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Postgraduate Programme Renewable Energy

PPRE

NEWSLETTER

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Content

Moin Moin from Oldenburg !

The wind of change is blowing again through the premises of PPRE and we have to report about quite a few events and developments in this edition of the newsletter.
PPRE and EUREC-REMA are increasingly popular – the number of applications is further growing. The downside of this is the tremendous workload of the evaluation and selection process of future participants.

The project that leads to the development of a full-fledged blended learning Renewable Energy has gained speed and makes good progress. New PPRE team members have joined this activity.

Together with a substantial number of visiting alumni (and alumni staff & teachers) we celebrated PPRE's 25th anniversary with a conference titled 'Experts Vision on Renewable Energy 2030' on October 1st and 2nd 2012. The conference, which was a great success, will be documented in two special volumes.

Based on the 2012 case study project, an architectural competition at the University College Oldenburg developed a design for a new `Energielabor 2.0' building – the case study 2013 will study alternative energy supply concepts for such a new possible building. Meanwhile we have to live with the Energielabor building of 1982 and PPRE staff convinced the university to invest into the repair and renovation of our beloved RE pioneer symbol.

Among many other things that need to be mentioned is this years' Biogas Compact Worksop which was embedded into the Alumni Summer School 2013 'Water, Energy and Sanitation in Urban and Decentralized Regions', and of course the yearly PPRE Challenges. Please do not miss the news from alumni, the details of recent MSc projects and all the other things that might raise your interest. Actually this newsletter contains news, reports and updates of more than 170 students & graduates of PPRE.

Another change concerns Dr. Konrad Blum, who is going to leave the university at the end of the summer term. Although he promised to be an ongoing active member of the PPRE alumni network and will continue to teach (Biomass Energy & Hydropower lectures) on reduced level, he nevertheless looks forward to have more time for his personal life.

Herzliche Grüße

E. Knagge, K. Blum & PPRE-Team

PPRE 25 YEARS by Andreas Guenther, Michael Golba and Julia Rudman

In 2011 we already faced the question: What to do when in 2012 PPRE will turn 25? How can we celebrate such an achievement? Without the students there would be no PPRE. So what better way to celebrate than with the former students and staff who helped to make PPRE the programme it is today.

After many thoughts and discussions, the celebration took place as a two-part event. The first part was to be an alumni seminar with two days spent in Potsdam, a very attractive and historic (Sanssouci Castle, Potsdam Conference 1945) city close to Berlin, followed by a two-day workshop on 'Regional Challenges and Possible Solutions for Future Energy Supply' at Hanse Wissenschaftskolleg (HWK) in Delmenhorst. The participants of the alumni seminar had one day of rest before the start of part two which was a two-day international conference titled 'Renewable Energy 2030 – Experts' Visions'.

The PPRE alumni seminar was to be a DAAD funded event: 33 alumni from 23 countries, amongst them 'veterans' from the first PPRE batches as well as 'fresh' graduates. A hotel in Potsdam would be 'home' for two days. The seminar started with a Ceremonial Act at Lower Saxony's Representative Office in Berlin: 80 participants including PPRE alumni and students, representatives from 17 different embassies, amongst them eight ambassadors, as well as the University of Oldenburg's president, Prof. Dr. Babette Simon, the DAAD Secretary General, Dr. Dorothea Rüland and the Secretary of State of the Lower Saxon Ministry for Science and Culture, Dr. Josef Lange, made the ceremony into a celebratory event to be remembered. Right after the Welcome Addresses from Babette Simon, Josef Lange, Dorothea Rüland, H.E. Dr. Eddy Pratomo, Ambassador of Indonesia, opening the Ceremony, a moderated panel discussion followed on 'Capacity Building and International Cooperation in Higher Education'. A lively discussion evolved between H.E. Francisco N. Gonzalez Diaz, (Ambassador of Mexico), Dr. Dorothea Rüland (DAAD Secretary General), Prof. Dr. Katharina Al-Shamery (Vice President for Research, University of Oldenburg), Michael Golba (Managing Director PPRE) and PPRE alumnus Shahriar Chowdhury (United International University, Dhaka, Bangladesh), enriched by the audience with comments and questions.

Musical accompaniment was provided by Cellolitis from Berlin, consisting of Nikolaus Herdieckerhoff and Umbra, his cello. The day was rounded off with a tour of the Potsdam Institute of Climate Impact Research (PIC). In the evening a relaxing stroll into the old town of Potsdam was possible.

The following day on the way to Oldenburg, the group made an information stopover at Nordmethan to visit an eight-megawatt biogas plant in Könnern, Saxony-Anhalt, which produces Methane to be injected directly into the German natural gas grid. It was a very impressive sight and our guide through the plant was very knowledgeable and was not fazed by Sham's stream of questions. In the afternoon, the bus headed towards Delmenhorst (near Bremen), were the group would stay for the next two days. 33 alumni as well as 10 students from the new PPRE batch participated in the work

shop 'Regional Challenges and Possible Solutions for Future Energy Supply' which took place on 28th and 29th September at Hanse Wissenschaftskolleg in Delmenhorst.

The workshop was modeled on the 'World Café' format where groups of about eight people visited each 'café' to learn and discuss ideas and then later focus on a favorite topic. PPRE alumnus Tyler Goepfert prepared and chaired the workshop, supported by 15 facilitators who were selected out of the participating alumni. The workshop had five separate working areas motivated by driving forces of climate change, depleted resources as well as access to energy in developing countries. As a result, each of the five groups created an informative poster explaining the workshop findings on each topic for display at the subsequent international conference.

The Get-Together on Sunday evening, 30th September, at Havana Restaurant provided the opportunity for the newly arrived conference participants to get to know each other. Of course, this was not necessary for the numerous former PPRE students or staff members. The restaurant was filled with old memories…

Monday, 1st October was the first day of the International Conference 'Renewable Energy 2030 – Experts' Visions'. The president of the University of Oldenburg, Prof. Dr. Babette Simon, opened up the conference with her Welcome Address, followed by a joint speech of two PPRE alumni, Sandra Chavez from Mexico and Ramesh Muthya from India, and some words from the Managing Director of PPRE, Michael Golba.

International Conference Renewable Energy 2030 - Experts' Visions on the 25th anniversary of PPRE group picture

Moderated by Dr. Konrad Blum, PPRE lecturer and staff member since the very beginning of PPRE, the keynote speakers were invited to look into the future of Renewable Energy from different perspectives, namely Prof. Dr. Joachim Luther, (former Head of ISE – Fraunhofer Institute for Solar Energy

Systems, and one the PPRE founders), Prof. Dr. Daniel Kammen (founding Director of the Renewable and Appropriate Energy Laboratory at the University of California, Berkeley), Prof. Dr. Claudia Kemfert (Head of the Department Energy, Transportation, Environment at the German Institute of Economic Research, Berlin) and Dr. Reinhard Loske (International Climate and Energy Policy Advisor and former Senator in the State of Bremen). In the afternoon, PPRE alumnus Dr. Binu Parthan, Energy and Environmental Advisor from India, gave his introductory talk for the subsequent panel discussion with the participation of the keynote speakers, moderated by Prof. Dr. Reto Weiler (Rector of Hanse-Wissenschaftskolleg).

In the evening, the conference participants were invited to a dinner buffet at the university's Library Hall, enjoying the meeting of new and old friends and the musical accompaniment by singer Leonie Ibing (PPRE staff) and piano player Jonas Mosebach …

The second day of the conference was opened by PPRE alumnus Dr. Anil Misra (GIZ, India) who gave an introduction to the ensuing parallel sessions. The groups discussed technical aspects of Solar and Wind Energy as well as Biomass Technology and System Integration and Management, but also topics like Energy and Development, Higher Education and Capacity Building, Energy Policy and Economics as well as a future concept for the Energielabor. The Feedback and Farewell Session in the afternoon closed this exciting event.

In addition to the scientific discussions and the official ceremony, the anniversary was dominated by meetings with friends, colleagues and former and current students, in some cases after many years. From a tiny little initiative in the late 1980s this programme has grown up to a worldwide and active networking Renewable Energy community and is still growing faster than ever ….

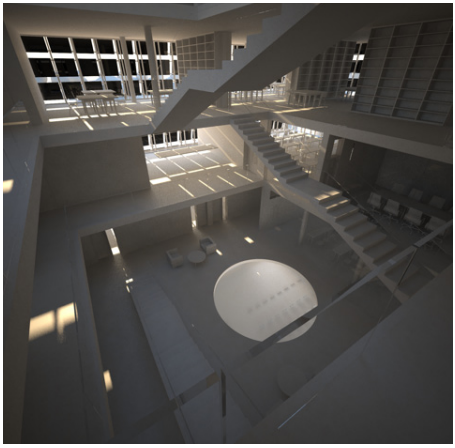
THE NEW ENERGIELABOR

by Hans Holtorf

The present Energielabor was built in 1982 / 1983 as an outstanding pilot project for the research and demonstration of renewable energy use. Now, 30 years later, the situation in Germany has changed dramatically. Renewable Energy (RE) plays a significant role in the energy supply, and energy homes (houses supplying more energy than they consume) can be bought from the shelf. At the University of Oldenburg, the education of Renewables demands a much larger building. It was therefore decided on the annual staff meeting in February 2012 to seek for a house which could accommodate lectures and labs for PPRE, EUREC, the European Wind Energy Master, and many students who have RE related specialization lectures in Oldenburg, e.g. for the Physics Master, the Sustainability, Economics and Management Master or the Engineering Physics Master. In the city of Oldenburg, interest in Renewable Energy education is reflected in school workshops or in courses at the Volkshochschule (adult education center).

PPRE students of the 2011/2013 batch therefore were given "New Energielabor" as a task in their Case Study 2012. They established the space demand by interviewing all relevant RE stakeholders at our university, developed a first architectural concept of

the new building and investigated possible energy supply schemes for their proposal. As a second step, a workshop at the "Visions 2030" conference in October 2013 was held on the topic. In three parallel sessions the application of state-of-the-art energy supply and energy saving technology in a New Energielabor, the corporate identity of the new building, and RE education in Oldenburg and its demands in the new building were discussed. The third step was to incorporate Jade Hochschule. In the winter semester of 2012/2013, architectural students of that university of applied sciences were given the task to develop the design of a New Energielabor. They had the choice to design a totally new building, a building resembling the old one or a building integrating the old Energielabor.

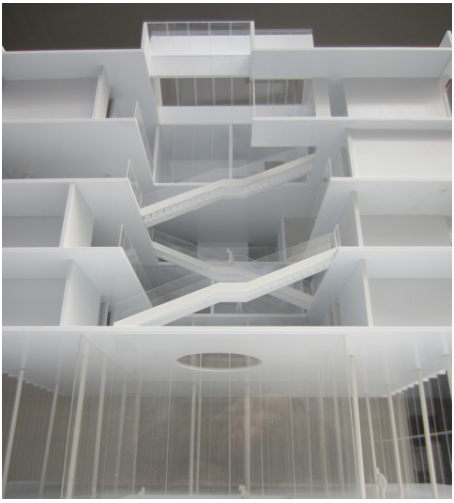


14 proposals were displayed in a presentation, in architectural drawings and in models. The results were introduced to a top jury on Friday April 5th 2013 at Jade Hochschule. The jury consisted of members of the head of the University of Oldenburg and the Jade Hochschule, public figures (Dr. Buddenberg, head of EWE sales and distribution; Ms. Busch-Maaß, State Construction Management of Oldenburg; Ms. Nießen, Oldenburg's City Building Counsellor; Mr. Steinhoff, head of Steinhoff Group; Mr. Tabery, vice president of the Chamber of Architects of Lower Saxony), and PPRE staff members. It was in fact difficult to make a decision between all those very interesting designs, but finally, five project results were awarded a prize. Hannes Varelmann and Ulf Janssen won the first prize - for more details see:
http://www.jade-hs.de/jadewelt/studium-lehre/detailseite/article/wettbewerb-am-fachbereich-architektur/ (in German).

In their outline they write (translated by the author):

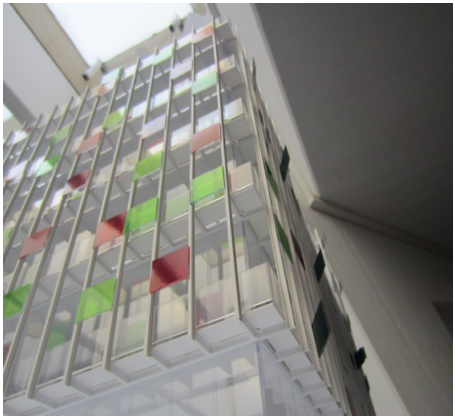
"The building has to serve its users! It will mark the entrance to Wechloy campus. From a distance it will be tangible and visible. However, it will dissolve when getting closer and then is almost subordinate to the outer space. The supply technology of the building will be visible in the basement. The implementation of the design concept is carried out by a highly transparent, fully glazed ground floor exhibition space. An auditorium for 100 people and communication areas with catering facilities are located there. An oculus above the auditorium allows a view into the upper floors of the Institute. Above, on top of the ground floor, almost lifted, is the actual institute's building. Here, public processes create an almost private atmosphere. The "brain" of the building opens up three floors with seminar rooms and offices. The very top floor is designed for laboratories and workshops. The outdoor lab will be placed on the building's roof surface. All four floors are connected via a 100 m² large, central atrium. Here, the emerging diagonal axes follow the internal access of the building.

The building receives a double façade. The entire area of the outer façade serves as a test area for long-term experiments. The strict cubage of the building (l=27m) allows maximum freedom in surface design of the façade by the experimental setups of scientists and students. The outdoor space is part of the design. Open spaces, the system of



paths and the water surfaces are connected to the existing system of the Wechloy campus and are expanded and organized accordingly. The building is aligned exactly to the compass."

The fourth step: At present, PPRE students (2012/2014 batch) are developing the energy supply system for this design within the 2013 Case Study. Their focus is on a close-to-100% renewable energy supply system



for the new building, but they also concentrate on didactical concepts of the energy supply system setup. Users of this building should experience challenges and options of the energy supply of a building of this size and this type of usage in participatory observation.

In one of the next presidential chair meetings of the University of Oldenburg the top three designs will be presented. Expectations are flying high! We will keep you updated on further developments.

NEW MEMBERS FOR BLENDED LEARNING MASTER RENEWABLE ENERGY

by Tanja Behrendt, Larissa Krekeler and Robin Knecht

The development of the Blended Learning Master Renewable Energy as part of the collaborative project mint.online recruited two new members. The new master program addresses students who do not have the possibility of studying abroad from their home for 1.5 years due to professional or private obligations. Therefore, it is designed to be studied part-time and predominately online with only a few face-to-face courses in Oldenburg.


Larissa Krekeler

In May 2012 Larissa Krekeler joined the project to develop an online mathematics course and a simulation course. In order to gain information on PPRE students' needs, she implemented a preparatory math course at the beginning of the winter semester of 2012/2013 with the students of PPRE 2012/14 batch as a test group. The course has been evaluated by means of a survey. During the summer semester of 2013 the math course will be offered online; the simulation course will be offered to students in the winter semester of 2013/2014.

Larissa Krekeler studied mathematics and computer science at the Lomonossov University Moscow. Her PhD, also in Moscow, was about geometry in space and in applied computer science. She worked on research projects of aircraft and space technology, technical and medical informatics, cryptology, stochastical and statistical empirical studies. Larissa gained experience as a lecturer for mathematics, stochastics, statistics and computer science at universities of applied sciences at Moscow, Nancy, Hamburg, Osnabrück, Bremen and Oldenburg.


Robin Knecht

Since November 2012 Robin Knecht has been responsible for the design of laboratory experiments during the face-to-face phases of the program as well as preparing the online semiconductor/photovoltaic lectures. The limited on-site time for the students necessitates a different approach to hands-on experiments. The team is currently trying several techniques to prepare the students and streamline the experience using online media. Several lectures concerning semiconductor basics and photovoltaic specialization of the four-semester program are realized by Robin as part of a wide range of other specializations developed in-house or with partners like NextEnergy or ForWind.

Robin Knecht has previously finished his PhD at the Energy- and Semiconductor Research Laboratory at the University of Oldenburg researching Cu(In,Ga)(S,Se)2 photovoltaic devices. Parallel to his research he supervised PPRE students in the winter and summer laboratories and participated in the Summer Excursion.

mint.online is a project in the competition "Offene Hochschulen: Aufstieg durch Bildung" funded by the German federal ministry of education and research. Within the project, different online study programs will be developed with a special focus on environment, technology and natural sciences.

mint.online

NEWS FROM THE „ENERGIELABOR"

by Michael Köritz

A wet start to his new job it was for Michael Köritz, who began in October 2012 as a technical assistant for the care of the PPRE labs. At the start of the winter semester, it rained through the roof of the Energielabor in many places, including the lecture room!


Michael Köritz

This meant that, instead of lab work, he had to deal with emergency repairs of the roof. However, in the course of the repair work it turned out that the 30-year-old roof insulation also no longer met the current requirements and had to be renovated urgently.


Waterfall in the lecture room

During the semester break, the energy lab was cleared, wrapped in plastic foil and put under quarantine to remove the damaged insulation wool.


Business...

After this task was completed it was possible to replace the ceiling and paint the rooms again. Just in time for the start of the new semester, PPRE was able to move back into the renovated Energielabor and return to work before Easter for the Biogas Workshop. So, at the same time, the dinner for the workshop was the informal reopening event...


Before pleasure!

25 YEARS PPRE / 9 YEARS EUREC (OL-CORE) - A STATISTICAL REVIEW

by Edu Knagge, Germany, PPRE 1990/91

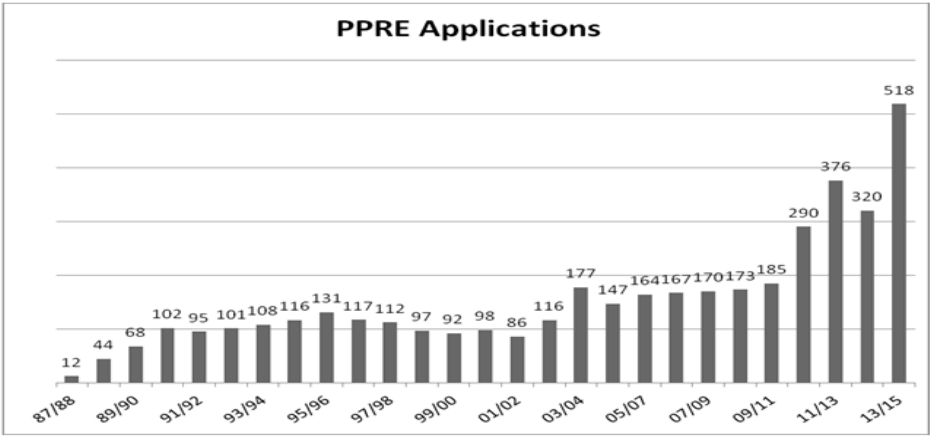
Since 1987 a total of 537 students from 84 countries joined the Master Programmes with respect to Renewable Energy at Oldenburg University. Out of these 422 studied the Postgraduate Programme Renewable Energy (PPRE) and 115 the European Master Programme Renewable Energy - Oldenburg core (EUREC) so far. The female quota in both programmes lies above 20%. Nowadays we welcome some 35 new MSc-Students every October at Energielabor, Wechloy Campus, University of Oldenburg.

Back in the late eighties in average some 50 applications for PPRE were counted, whereas until Mid January 2013 we obtained 518 applications for PPRE 2013/14 and another 80-90 applications we expect until Mid June 2013 for the coming EUREC. So competition is very tough these days, because seats available are limited to max. 25 for PPRE and 15 for EUREC. The restricted intake capacities for both programmes stem from the limited resources (personnel, labs, rooms) available.

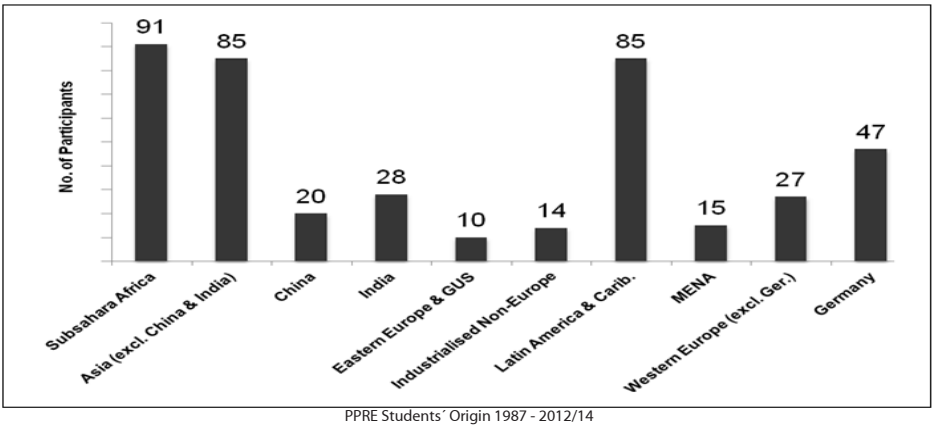
The continental distribution of the students' origin is wide spread in the PPRE programme, whereas approx. 55% of the EUREC–students are coming from Europe itself, ~10% from industrialized non-Europe (US, Canada), ~14% from Latin America, ~10% from Asia and ~10% from Africa, MENA, etc. Surely the main reason for this is the higher tuition fee, especially for Non-Europeans.

Both MSc-programmes have in common that by far the majority of students (~80%) have an engineering background. Before joining PPRE, students did their undergraduate studies in Electrical (32 %), Mechanical Engineering (28%) or other engineering fields. Most EUREC-students studied Mechanical Engineering (31%) before, but backgrounds in the other engineering disciplines (Electr., Industr., Civil, Environm., Aerospace, Materials, etc.) are much more spread.

Because of the extremely competitive selection process, the actual participants of



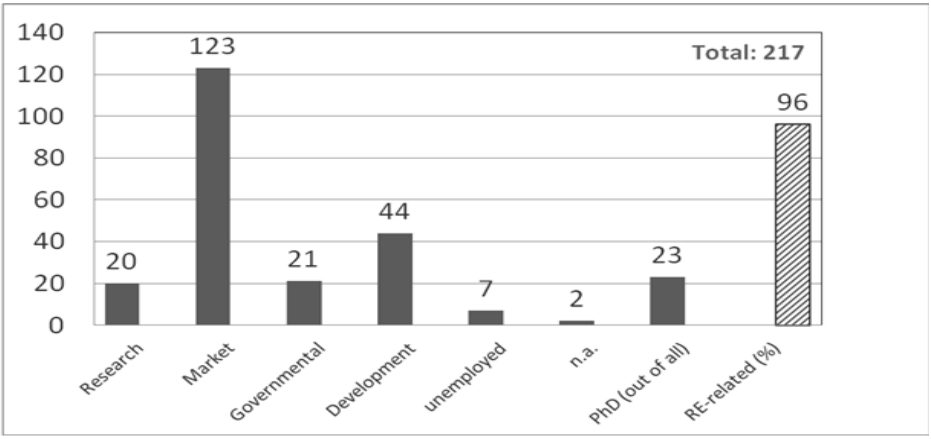
The temporary retrogression in 2012 stems from the cancellation of the late application deadline



PPRE Students´ Origin 1987 - 2012/14

the MSc-programmes Renewable Energy are usually highly qualified and motivated, which might be one of the reasons why only very few drop-outs (~1,5%) were noticed during the last 25 years. Additionally some other students did not reach the MSc-title but only got a Diploma certificate instead. In the end over 97% successfully completed their RE studies with an official MSc-degree from University of Oldenburg. About 25% of our graduates went for further studies and ~20% even finished their PhD afterwards (survey done in 2008).

Most recent analysis confirms that over 96% of our graduates from both MSc-programmes actually are involved in RE activities. Only 11 % went for further academic qualification over the last seven years. This is probably due to the fact that a multitude of qualified jobs were available in the RE industry. Nevertheless, , after a decade of bright sunshine, especially in the last year some drawback can be noticed: some fresh graduates faced difficulties in finding permanent positions in the RE field or even stayed unemployed for a longer period, caused to a large extend by the stagnating RE markets in Germany / Europe these days. But these cases are limited and most graduates still find appropriate positions.



MSc Programmes PPRE and EUREC - Employment after Graduation 2006 - 2012

SUMMER SCHOOL 2013 "WATER , ENERGY AND SANITATION IN URBAN AND DECENTRALISED REGIONS"

by Evelyn Brudler

including the annual Compact Workshop on *"Mass Dissemination of Domestic Bio-digesters in Developing Countries"* with experts from the SNV, Netherlands (non-profit) Development Organisation.

