hybrid mini-grid systems for rural electrification in northern territory, Australia**
James Hazelton, Anna Bruce Iain Macgill, Sydney, Australia

15.45 **Development of hybrid training curriculum for Kenya**
Geoffrey Stapleton, Global Sustainable Energy Solutions Pty Ltd, Ulladulla, Australia

16.00 **Discussion**

16.30 **Closing Remarks**
Henrik Bindner, DTU Electrical Engineering, Roskilde, Denmark
Michael Wollny, ARE, Alliance for Rural Electrification, Brussels, Belgium

16.30 **End of the conference**

Organisation

Organisation Committee

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Conference Venue

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www.stadthalle.bad-hersfeld.de

Online-Registration

Only online registration available. To register for the conference please visit: https://www.otti.de/registration/IPV-4314/

Conference Fee

If registered until February 28th, 2014 | after February 28th, 2014

Per Person: € 740,- | 820,-

Member of OTTI and supporting organizations:
Per Person: € 640,- | 690,-

Workshop: € 290,- | 340,-

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 materials.

Accommodation

Please book your accommodation as soon as possible by yourself.
www.hotel.info/en/bad-hersfeld/hotels-30756/

Conference Location

Bad Hersfeld is located in the heart of Germany, close to the airports Frankfurt and Kassel.

The city is famous for it´s various cultural activities, especially the annual Bad Hersfelder festival.

Bad Hersfeld has it´s own ICE train station with direct connection to Frankfurt Airport.

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

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.

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Alliance for Rural Electrification
Shining a Light for Progress

AREA African Renewable Energy Alliance

BSW Bundesverband Solarwirtschaft

ENF ACCELERATING THE INDUSTRY

EUREC AGENCY
European Renewable Energy Research Centres Agency

greentechmedia

ISES International Solar Energy Society

luxresearch

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Online registration via https://www.otti.de/registration/IPV-4314/

Workshop Clean Energy Hybrid Mini-grids in Remote Areas
European Conference on PV Hybrids and Mini Grids