A New Idea

The focus of the Summer School 2013 was on living conditions in developing countries and emerging economies and the possibilities for improvement – addressing the topics with a multidisciplinary approach.

The experience of last year's workshop on *"Mass Dissemination of Domestic Bio-digesters in Developing Countries"* as well as the previous workshops (since 2006), has convinced the organisers of the importance and the benefits of this small-scale technology.

Building on this positive experience with a technology of smokeless fuel from biogas, dealing with organic waste and protecting groundwater at the same time, getting organic fertiliser from slurry, improving living conditions and reducing environmental load in several regards, we wanted to extend the scope of the event to urban regions and include related aspects of sanitation and access to clean water.

We therefore invited a multidisciplinary group of participants for this DAAD-funded Summer School: researchers and field workers who work on biogas programmes, urban planners addressing water supply for the poorest, waste water experts investigating water quality, experts on implementing new technologies or infrastructure such as a water metering system, DEWATS experts for small-scale water supply systems, a lawyer who addresses long-term contracts amongst states to insure a peaceful and long-lasting usage of water resources, an expert who works on recycling policy for the judicial system, implementers of Renewable Energy education, policy and technology implementation, experts on technical auditing and many more.

Drawing conclusions from this first Summer School on "Water, Energy and Sanitation for Urban and Decentralised Regions" by the feedback of the participants, we can state that it was a benefit for the participants as well as the organisers!

Biogas Compact Workshop 2013 at the University of Oldenburg – 65 participants from 41 countries

- THE SUMMER SCHOOL - PART ONE

The Summer School started with 23 DAAD-funded participants from all over the world. Additionally, we welcomed field workers and other experts whose participation was financed by the IRENA (International Renewable Energy Agency).

The first day was dedicated to the DAAD alumni for presenting their fields of work and research - getting to know each other and learning about their various approaches. A World Café on the second day with moderated groups on the topics Technology, Communication and Participation continued exchange and discussion. A visit to the Klimahaus in Bremerhaven rounded off that day. It had been a cold springtime day where we still needed winter clothes. Participants commented on those first two days that it had been a very positive atmosphere.

World Cafe - extensive exchange

Visit to Klimahaus in Bremerhaven

On the third day Prof. Jan Vymazal from the Czech University of Life Science, Prague, gave a presentation on "Constructed Wetlands for Waste Water Treatment"; a low-

Prof. Vymazal, Univ. of Life Science, Prague

technology solution for waste water which was found to be applicable for many different sources of pollution.

- PART TWO: BIOGAS COMPACT WORKSHOP

After the lunch break on Wednesday, the second part of the Summer School, the Biogas Workshop on "*Mass Dissemination of Domestic Bio-Digesters in Developing Countries*", started for the 7th time - held by PPRE and the experts Felix ter Heegde and Jan Lam from SNV (a Dutch NGO).
Apart from the summer school participants, another 15 students from the Master course *Engineering in Energy and Environmental Management in Developing Countries (SESAM)*, University of Flensburg, our 21 PPRE students from the batch 2012/14, some students from the Master course on Sustainable Economics and Management at the University of Oldenburg, and other experts from abroad participated. We are pleased to have had 65 participants from 41 countries.

The workshop addressed the mass dissemination of domestic bio-digesters. It was held by Jan Lam and Felix ter Heegde, our experts from SNV (www.snvworld.org/en) with experience of more than two decades in national programmes on domestic bio digesters in South East Asia and four years in East and West Africa. In-depth presentations were held on microbiology (Prof. Rabus, Univ. Oldenburg), on technical aspects and plant dimensions, market development, mass dissemination models, and lessons were learnt.
Beyond the presentations several highlights added to the workshop:
Half a day was dedicated to **practical sessions:** on the performance of biogas suitable stoves and gas lamps, on flow patterns and mixing behaviour of organic material inside digesters, on the analysis of bio-digester performance parameters (pH, ash content, VOC, others) and steps of practical handling. One session on PPRE's lab education concept with a visit to the summer lab experimental set-ups was offered as well.

After the practical sessions Katrin Pütz, University of Hohenheim, gave a presentation on her concept of the Biogas Backpack business model. The backpack stores 1.2m² of biogas.
A **public lecture** in the evening on **"Peak Soil"**, given by the German journalist Thomas Fritz, opened the view to the use and consumption of agricultural land. He gave in-depth information on the degradation of soil and the so-called 'land-grapping' processes, showing figures on global distribution, the intensity of that process and the stakeholders involved in that process.

Biogas lamp testing with Felix ter Heegde

Addressing the question of "Water, Energy and Sanitation in Urban and Decentralised Regions" we were happy to have had the chance to listen to former PPRE student Camilo Wilches, now employed at Biogas Weser Ems and doing his PhD at Rostock University. His presentation was on **"Urban Waste for Biogas Power Plants"**, a technology first implemented in Great Britain and showing the option to deal with large amounts of organic waste, its collection and processing, the dealing with tons of digestate (bio slurry) per day and setting up feasible financial plans.
On the last day our last of the Biogas Compact Workshop, the external speaker, Steven von Eije, Energy Analyst from the Energy Delta Institute (Netherlands), gave a presentation on **"Financial Feasibility Studies of Small Bio-Digesters for different Developing Countries".**
He did have his audience and a lively discussion on that Sunday morning despite the good party organised by a few nice people, with individually prepared international dishes and a lot of dancing in the Energy Lab, which lasted late into Saturday night.

- Third Part of the Summer School: the Hannover Fair

With the workshop ending on Sunday noon, the DAAD participants headed for the third part of the Summer School: the Hannover Fair, the world's biggest fair on industrial products. Mr. Christoph Klein, Ms. Maren Drossart from DAAD, and Ms. Ayla Öztürk-Banha welcomed the participants at the hotel. A presentation introduced them to the DAAD Alumni Portal (www.alumniportal-deutschland.org/en/start-page.html), the opportunities of re-invitations, networking, and the infrastructure support given by the DAAD (www.daad.de).

Participants could choose between individual and organised booth visits addressing technologies from the Summer School's theme during the following four days. The guided tours were very much appreciated since participants felt they got the most benefit from such a huge event through them. We visited the company *Schnell Zündstrahlmotoren*, which offer CHP technology for Biogas, *FuelCell Solutions* for Methane feeding to Fuel Cell moors, *Ritter XL Solar*, which offer solar thermal technology (vacuum tube systems) for process heating (e.g. drying of tea leafs in Kenya replacing firewood) and *Dehn & Sons Lightning Protection*, e.g. for protection of bio-digesters. Those joining these 30-minute visits were pleased with the in-depth insights. We will continue in the future with this model of visits to have the highest benefit from the limited time.


Party preparation

What else to say? The Summer School ended with a wonderful party at the hotel, happy faces, dancing people and many wishes to stay in contact.


Summer School party

We say a big "Thank you!" to the DAAD for funding the summer school and for giving us the opportunity of further networking with alumni worldwide. Personally I want to thank the overall team of PPRE for preparing content and sessions, to support the overall planning and I want to thank the students and fresh PPRE graduates still around in Oldenburg who worked on the World Café, mentored the guests and who were indispensable in providing everyone with internet, refreshments and who were there when needed.

Last but not least, we would like thank Jan Lam and Felix ter Heegde and their employer SNV for the continuing cooperation, for coming to Oldenburg University annually to share their experience on small-scale energy supply systems to improve living conditions in rural areas in regard to **Water, Energy and Sanitation**. My thanks go as well to all speakers contributing to the Summer School.


Jan Lam and Felix ter Heegde

We hope that the overall Summer School theme and the compilation of topics, speakers and participants were helpful to proceed in that regard. The feedback we received both orally and in writing positively meets our impression on the importance of the subject and the format of the event.

FINAL EXCURSION - PPRE / SEM 2012

by Yutriz Pernía, Venezuela, PPRE 2011/13

Brilon was the first stop of our excursion. This small, nice place surrounded by mountains and pines is the home of a lead mine that was working until the seventies. The visit gave us the opportunity to experience what it feels like to be a miner, working with 350 meters of soil above your head and operating heavy machinery to extract the minerals from the earth. This made us think about the miners' lifestyle, and the most impressive discovery was to see how proud they were of their job. A lot of us will think about it when we are in a comfortable office, feeling proud of what we are doing, no matter what it is.

Our next stop was ***Hoppecke***. This is a very important family-owned German battery manufacturer, specialized in industrial applications. They were very welcoming and presented their company, internships and job possibilities and an overview of the theoretical background related to batteries. We had the chance to visit the assembly lines, where we could have a much better idea about how batteries are made. The visit was very interesting and our guides were very competent and open to our questions.

Visiting ***Bioenergiedorf Jühnde*** allowed us to understand how important the participation of the community is for a renewable energy project. This village uses biomass to supply heat and power for 750 people; the feed consists of cow manure, which is considered waste, and triticale. The bacteria inside the biodigester process the substrate and produce biogas, which is used to run a CHP unit; in order to cover the demand during winter, a boiler with wood pellets is used. This time we had a lecture on the motivation and the project and we visited the installation.

Our journey took us to Kassel to visit ***SMA***, a solar energy equipment supplier, specialized in inverters. They gave us a presentation about the PV market, their products, job opportunities, and then we could also see the installations and the production lines. Frankfurt was next; in this dynamic and important city we had the chance to visit ***KFW Development Bank*** and ***GIZ***. We could understand a bit more about how these institutions work and interesting discussions came up about how projects to help developing countries are financed and implemented and the motivations that drive Germany to be involved in these projects.

At ***JUWI*** we had an overview of the numerous activities the company is involved in. We could see the electric cars, wind turbines

Students visiting JUWI wind & solar farm

and PV plants. Their headquarters "scream" renewables everywhere and it proves to be a great example of an energy-efficient building, helping us to understand more about the design and the ideas implemented to save energy and the use of renewables for the supply, it was very interesting and useful.

Students on top of the Alps

The mountains and lakes of the Bavarian landscape made way for us to visit ***E.ON Walchensee-Kraftwerk*** and ***TU München Hydrolab***. In the first one we had a guided tour where the history of the plant was explained, the different turbines used in hydro were described and we could see the machinery room. Our second visit took us to a lab were hydropower and rivers can be simulated in scale models. It was impressive and interesting, and one student was reminded of one of her favorite games when she was a kid, the LEGO.

The Hofbräuhaus in München gave us the chance to see a bit more of the Bavarian culture, the clothes, the food, the music and the beer of course. It was a great way to celebrate, laugh and have fun. Next morning ***the Alps*** were waiting; beautiful landscapes accompanied us along the way to the hut. It was like looking at a postcard in each step. During this visit we could study the energy supply system, where solar panels, collectors, a wind turbine, batteries and wood work together to supply the demand. This excursion was full of discussions about technical aspects, from different fields of renewables to sustainability, development and energy efficiency. In this experience we got to know each other more, we laughed and we played. Name any game you can play in a group, we probably had it! From taboo, charades, cards, mafia, we even became serial killers, taking down person by person. Maybe the only thing we didn't like was saying good-bye to the people. All the best to all of us, and for the next excursion we can just tell you, it's going to be amazing!

PPRE CHALLENGE 2012

by Dishant Parikh & Harpreet Singh, India, PPRE 2011/13

The PPRE challenge is a much-anticipated event every year, and this year was no different. On 6th June 2012, PPRE students faced PPRE Staff in a soccer match. PPRE staff had defeated the previous batch of PPRE students, which gave them the moral edge. To make the playing field even and to gain some confidence, PPRE students practiced regularly on every Saturday leading to the match. Originally, a volleyball match was also scheduled, which was indefinitely postponed on the day of the match because of bad weather. The focus now was solely on the soccer match. The venue of the match was the soccer ground behind Energielabor. It was decided to play eight-a-side with at least one female member. There was no official referee in this match so all the decisions were made on the field by the players. The match began with both teams charged and ready to demolish the other team. With dark clouds and wet field, both teams had

PPRE Students: Top (L-R): Mehari, Martin, David, Nuran, Harpreet, Sven, Alfonso, Dishant, Abdou
Bottom (L-R): Greg, Paulo, Habtom

PPRE Staff: Top (L-R): Andreas G., Edu K., Jörg O., Tarek.F, Michael G., Annette K., Evelyn B.
Bottom (L-R): Burak Turker, Detlev Heinemann, Florian Grubitzsch, Jonathan Blum (son of Konrad)

their fair share of slips and falls and collisions but none of it deterred either of the teams from continuing on their quest to win the game. For the first ten minutes the two teams were evenly balanced till Habtom decided to put the game in the favour of students by scoring a goal by heading one through the defence of the staff goal keeper. No more goals were scored till half time and the score stood at 1-0 in the favour of students after 30 minutes of play.

During the second half, PPRE staff players took the field with a lot more aggression, determined to score. The staff players made a couple sharp attempts at scoring goals but the defenders and the goal keeper of the student team did not let the ball through. In an attempt to strengthen their attack, the staff reduced the number of defenders and utilizing this opportunity, Greg made an amazing field goal by receiving a brilliant pass from Abdou, taking the score to 2-0. In the last 2 minutes of the game, Mehari Siltan made a brilliant goal, once again receiving a smart pass from Abdou taking the score to 3-0.

The football game was followed by a well-organized barbecue. Hans Holtorf took charge of the grill and with assistance from Yutriz and Karakoz prepared delicious food for all the students, staff, and family members present at the occasion. Paulo treated the attendees with a self-prepared Brazilian specialty - Caipirinha. The barbecue provided the students with an opportunity to interact with the staff members outside classroom environment. Away from the classroom stress, students and staff mingled and enjoyed a wonderful evening loaded with fun.

The students would like to thank all the staff members for a game played in good spirits and the exciting and fun barbecue. We extend our special thanks to Hans, Yutriz, Karakoz and Paulo for the special treats and Dr. Blum and Diana for capturing the special moments.

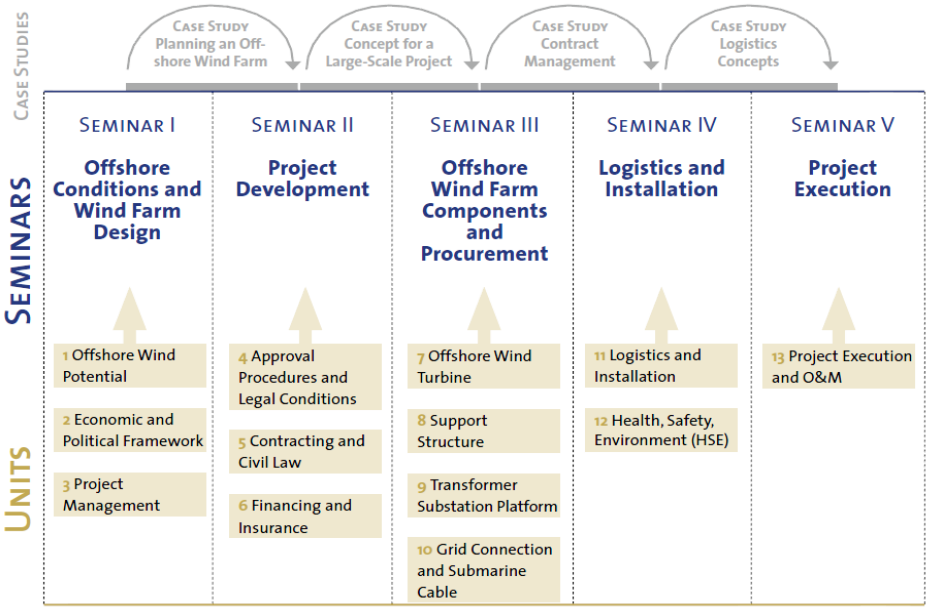
The Barbecue Attendees

OFFSHORE WIND STUDIES PROGRAMME – FIRST COURSE A GREAT SUCCESS

New study year starts in the autumn

The first course as part of the innovative Continuing Studies Programme Offshore Wind Energy which has been running since October 2012 is already nearing its end in May 2013 and it has been a great success. There has been very positive feedback from the 24 participants regarding both the unique combination of subjects covered by the course and the whole study concept. Consequently, the study programme will strengthen the offshore industry not only by communicating relevant content but also through the joint exchange of experiences.

The offshore wind studies programme is a continuing studies programme specifically for professionals from the offshore wind energy industry. In order to be able to meet the major challenges involved in realising offshore wind energy projects, current and future employees within the industry require fast needs-based further training. The offshore wind studies programme meets the need for that targeted further training, firstly by comprehensively covering a range of subjects from turbine technology to ship charter contracts and financing and also by ensuring the necessary transfer of information through its concept of active study. The variety of topics is covered in 12 study modules which are examined in depth by the authors themselves over five four-day classroom seminars. Alongside the seminars, the participants work on case studies in set teams in order to put what they have learned into practice and expand their skills through the mutual exchange of knowledge.



Students of the first Offshore Wind Study Programme on a field trip to the Tripod production site at Weserwind, Bremerhaven

It is essential to exchange knowledge and experience as failures can be costly and have far-reaching consequences, especially in this industry. That is why the network of experts and participants created as part of the offshore wind studies programme is so important for the whole offshore industry. The participants exchange knowledge and experiences with each other within an open study environment and consequently gain a deeper understanding for the projects. It is ultimately the whole industry that will benefit from this exchange and the network of experts that will continue to grow year by year.

In any case, the participants from the first year are already convinced that the nine-month study programme has been worth it. "The study programme is based on theory but also has a very practical approach – that is an optimum combination, especially when it comes to assessing offshore wind energy projects realistically", explains one participant. "Also, the contacts you make are invaluable".

The closing date for applications for the 24 places on the next programme for 2013/14 is 30 June 2013.
The offshore wind studies programme is a joint project that is being conducted by the ForWind – Center for Wind Energy Research of the Universities of Oldenburg, Hanover and Bremen, the Wind Energy Agency WAB e.V. and the City of Oldenburg, with financial support from the Bremer Landesbank, nkt cables GmbH, Nordwestassekuranzmakler GmbH & Co KG and Siemens AG.
For further information on the study programme and application documents, please go to http://www.offshore-wind-studies.com/ or call Dr. Juliane Reichel (ForWind) on +49 441 798 5085.

INTERNATIONAL DAAD-ALUMNI SUMMER SCHOOL 2012 IN "ENVIRONMENTAL MANAGEMENT INFORMATION SYSTEMS FOR SUSTAINABLE DEVELOPMENT"

14 – 22 April 2012 in Oldenburg, Germany

by Tariq Mahmoud, Department of Business Information Systems, University of Oldenburg

The program was organized and hosted by the School of Computing Science, Business Administration, Economics and Law: Department of Business Informatics with the financial support of the German Academic Exchange Service (DAAD).

The summer school targeted German university alumni from developing countries (DAC country nationals) who are professionally involved in environmental domain, sustainable development and those who are working for academic or educational institutions, development organizations, NGO's, donor agencies or private enterprises. Participants should be potential multipliers in a position to spread the acquired knowledge and experience and/or make decisions on implementation.

The summer school promoted exchange between the participants in the field of environmental domain, facilitated international scientific cooperation and qualified the participants in the field of industrial green technology, IT efficiency, and environmental information systems. The summer school fostered exchange of experiences, establishment of international networks between the participants, scientific discourse with regard to environmental sustainability, and international academic cooperation in this field.

Participants of the summer school 2012 in front of the guest house of the University of Oldenburg

It stimulated and promoted ideas for joint research, technology development and knowledge transfer on sustainable development and corporate environmental management information systems.

The main topics covered in this summer school included:
•Industrial green technologies adapted to local conditions in the participants' countries
• Green IT
•Green Logistics
•Corporate Environmental Management Information Systems (CEMIS)
• ICT-supported Sustainability Management
from CDEAM researchers to the PPRE and EUREC students. The presentation included the infrastructure, the skills, past and actual projects of. The students were invited to Manaus in order to write their Master Thesis.

The summer school program included:
•Papers and case studies presented by the participants (alumni)
•World Café and group discussions
•Presentations by invited experts from universities and companies
•Excursions to a company in the area of Green Technologies in Oldenburg
•Presentations of further research activities of the University of Oldenburg
The actual summer school was followed by a visit to the world's biggest industrial fair "Hannover Messe" 23 – 26 April 2012 in Hanover, Germany.

Among the 26 participants from 20 countries also were 2 PPRE alumni, namely **Cesar Rivasplata from Peru, PPRE 1989/89** and **Ahsan Javed from Pakistan, PPRE 2008/10**

IPID – INTERNATIONAL DOCTORATES IN GERMANY

by Julia Rudman

IPID is a DAAD funded program. The program being followed here is the bi-national program and this is in cooperation with the University of Victoria BC, Canada. The DAAD funding, which is available till the end of 2013, allows us to send doctorate students to Victoria and invite some students to Oldenburg to complete complementary research at the partner institute.
2012 was an active year for both the staff and students of the PhD Program Renewable Energy.
The exchanges that took place were in the area of Thin Film Photovoltaic, Energy Meteorology and Wind Energy.
In the first half of 2012 Jan Kühnert (Energy Meteorology) went to Victoria for a short research visit of two weeks. About the same time we were pleased to welcome Mike McWilliam, whose research area is wind turbine design optimization.
Mike Optis from Victoria was the first to take the opportunity of undertaking a two-month research visit. His research field was vertical wind profile modeling, which fitted in well with work currently being done

within the Wind Energy Meteorology group at Oldenburg.
Regina Nowak, NEXT ENERGY, was the first Oldenburg student to take the opportunity of a two-month research period in Victoria. Regina works on Thin Film Photovoltaic and before she left it had already been decided which Canadian student she would be working with, Sahar Sam, and how they would be able to support the others research.
Other exchanges were Martin Theuring, also from NEXT ENERGY, and Mostafa Rahimpour from Victoria.
In total the Oldenburg students were involved in one short exchange visit and three long visits.
The Victoria students were involved in one short visit, one medium length visit and one long visit.
In January 2013 we were pleased to be able to greet three Canadian lecturers (Lawrence Pitt, Curran Crawford with his wife Reena and Rustom Bhiladvala) and one PhD student (former PPRE student Torsten Bröer). In four days they toured the labs of all the renewable energy research related labs and institutes at the University of Oldenburg, endured the biting cold wind to see the ENERCON Wind Turbine plant in Aurich and a Photovoltaic Farm and have lunch of locally caught fish. Another highlight of their tour was to go to the local state theater for a production of Carmina Burana.
After their return Jarek Puczylowski, from the TWiST work group in Oldenburg, went to Victoria for a two-week intensive research visit. Further plans for this year are to send and receive more students for research visits.

The funding for this DAAD program ends at the end of December 2013. To mark this event we want to hold a small PhD conference (50-60 participants) in December. The title of this two-day conference will be “Future Challenges in Renewable Energy Research”. A one-day workshop at the HWK in Delmenhorst will be followed by a one-day meeting in Oldenburg.

The most impressive and satisfying part of this program has been to see the success, pleasure and friendships gained by the exchange visits. People from different countries getting together to research and discuss the same topics. They find similarities in how each work and differences and note how one can learn from these differences.

Thank you to all concerned that we could experience with you!

ANNOUNCEMENT: 3RD INTERNATIONAL CONFERENCE ON THE DEVELOPMENTS IN RENEWABLE ENERGY TECHNOLOGY

January 9-11, 2014

Principal Organizer: United International University, Dhaka, Bangladesh
Local Coordinator: Shahriar Ahmed Chowdhury, Bangladesh, PPRE 2004/06
Co-organizers: University of Oldenburg, Germany
Kathmandu University, Nepal
Center for Energy and Global Environment, VPISU, USA

About ICDRET

After Kyoto Protocol and Cancun Conference, world community is getting closer towards a unified collaborative effort to curb Green House Gas (GHG) emission. The scale of the problem has been taken seriously by most of the developed nations. Promotion of Renewable Energy (RE) and adoption of enhanced efficiency at every stage has been envisaged. Although RE is still expensive, rapid fall in the price of the solar PV panels and other RE technologies have rejuvenated the hope for a rapid growth of RE based energy usage throughout the world. Both the developed and developing world are taking equally optimistic approach towards popularizing RE technologies and working jointly to make this world livable for our next generation.

With this backdrop, United International University is going to organize the 3rd International Conference on the Developments in Renewable Energy Technology, ICDRET 2014, on January 9-11, 2014 at Dhaka, Bangladesh. With a high number of participation by the researchers from academia and the industry in the previous ICDRETs, we expect enhanced participation from all tiers of RE sector to make the conference a useful forum for sharing experiences, exchanging views and helping to forge a long lasting bondage between academia, industry and the people involved in the dissemination of the technology at the grass root level.

Scope

ICDRET 2014 will cover all aspects of Renewable Energy. The topics of interest include but are not limited to :

a) Solar PV

b) Solar thermal

c) Biomass and biogas

d) Wind

e) Mini and micro-hydro

f) Tidal, Wave, sea or River Current energy

g) Geothermal and other RETs

h) Socio- economic aspects of RE

i) Policy matters

Please see the ICDRET website (www.icdret.uiu.ac.bd) or website of United International University (www.uiu.ac.bd) for details on paper submission.

Deadline for submitting papers: 1st of August 2013

MY EXPERIENCE IN INDONESIA

by Yutriz Pernía, Venezuela, PPRE 2011/13

In 2012 the organization Developing Sustainability gave the opportunity to go to Indonesia. The purpose of my visit was to describe and evaluate a hybrid system located in South of Java in order to propose suggestions that could help to improve the efficiency of the system and use the knowledge and lessons acquired in this site for future projects in Indonesia.

The site has 3 groups of solar panels installed and 2 groups of wind turbines. A series of measurements were performed in order to determine the power consumption, the availability factor of the wind and solar resources. The study also included an inventory of the equipment, a description of the operation of the system, a simulation in HOMER, and a 3D map of the site was also made.

The data showed that the solar panels provide a very reliable service, and they require very low maintenance. The availability factor was between 40% and 50 % in a 24-hour period. In the case of the wind turbines, they have a very low availability factor, because during this study the wind speed in the area was very low and unstable, and the wind turbines cannot reach the necessary voltage to provide power to the system, actually the wind controllers are consuming power from the system to operate. In addition to that, they require a lot of maintenance; the main failures are found in the generators, power cables and slip rings.

Still, the entire installation has improved the quality of life of the people living in this community since it is providing low-price ice for the fisherman, illumination on the beach, electricity for water pumps, for the restaurants, water fish ponds, irrigation systems for plantations near the beach, and it has created new jobs.

From a personal point of view, I must say it was an honor for me to spend a couple of months in this beautiful country. To work with very nice people, who were always willing to help. I learned that I don't need much to live, we didn't have running water, we had a well, we didn't have a fridge, we ate in a carpet on the floor. I remember I brushed my teeth with a pot outside, contemplating the wet rice fields. I actually didn't care about these trivial things, I was so fascinated by the people, who were always so friendly, always giving me delicious food to taste, talking to me with signs. I could live with a beautiful family that gave me so much love in spite of the fact that we couldn't speak the same language; it was an incredible experience, to become a weird member of the family. I remember the kids were a bit afraid of me at first, I mean in Oldenburg I'm short and dark, but in that village I was taller that most men and whiter than everybody, but little by little they acce-

A picture of me with my Indonesian family

pted me, they could eat while I was hugging them. What surprised me the most was the connection I developed with my Ibu (mom), this little woman who took care of me, I couldn't stop crying when we said good-bye. It's amazing how two people can understand each other with signs and a dictionary.

MASTER STUDENT'S REPORT BACK FROM AFRICA

by Greg Landwehr, South Africa, PPRE 2011/13

1. Introduction

Between August 2012 and March 2013, I was awarded a scholarship to complete my Master's Thesis in South Africa, the topic of which is "An Assessment of the Short Term Wind Energy Forecasting Potential in South Africa". During this time, I was fortunate enough to:

- Complete several site visits to the wind farms relevant for the thesis
- Travel to several Renewable Energy conferences
- Complete a Windfarmer © software course
- Interview prominent personalities in the Energy field in South Africa
- Get some invaluable work experience in the field of renewable energy grid connection

The following gives a brief outline of each of the above activities.

2. Site Visits

Numerous site visits have been undertaken to the existing wind energy facilities in South Africa. These were completed to assess the sites in question and the information gathered was incorporated into the thesis. Other site visits have been conducted to investigate the feasible solar farm sites in the Gauteng region. Further, to design the grid connections for the solar and wind farms, site visits were undertaken to assist with the design completion.

3. Conferences

I have been fortunate to attend the Renewable Energy Africa conference in Midrand in late 2012 (sponsored by Powergen Africa) as well as the Future Solar South Africa conference in Cape Town in February 2013 (Sponsored by First Solar). Both conferences were an excellent experience and have given me a holistic view of the state of renewable energy in the country. Numerous presentations from these conferences as well as the Windaba conference were used in the compilation of my thesis report.

- http://www.powergenafrica.com/content/dam/Events/POWER-GEN%20Africa/documents/PGAF_REWAF_2012_Post_Show_Report.pdf
- http://www.thesolarfuture.co.za/
- http://www.windaba.co.za/windaba-2012/

4. Course

During November 2012, I was fortunate to spend two days in Cape Town attending a course giving an introduction and overview to the GL Garrad Hassan software called 'Windfarmer ©'. The course began with an introduction to methods of wind farm site assessment and the physics behind these methods. The following day was spent going through the software in detail and completing worked examples using dummy wind speed data to find the best positions to place wind turbines for maximum wind energy output.

5. Interviews

In November 2012, two prominent members of the energy provision community in South Africa were interviewed with the aim of establishing an expert opinion regarding the future of renewable energy in South Africa. The two interviewees were:

- Pierre Rubbers – former Eskom Head of the Transmission Group, Former Eskom International Energy Trader & Africa Desk manager. Pierre received his qualification from the Université Catholique de Louvain in France and has decades of experience in the establishment of energy resources and energy transmission in South Africa for Eskom. He now works as a private consultant for strategic high-level special projects.
- Jean-Pierre Marais – National Manager Power Distribution Technology, Trans Africa Projects (Pty) Ltd. (a 50% owned subsidiary of Eskom). Pierre graduated from the University of Natal with a Bachelor in civil engineering and later gained an MBA from Wits University. He has been heavily involved in the development of the South African distribution and transmission grid and has 20 years of experience in strategic powerline design.

In summary they spoke of hydro-electric energy being the only form of renewable energy that can practically compete with coal-most dispatchable. There was the sentiment that there will continue to be investment, in particular, in wind and solar energy development in South Africa with the sustained competitiveness of wind energy depending on how efficiently IPP's can compete against Eskom and other large utilities. The expense of Eskom's new coal fired stations was discussed in terms of how this increases the relative attractiveness of wind. Ultimately there was consensus that the strength may lie in supplying remote distribution networks.

6. Work Experience

To support my family during our time in South Africa, I have taken a position as a design engineer at a consulting firm called Trans Africa Projects ©. My focus has been primarily on the grid connection of the renewable energy projects in South Africa, particularly wind and solar. I have completed the design for the grid connection of a 96MW wind farm and a 40MW solar plant.

7. Thesis

My MSc Thesis discusses the topic of: 'Potential for Short Term Wind Energy Forecasting in South Africa'. After working extensively on the report during November and December, at this point, I have handed in my first draft and received comments back from my supervisor at Energy and Meteo Systems GmbH, Matthias Lange. I have addressed his comments and handed in the final thesis.
In terms of collaboration with NMMU, my supervisor - Dr. Frederick Vorster has given his final comments as well and these have been addressed in the final thesis

8. Thesis Defence

I have just recently arrived back in Oldenburg and completed my final thesis defence. The final result for the thesis was 1.3.

9. Personally

My wife and I were happy to welcome our first daughter into the world in December 2012.

10. Conclusion

In conclusion, the whole experience of returning to South Africa was extremely successful. I was able to conduct research that

was not possible remotely from Germany. Further to this, I was able to complete site visits to the wind farm sites, interview important personalities in the energy industry and attend courses on relevant software for wind farm site selection and design.

All in all, it was a valuable and enlightening experience for me and thanks must go out to DevSus for their financial support and PPRE for their guidance and administration during my time there.

LOVE STORY IN INDIA.

by Karakoz Nurmukhanbetova, Kazakhstan, PPRE 2011/13

When it came time to make decision about practical training, I had a contact with a German professor about research in the CSP area. But I was in doubt about it since I was very exhausted after my first semester in Oldenburg and the place of possible training was located in the north of Germany also. I felt sick without sun and decided to try a sun-rich country. India has always been very attractive for me due to its inscrutable and ancient culture. My classmate helped to find an intern position at TATA BP Solar Company (currently TATA Power Solar), New Delhi.

The first few weeks I was living with my friend's family and they had helped me very much since I had no idea about India at all. There were many questions, like how to use the metro? Don't drink water from a tap! Wear modest clothes, bargain with sellers and rickshaws and many many others. During the first week I just went through the company's work scenarios and decided to concentrate on the PV installation process. As a part of my training I visited PV power plants in Allahabad, Varanasi and Lucknow. The two-week trip and meeting with wonderful people made my visit of India memorable.

After coming back from the trip to New Delhi I decided to find friends among my colleagues. Till then they had avoided me, because a GIRL who came ALONE from Germany was too strange and unusual for them. Thus, one of the weekends I invited my nearest neighbor/colleague Manoj to the cinema. He came with his friend and we had a wonderful day together. This way our friendship started. Usually we had long conversations after office hours and I came to know much more about Indian culture and traditions. I also found that it is very similar to Kazakh culture. After a few meetings we started understanding each other

Happy newlyweds!

in the best way and our friendship became stronger and stronger day by day ahead.

Going back to Germany for my second sem-

ester I had the strong desire to come back to India for the master thesis period. The second semester was a real test of my and Manoj's feelings. With the busy PPRE schedule, 4 hours of time difference, and such a big distance between us, we had found time to chat by Skype EVERY DAY for a couple of hours. Sometimes we had forgotten about the time and thus just sunrise in India interrupted our conversation. Worthy to say, that I overcame all difficulty of the PPRE's second semester mainly due to him.
This time I searched for a master project in India in advance. I applied to many companies and institutes, but they answered very slowly. Thanks to the PPRE staff, I was accepted to a project at GIZ in New Delhi. My dream was coming true – I was going back to Delhi!!! This time I was coming back not to a foreign country, but almost home. When I finally met with Manoj after 5 months of separation I was so happy!
Even before my return to India we often discussed how serious we were about our relationship and dreamed about possible marriage. The fact of pregnancy just accelerated us and we married in the middle of November, 2012. Despite his parents ban, traditions and many difficulties, our marriage took place in a small temple in Delhi. After this our life established – his parents accepted me and the visit of India by my mother has also turned my relatives positive about our marriage.

This is how it turned out that I came back to Oldenburg for my master project defense with a big belly in March, 2013. The reaction of my PPRE friends was surprisingly the same – WOW! Cool!! Well done! From the bottom of their heart my friends, tutors, neighbors were happy for me! And I was extremely happy also!

Now, just one week after the graduation ceremony, I am writing this story. Additionally I can just say that fate sometimes plays very interesting games in our life. When I had got my DAAD scholarship, when I was going to Germany, when I was flying to Oldenburg just one and a half year before, I had no idea that the last destination of this big trip will be New Delhi…!

MY FIELD RESEARCH TRIP TO SOUTH-EAST AFRICA

by Hans Holtorf, Germany, PPRE 1988/89

From 1.2.2013 to 26.3.2013 I spent time in Uganda and in South Africa doing field studies for my PhD "Success of Solar Home Systems". The methodologies I made use of were "Participatory Observation" and "Semi Structured Interviews".

For the "Participatory Observation" I stayed with families living on the electricity supplied by a 50Wp to 60Wp Solar Home System (SHS) and I observed the impact of the SHS on their lives and living conditions. In South Africa I was in the favorable condition to have my own SHS which allowed me to operate my computer and one CFL lamp. I experienced my personal priorities of electric services intensely: Communication and reliable, safe illumination. The other services like radio, TV and fridge named by the interviewed households did not have such a high priority for me.

Hans in front of his rondavel preparing his day of work

Group photo with the short-term teacher Hans Holtorf

When my CFL lamp broke down I learned to appreciate the value of nearby spare part supplies. I have highly appreciated this experience. I wish for project implementers to do some weeks of participatory observation in their project region before deciding on their projects of rural energy supply.

After four hours of lecturing solar energy and two hours of SHS outdoor lab course at Namanemy High School in Kwa Zulu Natal (South Africa) the learners joyfully had a group photo with their short-term teacher Hans Holtorf

Thanks to **Wycliff Jagwe (PPRE 2005/2007)** and **Hamadou Tchiemogo (PPRE 2008/2010)** for their support in developing the infrastructure of my field studies.

REFOCUS

International Student Forum on Sustainable Energy [Nov.29 - Dec.1, 2012 @ Freiburg, Germany]

By Mitu Hiremath, India, PPRE 2012/14

In winter semester, around 11 students from our present PPRE/EUREC batch participated in an International student forum on sustainable energy at Freiburg, Germany. The objective of the event was to facilitate international students engaged in the sustainable energy field to get together and develop a sustainable student network, apart from exposing them to different workshops organised under the banner of UN's 'Sustainable Energy for All - 2012 initiative'. This event was organised by masters' students of the University of Freiburg, and was supported by Fraunhofer ISE, DBU, SUNTECH, the European Environment Foundation and many other similar organisations.

The workshops and lectures at the event addressed three main energy-focus areas: worldwide sustainable energy access, energy efficiency & renewable energy, i.e. basically the three pillars of the 'Sustainable Energy for All' initiative (http://www.sustainableenergyforall.org/objectives). This 3-day event was inaugurated by Dr. Pradeep Monga, Director of Energy & Climate Change Department at UNIDO. Through his talk, he highlighted the necessity of a new kind of approach in the global energy agenda, and related how this is being done via the UN's new sustainable energy Initiative.

On the first day, the program started with a talk on 'Energy Efficiency' by Dr. Martin Pehnt (IFEU Heidelberg). The talk highlighted the importance of energy efficiency & conservation, including barriers & policy approaches for achieving the same. The next talk was related to 'Recycling Engineering' by Prof. Ernst Ulrich von Weizsaecker, German scientist & politician. In the afternoon, there were two more lectures; first one by

Prof. Peter Adelmann (University of Applied Sciences, Ulm, Germany), which highlighted the problems associated with rural electrification projects (esp. for solar lighting systems) and how these can be overcome by Min-E-Access principle; a second one by Mr. Bill Meehan (ESRI Utility solutions), which discussed using geo-spatial technologies for energy access and utility distribution. In addition, we participated in two workshops, REDUCE (designed to show how hard it is to come to an agreement in a real world, esp. in policy making & enforcing field) & REACCESS (designed to help participants understand key considerations that are involved in creating energy access for remote communities).

The next day, Prof. Eicke Weber (Director, Fraunhofer ISE) started the agenda by a talk on 'Increasing the Share of Renewable Energy in Global Energy Mix'. Then, we participated in the 'RENEW' workshop which was designed to expose the intricacies involved in planning for the energy independence of a locality. The last talk by Dr. Lambert Schneider (climate change and energy policy expert) connected all these three workshops with the climate change negotiations that were happening at Doha (COPs) during that time. An online Skype chat with an ambassador at Doha followed this talk wherein she gave us some inputs on the scenario over there.

Finally, the event ended with a visit to VAUBAN (neighbourhood of Freiburg, famous for alternative & sustainable ways of living of its inhabitants (http://www.vauban.de/info/abstract.html). Also, I presented a poster on 'Grid-Connected Solar Power in India: Present Status & Challenges' during this event. Overall, the event was both educative and enjoyable one. More details on the event are available at http://www.refocus.de/.

REFOCUS group picture

SOLAR COFFEE ROASTING AND THE EXPERIENCE OF LIVING IN PERU

by François Veynandt, France, EUREC 2007/08

After I completed my PhD in January of 2012, I embarked on a 6-month stay in Peru. I worked at the Pontifical Catholic University of Peru (PUCP) in the group helping the rural sector: "Grupo de Apoyo al Sector Rural" (http://gruporural.pucp.edu.pe/). I participated in a project of solar roasting of coffee! We were a team of 5, developing this technology aimed at the rural sector. The idea is to set up a process to produce ecological coffee, from its culture to the final product. Making the technology affordable to the rural world enables producers to sell their coffee roasted, thus with aggregated value. We worked on a prototype of 1kW thermal, based on a Scheffler reflector of 2.7m². This open source technology is used a lot in the application of solar cooking: http://www.solare-bruecke.org/. We predict a roasting capacity of 500g coffee.

The University is located in Lima, which is a huge city (more than 9 million inhabitants!). But life is not that bad thanks to many green spaces: trees in the streets, squares, parks... I even cycled to work, using secondary streets with little traffic. I've also had the opportunity to travel to the "sierra", in the heart of the Andes, in the footsteps of the Incas! The coffee really is produced in the region of Cusco, near the famous Machu Picchu. I was there in the beginning of my stay to learn about the world of coffee. In the north of the country I contributed to a solar dryer project. It was also a good opportunity to discover civilisations that built the history of Peru before the Incas. Shortly afterwards, the Easter weekend enabled me to experience the great celebrations of the holy week! Religious processions on a pavement of flowers, very original fireworks, Andean dances... The Peruvian gastronomy is also one of the attractions of the country! The great variety of fruit and vegetables is especially delicious. Although the country is known to be pretty unsafe, the daily life is jovial and Peruvians are very welcoming! My Spanish has improved "bastante": I was able to give a lecture on solar energy in Castilian, but I can still improve a lot...

I have had the opportunity to meet a professor that is doing his PhD with my institute in France: Jorge Vargas Florez is working with the center of Industrial Engineering of Ecole des Mines d'Albi. He is investigating ways to optimize humanitarian logistics in case of an earthquake. I also met Gilles Flamant, head of CNRS-PROMES, the close partner laboratory of RAPSODEE, where I did my PhD! He has given a presentation on concentrating solar technologies during a conference in Lima! This very interesting event aimed at stimulating opportunities of collaborations between Latin America and Europe in the field of Renewable Energy.

Finally, my Peruvian adventure came to an end in August 2012. It was a very rich experience on many aspects: scientific, cultural, human... I am still in contact with the research group there to publish our work on coffee roasting with solar energy. I am now back in France, working on a post-doc at Ecole des Mines, in Albi. I am continuing the research about concentrating solar power based on Linear Fresnel Technique. We are now investigating opportunities for hybridization of solar thermal power plants: combining solar heat, energy storage and other heat sources. It is very interesting! I am also involved in citizen projects like the Transition movement and related local projects (gardening, cycling, local supply) towards a sustainable society.

INTERNSHIPS
PPRE 2012/14
The students of PPRE 2012/14 completed the following internships in the winter break 2013:

Family Name	First Name	Nation	Institution	Website	Location
Abdelrazik	Mohamed Atef	Egypt	University of Birmingham, School of Chemical Engineering	www.birmingham.ac.uk/schools/chemical-engineering	Birmingham, UK
Armeni	Alexandra	Greece	ForWind	www.forwind.de	Oldenburg
Ballarin	Andrea	Italy	Next Energy	www.next-energy.de	Oldenburg
Ernst	Eva-Christin	Germany	University of Victoria, Wave Energy Group	www.iesvic.uvic.ca	Victoria, BC, Canada
Fred	Fidelia Olga	Malaysia	Hybrio Engineering Sdn Bhd	www.hybrio.biz	Johor Bahru, Malaysia
Goda Asebey	Samuel Jorge	Bolivia	Energizing Development EnDev - GIZ	endev.info	Eschborn
Gogoi	Madhumita	India	GIZ	www.giz.de	India
Hiremath	Mitavachan	India	UNFCCC	www.unfccc.int	Bonn
Jimenez Martinez	Cuauhtemoc Adrian	Mexico	University of Birmingham	www.birmingham.ac.uk	Birmingham, UK
Ketter	Ronald Kipkoech	Kenya	Center for Energy Research, NMMU	energy.nmmu.ac.za	Port Elizabeth, South Africa
Labib	Mohamed Mamdouh	Egypt	Next Energy	www.next-energy.de	Oldenburg
Migadde	Johnmary	Uganda	EWE Biogas	www.ewe-biogas.de/english	Wittmund
Morales Ardila	Diana Milena	Colombia	GIZ	www.giz.de	Chennai, India
Palacios	José Luis	Ecuador	KIT	www.kit.edu	Karlsruhe
Preissler	Natalie	Germany	ENYATEC	enyatec.com.ec/sitio	Quito, Ecuador
Rodriguez	Hector	Venezuela	PPRE	www.ppre.de	Oldenburg
Shrestha	Binita	Nepal	GL Garrad Hassan	www.gl-garradhassan.com	Oldenburg

Family Name	First Name	Nation	Institution	Website	Location
Stuehrenberg	Jonas	Germany	Universidad Central de las Villas	www.uclv.edu.cu	Santa Clara, Cuba
van Someren	Christian	Canada	SNV	www.snvworld.org	Burkina Faso
Vandermeer	Jeremy Berend	Canada	Vestas	vestas.com	Aarhus, Denmark
Wassie	Alexander Tsegai	Eritrea	DEWI GmbH	www.dewi.de	Oldenburg

M.Sc. THESIS PROJECTS

PPRE 2011/13

The following thesis projects were successfully completed in 2013

Family Name	First Name	Nation	Institution Master Thesis	Title of Thesis
Arias Pérez	Alfonso	Costa Rica	Next Energy, Oldenburg	"Life Cycle Assessment of Conversion Processes for the Large-scale Underground Storage of Electricity from Renewables"
Beyene	Mehari Siltan	Eritrea	ForWind, Oldenburg	Impact of Wind Turbine Generator Systems on Electromagnetic Transients of Electrical Networks during Fault Occurrence - Relevant to Grid Integration
Candra	Dodiek Ika	Indonesia	Biogas weser ems, Friesoythe	Gas Storage Optimization for Biogas Power Plants
de Oliveira Nascimento	Paulo	Brazil	MT Energie - Biogas, Zeven	Feasibility study of a biogas power plant powered by organic waste from supermarket in Brazil
Dhir	Harpreet Singh	India	IBC Solar Ag, Bad Staffelstein	The effect of soiling on energy production for large-scale photovoltaic plants
Faerron	Ricardo	Costa Rica	Phaesun, Memmingen	Development of a concept for the modular design and sizing of a PV ice-making shipping container for rural applications
Gaur	Varun	India	"GIZ, Berlin Energy Meteo Systems, Oldenburg"	"Smart Mini Grids in Philippines Wind Power Forecasting in India"
Herrerías Azcué	Martín	Mexico	Capdevila - Private Consultancy, Stuttgart	Development of a software system to achieve increased predictive accuracy and enhanced modeling capabilities for upcoming PV and CPV technologies

Family Name	First Name	Nation	Institution Master Thesis	Title of Thesis
Kaminski Küster	Kristie	Brazil	IWES Fraunhofer, Kassel	Real-Time Estimation of Available Active Power in Wind Farms in View of Provision of Operating Reserve to Balancing Power Markets
Kigima	David Thamaini	Kenya	Energy Meteo AG, Uni OL, Oldenburg	Comparison of power outputs of various PV technologies in Northern Germany using INSEL simulation software
Kühnel	Sven	Germany	DLR, Instit. of Techn. Thermodynamics, Dep. of Systems Analysis and Techn. Ass., Stuttgart	Investigation of the annual variability of solar and wind power generation potentials in Europe
Landwehr	Greg	South Africa	Energy & Meteo Systems GmbH, Oldenburg / South Africa	An assessment of short term wind energy forecasting potential on the future of the South African energy system
Lopez Escoto	Christian	Honduras	IWES Fraunhofer, Kassel	Automated Insertion of New Transformer Substations into existing LV networks with high PV Penetration
Mancera Guevara	Diana	Columbia	DLR, Oberpfaffenhofen	Generation of a CALIPSO climatology of near-surface boundary layer aerosols for solar energy applications
Nugusse	Habtom	Eritrea	Fraunhofer IWES, Oldenburg	Validation of computational fluid dynamics (CFD) modelling for the atmospheric boundary layer (ABL) in complex terrain
Nurmukhanbetova	Karakoz	Kazakhstan	GIZ India; Dehli, India	Techno-economic study on Indo-German TRIGEN project. Replication possibilities in Kazakhstan
Parikh	Dishant	India	Sunkalp Energy; Dehli, India	Design of Stand-Alone and Grid Connected Hybrid Standardized Solar Power Systems for Rural and Urban Applications in India
Pernía Rodríguez	Yutríz	Venezuela	ISE Freiburg	Nickel Diffusion Barrier for Plated Copper Contacts on Printed Seed Layers for Silicon Solar Cells
Sahin	Nuran Pinar	Turkey	Concentrator Optics, Coelbe	Optical tooling process for concentrated photovoltaic manufacturing technology
Vega Alzate	Daniela	Panama	Centro Solar AG, Hamburg	Solar Power Plants in Multi-Family Dwellings in Germany

EUREC 2011/12

Family Name	First Name	Nation	Institution Master Thesis	Title of Thesis
Ayoubi	Amjad	Syria	sbp sonne GmbH, Stuttgart	Modelling and Optimisation of Heliostat Fields with a Ray-Tracing-Tool

M.Sc. Thesis Projects

Name	First Name	Nation	Institution Master Thesis	Title of Thesis
Benberrah	Abdelhalim	Algeria	PROMES-CNRS, Perpignan / France	Investigation of a State-of-Charge Determination Method for Latent Heat Energy Storage; Application to Paraffin
Berges del Arco	Pablo	Spain	SMA Solar Technology AG, Niestetal	confidential
Gonzalez	Antonio	Mexico	Solar Tower Systems GmbH, Starnberg	Business Feasibility Study South Africa: Industrial Heat & Power for Off-Grid Applications
Gonzalez	Ricardo Sebastian	Colombia	Cemex Research Group AG, Bruegg / Switzerland	Technical and Economic Feasibility Analysis of Using Concentrated Solar Thermal Technology in the Cement Production Process: Hybrid Approach - a Case Study
Kalisar Ramachandra	Bhargav	India	Solar Tower Systems GmbH, Starnberg	Low-Cost Heliostat Development
Liu	Ke-Hsuan	Taiwan	Austrian Institute of Technology, Vienna / Austria	Influence of Applied I-V Correction Procedures on the Measurement Accuracy of State-of-the-Art PV-Module Technologies
Mittal	Ankit	India	Austrian Institute of Technology, Vienna / Austria	Short-Term Metastable Effect in Amorphous Silicon Modules
Charalampos	Nikolis	Greece	Hydrus Engineering Ltd., Athens / Greece	Energy Efficiency in Ship Industry: a Case Study on Cargo Heating Optimization
Ottaviano	Dimitri	Italy	ETH Zuerich / Paul Scherrer Institut, Villigen / Switzerland	Technical Assessment and Modeling of Lithium-Ion Batteries for Electric Vehicles
Parekh	Varun	India	Fichtner GmbH, Stuttgart	Molten Salt Application as a Heat Transfer Fluid in CSP Systems and Its Comparative Study With Respect to Use in Line Focusing and Point Focusing Systems
Perez Rodarte	Aldo	Mexico	Cologne University of Applied Sciences, Cologne	Load Flow Analysis and Short Circuit Calculation in Real Low-Voltage Grid Fed by Photovoltaic Generators
Saenz	Cesar	Chile	Institute of Physics, University of Oldenburg	Parabolic Solar Concentrator for Domestic Use
Staffolani	Nicola	Italy	Dept. of Mech. Engg., TU Darmstadt	Symmetries of the Lundgren-Monin-Novikov Hierarchy and Related Turbulent Scaling Laws

ADVICE ON YOUR PHD APPLICATION

by Evelyn Brudler and Hans Holtorf

The following statements were part of an email discussion and have been edited into a small guide on PhD applications for the PPRE newsletter 2013.

Dear Alumni!

I **[Evelyn]** received several questions concerning the application procedure. In principle:

All questions arising which are not clear by the published job offer, e.g. German language proficiency, salary/scholarship, where to find more in-depth information about the research area and the research group, can be solved by either contacting the person you should send your application to – but it is wiser to invest some time and use the search function of the University of Oldenburg (http://www.uni-oldenburg.de/) or the respective organisation, not bothering the contact person or even the professor with questions which could be clarified by an extensive analysis of what is given on their homepage. If the information on the English website is scarce, go to the German version (which is typically more comprehensive) and use any translation software.

A more comprehensive answer for the question 'what are the "übliche Bewerbungsunterlagen"' (typical application documents):

1. A cover letter. Here you address in a condensed form why you apply for the specific job offer and what you think qualifies you for the respective position.

This is a 1-page letter. Since this should encompass your address and your signature, you may realise that only half a page is left to describe why you are the one, what qualifies you and what your special interest in that topic is.

2. Motivation letter: If you feel that it's impossible to address the important parts in the cover letter, you may add a Motivation Letter: One to one-and-a-half pages, maximum. The shorter and the more concise - the better.

3. Your CV: you may check internet pages which are up-to-date for formats for Germany or other countries. All time gaps without employment or education should be explained: a child, internships ... At the end the CV typically lists language skills, computer skills and other relevant skills.

4. Reference letters: sorted in order with the most recent letter first. Compilation without gaps. What was listed in the CV has to be proven by a reference letter or certificate.

5. Additional activities for qualification: language proficiency certificates, training certificates, internship certificates, social activities (intercultural, social, etc.), sorted in order with the most recent letter first

The preconditions for the respective faculty you are applying for should be discussed with the professor in charge.

It would be very difficult for a graduate of the Social Sciences to apply in the department of Physics or even an engineer. But if someone could prove his/her proficiency in the field of e.g. solid state physics, methodology in natural science, mathematics etc. it might not be impossible, although very difficult. The more important - you may realise - is the content of the cover letter. So check the faculty where the respective PhD offer is located! Each faculty will have other conditions, e.g. Informatics might easily accept engineers (Faculty II) etc. Further formal

obstacles should get answered by the one responsible in the research group.

Another case:

Your own PhD proposal:

Typically you have to actively find a research group, a professor, financing. The formal conditions (when to supply which papers to which unit (including embassy, university administration and probably many more), are too many to answer here. Still, you can ask other alumni doing or having done PhD's to share their experiences, either for self-organised PhD topics or on PhD offers/ scholarships. Still it would be helpful to hear about your experiences.

Kind Regards

Evelyn

Dear All,

I **[Hans]** would like to open the discussion on the application for a PhD from the point of view of a PhD student doing his PhD abroad. It was my initiative to apply for a PhD as opposed to applying for an open PhD position. I will simply share my experience with you.

The idea to do a PhD arose some five years ago. In a first application for a PhD I failed for formal reasons. A physics department was not ready to have an engineer doing a PhD. I continued to look for chances. One year later I was lucky to have the chance to meet a professor from Murdoch University through the course of my professional activities. I talked to him and asked for the possibility of doing a PhD at his university. He asked for my CV and passed it on to the head of the research group. In a second step I put an effort into getting an appointment at Murdoch University and to visit. While staying there I introduced myself to many people and I gave a lecture on our PPRE activities within the "School Seminar". This School Seminar is addressed to all members of the research group. I had brought two ideas on a PhD topic to this one-week stay. I discussed both ideas with possible supervisors and we decided on "Success Factors of Solar Home Systems". "Lead Acid Batteries from SHS and their ecological impact" was not a topic which the research group was able to supervise.

After this visit it took me one year to gather all the necessary paperwork and to prepare and pass IELTS before, in a second visit, I started my PhD project in February of 2010. I can assure you that I am enjoying the PhD but there are hard times. If I would not be totally convinced of the necessity of the subject and highly motivated to work on exactly this topic I guess I would have given up after some time.

Now to summarize my experience: Applying for a PhD is time-consuming and requires a lot of hard work and effort. You may have "offers from the newspaper" or you may take the initiative yourself to apply for a PhD based on an idea you developed yourself. In any case you need to assure how to finance the project. Will you be doing it part-time and earn money in parallel, will the PhD work be refunded or will you need a scholarship? Many institutions welcome your PhD proposals but they expect you to bring along your financial means.

The second step is communication, communication, communication. Inform yourself about the institution you are heading for (homepage). Make contact to the institution when you feel well-informed. Consider that the relevant people are very, very busy and they will reject any inquiries of the sort where you could have got the information from the respective institution`s homepage. This is something you also read in books on "How to …" and it is absolutely true.

Formal prerequisites are usually as mentioned in Evelyn's email:

- Cover Letter
- Motivation Letter
- CV (standardized)
- Latest Certificate(s)
- Reference Letters
- Publication List (when available)
- Possible Awards

Formally, the correct source of information is the "Promotionsordnung" (PhD regulations) of the respective faculty. Furthermore, check for other prerequisites (e.g. language proficiency) on the homepage or by personal communication with the faculty. Inform yourself about the formal steps you have to take in the application procedure. This might be proving the financial status, visa formalities, health and other insurances… Deadlines can decide on your acceptance or on your failure. Please make sure that you start the process of collecting necessary paperwork in time to meet the deadlines. Specific steps during the application process might include presentations to the members of the research group or additional pre-courses.

I would love to hear from your experiences on your application and on your PhD projects.

Kind regards

Hans

FUNCTIONAL OXIDE THIN FILMS: LASER DEPOSITION, MICRO- AND NANOSTRUCTURING, CHARACTERIZATION

by Meirzhan Dosmailov, Kazakhstan, PPRE 2003/04

The first task of the project is to grow thin films as ZnO and Al-doped ZnO films on glass and polymer substrate by means of pulsed laser deposition, to characterize their optical, electrical properties and crystalline structure and to study laser-induced modifications of films. Optical transmission of ZnO films will be modeled and compared with experimental data. Surface Plasmon Resonance of doped ZnO films will be modeled.

The second task of the project is to grow high-temperature superconducting YBa2Cu3O7-δ (YBCO) thin films on single crystal substrate and to characterize their optical and electrical properties and crystalline structure and to study laser-induced modifications of films. Nanostructuring of YBCO thin films will be performed by ion irradiation and laser-based methods.

Meirzhan started in October 2012 at the Institute of Applied Physics in Linz, Austria – good luck!

HEAT TRANSFER TO AND FROM A REVERSIBLE THERMOSIPHON PLACED IN POROUS MEDIA

by Bidzina Kekelia, Georgia, PPRE 1998/99

The primary focus of this work is an assessment of heat transfer to and from a reversible thermosiphon imbedded in porous media. The interest in this study is the improvement of underground thermal energy storage (UTES) system performance with an innovative ground coupling using an array of reversible (pump-assisted) thermosiph-

ons for air conditioning or space cooling applications. The dominant mechanisms, including the potential for heat transfer enhancement due to natural convection, of seasonal storage of "cold" in water-saturated porous media are evaluated experimentally and numerically. Winter and summer modes of operation are studied.

A set of 6 experiments are reported that describe the heat transfer in both fine and coarse sand in a 0.32 cubic meter circular tank, saturated with water, under freezing (due to heat extraction) and thawing (due to heat injection) conditions, driven by the heat transfer to or from the vertical thermosiphon in the center of the tank. It was found that moderate to strong natural convection was induced at Rayleigh numbers of 30 or higher. Also, near water freezing temperatures (0°C-10°C), due to higher viscosity of water at lower temperatures, almost no natural convection was observed.

A commercial heat transfer code, ANSYS FLUENT, was used to simulate both the heating and cooling conditions, including liquid/solid phase change. The numerical simulations of heat extraction from different permeability and temperature water-saturated porous media showed that enhancement to heat transfer by convection becomes significant only under conditions where the Rayleigh number is in the range of 100 or above. Those conditions would be found only for heat storage applications with higher temperatures of water (thus, its lower viscosity) and large temperature gradients at the beginning of heat injection (or removal) into (from) soil. For "cold" storage applications, the contribution of natural convection to heat transfer in water-saturated soils would be negligible. Thus, the dominant heat transfer mechanism for air conditioning applications of UTES can be assumed to be conduction.

An evaluation of the potential for heat transfer enhancement in air-saturated media is also reported. It was found that natural convection in soils with high permeability and air saturations near 1 becomes more important as temperatures drop significantly below freezing.

Bidzina has already defended his dissertation and is now a Post-Doctoral researcher working with his advisor at the University of Utah. The goal of the project is the development of a non-electric heating/cooling system for an electric car to improve its mileage: "Thermal Battery Based on Advanced Metal Hydrides for Electric Vehicles."

MEASURING LOW-CARBON ENERGY INNOVATIONS – THE CASE OF DEVELOPING COUNTRIES

by Binu Parthan, India, PPRE 1997/98

The research work has focused on the prospects in developing countries of low-carbon energy technologies namely renewable energy, energy efficiency, clean coal, carbon capture and storage, nuclear energy and smart grids. The research has explored ways to measure low-carbon energy innovation and deployment in developing countries. An extensive research was carried out into low carbon energy technologies and their scientific and technical aspects, barriers to deployment, application potential and markets in developing countries. Also reviewed were the institutional framework for promoting low-carbon energy and key global low-carbon energy programmes. Processes of technology innovation were studied and existing approaches to measure low-carbon energy innovation were reviewed and anal-

ysed. Based on this extensive body of research a quantitative measurement framework to evaluate low-carbon energy initiatives was developed. The quantitative framework – Developing Country Low-carbon Energy Initiative (DeCLEI) index has been applied to 30 low-carbon energy innovations covering 21 developing countries and results when compared with actual achievements show significant future application potential.

LOAD MONITORING OF WIND FARMS WITH STANDARD WIND TURBINE SIGNALS

by Luis Vera Tudela, Peru, PPRE 2005/07

Increasing the reliability of larger wind turbines is a necessary step to improve the cost of energy. Advanced condition monitoring and fault prediction systems, coupled with wind energy forecast, should facilitate the improvement of current operation & maintenance strategies. The loading history of wind turbines is not normally recorded during the operation of a wind farm due to the high cost associated. Measurement campaigns are mostly limited to prototypes and actual loads at a given site are hard to predict. Additionally, wind turbines are normally designed based on loads calculated from one of the standard wind classes from IEC 61400, thus loads used to design the machines are not representative for the aeroelastic behavior of wind turbines in all sites. Therefore, the design assumptions imply that wind turbines are expected to be overdesigned, though still unexpected failures occur in the field.

The need for system loads monitoring seems to be obvious as the wind energy market moves towards larger machines and far offshore sites. Previous research has shown the viability of using typical and already available SCADA signals (rotor speed, pitch angle, electrical power, etc.) to monitor loads on a wind turbine (Cosak, 2010; Obdam, 2009) without the need to install new measurement devices, by using trained artificial neural networks to estimate overall fatigue loads identifiers (bending moments, torque, rotor thrust, etc.). The main objective of the dissertation is to further extend, by means of numerical and experimental investigation, based on data from three offshore wind farms, a portable methodology to monitor fatigue loads on wind farms based on SCADA signals.

Finally, it is expected that the high effort involved in this complex problem will be rewarded by the potential great practical relevance for the design, finance and operation of large wind turbines and wind farms. The results of this dissertation should establish model requirements to make the methodology transferable. The use of this methodology in a manufacturer should help a structural designer to better evaluate its design assumptions and should help the controller designer to better improve its controller strategy. The use of this methodology by an operator should be beneficial to better estimate its financing and O&M strategy. Finally, certification bodies and local authorities should have a better reference to better estimate the expected life of a wind farm in a given site and facilitate building authorization or life extension permits.

Luis is working as a researcher at the ForWind Center for Wind Energy Research in the Research Group Wind Energy Systems.

STRESS AND DEFORMATIONAL ANALYSIS OF ANISOTROPIC SHELLS OF REVOLUTION WOUND USING SEMI-GEODESIC FIBER PATHS AND ITS APPLICATION TO FILAMENT WOUND WIND TURBINE TOWERS

by Can Serkan Ibrahimoglu, Turkey, EUREC 2009/10

Title - Shorter Version: Semi-geodesic winding of composite conical shells – Possible application for composite towers

The wind turbine market dominated by welded steel shell towers is looking for new structural solutions as the turbine sizes and heights are increasing continuously. Although composite materials are not used as the structural material in the towers of today's turbines, the demand for larger wind turbines is forcing engineers to seek for alternative material systems with specifically high strength and stiffness ratios to be used in towers. Inspired by the applicability of filament winding manufacturing technique in wind tower production, the present thesis investigates unconventional fiber paths (semi-geodesic paths) and tries to increase the number of optimisation parameters for the structural designer. The semi-geodesic winding allows the designer to change the winding angle, thickness, stiffness coefficients and vibration characteristics of conical composite shells and is considered to be a key parameter for the cost-effective wind turbine tower manufacturing.

NEWS FROM ALUMNI

RE - RELATED

Patrick Mugisha, Uganda, PPRE 1991/92, writes, „Past, present and Future are now taken seriously in the planning process. Opportunities are immense despite all these challenges around. I read about the road map to mitigation of climate change due to intensity and sources of energy use in buildings from researchers across the globe and it reminded me of Energielabor lectures in Solar and Wind power. I am keenly interested especially in realizing low energy buildings/green buildings as a contribution to mitigation of climate change effects some of which are negative. On a personal note, I am preparing retirement from academic life *(University of Kampala),* but still remain in PPRE business/consultancy/extension service/collaboration etc."

Enrique Fuentes, Chile, PPRE 1995/96 writes, "It will soon be two years since I retired, but I am still collaborating as Editorial Advisor with the Scientific Magazine that Universidad de Tarapacá publishes in the Engineering areas of knowledge, including engineering education. The name of the magazine is *Ingeniare. Revista Chilena de Ingeniería.* You can visit the following URL for the English language on-line version: http://www.scielo.cl/scielo.php?script=sci_serial&pid=0718-3305&lng=en&nrm=iso

We would be very pleased to receive contributions, following the specified instructions found in the mentioned URL, from current and former staff and students of the PPRE course, specially because we have not received many papers on Renewable Energy. The accepted publications will be included in our Magazine without cost for author(s)."

Aravind P.V., India, PPRE 2001/02 is currently on a one-year stay as a visiting Assistant Professor at Imperial College London since September 2012 (also partly at Cambridge). He also has to teach at Delft during this period by travelling regularly. For April 19th, 2013, he organized the 2nd International Symposium on Solid Oxide Fuel Cells for Next Generation Power Plants at Imperial College London. For more information please visit the symposium website:http://dutw1479.wbmt.tudelft.nl/~sofcpowergen2011/2013/home.htm

Andrew Peel, Canada, PPRE 2005/07 moved back to Canada in 2011 to work as an independent consultant in the sustainable buildings sector. In 2013 he began working part-time as an Associate for his former UK employer *BRE Ltd*, which has opened up an office in Toronto. Additionally, Andrew joined the *Canadian Passive House Institute* (CanPHI) as a Director. CanPHI is a non-profit educational organization that provides resources, connects professionals, and promotes training and certification around the Passive House standard. Passive House is a voluntary building energy performance standard that provides a robust quality assurance process for the design and construction of low energy buildings. Since its development in the early 1990s, it has seen growing adoption in dozens of countries worldwide. Today, tens of thousands of buildings have been built to the standard, municipal governments are requiring it for new public buildings, and it is influencing standard build practices. Further info can be found at www.passivehouse.ca and www.passiv.de.

Michael Sterner, Germany, PPRE 2005/07, who is a professor at the University of Applied Sciences in Regensburg, is "doing a small PPRE", as he puts it, in Regensburg close to his hometown and has developed a new storage concept (power-to-gas – converting wind & solar into something like biogas / storing renewables in the gas grid for power, heat and mobility). For details see his publication called 'Bioenergy and renewable power methane in integrated 100% renewable energy systems - Limiting global warming by transforming energy systems' **available at**: http://www.uni-kassel.de/hrz/db4/extern/dbupress/publik/abstract.php?978-3-89958-798-2

Valerie Bennett, Canada, EUREC 2006/07, is now based in Beijing, China, after being transferred by her Canadian company (*Marbek Consultants, Ottawa*). She is working on industrial facility energy efficiency and demand-side management consulting practice for clients in China and other parts of Asia. She is acting as a technical liaison between the Canadian, Chinese and US offices. Valerie writes, "The work has been exhausting but also exciting, with late night conference calls and constant change and new ideas. I feel so lucky to be able to witness China's dynamic growth while living in Beijing. I'm also learning Chinese and practicing other languages with expats. Sometimes I even make it to the great wall, like the trip with my former student fellow **Bodo Richert, Germany, PPRE 2006/08** and his colleague while he was visiting China for a conference in November of 2012."

Valerie Bennett with Bodo Richert and colleague at the Great Wall in China

Solène Goy, France, EUREC 2007/08 went to Brazil for a couple of months at the end of 2012. She wrote: „I have been working for 3E in France (Toulouse) since 2009 in the field of due diligences for PV systems in EU and South Africa. I had been willing to go to Brazil for quite some time, so, in August 2012 I went to Porto Alegre (South of Brazil) with the goal to understand a bit better this great, lively, diverse country with so much potential for RE. I was taking intensive Portuguese classes at the university while getting to know the status of the RE markets focusing on the solar and wind sectors (Brazil is already well known for its experience in hydro energy and biofuels). The wind market was in a more "advanced" state thanks to the bidding processes established for some years now; PV grid connected systems development is at a more initial step but still, dynamic and with new initiatives regularly. I also got the chance to visit R&D laboratories in the solar field where high-level research has been developed for many years (e.g. PUC). Time passed by quickly and in December 2012 (end of the semester) I went back to France. It was definitively a great experience to get an insight into this vibrant country and to witness the development of some renewable energies there."

Nancy Chacon Calderon, Guatemala, EUREC 2007/08 is currently working for a cement plant. She is in charge of the alternative fuels for cement and lime production, huge challenge! Last year she got a scholarship to study a wind power course and travelled to China, Sweden and it was a great experience. Unfortunately her study will conclude that wind power in Guatemala has limited potential.

Aquil Jalia, India, EUREC 2009/10 is now working for Siemens, Erlangen, Germany, since September 2012. He started in a consulting group in Siemens Power Technologies International, Erlangen, in which they focus on all types of electricity network studies. In particular, Aquil is involved in steady-state network planning, integration of renewables and smart grid, electricity markets initiatives.

German Campero, Mexico, PPRE 2010/12 has just opened a business back home in Tampico as a consultant and installer of renewables, promoting solar water heaters, residential PV installation and rural electrification. He sees himself as a wholesaler and installer with a consulting service for energy saving projects. He is strongly promoting a solar charger; the idea is for the local people to get familiar with PV technology, great for camping, beach weekends, or any outdoor activities. However, it could be also very helpful for people in some parts of Africa. (see small report under *initiatives* in the back).Still, German has not put aside the idea of developing open source hardware like battery chargers or sun trackers, but for now it is on standby until his business is running more stable. He is also building his company webpage, the address is www.tecnoden.com. Feel free to take a look!

BIOMASS/BIO-ENERGY

Jan Lam, Netherlands, PPRE 1998/99 left the National Biodigester Programme in Cambodia to start as Sr. Advisor Biogas for *West & Central Africa region at SNV (Netherlands Development Organisation)* in Ouagadougou, Burkina Faso in August 2012.

Tristan Lermitte, UK, EUREC 2004/05 returned to Bremen near Oldenburg in September 2012, where he became a Tender Manager for *Areva Renewables*. He is working on a variety of Biomass projects European wide.

Roberto Del Cid Lemus, also Guatemala, EUREC 2007/08 is still working at the sugar cane mill providing biomass for power production.

Tuong DoDuc, Vietnam, PPRE 2010/12 is now in Hanoi at *SNV Vietnam* to work on an interesting project to utilize rice residues.

PHOTOVOLTAICS

Thomas Schwarz, Gemany, PPRE 1988/89 Informed us earlier this year that he changed his place of work last year already. Unfortunately, the problems in the PV industry also affected Phoenix Solar in such a massive way that they had to close down virtually all German operations and lay off most of their employees, so sadly, Thomas also had to leave *Phoenix Solar* after almost 11 good and successful years. Therefore, he has been working for *ET Solutions* in Munich since September 2012, mainly being busy with large PV projects in Romania. But still Thomas looks ahead and hopes for some commitment to off-grid PV projects worldwide! His new business email is Thomas.Schwarz@etsolutions.de.

Adrien Clauzonnier, France, EUREC 2004/05, joined *Wind Prospect SAS in Paris*, France as Solar PV expert in February of 2012. His main duties involve technical, financial and regulatory framework consultancy / business development / sales of services / technical asset management / training and supervision.

Antonio Antonopoulos, Canada, EUREC 2005/06, who has been working as Regional Manager at CarbonFree Technology in Ontario, Canada for several years, was invited to give a presentation about 'The Canadian PV Market Potential' on the Intersolar Conference, which took place in June of 2012 in Munich, Germany. During the Conference Antonio met other PPRE alumni like **Michael Sterner, Germany; Rodolfo Hegel, Guatemala; Steven Xuereb, Canada**, and **Hadi Sader, Lebanon** (all from the same batch in Oldenburg) – *see also his report in the back.*

Wycliff Jagwe, Uganda, PPRE 2005/07 owns a company now called JW-Technologies Limited (www.jw-technologies.com), with key focus on Solar, Hydropower, Biomass and Wind. He promotes solar water pumping systems technology, ranging from 100 Watts to 50 kilowatts pumping from 1m³ to 1000m³ per day, with pumping heads ranging from 10 meters to 300 meters. Solar-PV systems for water pumping range between 100 Watts and over 100 kW in size. He has suppliers and installers all under one roof. He writes, "We deliver turnkey solutions as well as independent consultancy services for project development and engineering design, procurement, logistical support, construction supervision commissioning and training, and knowledge transfer. JW-Technologies Limited is currently implementing two sizeable projects financed by the World Bank and the African Development Bank, applying advanced solar-water pumping technology, utilising automated 3-phase power inverters to power 3-phase AC pumps between 5kW-25kW, which are pumping water of volume between 50,000-250,000ltrs per day. They are implementing this technology at nearly 60 sites in rural Uganda. So far 16 sites are complete and commissioned.

Hans Holtorf visiting Jagwe & family at his house in Kampala – 2/2013

Wycliff inspecting a 12.6 kWp SPV water pumping project in Uganda

Rania Elhadi, Sudan, PPRE 2007/09 is a Researcher at *National Energy Research Center in Khartoum,* Sudan. In 2012 she travelled to Japan doing a training course on solar power generation where she was in charge of developing an action plan about increasing the share of solar energy in Sudan's national Energy balance by implementing PV mini grid in the remote areas in Sudan. The program went on for two months. It was very interesting to visit Japan and see a different part of the world with a unique culture and people (*see also small report in the back*).

Michael Norton, Ireland, EUREC 2010/11 is now working for *iEnergia* in Santiago de Chile. The company website is www.ienergia.cl if you want to get some general informatiom about the company. Until the end of 2012 he prepared a PV course for the company which they sell to Universities and private companies with the long-term goal of becoming the first people to certify PV installers in Chile. He will also be making a small test laboratory on the roof of the office to test some of the products that the company distributes *(please see also article in the back).*

Danilo Lima, Brazil, PPRE 2010/12 is currently working at *Dya Energia* Solar, the only company to manufacture PV modules in industrial scale in Brazil. He is designing grid connected and off grid PV systems to be deployed all over Brazil. Recently, Brazil adopted the net metering system (energy compensation), allowing RE-based mini and micro generators to export electricity to distribution grid. Due to this recent regulation, the PV market in Brazil is developing consistently ("although not as fast as we, RE enthusiasts, would like").

In February 2013, he started teaching Solar and Wind Energy for undergraduate students of the Energy Engineering course at *Pontifícia Universidade Católica of Minas Gerais* (PUC-Minas). He will make sure everyone know the collector equation ("wink to Hans Holtorf"). Nevertheless, he never forgot his true passion: Waste-to-Energy applications.

Ankit Mittal, India, EUREC 2011/12 started his doctoral research right after finishing his EUREC Master. His PhD is based on analyzing the 'Short-term metastabilities inside the thin film solar cells'. The Insitute where he is doing his research is the Austrian Institute of Technology (http://www.ait.ac.at/) and he is registered as a PhD student at the University of Vienna (http://www.univie.ac.at/).

WIND ENERGY

Dr. Rosana Rodrigues dos Santos, Brazil, PPRE 1993/94 informed us last year that she is working for *Suzlon* (WTG manufacturer) in Brazil as a Director for Projects & Business Development. Her specialties are: Business Development, especially Wind Projects / Electricity Generation Regulatory Framework / Electricity tariff calculation and definition as well as bridging the gap between the regulator and the company / Managing of concession contracts / Finding of business opportunities within the building regulatory framework.

Mathieu Sarran, France, PPRE 2003/04 joined *EPURON SARL* in France as a Wind Farm Construction Manager in July 2012. EPURON is a German based company, which finally developed more than 350 MW of Wind Energy projects in Germany and France and presently has approx. 650 MW of WE projects under operational management.

Steven Xuereb, Canada, EUREC 2005/06 writes, "After over five years back in my home town of Toronto, Canada, my wife and I have moved back to Germany to her home city of Berlin as of May 2012. In Canada I spent five years developing wind farm projects across the country for two Irish companies, Airtricity and then Mainstream Renewable Power. I was lucky enough to have the opportunity to continue working with Mainstream in Berlin, where we have a small office of five which primarily concentrates on the development of an offshore wind project in the North Sea. My new role as a contracts manager is to support our onshore wind and solar projects internationally with the procurement of main components and construction services. Currently my focus is South Africa where we are actively participating in the country's renewable energy procurement program, where later this year we will begin construction on a 138MW wind farm and two 50MW photovoltaic projects. I'm very happy to be living here in Berlin and my wife and I are excited about our next life-changing experience: the birth of our first child in November!"

Giovanni Pabón Restrepo, Colombia, PPRE 2007/09 has recently got a job at Siemens for the development of tooling for installation and service of the turbines. He is located in Denmark (Brande/Ringkøbing) but since he is working for the service and installation area, it will be very possible to visit Germany quite often.

Alumni gathering at 4th Brazilian Solar Congress (fr. l. to r.): Danilo, Mariana, Rafa De Vecci & Rafa P. Santos

Rafael De Vecchi and Maríana Binda Pereira both Brazil & PPRE 2009/11 returned to Sao Paulo after working for GE Wind in Germany. Rafael writes, "Mariana kept working in GE and I will start soon to work at Renova Energia, a Renewable Energy developer in Brazil. Pretty cool. We met up **Danilo de Brito Lima, PPRE 2010/12** and **Rafael Pereira Santos, PPRE 2008/10** here since they came for the 4th Brazilian solar congress. - Look how we did our little celebration in Sao Paulo on the 20th of September 2012. It is Renewable Energy putting people together on the other side of the world. It is a great thing that we are all back home working and promoting Renewables in Brazil."

Frédéric Bussières, Canada, PPRE 2009/11, joined the Edison Engineer Training Program at *GE Wind* in Germany right after his PPRE studies. Presently a part of the mechanics team at *GE Jenbacher GmbH Co OG*, Germany, he is responsible for carrying a gen-set alignment study and optimizing mounting strategies for engines and generators through multi-body simulations.

Corollary duties include continuous cross-functional support for a structural wind turbine blade NTI project.

Andreea Costache, Romania, EUREC 2009/10 has a job at *Hochtief*, Germany – an international operation contracting company involved in Offshore-Wind Energy Projects. Currently she is working in the Planning department, assessing what influence the weather has on various offshore installation processes. Every day she is in between Matlab, Excel and Ms-Project.

Pedro Peña, Spain, EUREC 2009/10 has relocated to Mannheim to work for *ABB AG.* He is working as a tender engineer for grid connection projects for offshore wind parks, dealing with offshore relay stations, underwater and buried cables und conversion stations.

Nick Brown, USA, PPRE 2009/11 is now working with *Vestas* in Portland, Oregon, US, as a Wind and Site Engineer.

Rafael De Vecchi, Brazil, PPRE 2009/11 started to work as Wind Engineer at *Renova Energia SA*, São Paulo, Brazil. His main duties include participation in the development of large-scale Wind Farm Projects in Brazil. Topics covered are: technical due diligence, micrositing, project optimization, site condition assessment, site visit and others.

Juan Pablo Villa, Argentina, PPRE 2010/12 is now working for *ForWind*, Oldenburg, as an Assistant/Programmer in a Multi-LIDAR project. The objective of the project is to be able to obtain wind radial velocity from different LIDARs aiming at the same spot, i.e. multidimensional measurements (against a normal LIDAR which only measures in the direction of the beam). His tasks within the team consist of helping in the development of the MASTER and the RELAYS software programs which control the behavior of the individual sensors; for that they are working for the information/commanding of the LIDARs with their own TCP/UDP protocol and utilize relational databases to store and retrieve the information for further analysis.

Orlando Venegas, Chile, PPRE 2010/12 is now with *ENERCON* in Remels, Germany, where he is working as a Project Engineer for energy yield calculations in the Site Assessment Department.

Rangini Kumaraswamy Sivaprakasam, India, PPRE 2010/12 is now working at the *Centre for Wind Energy Technology (CWET)*, Chennai, India and is involved in Wind resource assessment projects. This is where **Muthya Ramesh, PPRE 1988/89** has worked for some time and on the same campus as **Indradip Mitra's (PPRE 2003/04)** current workplace at the SOlMap project – it's a small world!

Elizabeth Henningsgaard, US, EUREC 2010/11 wrote in mid 2012: "After my thesis/internship ended with ABB Switzerland I went back to the US for a few weeks while awaiting a work & residence permit for Sweden! During my thesis I interviewed for a position with ABB in Sweden and was offered a place with the HVDC Power Systems Group in Ludvika, Sweden. Specifically, I am working in Project Management on the HVDC `Plants` as they call them. They are the transmission links, i.e. converter stations, for high voltage DC transmission. The group I am with was responsible for the Dolwin and BorWin platforms for the offshore wind farms. Right now I am working on a link between two grids in the US which is mainly for grid stabilization, partly to accommodate existing and future wind farm energy feed-in. So far the work is challenging because my background is not in electrical engineering, but I am enjoying it a lot. I was thinking the other day that it may be a good place for thesis projects for anyone interested in HVDC transmission. I don´t know what the internship program is like here but I could look into it more. - Other than work, I am trying really hard to get used to the small town living in Ludvika. I am about 2.5 hours from Stockholm in a really tiny town, much smaller than Oldenburg. Luckily I have enough work to keep me busy for now but I am starting to find things to do outside of the office. I am also making a good effort to learn Swedish. The small amount of German I picked up has helped me a lot, and I must say Swedish is much easier than German."

RURAL ELECTRIFICATION & DEVELOPMENT

Alhousseini Issa Maiga, Mali, PPRE 1988/89, who works for GIZ Mali, went on a 10-day trip to Germany visiting Yandalux, Hoppeke and SMA. He sent us the following pictures of street and traffic lights with solar panels back home in Mali:

PV street & traffic lights in Mali

Partha Mukherjee, India, PPRE 1989/90 is currently implementing a poverty removal programme that focuses on achieving the objectives of the Millenium Development Goals. Partha is head of an NGO in Pune, India. *(see also report in the back)*

Satish Gautam, Nepal, PPRE 1994/95, joined the Renewable Energy for Rural Livelihood (RERL) program as the National Programme Manager last year. It is the follow-up of the Rural Energy Development Programme where he used to work before leaving for further studies. He went to the US and then to Afghanistan.

Elizabeth Kingu, Tanzania, PPRE 1995/96 informed us in February of 2013 that she was working for the Ministry of Water in Tanzania as Assistant Director, dealing with Programme Preparation for Water Supply and Sanitation Authorities in Tanzania under the local Urban Water Supply. Privately

she is the Director to the RESCO Tanzania LTD, promoting the use of renewable energy in Tanzania. Currently she is affiliated with a programme to propose and design renewable energy systems for water pumps in villages.

Dr. Binu Parthan, India, PPRE 1997/98, resigned from his position as Deputy Director General at REEEP, Vienna, Austria, last year. He also completed and defended his Doctor of Technology dissertation at TU Graz successfully. Now he is back in India advising UNDP on developing a clean energy programme for East Africa. Actually he spent several weeks at the end of last year and early this year in Lesotho, where he developed the Lesotho Renewable Energy Policy (LesREP) for the Government of Lesotho *(see article in the back).*

Other PPRE alumni from India also play a prominent role these days in the GIZ team in India:

Dr. Anil Misra, India, PPRE 1989/90, Dr. Indradip Mitra, India, PPRE 2003/04 and Dr. Anand Shukla (PPRE 2001/02) on a field trip in India

Edwin Dola, Kenya, PPRE 2009/11 has been employed as a technical manager at *Solatrend Ltd.*, Kenya, since 2011. He is supervising renewable energy projects, commissioning installed renewable energy projects, participating in consultancy and tender application services, planning, sizing and designing domestic and commercial solar water heating, water pumping and lighting systems.

Pau Farrés Antúnez, Spain, EUREC 2010/11 is currently located in Rio de Janeiro, working for INTEGRATION umwelt&energie in some projects related to rural electrification which are funded by GIZ. His current contract lasts until the end of February [2013], but he might have the chance to stay a bit longer. At the moment, he is enjoying the job and loving Brazil, although he likes the idea of coming back to Europe in a few months for a PhD.

ENERGY POLICY / ECONOMICS / STUDIES

Krishna Pandey, India, PPRE 1990/91 was selected to the post of "Project Coordinator - All India Coordinated Research Projects on Renewable Sources of Energy for Agriculture & Agro-based Industries". This project has 18 cooperating centres spread all over India in agricultural universities to conduct research and extension of renewable energy sources. He coordinates the activities and guides them for R&D.

Wisdom Ahiataku-Togobo, Ghana, PPRE 1997/98, writes, "It will interest you to know that PPRE alumni are running the RE show in renewable energy at the Ministry of Energy in Ghana. The only two other PPRE alumni currently in Ghana (Seth Mahu, PPRE 2005/07 and Isaac Ennison, PPRE 1990/91) are working with me at the Renewable Energy Directorate of the Ministry of energy as my Deputy Directors. What I will love to have now is a female professional preferably from PPRE to also look at the gender related issue on RE."

Wesly Urena Vargas, Costa Rica, PPRE 1998/99 returned to Germany earlier this year to become Senior Technical Advisor Climate and Renewable Energies at the German *KfW Development Bank*. Main Duties: Technical support to wind projects in Middle East and North Africa region, under the

dle Climate and Environment Division / Advice technical details on geothermal projects within KfW current portfolio / Contribute to a sustainable implementation of projects and programs in KfW Development Bank, including Due Diligence and pre-investment assessments in project design and structure.

At the end of last, year, **Oliver Risse, Germany, PPRE 2001/02** founded his own cleantech company in Singapore, helping early stage companies on their way to growth in Asia and Europe. The field is similar to his former workplace, *Asia Cleantech Capital*, but he can work more independently, which he is doing with a lot of positive energy. He is currently managing a big account in Germany and can therefore be found in the north of Germany many times in 2013. His family has also moved back to Germany.

Ram Dhital, Nepal, PPRE 2001/02 is now the Deputy Director at AEPC. He is also working as the program manager for the solar energy component of the National Rural and Renewable Energy Program, which is being supported by a number of external development partners in Nepal.

Butchaiah Gadde, India, PPRE 2001/02, has now started working as Regional Technical Specialist at *UNDP-GEF* (Global Environment Facility United Nations Development Programme) in the regional centre in Bangkok, Thailand after a long tenure of work as a consultant. One of his portfolio countries is DPRK, where the UNDP-GEF small wind energy project is being overseen by him from the regional centre. Actually, in 2012 he met **Mathias Hölzer** (former physics student and PPRE tutor at the University of Oldenburg, who is now working for German Profec as a consultant for a small wind energy project) in North Korea.

In early 2013 **Ram Prasad Dhital, Nepal, PPRE 2001/02**, attended a conference in Bangkok and visited Butchaiah & family (see photo).

Ram Dhital (left), Butchaiah Gadde & his family.

David Otieno Ochieng, Kenya, PPRE 2004/06, writes, "As some of you may already know, I have finally joined the *EU Energy Initiative - Partnership Dialogue Facility (EUEI PDF)* as one of their project managers. Perhaps to explain to those who haven't heard about it, EUEI PDF is a flexible instrument of the EU energy initiative funded by several EU member states and the European Commission. We support and work with partner countries and regions to develop policies and strategies that contribute to improved access to affordable and sustainable energy services. Our activities focus mainly on Africa, but we also operate in other parts of the world. We also support the strategic energy dialogue of the Africa-EU Energy Partnership (AEEP) as a secretariat, as well as the "Renewable Energy Cooperation Programme" within AEEP. I find it exciting to now combine my several years of „field experience" in the region and in particular Uganda, with now rather macro and sometimes abstract discussions and policies in an almost global context. I am particularly glad that most of the subjects and topics that I will specifically be working on ties in well with what the energy sector

in Uganda and the region is working on and striving to achieve as well."

Ahsan Javed, Pakistan, PPRE 2008/10: Since February 2013 Ahsan has been NAMA Coordinator at *Ministry of Climate Change*, Islamabad, Pakistan. He is coordinating and devising policies/ strategies in various sectors of the economy as part of the domestic commitment to reduce greenhouse gas emissions.

Pablo Carvajal, Ecuador, PPRE 2010/12 is now working as RE advisor at the local *Ministry of Electricity and Renewable Energy*, which is a challenge since it is a very political and also technical position. He is in charge of promoting hybrid systems in the Galapagos Islands, and he is also doing wind measurement campaigns for future wind parks. *See also his small write-up about the energy situation in Ecuador in the back.*

Sebastián A. Arroyo, Chile, PPRE 2009/11 started working in another department in the *Energy Ministry of Chile* - the Renewable Energy Division. They work on developing maps for RE potential, norms, pilot projects, financial instruments, policies, etc.

Javier Rodriguez, Colombia, PPRE 2010/12 has enrolled as a consultant for a local government division in charge of the planning of energy issues on a national level (*the UPME, or Mining and Energy Planning Unit*). Initially he will be working in the development of a project with the IDB, tackling the issue of currently existing barriers for RE promotion in Colombia, and mechanisms/policy instruments which shall remove these barriers. He will not be focusing too much on biofuels at first, but the opportunity is a great one to get started on the cause.

Alan Kwan, USA, PPRE 2010/12 recently started his job as an Energy and Climate Change Advisor with the *US Agency for International Development* in Washington, DC. They are working with countries (in Southeastern Europe and Eurasia in his case) developing greenhouse gas inventories and disseminating renewable and efficient technologies. It has been very interesting and educational so far.

R**ebeca Ramirez, Panama, PPRE 2010/12** has been working in Panama for the **Energy Secretariat Panama,** which is like the Energy Ministry, and right now also for VDE as consultant. Because she loves Germany so much, she did not want to lose her contacts there, so VDE decided to try to help by giving her some work abroad. Rebeca writes, "I love it. I have my company here and I have a lot of work, which is perfect for now while I don't have kids or family... I have to work 12 hours a day minimum..."

Sandra Chavez, Mexico, PPRE 2010/12, is currently working in Ren21, a multi-stakeholder network working for a rapid global transition to Renewable Energy. The flagship product from Ren21 is the Renewables Global Status Report (GSR). It provides an integrated perspective on the global renewable energy situation and has become the most frequently referenced report on renewable energy business and policy, serving a wide range of audiences. Sandra is living in Paris and enjoying it. She writes, "It's very dynamic, international and interesting. It's only an internship but it's full of responsibilities, I am collaborating in the elaboration of the Global Status Report (ren21.net/gsr). It's just fantastic. I am going to stay here until the first week of June."

SYNERGY, ENERGY FOR DEVELOPMENT

By the Synergy team (PPRE/EUREC 2010/12)

In 2011 a group of students came together to start an initiative called **SYNERGY, Energy for Development**. Inspired by the multicultural backgrounds of PPRE and EUREC students, their exceptional groundwork, and the fact that deep inside we all want to *"contribute to a better world"*, a great collaboration began to form.

SYNERGY is an initiative of students and professionals interested in working voluntarily on rural energy projects with the aim of promoting rural development. To achieve this goal, SYNERGY aims to bring together the PPRE/EUREC renewable energy community with the purpose of analyzing specific situations and creating suitable and sustainable solutions. SYNERGY has two main goals, first to design tailored-fit energy supply solutions for rural communities, and to strengthen a global network of renewable energy professionals united by common ambitions.

In 2012 SYNERGY organized a workshop with the PPRE and EUREC community between March 26th and 28th of 2012 at the University of Oldenburg. The topic was the Maforga Mission, a volunteer's association suffering from critical funding problems situated in Mozambique. The objective was to search for ways to create energy-related businesses to supply the Mission with a sustainable income by using a stream that flows within the Mission's grounds. Grain milling and irrigation were reviewed in regards to technical and economic aspects as well as energy efficiency. The results of the workshop were communicated to the person in charge of the project in Mozambique and they are expected to be implemented by the end of 2013. More details of the project can be found on the SYNERGY website.

Synergy workshop participants, Oldenburg, March 2012

During the „Renewable Energy 2030 – Experts' Visions" conference, SYNERGY participated as a crosscutting issue for Energy and Development. A poster about SYNERGY, its scope, structure and Maforga workshop information was presented (also available on the website).

Currently the SYNERGY team is evaluating a hybrid system to supply electricity to a small community in Bahia, Brazil.

Special acknowledgement goes to PPRE staff, University of Oldenburg and DAAD who supported this project since its beginnings.

Are you interested in knowing, participating or contributing with SYNERGY??

Please visit our website www.synergy4dev.org or contact us in info@synergy4dev.org

Groupe REaction

by Frederic Bussières, Canada (PPRE 2009/11)

Groupe **RE**action (GRE) is an independent *Engineering and Renewable Energy Consultancy* company that was partially founded in 2011 by PPRE graduates.

GRE is a committed team of engineers bonded by a common passion for renewable energy and working towards one goal: **a cleaner future!**

GRE dedicates its experience and know-how to its customers who may be energy companies, developers, local authorities, banks or investment funds. Our company's renowned and specialized engineers consider the specific needs of each customer while complying with its fundamental values: high quality of service, reliability and benefit to the society.

GRE offers the following services across renewable energy technologies:

- Pre-feasibility and Feasibility Studies
- Market Research
- Resource Assessment
- Site Selection and Qualification Studies
- Technical and Financial Advisory
- Due Diligence
- Tailor-made Off-grid Solutions
- Energy Efficiency Studies
- Carbon Credits Advisory
- Energy Audits

Apart from Frederic, **Can Serkan Ibrahimoglu, Turkey, EUREC 2009/10** is also active in the consultancy. **Please check:** http://groupereaction.com/

PORTABLE MOBILE PHONE SOLAR CHARGER

by German Campero, Mexico, PPRE 2010/12

Since last summer 2012, finishing the PPRE experience and becoming officially a Master on Science in Renewable Energy, I jumped into an adventure of opening a business where I could offer complete solutions for people in the need of renewable energy facilities in rural areas. Although in Mexico there is a little bit less than 3% of total population without access to electricity, these 3% represent 3 million people that are, for instance, the total population for Panama or half the population in Norway, without electricity.

Leaving the facts aside, we have started to manufacture an affordable 3 W portable solar mobile phone charger that is foldable and lightweight to carry wherever the user goes, available for just 25 Euros.

Proven to be perfect for people in rural areas where the electric grid is not available for recharging mobile phones, we want to start promoting them also in places like South America and Africa where lot of people could be found in the same conditions. So any help from the PPRE network interested on promoting these solar chargers would be kindly received. More information (in Spanish though) can be found on "www.tecnoden.com/cargador-solar-portatil".

EUREC MASTER ALUMNI NETWORKING

by Bertrand Gulliot, France, EUREC 2005/07 & François Veynandt, France, EUREC 2007/08 & other EUREC alumni

We would like to introduce ourselves as the organizing team of the 4th EUREC Master Alumni conference and forum. This annual EUREC alumni meeting has been held on Saturday, November 17th, 2012, after evolving from a side event during the Master thesis presentations. About 50 people gathered in Paris to attend this seminar where volunteers were kind enough to share some of their knowledge and practical experiences through a day of presentations and workshops. This event was surely a reminder of the power of networking and why it is especially important in the field of renewables. In a growing industry you cannot always rely on a fully established way of making your professional career grow and evolve. Learning from experiences of people who started their own activity, meeting with potential employers and employees, sharing business models and ideas and having them challenged, these are all needs that are best served by face-to-face conversations.

As a system approach is usually required for renewable energy design and integration, this often leads to people having to acquire an expertise while keeping the ability to collaborate across disciplines with experts from other areas. If you are keen on improving your skills, it is important to share first-hand experience on project management and technical issues out of your field of expertise. This is crucial to make innovation happen in practice, contributing to speed up the urgent (r)evolution towards a more sustainable world.

A EUREC Master Alumni Network is play ti

November 2012: EUREC & PPRE Master Alumni gathering in Paris, France

a great role in bringing renewable energy experts together to share, work, and create. While waiting for our next meeting, it is worth mentioning the LinkedIn platform: this on-line exchange space enables collaboration and networking regardless of geographical constraints. It is therefore powerful and strengthens the networking potential. The EUREC Master's website is also a space where information is to be found and shared! Last but not least the EUREC newsletter is a useful tool that also brings significant value to our alumni network. With these words, we wish you all a valuable reading and success to your projects!

NEPAL OLDENBURG RENEWABLE ENERGY CENTER (NOREC)

by Sunil Prasad Lohani, Nepal, PPRE 2006/08, Kathmandu University (KU)

The annual meeting of NOREC held on 23rd July, 2012 at Kathmandu has made the following unanimous decision:

1. The current working committee has been reshuffled and the new one is as follows:

Mr. Ram Prasad Dhital --- Chairman

Mr. Prashun Bajracharya---Vice Chair

Mr. Sunil Prasad Lohani---General Secretary

Mr. Manoj Khadka ---Treasurer

Mr. Ram Prasad Ghimire --Member cum Advisor

Mr. Satish Gautam---Member cum Advisor

Mr. Subash Mishra---Member

Mr. Om Prasad Poudel---Member

2. Mr. Sunil Prasad Lohani will be responsible for all communication, information flow

within and outside NOREC.

3. The NOREC along with KU will organize a day workshop with tentative theme of "Biomass Resource Potential and Technologies in Nepal" in due course.

4. NOREC will soon hold a discussion with the German Embassy, Nepal, the University of Oldenburg and other relevant stakeholders to expedite its active participation in Renewable Energy and Climate Change sector in Nepal. The necessary support will be up to all stakeholders after formulating a clear plan on it.

NOREC was established back in 2005 with the major objective of the PPRE alumni in Nepal to seek for cooperation among all members of the alumni network, use the knowledge and expertise gained in the renewable energy sector for the overall development of the nation, create an effective network with the University of Oldenburg, the DAAD and former alumni.

Other objectives of NOREC are:

- *Identification of Renewable Energy Sources and their implementation for environment conservation and income-generating activity.*
- *Collaboration with national governmental and non-governmental agencies working in the sector of renewable energy and climate change.*
- *Creation of a network and pressure group for the promotion of renewable energy among different stakeholders.*
- *Organisation of workshops, seminars and conduct training for effective experience sharing and effective planning of the renewable energy program.*
- *To conduct research and development of renewable energy technology and suggest proper measures for implementation of these technologies to replace indigenous traditional technology.*
- *Creation of an effective network among PPRE (Postgraduate Programme Renewable Energy) alumni, professors and lecturers of the University of Oldenburg for the development of renewable energy technologies in Nepal.*
- *Providing technical and consulting services for the promotion of renewable energy technologies.*
- *Publication of articles, magazines, and a newsletter related to renewable energy technology, energy planning, and climate change and dissemination among related stakeholders.*

2 NEW ALUMNI NETWORKS FOR INDIA / ASIA IMPLEMENTED

by Shamsundar Subbarao, Mysore, India, PPRE 1999/2000, Director, NIE - Centre For Renewable Energy & Sustainable Technologies (NIE-CREST)

"We are happy to share with you that, we have started/registered two alumni networks in India /Asia region namely : 1) ANGIRAS and 2) GANES.

1) ANGIRAS stands for the Network of Indian Alumni from German Universities for Sustainable Solutions, which is the newly registered not-for-profit organisation initiated by the Indian alumni graduated from the two universities University of Flensburg and the University of Oldenburg.

ANGIRAS: http://www.alumniportal-deutschland.org/en/networks/alumni-networks-list/angiras-the-indian-alumni-network-of-german-universities.html

ANGIRAS was registered as a trust (non-governmental organisation, NGO) on 17 June 2011 in Mysore, with six Indian alumni as its founder-trustees. Presently, ANGIRAS has active contact with 15 alumni, 10 from the ARTES/SESAM programme of the University of Flensburg, 4 from the PPRE programme of the University of Oldenburg, and another from yet another German institute, the Max Planck Institute for Polymer Research, Mainz, Germany. Mrs. Mona Doctor Pingel (1992–94 ARTES alumna), the first Indian to have graduated from ARTES, is the President of ANGIRAS and Mr. S. Shamsundar, an alumnus from the University Oldenburg, is the Managing Trustee, looking after the day to day affairs of ANGIRAS.

It is the desire of the founders of ANGIRAS that ANGIRAS acts as a catalyst for motivating other Indian DAAD fellows who have studied at various German Universities to get connected either as members of ANGIRAS or by ANGIRAS getting associated with other similar alumni networks. Therefore, the Trustees of ANGIRAS, during the Board Meetings held in Mysore and Auroville, have decided to organise an Indian Alumni Convention.

ANGIRAS Charitable Trust will organise the first "Indian Alumni Convention for Energy and Sustainable Development in Remote Areas" as its first major activity in October/December 2013 at the International Township for Human Unity – Auroville, near Pondicherry, to be partly sponsored by the DAAD, Germany.

2) GANES (German Asian Alumni Network for Energy and Sustainability).

GANES MISSION - PROMOTING SUSTAINABLE ENERGY SYSTEMS IN ASIA THROUGH PROFESSIONAL EXCHANGE

GANES is committed to attaining its vision by bringing together the Asian alumni from German universities for a collective endeavour. GANES will work towards development through concerted efforts and innovations aimed at harnessing and utilising sustainable energy technologies. GANES will promote sustainable energy systems and efficient energy management practices in Asia through professional exchange of expertise and experience among alumni from different countries.

GANES: http://www.alumniportal-deutschland.org/en/networks/alumni-networks-list/ganes-german-asian-alumni-network-for-energy-and-sustainability.html

We welcome alumni of Asia and India to become members.

ELECTRIFICATION WITH SOLAR POWER IN D.R. CONGO

by Simeon Obinna Nwaogaidu, Nigeria, PPRE 2007/09

Since March 2009, I have been working as a Supervisor/ Team leader of Alternate Energy Unit. The Unit is under the Communications and Information Technology Section of the United Nations Organization Stabilization Mission in the Democratic Republic of Congo.

In line with the United Nations millennium development goal and our Unit Disaster Recovery and Business Continuity (DR&BC) plan, our team is committed to sustaining the reliability of all our communications and electronic equipments in the mission through alternate energy means and offer support measures to ensure that the use of energy is optimized with the aim to minimize the mission's greenhouse gas emissions while ensuring enough power for proper functioning.

Throughout the Democratic Republic of Congo (D.R.C.), energy from the local grid network has been a very serious challenge. This is mainly due to the lack of maintenance at the various local distribution plants which has caused their deterioration. And because of the years of neglect, power shortages have become the norm rather than the exception and this is really posing great problems to the mission.

Currently, we are embarking on the installation of solar power and other uninterruptible power supply systems to cover our most remote team site locations either as a main source of power or standby hot. However, for the past three years, solar power has proven to be a reliable and stable power source to keep critical communications equipment (satellite dishes, servers, ,microwave radios, PABX, switches and PCs, etc) in our mission running uninterrupted.

Our team has successfully completed eight working solar power supply farms at different remote team site locations of the mission. Some pictures of our work in one of the team sites (Mbuji-Mayi) are shown below:

It is however projected that another three to four team sites would be installed before the end of the year 2012 and most remote sites will be fully on PV systems with secondary power provided by generators.

About 74.5kWh of electricity is produced daily from the eight working solar farms, which is about 27,000 kWh annually (each PV system is approximately 5.0 KVA of capacity). The entire currently installed capacities are saving D.R. Congo about 11,610 kg of CO2 emissions per year - considering on average, the use of 1kWh of electricity produced by fossil fuels emits 0.43 kg of CO2.

Now that we are expanding and upgrading our communication equipment and because generating clean solar power also reduces CO2 emissions, plans are in place to increase the existing PV systems capacities and optimize their reliability in conjunction with possible fuel cells without undermining environmental factors such as temperature, soil, water and air, etc.

Consequently, the solar power system is helping the mission to reduce its carbon footprint. This has actually contributed to the improvement in the quality of our services to clients, with the reduction in our equipment downtime. Our clients are also becoming aware of the ways to cut down on electrical costs as well as renewable energy and energy efficiency issues.

Frankly, I am proud to let you know that PPRE gave me a lot of opportunities and has greatly influenced my life. I would recommend PPRE to anyone who is looking for education and wider experience in the field of Renewable Energy.

PROJECT INTIKALLANA: ROASTING COFFEE USING A SOLAR CONCENTRATOR

by François Veynandt, France, EUREC 2007/08

1 Context and Objectives

The project Intikallana aims at providing a clean and economic technology to coffee producers. In the communities of the Andes Mountains, the producers mostly sell their production of coffee as dried green beans. However, most of the added value is in the roasting process. Although the roasting needs some know-how, local people practice it for their own consumption. Being able to roast coffee in an ecological way could help the producers improve their income and thus their quality of life. A solar technology is clean of emissions during use, in comparison with roasting with wood, which is the common energy source in artisanal roasting. The objective is to provide a low-tech process, for a robust technology that keeps costs low. Once the investment has been made, the operation costs remain very low.

Close contacts are established with the village of Huyro, where the implementation of the technology is to take place first. Huyro is at one hour from Quillabamba, in the district of La Convencion, region of Cusco, Perú.

2 Design of the solar coffee roaster

Scheffler solar concentrator Taking into account the context, a Scheffler concentrator is chosen to provide the concentrated solar energy source. Indeed, the Scheffler reflector is open-source technology, which means anybody can copy it without paying to use a patent. This is considered as a key advantage in the scheme of the project. The photo 1 shows the Scheffler concentrator of 2.7 m² of mirror surface used for the roasting experiments.

Physical model The designing process is guided by results of experiments and a physical model. The physical model is analytic

It gives information on the global behavior of the system.

Direct solar flux on coffee The approach chosen is to heat the coffee beans directly, allowing the concentrated sun beam to reach the beans. The light beam of the Scheffler at this latitude is close to horizontal. A horizontal cylinder, opened at one end, is thus perfect to let the solar flux enter. The opening enables the humidity and the smoke produced to escape. According to the quality of the focus point a diameter of 20 cm is required for the opening.

Delicate use of a glass cover Some tests have been conducted with a glass closing the opening. The aim is to reduce the thermal losses from convection and infrared radiation although an opening has to be provided for humidity to be evacuated. It is also good that the thin silver skin that falls from the grains during the roasting can be eliminated. Although the design does not allow a good elimination of this silver skin, adding a glass cover would worsen the situation. From the thermal performances, the results of the tests show the glass sheet helps. But as the light entering is also reduced by reflectivity and transmissivity of the glass, the benefit is reduced. For security reasons it is also better not to get glass involved. Especially considering the high temperatures experienced by the glass, a tempered glass is required. In the end it was decided not to use the glass cover. However for special application, the glass cover seems to be necessary. For example for producing pop-corn, if conduced without glass the test shows food is provided to the operator as corn grains are popping out of the drum! In this case the test with glass gave very good results. The grains popping early do not degrade as their white color reflects most of the light.

Scheffler concentrator in the test field in Huyro, region of Cusco, Perú

Material of the drum: stainless steel Stainless steel seems to be a good material for the inner surface of the cylinder. Tests were conducted with aluminum which performs well too, provided a good insulation is used. Without insulation, the high con-

ductivity of aluminum leads to bad results.

Optical absorptivity of the material An absorbing material is better than a reflective one. This is especially true in the first phase of the roasting, when the coffee beans have a clear color. A dark surface absorbs more radiation and brings more heat to the coffee per conduction. The stainless steel is a good candidate in this sense: from reflective when new, it turns brownish after some minutes of exposition at high solar radiation.

Size of the drum The size of the cylinder proved to have a significant effect on the roasting time. A smaller cylinder gets better results because the surface for thermal losses is reduced. A compromise is to be found between the size of the cylinder and the quantity that can be roasted.

To reduce its size, keeping the opening of 20 cm diameter, the cylinder can be inclined. An inclination of up to 19° showed to have relatively low effect on the thermal performances of the process. Thus a cylinder 28 cm deep with a 25 cm diameter can roast up to 1.5 kg of coffee.

Thermal insulation Further parameters were studied. The influence of thermal insulation is clear; it proves to be necessary. A textile was chosen for its neutrality with food: recycled cotton textiles were used although the temperatures the insulation faces is at the limits of the resistance of the material. Special precautions have to be taken. Alternative material would be mineral or glass wool. If such a material is chosen, it is recommended to carefully enclose the insulation to ensure no fiber can be mixed with the coffee. This would lower the quality, possibly putting in danger the consumer's health.

3 Results

Test campaigns Some preliminary tests were conducted in the University in Lima, making the most of the little sun radiation in the winter season. A more significant test campaign was realized in Huyro where the solar radiation is generous. 4 days of full testing enabled the team to get good results and permitted the establishment of guidelines for roasting and to further optimize the coffee roaster.

Roasting 1 kg in 24 minutes With moderate sun radiation of 740 W/m², the tests show 1 kg of coffee can be roasted in 24 minutes with an inclination of 19°. With high radiation of about 900 W/m², 1.5 kg can be roasted in 36 minutes. It is not recommended to roast much more than 1 kg as the more time the roasting lasts the lower the quality tends to be. Indeed the ideal time is to roast in 15 to 20 minutes.

The roasting time depends a lot on the radiation level and the quantity of coffee. The results presented here are to be seen as orders of magnitude.

Evolution of coffee temperature during roasting Figure 2 shows how the coffee temperature evolves during roasting and cooling. In this case 621g of roasted coffee were yielded from 750g of green coffee (17% mass loss). It can be observed that the heating slows down when the temperature increases. But once 160°C are reached after 7 minutes, the coffee bean is completely dry (1% of humidity) and the roasting chemical reactions start to take place. As the coffee color starts changing from light green to yellow and finally brown, the coffee bean absorptivity increases. This explains the maintained heating efficiency at higher temperatures. The famous "first crack" was heard after 13 minutes. It is caused by the changing structure and volume expansion of the bean during the roasting. A coffee bean can double its volume. Additionally to the effect of increasing absorptivity the reactions tend to be exothermic in the last roasting phase. For that reason and to avoid

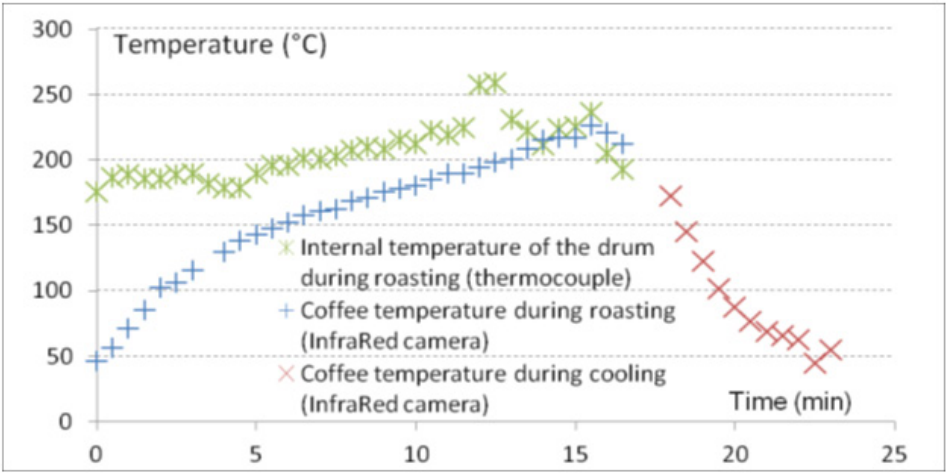
overheating of the coffee, at 15.5 minutes the Scheffler concentrator is defocalized which lowers the heating power. It is observed that a light decrease of the coffee temperature takes place in the following minute. The coffee is extracted from the roaster after 17 minutes. The cooling process takes 5 minutes to lower the temperature from 200 °C down to 50 °C.

Recommended characteristics of the solar roaster A cylinder in stainless steel of 28 cm depth with a 25 cm diameter, see photo 1 for dimensions, gives good results. A bigger size does not bring any benefit. The cylinder should be insulated with about 5 cm of insulation. A glass cover is not necessary. To fit more coffee in the cylinder it can be inclined at up to 20°.

the heart can be heated up

- rotating the drum faster: darker traces on the flat side of the grains are an indication of a too low rotational speed of the drum. With around 10 rpm grains remain too long in contact with the hot surface of the cylinder.

Alternative approach to be investigated
An alternative approach consists in heating the solar roaster drum from the outer surface. The cylinder would be black at least on the outside so as to absorb as much light as possible. Holes in the cylinder would enable elimination of the silver skin, water vapor and other gases produced during the process. The drum would be located in an insulated box with a hole that should be inclined downwards to limit convection



Typical evolution of temperatures during roasting and cooling process Foreseen improvement

The quality of the coffee obtained is good for a first step. Small imperfections indicate some ways of improvement:

- pre-heating the cylinder at no more than 180 °C: indeed over-roasting on the outside and under-roasting in the heart of the grain is observed in some of the tests. It is probably due to over-preheating of the drum. Thus when introducing the coffee the grains tend to burn on the outside before

losses. Having a cylinder totally closed enables a size reduction for the same amount of coffee, further improving the thermal performances of the system.

Charging coffee could be done as always per gravity and discharging could be done by clever blades in the drum that extract coffee beans simply by reversing the rotational direction.

This alternative approach has not been investigated yet due to time constraints and because the focus was on developing the most simple and efficient system. But the results obtained in the current study encourage both improving the current prototypes and investigating seriously in this alternative direction.

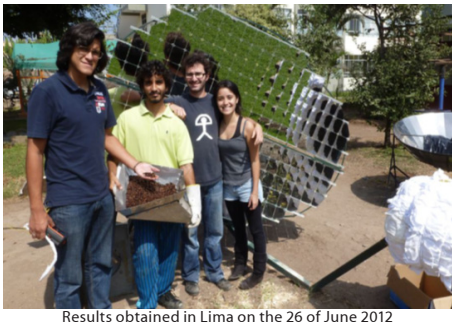
4 Perspectives

Further applications can be developed based on this technology. It was demonstrated that the coffee roaster can be used to roast cocoa and broad beans too. Popcorn can even be produced easily, provided a tempered glass is placed in front of the cylinder to prevent the corn beans to pop out of the cylinder! The same concentrator can be used for cooking and other application can be developed, such as milk pasteurization, essential oil extraction...

The current state of development of the technology is very promising. The concept proved to yield good results like photo 4 illustrates. The technology raises attention and people from the community seem interested. The perspectives of this solar roasting technology are great, but there is a lot to do to improve this first generation of prototypes. The foreseen steps to follow in the next phase of this project can be summarized as follow:

- improvement of the prototypes developed:
  - improve the structure that supports the roasting cylinder, including the system that enables easy extraction of the coffee at the end of the roasting;
  - improve the cooling process of the coffee to ensure good quality of the coffee;
  - implement a temperature sensor for easy control of the temperature in the cylinder;
  - implement the photovoltaic power unit to supply the motor that ensures the rotation of the roasting cylinder; the same power unit could provide energy for the cooling process;
  - design a robust electrical system to resist the humidity;
- provide a user guide and organize a workshop on how to use:
  - the Scheffler reflector and
  - the solar roaster, specific know-how is required to obtain coffee of good quality. Although with little experience, it is possible to learn and get decently good coffee;
- further experiment with better monitoring of the variables of interest. This will enable comparison with the physical model, leading to a better understanding of the system. In this way the design of the technology will

Example of test on a prototype with insulation (left) and without insulation before the installation of the motor (right), test field of the support group for the rural sector, Pontificia Universidad Católica del Perú



Results obtained in Lima on the 26 of June 2012

be surely further optimized.

- investigate seriously in the alternative approach based on a closed cylinder heated from outside and protected by an insulating box.
- develop a physical model inspired by the existing one,
- develop and build prototypes to validate expected results
- study the strategies to enter the market with such a solar coffee roaster

MY WAY AFTER EUREC

by Michael Norton, Ireland, EUREC 2010/11

There are certain advantages to being a native English speaker. I left Ireland in 2009 to work in solar cell research in Leuven, a Flemish speaking city in Belgium. This was my first experience of living abroad, in a country where English was not natively spoken. Needless to say I didn't need to learn a word of Flemish to get by, and so I didn't. Then it was off to Oldenburg, Germany, for the core semester of the EUREC masters. With only one other native English speaker among the PPRE and EUREC crew, I was severely impressed with the level of English my fellow classmates had, and at the same time, curious as to what it would be like to be able to master another language. I certainly didn't need to learn a word of German to get by, and so I didn't. For the master's thesis project I went to Norway. And it so happened I didn't need to learn a word of Norwegian to get by, and so I didn't. After the thesis presentation, enough was enough, it was my personal mission to enter the void, and learn to communicate in another tongue. Buenos dias, Buenos Aires, I thought.

One year later, after an enjoyable linguistic learning curve, which continues to curve, a

Orlando Venegas (PPRE 2010/12) visiting me at the iEnergia stand, Expo Eficiencia, March 2013, Santiago, Chile.

iEnergia Team with Visitors from Lorentz China, November 2012.

bit of travelling and a short stint as a waiter, I'm working as a PV specialist for iEnergia, Santiago, Chile. Started in 2008, the company has three main branches. The first to take off was the Solar Pumping part, now boasting over 500 installations the length of Chile, which is long, and thin. The second line deals with efficient lighting, from office illumination to street lights and from warehouse lighting to solar posts. Where it gets really interesting for me is in the PV part of the company, where yours truly designs Grid tie, Off Grid and "Hybrid" i.e. Grid tie with battery backup, systems. Right now we are working on a rural electrification project in the scenic Lake District in the south of Chile. We have designed and will install around 70 small off-grid PV systems, in communities based in logistically challenging areas. Let the fun begin.

Other exciting tasks include setting up a PV demonstration and teaching laboratory in our office/warehouse. The purpose of the lab is to demonstrate the functioning of the different types of PV systems and to continuously test and compare different PV components such as charge controllers, modules, inverters, and also system architectures. The aim is to find the best solutions for the Chilean market. The lab will also serve as the practical hub for our PV training courses which we aim to give to installers, universities and businesses. Now we just had the floor put down and a wall painted red, but soon it will be filled with wonderful toys.

KENYA'S FUTURE ELECTRICITY GENERATION MIX

by Ronald Ketter, Kenya, PPRE 2012/14

Kenya's economic blueprint, Vision 2030, recognizes the energy sector as one of the infrastructure enablers of the economic, social and political pillars underlying the Vision. As Kenya aspires to be a middle income economy as envisaged in Vision 2030, it faces an enormous task of meeting en-

ergy needs due to the expected economic growth and hence an increase in energy demands. The government of Kenya recognizes affordable, quality and cost-effective energy services as an important prerequisite for attainment of accelerated social economic growth and development. There are three main sources of energy in Kenya. These are: wood fuel, petroleum and electricity, accounting for 70 percent, 21 percent, and 9 percent of total energy use respectively. Renewable energy is also becoming important although it remains insignificant in the country's overall energy mix.

Kenya's current electricity generation mix is highly dependent on increasingly unpredictable hydropower and fuel-price-sensitive thermal power options. Hydropower accounts for 50.4% while thermal power accounts for 39.1% of the installed capacity of 1670 MW as of June, 2012 (KPLC). The expanding economy and the accelerated national electrification program require continual expansion of energy supply resources to match requirements. The country therefore has had to come up with strategies and investment plans to secure sustainable supply of energy to meet the growing demand. Over the years the government has been involved in medium to long-term planning of the electricity sector through the annual 20 year rolling Least Cost Power Development Plan (LCPDP). This is done by identifying existing potential in power generation and carefully forecasting on future demand for power and how best it can be met. In addition, the LCPDP explores possible investments in transmission network to evacuate the power to the load centres. The latest published update to the LCPDP was prepared in 2010 and covers a forecast period of 2011 to 2031. The LCPDP seeks to ensure the development of a diversified portfolio of power generation assets that is expected to shift to greener, cheaper and more dependable and sustainable technologies such as geothermal, wind, firm regional hydro power imports and nuclear power.

Kenya is considered to be one of the leading countries globally with significant geothermal resources with an estimated potential of between 7,000 MWe and 10,000 MWe. Geothermal has numerous advantages over other sources of power being a green source of energy with no adverse effects on the environment as well as high availability rate of over 95%. This makes geothermal one the most suitable source for base load electricity generation in the Kenya. However geothermal development had been slow due to lack of private sector participation mainly because of the high upfront risks and enormous capital investment. In order to facilitate investor entry into the geothermal sector, the Government of Kenya established the Geothermal Development Company (GDC) to accelerate the development of its geothermal resources. GDC was formed to undertake integrated development of geothermal through initial exploration, drilling, resource assessment and promotion of direct utilization of geothermal.

The current installed geothermal generation capacity as of June, 2012 was 209 MW (KPLC). According to Vision 2030 a total of 10,000 MWe will be required over the next 20 years, of which 5000 MWe is expected to come from geothermal sources. The ongoing geothermal projects include: 280 MW plant project scheduled for commissioning in 2014 in the Olkaria field, drilling in the Menengai Field for Phase I of 400 MW and initial project development activities for the development of 800 MW in the Bogoria – Silali Block.

Kenya is also considering nuclear energy as part of its energy mix. According to LCPDP 2011-2031, the first nuclear power plant of 1000 MW is expected to be operational by year 2022. Kenya Nuclear Electricity Board (KNEB) is the body charged with the re-

sponsibility of developing a comprehensive legal and regulatory framework for nuclear energy use in Kenya. So far KNEB has established a Pre-Feasibility Study Team, which is currently reviewing relevant international and national legislation impacting on the development of Kenya's nuclear energy programme. The objective of this review is twofold: first, to develop plans for the enactment of robust national nuclear legislation that complies with international best practice in accordance with the IAEA's Milestone Approach and second, to ensure that the national nuclear legislation that is developed does not conflict with any existing legislation. There have also been training of staff geared towards developing local skilled manpower that will be able to regulate and run nuclear energy related functions.

The Ministry of Energy has developed a draft National Energy Policy and Energy Bill (2012) which recognize nuclear energy as a potential source of energy for electricity generation in accordance with Vision 2030 blueprint. The Policy and Bill seek to transform the Kenya Nuclear Electricity Board into a Nuclear Electricity Corporation which will perform a number of important functions including but not limited to promoting and implementing the nuclear electricity generation programme; developing policies, regulations and proposing legislation necessary for the successful and efficient implementation of a nuclear power programme and undertaking extensive public education and awareness on Kenya's nuclear power programme. An independent nuclear power regulator is a key component in any successful nuclear power program. Plans to develop a regulator that would supervise safe and secure use of nuclear energy and additionally ensure compliance with nuclear energy regulations are underway, taking into account the current roles of existing bodies and how these roles would fit within the framework of nuclear energy use in Kenya.

Renewable energy is also going to play an important role in the diversification of electricity generation. Kenya aims at increasing the uptake of renewable energy sources and is one of the six countries selected by the World Bank to benefit from the Scaling-Up Renewable Energy Program (SREP). The program was developed "to pilot and demonstrate the economic, social and environmental viability of low carbon development pathways in the energy sector by creating new economic opportunities and increasing energy access through the use of renewable energy." Of the renewable energy sources, wind and solar energy sources are the most promising ventures. Thus far wind energy projects with an expected installed capacity of over 350 MW are at various stages of implementation. Solar energy projects so far have been mainly concentrated in rural electrification programs undertaken by the government and its development partners.

THE ENERGY SITUATION IN ECUADOR

by Pablo Carvajal, Ecuador, PPRE 2010/12

The Ministry of Electricity and Renewable Energy is the national authority regarding generation, transmission and distribution of electricity. It plans and constructs conventional and non-conventional energy projects and implements national policy to chance the energy matrix to a more sustainable one. For more than a year I have been working as an advisor at the Undersecretary of Renewable Energy and Energy Efficiency and with a multidisciplinary team we are leading several projects that are starting the transition of the way energy is generated


Ecuador's first on-grid wind park in the province of Loja, 16.5MW

and consumed. Renewables started strong last year with the agreements to install 282MW of PV power plants which would almost reach 6% of the total installed capacity of the country, and January this year we inaugurated the first wind park connected to the national grid with 16.5MW. The efforts in Hydropower have been even more significant, for 2016 we expect to feed 2500MW to the national grid so that more than 95% of the electricity generated in the country comes from renewable sources. Earlier this year we launched the Ecuadorian Wind Atlas and for late 2013 we expect to have our Bioenergy Atlas to identify regions in the country where biomass is concentrated and could be of use. Incentives for renewables have consisted in a feed-in tariff and Power Purchase Agreements that ensure the profit to private investors. For large Hydropower projects, international loans with friend countries have been made.

In the field of energy efficiency, we finished the national project to substitute 16 million residential incandescent lamps with compact fluorescent lamps last year. The 5-year project consisted in banning the import of incandescent lamps and flooding the market with efficient bulbs; estimations show that we have saved more than 280GWh/annum and delayed the installation of a 384MW thermoelectric plant. For the next 5 years we have a project to substitute 330.000 inefficient refrigerators with new class "A" ones that will save up to 533 GWh/annum. But the most ambitious project is yet to come with the introduction of more than 3 million induction electric cook stoves to replace cooking with LPG and that will save more than 300 million dollars a year of the importation of this fossil fuel.

As it seems, it is one of the best moments for the Ecuadorian power sector and especially for renewables. I hope this short summary of what is going on in my country has been of interest and if somebody has any doubts about one of these projects do not hesitate in contacting me. I am certain that a sustainable and cost-effective energy matrix is the first step for national sustainable development that will reduce poverty, renovate our production matrix and preserve our valuable natural resources.
PPRE team, keep on forging new generations of passionate professionals that care for their environment and society through the promotion of clean energy technology.
Kind regards from Quito, Ecuador.

SOME CASE STUDIES ON BIOGAS IN THE US & MEXICO

by Leodegario Lopez, Mexico, EUREC 2005/06

Specialization: Bioenergy / Company: Biogas Maxx Inc. / Place: US, NY, NYC

Michigan, US
Looking for a way of reducing or substitute their consumption of LPG, a mid-size vegetable and fruit processing company in Michigan contacted us in 2012 for developing a

Leodegario (right) on site visit at pharmaceutical plant in Mexico

biogas project with their organic residues. The company processes 12 different types of vegetables and 3 kinds of fruit. The total residue volume is around 25,000 tons per year. This is enough to power a 530kWe (or 1MWt) biogas facility to offset ~ 50% of their heat demand, even though there were some troubles: the production only takes place for 8 months a year and the electricity and fossil fuels prices are still rather low. Under such a scenario the project was not feasible.

One solution was to generate more income streams. As the company owned some land the advice was to cultivate some corn silage for running the facility during winter time where no residues are available. With an amount of 5,000 tons of corn silage (on idle land) they could run the plant during winter time and scale up to 790kWe (~ 1.6 MWt). Unfortunately, this still was not good enough. Only by offsetting the fossil origin fertilizer by the organic one produced at the biogas plant, the project could turn feasible. Luckily a fair number of combinations exist for generating more revenue. With the use of only a part (~40%) of the organic fertilizer the project turned feasible. Currently we are working with them to find a solution about the liquid fraction of digestate that is not needed for their crops. As in many northern cold regions the agricultural land is saturated with nitrogen and dumping it to the environment is definitively not an option. We are working on the issue to find a cost-effective way to treat the liquid digestate surplus while the solid part will be used into a 100%. The construction of the plant is programmed to start in 2014. The political and regulatory environment in the US towards renewable energy is changing slowly but surely, as for now, and the biogas sector is gaining more support and momentum. We hope it continues this way!

Toluca, Mexico

A well-known international pharmaceutical company contacted us last year to explore the possibility of reducing their energy bill while diminishing their carbon footprint as part of a new company directive. The company is producing vaccines and their residues are pretty humid (sludge alike). To avoid any bio-hazard the company basically dehydrates the resulting sludge. Such process, though necessary, is energy intensive and costly. Biogas technology turns out to be a good alternative to treat such bio-hazard residues, decreasing the use of fossil NG while reducing their energy bill and producing an additional cash flow.

The production period presented a similar problem to that of the facility in Michigan. The vaccines lines produce residues only 8 months a year due to limited market demand. As the production lines are used for the manufacture of other pharmaceuticals, their energy demand (heat & electricity) continues anyway throughout the whole year.

The use of corn as a feedstock for biofuels is forbidden in Mexico due to reasons of national security. Only imported corn is allowed to be used but this would have turned the operation into a very expensive and not environmentally sound option. For such reason we are working with a multi-stage AD process and the use of corn straw to operate during the entire year. Corn straw is allowed to be used as it does not compete with human consumption crops. The nearby region to the plant has abundant, native and low-cost straw for its use as feedstock while, at the same time, it gives a higher methane production per ton in relation to corn-silage etc. (whole plant).

In a first stage 1000 tons of sludge from the vaccine production plus 500 tons of corn straw will be producing 250 kW of installed capacity. This year is programmed to start this small-size facility construction. The pharmaceutical company plans to use the project as an example to show the potential use of hazard residues for energy saving, renewable energy production and carbon footprint reduction for other production sites belonging to the company.

SOLAR POWER GENERATION TECHNOLOGY PROGRAM IN JAPAN

by Rania Elhadi Adam, Sudan, PPRE 2007/09

I participated in a two-month training program on solar power generation technology which took place in Kitakysha city, Japan. The program was sponsored by the Japanese International Corporations Agency (JICA) and took place 26 Feb to 28 April 2012. We were 14 participants from different developing countries (Ecuador, Palestine, Nigeria, Bhutan, Pakistan, Cuba, Trinidad, Tobago, Algeria, Iraq, Uganda, and Sudan).

Objectives of the program

To understand the theory and principle of solar power generation and apply them to business for the introductory promotion maintenance and management of a photovoltaic power generation system – for the effective use of solar energy for electrification especially in rural areas.

Course contents

The course consists of lectures, practical work and visits, and covers the following topics:

- Japanese energy policies and comparison with those in our countries.
- Understanding the science and technology underlying a PV power generation system and its application as primary source of electricity.
- Understanding the technology behind a

Rania at practical work

power system of renewable energy and formulating an electrical system plan.

- Drawing up an action plan that best suits the country's situation

Cultural visits

Each participant spent one day with a Japanese family to see their style of living, and also to know some of their culture.

We also visited ancient and tourism places in different cities in Japan.

My current job

Currently I am working as a researcher in the Solar Energy department at the National Energy Research Centre (NERC), Ministry of Science and Communication of Sudan.

My main tasks cover:

- Conducting experimental research on PV modules and solar systems.
- Utilizing PV systems for rural electrification; the utilization of the PV system comprises system, design, installation and maintenance.
- Training of target groups including engineers, technicians, and also for the users of solar energy devices.
- Tutor of research projects and experiments related to PV for B.Sc. and M.Sc. students.

Rania visiting a local family…

…..& touristic places

REN21 RENEWABLES GLOBAL STATUS REPORT: BECOME A GSR CONTRIBUTOR!

by Sandra Chavez, Mexico, PPRE 2010/12

The Renewable Energy Policy Network for the 21st Century REN21 is a global multi-stakeholder network of both private and public sector stakeholders with the mission to promote the rapid uptake of renewable energy to meet the needs of both industrialized and developing countries. REN21 has the goal to facilitate knowledge exchange, policy development and joint action towards a rapid global transition to renewable energy.

A couple of months ago I had the opportunity to join the REN21 Secretariat and support them in the elaboration of the Renewable 2013 Global Status Report GSR **(ren21.net/gsr)**. First released in 2005, the GSR is a truly collaborative effort of over 500 authors, contributors and reviewers. Today, it is one of the most frequently referenced reports on the renewable energy market, industry and policy trends. It provides a testimony of the undeterred growth of electricity, heat, and transport fuel production capacities from renewable energy sources.

REN21 Secretariat Team with Sandra in the middle holding the RE 2013 GSR

The GSR process starts with the data collection, where hundreds of local focal points voluntarily share their information with the REN21 Secretariat. The authoring team uses this information to draft the report which is then reviewed by a global network of renewable energy experts. A key challenge during this process is obtaining recent and reliable data for all global regions, with Central Asia, South East Asia & Pacific and Africa being a particularly difficult region to cover due to language barriers and other obstacles. I'm confident that the PPRE community can collaborate in the data collection process and help close these gaps.

As renewable energy experts we have excellent, up-to-date information for technology, market data at country or regional levels, as well as for the rural renewable energy sector. I highly encourage all of you to participate and be part of this network! The time you invest will contribute to a more rapid global transition to renewable energy and you will be able to extend your network.

Interested in participating? Please send an email to contributors@ren21.net and we will be happy to provide you with further instructions. For more information please visit the REN21 website (ren21.net), where you can also take a look other REN21 products such as the Renewables Interactive Map and the Renewables Global Futures Report GFR.

A PROGRESSIVE RENEWABLE ENERGY POLICY FOR THE KINGDOM OF LESOTHO

by Dr Binu Parthan, India, PPRE 1997/98, Principal – Sustainable Energy Associates

bp@seassoc.org

The Kingdom of Lesotho is a land-locked country surrounded by South Africa and occupying 30,355 square kilometres. 74% of the country is covered by mountains and foothills resulting in the economic activities being limited to the remaining low lands. 83% of the households in Lesotho are in rural areas and 70% households derive all or part of their livelihoods from agriculture. The Human Development Index (HDI) value of Lesotho is 0.450 positioning the country at 160 out of 187 countries. A major impediment to human development in Lesotho is poverty; resulting from limited resources, low productivity etc.

The total primary energy supply for Lesotho is 37.2 PJ and the country's energy mix is dominated by traditional biomass with a share of 66%. Modern forms of energy such as petro-products, coal, electricity and gas constitute the remaining 34%. Electricity only contributes 6% of the national energy mix and the local electricity generation was 522.3 GWh from an installed capacity of 76 MW. The peak demand of 145 MW in winter is met through energy imports from the South African Power Pool (SAPP). Industry is the biggest electricity consumer at 39%, followed by the domestic sector at 34%. The annual per capita electricity consumption is 253 kWh, significantly below the African average of 579 kWh and the world average of 2,777 kWh. The electricity access rate is 26%, with 65% of the urban households and only 6% of the rural households having access.

The Lesotho Renewable Energy Policy (LesREP) which I developed for the Government of Lesotho with funding from UNDP and the government of Japan aims to create a progressive, long-term policy framework to use locally available renewable energy sources in Lesotho. The LesREP has three main objectives:

Rural households in Lesotho use kerosene wick lamps to light their homes. These are unsafe and often result in accidents and burn injuries.

- Enhance the energy security of Lesotho by reducing reliance on fossil fuels and electricity imports;
- Enhance the access to modern energy for rural and decentralised areas of Lesotho;
- Ensure protection of the environment through reduction of Greenhouse Gas (GhG) emissions from the energy sector in Lesotho as well as avoid related environmental damages.

LesREP also envisages two targets by 2030 – installation of additional 200 MW of power generating capacity through renewable en ergy and increasing the household energy access rate to 75% primarily through renewable energy.

Women spend almost half a day to collect shrubs for cooking and heating with serious indoor air pollution and resultant health issues to women and their children.

The scope of LesREP includes all renewable energy sources that are relevant to Lesotho viz. hydro, wind, solar, biomass and geothermal. Conversion technologies to covert these renewable energy sources to electricity and heat have been included in the scope as well as technologies to support the increased share of renewable energy in the energy mix viz. smart grids, energy storage and electric transportation. Based on analysis of the situation in Lesotho, the following elements have been included in the LesREP:

- Policy Measures have been made to significantly increase the contribution of renewable electricity, renewable heating and cooling and off-grid applications of renewable energy. The policy instruments that have been recommended include guaranteed access to the grid; net-metering for small systems; reverse bidding for feed-in-tariffs for large systems; third-party sale by large systems; incentives for solar water heating systems combined with a ban on electric geysers, financing for cook-stoves; a mini-grid based village energy service delivery model using public services and rural enterprises as anchor customers and an incentive mechanism to provide basic energy services in rural areas at urban tariffs. Also included are measures to encourage the utility to invest in smart grid technologies, grid-scale-energy storage as well as incentives for purchase of electric and hybrid cars by vehicle fleet operators and private individuals.

- A Regulatory Framework has been proposed for effective implementation of the policy measures and will consist of the technical and business conditions for net-metering, technical and business conditions for electricity sales to the utility and to third parties. The regulator will also determine the quantum of basic energy service that needs to be supported in rural areas.

- Standardisation and Quality actions have been proposed which are contingent on Lesotho to establish a national framework for standardisation, testing and accreditation. A large number of technical standards from international and regional standards bodies have been identified for application in Lesotho. Banning the import of second-hand

A proud owner of a Solar Home System next to her traditional rondevel.

Basotho Children showing off their new solar lighting system

equipment and incandescent lamps and limiting the use of fluorescent lamps have been proposed.

- Investment Framework and Financing arrangements have also been developed which consist of feed-in-tariffs with price discovery through reverse bidding, reduced sales tax rates, harmonisation of import duties within the Southern African Customs Union, investment incentives of accelerated depreciation and classification of renewable energy as a priority sector for lending. In addition, the government will move on from capital subsidies to interest subsidies and a finance facility will be established to support renewable energy, smart grid technologies and electric transportation through interest subsidies and incentives. A small levy will be introduced on sales of fossil fuels and electricity to sustain the finance facility.

- Institutional Arrangements have also been proposed which will see the renewable energy unit in the department of energy getting upgraded and strengthened, and a single-window agency established to support renewable energy investors. The other key renewable energy stakeholders like the regulator, meteorological services, the utility, national standardisation and quality assurance framework will also be strengthened with renewable energy capabilities.

It is believed that the LesREP will create the framework under which self-sustaining renewable energy markets will develop in Lesotho, driven by private investments catalysed by smart government policies to make the country energy secure.

THE SOLAR THERMAL INDUSTRY AND ITS LINK TO SUSTAINABLE DEVELOPMENT IN THE REGIONS SOUTH OF PERU

by Cesar Efrain Rivasplata, Peru, PPRE 1988/89

Faculty of Sciences, Center of Renewable Energies, National University Jorge Basadre Grohnman

Abstract

Energy in its various forms plays a fundamental role in the development of a country, its consumption and use representing a vital condition in the dynamics of different processes that play a role in the vital issues of survival, from cooking food to large-scale production processes in the industry. Electricity is one of the cleanest and most domestic types of energy we can have, but this generation mainly uses primary energy such as coal and oil, with the consequences of dependence, pollution, and the social consequences that the generation of this type of energy produces.

Domestic uses of electricity include shower water heating, space heating, refrigeration, air conditioning, lighting, cooking etc. The use of electricity for heating water for showers makes up for about 40% of electricity consumption in an average household, which usually consumes between 200 to 300 kWh / month.
These 40% have the possibility of being replaced by pollution-free solar energy.
The southern regions of Peru (Tacna, Moquegua and Arequipa) have some of the most promising energy resources in terms of mean solar irradiance values of the order of 6 to 5 kWh / m². During the day, the use of solar thermal energy for heating water is a growing practice, which has produced a high-potential industry with more than 5000 m² of collector area installed per year and an accumulated approximate 60,000 m², which means a contribution of approximately 43.800 kWh – a considerable amount when energy saving, the decreasing dependency on other contries and environmental pollution are considered (a power plant approximately equals 25 MW of installed capacity).

This paper assesses the history, growth and projections of the solar thermal industry in the southern regions of the country and its impact in terms of saving energy, generating jobs and reducing pollution.

Introduction

Peru has an area of 1.285.215 km2 and is the third biggest country in South America. The solar resource is available almost everywhere throughout the country: (4-5 kWh/m2 per day along the coast and in the jungle and 5-6 kWh/m2 per day along the Andean Range, increasing from the northern to southern area (www.minem.gob.pe). All these features and realities in Peru indicate that the use of solar energy represents an opportunity and sustainable energy is a serious alternative in certain scenarios where it is feasible to apply this type of development.

Technology Transfer and Projects in Solar Thermal Conversion

The Peruvian national company has agreed to its development since the subject of solar energy was expressed through the mass use of solar thermal. This development has greater application in places where the weather conditions are favorable. The city of Arequipa in southern Peru is a symbol of the widespread use of solar thermal. In this city alone, approx. 30 companies are engaged in the construction and/or marketing of solar thermal systems in the region. They spread the use of solar thermal systems (either for home, residential or industrial use) to different cities.

Studies commissioned by *Precobre*, Peru, on the issue of using copper piping in the solar thermal systems indicate an average number of actual cumulative production of around 60,000 m² of collector area, representing a contribution of energy power in the order of 25 MW. The technology used in the construction of solar thermal collectors is in a position to compete internationally, and there is a company that has managed to export within the Andean Community.

It should be noted that the solar thermal industry has not had more incentive to its development than the rules that prevail in the market. It started with an incipient technological development which to date has achieved a level of maturity and confidence that promotes an annual increase of 5% (average annual production: 5000 m² of collector area), generating jobs and contributing directly and indirectly in the reduction of greenhouse gases. Potentially this industry could prove to be superior to the exchange program of carbon credits.

On the other hand, the Peruvian state, through INDECOPI, has developed a series of voluntary technical standards related to the topic of solar collectors in the field of evaluation of the efficiency of collecting, labeling and technical conditions at the facility.

At the level of product quality control offered, there is an organization that cares about it. It has been raising the need for a quality control laboratory of the thermal and solar collectors, attesting not only efficiency parameters, but also product quality in terms of appropriate use of materials, aging tests, process safety installation, qualification of specialists, designers and installers etc.

Potentially some national universities (UNI-Lima-Tacna UNJBG UNS-Chimbote; UNSAC-Cuzco-Arequipa UNSA) could provide access to this service through their renewable energy centers and laboratories, but one must first generate a process of accreditation and certification of specialists in these laboratories and the existence of a regulation at the level of government that promotes the use of solar thermal in the national program of energy saving, and implement an obligation of companies to certify their product through these laboratories. Undoubtedly, this type of development must ensure a sustainable development point of view of the market, an industry that does not enjoy the privilege of subsidies by the state and has grown by its own efforts.

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1.65 MW ROOFTOP PV SYSTEM COMMISSIONED AT SALT PALACE CONVENTION CENTER

by Antonio Antonopoulos, Canada (EUREC 2005/06) – *VP Technology*, CarbonFree Technology, Toronto, Canada

Salt Lake City, May 24, 2012 – Salt Lake County and its partners will officially "flip the switch" on Utah's largest rooftop solar installation at a ceremony today.

The 1.65 megawatt system is forecast to generate approximately 2,347 MWh of clean electricity in its first year, offsetting 17 per cent of the Convention Center's annual electricity consumption. This is the equivalent of the electricity consumed by 250 average Utah homes.
The system is the largest photovoltaic installation in Utah to date, and the largest one in Rocky Mountain Power's utility service area. It covers 3.85 acres of roof space and uses 6,006 275W Buy American Act compliant solar modules made in Arizona by Suntech America, Inc. If laid end-to-end, the modules would stretch 7.3 miles.

The system was developed by CarbonFree Technology Corp., a leading North American solar project developer. CarbonFree also arranged and structured the financing of the project. The Salt Palace benefits from the use of New Markets Tax Credits, Qualified Energy Conservation Bonds, federal Section 1603 cash grants and other federal grants. Financial partners included JP

Morgan Chase and National Development Council, with Zions Bank Public Finance acting as a financial consultant.

"This project is one of a very small number of solar projects ever to use NMTCs. While the transaction was more complex than the standard solar financing, all parties were committed to making the project a success," said David Oxtoby, CEO of CarbonFree Technology. "As a result, the Salt Palace is able to buy the energy generated by the system at a low price competitive with grid electricity."

The system was installed by Bella Energy Inc. over a four-month period and required approximately 14,000 person-hours of locally sourced labor. It was constructed on schedule and on budget, with no change orders and no injuries.

Salt Lake County Mayor Peter Corroon has set a goal of installing up to 10 MW of solar power on county-owned facilities. The Salt Palace is the eighth and largest facility to use solar power so far.

"This solar project boosts the County's clean energy goals while benefiting our pocketbooks," said Mayor Corroon. "It will save money, generate clean energy, and serve as an example of the solar possibilities in Utah."

About CarbonFree Technology

CarbonFree Technology is a leading North American solar project developer. The company has developed more than 9 MW of photovoltaic projects across North America and has many more MW in the near-term pipeline. CarbonFree works with major institutional investors to develop portfolios of rooftop and ground-based solar projects. Industrial, commercial and institutional clients benefit from CarbonFree's Power Purchase Agreements, leases and other financial structures, enabling them to choose the best solar solutions and equipment for their own unique needs, at little or no upfront cost.

1.65 MW rooftop PV system at Salt Palace Convention Center, UTAH, US

AAMRAI (ORCHARD) -AN INTEGRATED TRIBAL REHABILITATION PROJECT FOCUSED ON LIVELIHOOD, ENERGY AND ENVIRONMENT

by Partha Mukherjee, India, PPRE 1989/90

Introduction

India is a country of over 1 billion people. Almost 70% of the total population live in the villages and depend on natural resources to meet their day-to-day basic needs like food, fuel, fodder and water, which results in ecological imbalance. The natural forest resources are depleting fast. Because of unscientific use of land, water and unlimited use of chemicals, more and more productive land is becoming degraded. Over and above, there is large-scale exploitation of natural resources by contractors and unscrupulous businessmen. As a result, many areas are already facing acute shortage of water, fuel and fodder. Tribal population who normally live in interior forest areas are hard-hit as their life depends on natural resources. Considering the plight of poor tribes, Jankidevi Bajaj Gram Vikas Sanstha (JBGVS), the CSR arm of Bajaj Auto Ltd. (second largest two & three wheeler manufacturer in India) has initiated the Aamrai project in partnership with the National Bank for Agriculture and Rural Development (NABARD), Govt. of India.

The Project

The project aims at establishing orchard of mango and another fruit locally known as amla (Emblica officinalis) on 900 acres (1 acre is equivalent to about 40,000 Sq.Ft.) of wasteland covering 900 poor tribal families in 18 villages of Pune District of Maharashtra. In addition, the project also covers 100 landless tribal families through livelihood development programmes.

In each acre, 50 fruit trees consisting grafted varieties of 30 mango and 20 amla saplings have to be planted. In addition, about 500 forestry species are to be planted around the boundaries of the land. The forestry plants are expected to provide fuel & fodder to the family. This programme is also known as WADI (small orchard) programme in India. Presently, half-acre WADIs are also being promoted on 20,000 sq.ft land through plantation of 25 fruit plants.

To reduce the use of firewood for cooking, an improved stove and a pressure cooker would be given to each of the participating tribal families. Landless tribal families (100) will be provided with income generation

Distribution of Saplings

Tribal family in their orchad

sources like goat rearing, dairy, trading of grocery items, small shops in the village etc., thereby covering 1000 tribal families.

Landless family with their goats

Achievements

The project was started in April 2009 and will continue until March 2017. The plantation on 860 acres of land has been completed covering 908 families (including 96 half-acre orchards) in the first 4 years. Because of non-availability of suitable beneficiaries in 40 acres of land, we have stopped further plantation activity. Within the next 4 years, the plants will be nurtured so that they grow well and produce good-quality fruits. All the families have planted local variety forestry species around the boundaries of the orchard so that the survival rate is high. It is expected that each tribal family will earn Rs.65,000 (about US$125) every year from the 10th year onwards from their orchard.

The project villages are in a high-rainfall zone. Because the terrain is undulating and there is a high run-off rate so that there is a water shortage during the summer months. We have provided plastic containers to the tribal farmers for watering the plants. They use plastic containers to carry water in bullock carts from the nearest water sources (ponds, lakes, wells etc.) to their orchard.
Because of large-scale deforestation of

Happy farmer

forests, the project has tried to tackle the firewood problem by increasing supply through plantation of local forestry species and conserving firewood by increasing efficiency through the promotion of improved cooking stoves and distribution of pressure cookers. Through government departments, 200 portable solar lanterns (local name of PV lamps) have been distributed to the tribal families for home lighting. To make the project sustainable, tribal men and women are trained on improved horti-

Training for SHG women

cultural practices, use of organic fertilizers, water and soil conservation techniques, cultivation of intercrop, efficient use of firewood for cooking etc. Every year, health check-up camps were organized mainly for women and children. Self-Help Groups (SHGs) of women were formed, training programmes were conducted to start saving

and credit amongst themselves and later linked them with banks for income generation loans.

Mr. Mukherjee in farmer's training

Conclusive Remarks

The plantation carried out in 2009 has started fruiting. Full-fledged production will start after the 7th year, i.e. 2016. This has given hope to all the farmers participating in the project and encouraged others. 50 landless farmers have started dairy and goat rearing at home and earning US $ 70-80 per month. More than 4 lakh saplings have been planted in 860 orchards developed on waste land. The project has empowered 908 resource-poor tribal families (approx. 5000 people) in 18 villages. Though there is no study as yet, the tribal families have informed that the use of improved cook stoves and pressure cookers has conserved firewood and reduced indoor kitchen pollution, which is one of the largest killers of women and children (who spend most of the time inside their homes) in developing countries.

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RENEWABLE ENERGY OUTLOOK IN PERU

by Dr. Johnny Nahui-Ortiz, Peru, PPRE 1993/94

The renewable energy scenario changed substantially since bidding processes were established in Peru.

First RER Bidding Process

The first bidding processes for the so-called Renewable Energy Resources (RER) in Peru were developed according to a regulatory framework established at the end of the year 2008 for the promotion of renewable energies.

The objective of the bidding process was to select RER generation projects based on biomass, wind, solar and small-scale hydropower in order to supply electricity to the main grid, which had some constraints such as: a) deadline for starting commercial operation was December 2012, b) energy quotas assigned for each technology, and c) reference ceiling prices.

Since total energy requirements were not covered by a first call, a second call was carried out in order to fulfill the remaining energy requirements. Thus, the first RER bidding process had two calls. The energy requirements (in GWh/yr) associated with the first call was: 813 (Biomass), 320 (Wind) and 181 (Solar). In the case of small-scale hydropower plants (less than 20 MW), the requirement was stated in terms of capacity, up to a limit of 500 MW. As a result of the first RER bidding, electricity supply contracts were granted to 17 hydropower plants smaller than 20 MW, 4 solar photovoltaic plants, 3 wind energy plants, and 2 biomass plants, accounting for a total of 411 MW and 1887 GWh/yr.

Ceiling prices were established by the regulatory body through studies conducted by a consulting company specialized in this type of technology and considering, among others, the type of technology, investment costs, exploitation costs, a 20-yr horizon, a 12% rate of return, project sizes, interconnection costs and other factors that encourage the investment in cost-efficient projects.

As a result of the process, it was achieved to cover 68% of the energy required for wind, biomass and solar technologies. In the case of hydropower RER plants, 32% of the offers were granted. Therefore, the first call was declared partially deserted, and thus it went that a second call was carried out to auction the uncovered requirements.

The objective of the second call of the RER bidding process was to cover the remaining energy from the first call for technologies based on biomass, solar, and small-scale hydropower. As a result of the second call, only an 18-MW hydropower project was granted. All the remaining participants were disqualified due to prices higher than the ceiling price established by the regulatory body. Renewable energy projects (associated with solar, wind and biomass power) that were granted through the first RER bidding process are shown below.

Technology	Project	Price offered (US$/MWh)	Capacity to be Installed (MW)	Plant Factor (%)	Granted Energy (GWh/yr)
Biomass	Agro Industrial Paramonga S.A.A.	52,00	23,00	57,00	115,00
Biomass	Petramax S.A.C.	110,00	4,4	73,00	28,30
Wind	Marcona	65,62	32,00	52,93	148,38
Wind	Central Eólica Talara	87,00	30,00	46,00	119,67
Wind	Central Eólica Cupisnique	85,00	80,00	43,00	302,95
Solar	Panamericana Solar 20TS	215,00	20,00	28,90	50,68
Solar	Majes Solar 20T	222,50	20,00	21,50	37,63
Solar	Repartición Solar 20T	223,00	20,00	21,40	37,44
Solar	Tacna Solar 20TS	225,00	20,00	26,90	47,20

Second RER Bidding Process

The second RER bidding process was carried out in August 2011 and the energy requirements (in GWh/yr) were: 593 (agro-industrial biomass waste), 235 (urban biomass waste), 429 (wind) and 43 (solar).

As a result of the second RER bidding process, a few contracts were granted including 7 hydropower plants with capacities below 20 MW, a 16-MW solar project, a 90-MW wind project, and biomass projects with urban waste under 2 MW.

Projects that were granted through the second RER bidding process are shown below.

Technology	Project	Offered Price (US$/MWh)	Capacity to be Installed (MW)	Plant Factor (%)	Granted Energy (GWh/yr)
Urban Waste Biomass	La Gringa V	99,99	2,00	80,00	14,02
Wind	Parque Eólico Tres Hermanas	69,00	90,00	52,73	415,76
Solar	Moquegua FV	119,90	16,00	30,50	43,00

Actual Energy Produced by RER projects
At present, peak electricity demand in Peru is around 4,500 MW. A report from April 2013 shows the following energy production associated with RER projects already in operation.

RER Project	Energy Production (MWh/dy)
Agro-Industrial Paramonga (Biomass)	317,80
GTS Majes SAC (Solar)	149,94
GTS Repartición SAC (Solar)	148,29
Panamericana Solar SAC (Solar)	158,51
Tacna Solar SAC (Solar)	163,14
Petramax (Biomass)	101.08

A third RER bidding process is expected to be conducted during 2013. Prices for electricity generation based on solar photovoltaic systems are expected to be lower than in previous bidding processes but prices for wind energy are expected to remain at the same level.

THE HAEUSLEBERG OFFGRID ELECTRIFICATION PROJECT IN GERMANY

by Roy Emmerich, South Africa, EUREC 2008/09

On page 22 of the 2009 PPRE Newsletter **Craig Wong, US, EUREC 2007/08** provided a short report of the work done on the Häusleberg farm near Freiburg in Southern Germany. I'm pleased to announce that the project is still chugging along and even has a bit of a web presence <https://sites.google.com/site/haeusleberg/> should you care to take a look.

For this newsletter I would like to draw your attention to my efforts in building and installing a pico-hydro turbine on the farm in 2012. Firstly I want to thank **Carlos Zárate Espinoza, Peru, PPRE 1987/1988**, Mauricio Gnecco and **Manfred Amoureux, France, EUREC 2007/2008** for their valuable input. Technical details can be found on the website under the phase 4 menu.

The story began when a few young RE engineers arrived on the Häusleberg farm in July 2009 to begin installing a small hybrid system. Upon being confronted by existing water reticulation infrastructure used only for drinking and cooling groceries, we knew we had to someday connect up a hydro turbine to generate electricity too. Easier said than done, especially with very little money to spare. Fast forward three years and the job is complete...well mostly.

Over the years we looked at many different designs which could cope with a head of 40 metres and a very low flow rate of only 1 litre per second. All were way out of our budget. We then considered using a pump (in reverse) as a turbine but due to the low flow rate I wasn't comfortable with this approach either. In the end I decided to convert an LG direct drive washing machine into a pelton pico-hydro turbine. Thanks to many websites such as The Back Shed <http://www.thebackshed.com/Windmill/FPRewire.asp> I was able to modify the stator to better match a 12 volt system. In the end, if you don't count volunteered time from a number of friends and all the mistakes I made, the end result come to about €600, including dump load and controller, compared to €2000 for a PowerSpout <http://www.powerspout.com/> without a controller. The added bonus was that I learnt an awful lot through the experience, including how difficult it is to get a turbine working really well.

And there lies the catch! Ideally the turbine could produce about 250 W. At 50% efficiency this would result in a respectable 120 W output. But unfortunately, even after reconfiguring the inlet piping to reduce ben-

ds, the end result is still only sitting at about 45 W. The main reason for this, I think, is due to a mismatch between motor and pelton runner. After modifying the stator I didn't have the time or facilities to bench test the new motor configuration. The pelton runner is too small in diameter which resulted in a low torque applied to the shaft by the jet of water. With hindsight it should have been at least the size of the direct drive motor stator. But despite the relatively poor performance of the turbine, it still saved our bacon this winter. We made it through without any major interruptions and without killing the batteries. I'm pretty satisfied with my little hybrid system on a shoe string budget!

Handmade pelton pico-hydro turbine from a direct drive washing machine

Stay posted for my next update in 2014. This summer I hope to design and install a data logging system based on open source hardware and software with remote data access capabilities.

RWANDA'S RURAL ELECTRIFICATION STRATEGIES - DISCUSSIONS

An article published in Africa Alternative Energy News on March 6, 2013 read as follows:

Comments sent by PPRE-alumni:
By Wisdom Ahiataku-Togobo, Ghana (PPRE 1997/98)
Director, Renewable & Alternative Energy, Ministry of Energy, Ghana:

Rwanda Debuts New Electrification Plan

Rwanda unveiled a new plan to up its rural electrification on March 5, focusing on solar panels and mini-grids. The government aims to bring power to 70% of its population by 2017, but that figure may be a bit too unrealistic since its current electrification rate stands around 15%. The Ministry of Infrastructure released a report that said with at the country's current rate, only 33% of Rwandans living on-grid will have electricity by 2017.

State Minister in Charge of Energy Emma-Francoise Isumbingabo said that 100,000 biogas digesters need to be fully subsidized to the poorest families in categories 1 and 2. However, the government will need to spend $17.6 million for fully subsided 22,990 biogas digesters for the poorest families while $2.1 million would be spent on loans for 76,580 biogas digesters. Overall, Rwanda will need to spend an estimated $621 million for universal access compared to its original plan of nearly $800 million under the Electricity Access Role-out Program.

I am afraid the path taken by Rwanda is not sustainable and will not lead to universal access to modern energy by 2017. Ghana ever walked this path but quickly realigned. Extension by grid electricity is the most sustainable path as was done in developed countries.

1. Besides lighting, electricity is required (or will be required) for other applications in the household such as radio, Tv, refrigeration etc. As soon as solar is provided for lighting, the people will start demanding for energy for other applications and will soon undermine or reject the government support for solar. Lighting accounts for less than 20% of electricity consumption in the average Ghanaian home.

2. Replacement of components such as dc lamps, regulator and battery for solar systems is another major challenge often beyond the ability of most rural households leading to system abandonment. Beneficiary communities with access to electricity from solar soon returns to darkness after say 5 years of installation.

BIOGAS

1 Domestic biogas plants are only suitable for farmhouses with sufficient feedstock (dung and water).
For the non-farm houses, workload for collecting dung and water for the digesters soon becomes a liability on the women.

2. Furthermore, the digested slurry will have to be collected and transported away from the house to the farm or where ever during off peak farming season. The biogas digesters risk being abandoned within the first two years of installations due to the above.

I am glad to share more practical experience on these for the interested parties.
Wisdom, Ghana – March 13, 2013

By Al-Mas Sendegeya, PhD (Rural Electrification), Uganda (PPRE 1999/00)
Lecturer/RE Consultant at Polytechnic of Namibia, Windhoek

Dear Wisdom,

Thanks for the information about your experience. Actually 100% I agree with your idea, which is the most sustainable approach to rural electrification. I have been getting problems with some people advocate for small options thinking that rural people need electricity only for lighting. This is a big mistake, the moment a people access modern energy services even their needs for better and more advanced services increase. By the way people must remember "Maslow's hierarchy of needs emphasises the importance of self-actualisation".

Other small options (e.g. SHS, etc.) should not be emphasised as an ultimate solution to rural electrification. From personal view and experience, small solutions may work as an introduction to rural electrification just work as an eye opener to people realise the importance of electricity. These are short term solution but should not be planned to stop possible future large projects. To make short solutions sustainable, it is vital for the planners to ensure that the systems installed may easily be integrated into the large system, e.g. grid. This has been a problem in most developed countries rural electrification projects. Most projects are done in isolation without ensuring resource integration!

Colleagues - I have a lot to write about rural electrification but let me stop here.
Al-mas, Namibia – March 13, 2013

Herewith the PPRE-Team would like to encourage such discussions among our well experienced alumni in due course for the

benefit of all members of the PPRE-alumni network – either via the existing PPRE-Alumni-E-mail list or via any other platform. Let everybody gain from your experience, but simultaneously be open for new inputs and learn.

SMALL WORLD

sent by Antonio Antonopoulos, Canada (EUREC 2005/06)

So the funny story is that I am at a friend's house, and he is telling me about a lunch he had with a local politician here in the Toronto area that was telling him about some charities he is involved in. And the topic of remote solar PV systems comes up, and he tells my friend about a project in Uganda, etc., and gives him the report. So now my friend is telling me about this, and I say to him, "you know, there is a guy I know well from the PPRE masters in Oldenburg that is from Uganda, and he is working on renewables still", and then he shows me the report and I practically fell off my chair when I saw my friend's name Jagwe Wycliff's -- I couldn't believe it! The world is small!

*Explanation note from **Jagwe Wycliff (PPRE 2005/07):** the local organization in Uganda in charge of the project consulted us for a solar-PV hybrid solution to the rural hospital they are supporting to deliver sustainable modern medical services to the rural population somewhere in northern Uganda.*

HOW PEOPLE LINK EACH OTHER IN PPRE

In November 2012 **Udayan Pandya, India, PPRE 1993/94** met **Ankur Agarwal, India, PPRE 2008/10**, in Ahmedabad, India. He wrote "It was a very pleasant surprise to know that you guys still have that small solar cooker that I brought from my home. I could not believe when he shared that it was preserved for such a long time (almost 20 years!). Actually it was damaged over a period of time and Ankur was given a task to fix it during his PPRE-studies. He did explain how difficult it was for him. I think I should have had revisited this during my stay in Oldenburg (Udayan participated in the 25 year celebration in October 2012). I do appreciate that you do take care of such things you receive from the participants. I would appreciate if you could send me a picture. By he way Ankur knows me only because of the task given to him for something that was brought from Ahmedabad and was preserved for so many years!"

20 year old solar cooker still functionning at E-lab in Oldenburg

PPRE Students

Course	Family Name	1st Name	Tit.	Origin
1987-88	Bekdach	Hussein	Dr.	Lebanon
1987-88	Demel	Lothar	Mr.	Germany
1987-88	Dibor	Alfred	Mr.	Nigeria
1987-88	Fischer	Eric	Mr.	Brasil
1987-88	Heilscher	Gerd	Mr.	Germany
1987-88	Zarate	Carlos	Mr.	Peru
1988-89	Hamad	Bakri	Dr.	Sudan
1988-89	Kimaro	Ainea	Mr.	Tanzania
1988-89	Holtorf	Hans G.	Mr.	Germany
1988-89	Morares-Duzat	Rejane	Dr.	Brasil
1988-89	Nontaso	Ngarmnit	Ms.	Thailand
1988-89	Lu	Bai	Ms.	China
1988-89	Jia	Xi-Nan	Dr.	China
1988-89	Maiga	Alhousseini Issa	Mr.	Mali
1988-89	Oludhe	Christopher	Dr.	Kenya
1988-89	Pietscher	Jochen	Mr.	Germany
1988-89	Rakha	Hassan	Dr.	Egypt
1988-89	Camillo	Roger R.	Mr.	Nicaragua
1988-89	Ramesh	Muthya Praneshrao	Mr.	India
1988-89	Toro Cortes	Francisco	Mr.	Chile
1988-89	Rivasplata	Cesar	Mr.	Peru
1989-90	Gao	Ying	Dr.	China
1989-90	Jahn	Ulrike	Ms.	Germany
1989-90	Kimani	John Muiruri	Mr.	Kenya
1989-90	Han	Wei	Dr. .	China
1989-90	Miranda Murillo	Alexis	Mr.	Honduras
1989-90	Misra	Anil K.	Mr.	India
1989-90	Mukherjee	Partha Sarathi	Mr.	India
1989-90	Reynaldo	Reynaldo	Mr.	Philippines
1989-90	Schwarz	Thomas	Mr.	Germany
1989-90	Tarh	Zaccheus T.	Mr.	Cameroon
1989-90	Thi Hong Hai	Nguyen	Ms.	Vietnam
1989-90	Park	Myong-Sik	Mr.	Korea
1990-91	Barroga	Maria L.	Ms.	Philippines
1990-91	Hassan	Gimba	Mr.	Nigeria
1990-91	Usbeck	Stefanie	Ms.	Germany
1990-91	Ennison	Isaac	Mr.	Ghana
1990-91	Pandey	Krishna C.	Dr.	India
1990-91	Adam	El Fadil	Dr.	Sudan
1990-91	Kioko	Joel M.	Mr.	Kenya
1990-91	Knagge	Edu	Mr.	Germany
1990-91	Mishra	Christanand	Dr.	India
1990-91	Okae	Charles	Mr.	Ghana
1990-91	Osman	Abdalla	Mr.	Sudan
1990-91	Peiris	Wettasingha	Mr.	Sri Lanka
1990-91	Lemus	T. Hernando	Mr.	Bolivia
1990-91	Xie	Enhai	Mr.	China
1991-92	Abel	Bettina	Ms.	Germany
1991-92	Ally	Noel	Mr.	Guyana
1991-92	Gyi	Aung	Mr.	Myanmar
1991-92	Hakiem	Mahmoud El	Mr.	Sudan

1991-92	Ingwe	Anna Naftal	Ms.	Tanzania
1991-92	Kaur	Jagjit	Ms.	India
1991-92	Mansaray	Kelleh G.	Dr.	Sierra Leone
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1991-92	Mugisha	Patrick	Mr.	Uganda
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1991-92	Tegeler	Ludger	Mr.	Germany
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1992-93	Budiono	Chayun	Mr.	Indonesia
1992-93	Hamid	Mohamed Ali	Mr.	Sudan
1992-93	Kariyawasam	Palitha L.G.	Mr.	Sri Lanka
1992-93	Kassenga	Gabriel	Dr.	Tanzania
1992-93	Lonis Abdu	Bertha	Ms.	Nigeria
1992-93	Magno Desendario	Evelyn	Ms.	Philippines
1992-93	Shresta	Kedar Shanker	Dr.	Nepal
1992-93	Pandya	Udayan	Mr.	India
1992-93	El Asaad	Kawther A.. Mohamed	Ms.	Sudan
1992-93	Mutwaly	Safaá	Ms.	Sudan
1992-93	Wang	Jing Jing	Ms.	China
1992-93	Wafula	James C.	Mr.	Kenya
1992-93	Blaas	Markus	Mr.	Germany
1992-93	Georg	Rolf	Dr.	Germany
1993-94	El-Ghany	Ahmed Fathy	Dr.	Egypt
1993-94	Tubail	As'ad	Dr.	Palestine
1993-94	Tommy	Henry J.M	Dr.	Sierra Leone
1993-94	Nahui-Ortiz	Johnny	Dr.	Peru
1993-94	Leon	Mathias Augustus	Dr.	India
1993-94	Rommel	Mathias	Mr.	Germany
1993-94	Mergia	Mesfin	Mr.	Ethiopia
1993-94	Gadah Eldam	Nagwa	Ms.	Sudan
1993-94	Siefert	Oliver	Mr.	Germany
1993-94	Andriamahefaparany	Olivier Donat	Mr.	Madagascar
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1994-95	Tolessa	Samson	Mr.	Ethiopia
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1994-95	Ghebrehiwot	Debesai	Mr.	Eritrea
1994-95	Mesfin	Yohannes	Mr.	Eritrea
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1994-95	Kuntze	Björn	Mr.	Germany
1995-96	Negash	Bereket	Mr.	Eritrea
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1995-96	Ahmed	Maqbool	Mr.	Pakistan
1995-96	Magpoc	Godofredo Jr.	Mr.	Philippines

1995-96	Maltsev	Alexandre	Mr.	Russia
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1996-97	Schröter	Wolfram	Mr.	Germany
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1997-98	Zhang	Yin	Dr.	China
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1997-98	Vanginé	Wooslène	Ms.	Haiti
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1998-99	Liu	Hui	Ms.	China, VR
1998-99	Yang	Na	Ms.	China, VR
1998-99	Urena Vargas	Wesly	Mr.	Costa Rica
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1998-99	Chima	Timothy Freeman	Mr.	Malawi
1998-99	Al--Alawi	Ali Salim	Dr.	Sultanate of Oman
1998-99	Chirvase	Dana	Dr.	Rumänien
1998-99	Dlamini	Sibusiso Ndumiso	Mr.	Swaziland
1998-99	Jamiyansharav	Khishigbayar	Ms.	Mongolia

1998-99	Lam	Johannes (Jan)	Mr.	Netherlands
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1998-99	Oehrens	Juan Sebastian	Mr.	Chile
1999-00	Tadesse	Alemu	Mr.	Ethiopia
1999-00	Khan	Md Mesbah	Mr.	Bangladesch
1999-00	Hoque	Mozammel	Mr.	Bangladesch
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1999-00	Wang	Di	Mr.	China, VR
1999-00	Paredes	Rodriguez	Mr.	Colombia
1999-00	Subbarao	Sham	Mr.	India
1999-00	Al-Nawaiseh	Bassil	Mr.	Jordan
1999-00	Gamula	Gregory	Mr.	Malawi
1999-00	Dahal	Yubaraj	Mr.	Nepal
1999-00	Musa	Mzumbe	Mr.	Tanzania
1999-00	Sendegeya	Al-Mas	Mr.	Uganda
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1999-00	Ulziisuren	Enhbold	Mr.	Mongolia
1999-00	Gläser	Bernhard	Mr.	Germany
1999-00	Kuyvenhoven	Simon	Mr.	Holland
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2000-01	Mu	Yundong	Mr.	China
2000-01	P.V.	Aravind	Mr.	India
2000-01	Srikanth	Subbarao	Mr.	India
2000-01	Gil Guerrero	Algert	Mr.	Mexico
2000-01	Ghimire	Ram Prasad	Mr.	Nepal
2000-01	Anahua Quispe	Edgar Narciso	Dr.	Peru
2000-01	Magessa	Finias Bryceson	Mr.	Tanzania
2000-01	Nguyen	Quoc Khanh	Dr.	Vietnam
2000-01	Islam	MD. Saiful	Mr.	Bangladesh
2000-01	Tang	Hui	Mr.	China
2000-01	Risse	Oliver	Mr.	Germany
2000-01	Abbas	Mushahid	Mr.	Pakistan
2000-01	Tardón Ruiz de Gauna	Saioa	Dr.	Spain
2000-01	Nino	Raul	Mr.	Venezuela
2000-01	von Hauff	Elizabeth Leoni	Ms.	Canada
2001-02	Mohtad	Ibrahim (Shafi)	Mr.	Bangladesh
2001-02	Belle	Vivian	Mr.s.	Cameroon
2001-02	Nanji	Henry Nota	Mr.	Cameroon
2001-02	Sanchez Mino	Santiago Jorge	Mr.	Ecuador
2001-02	Shukla	Anand	Dr.	India
2001-02	Gadde	Butchaiah	Mr.	India
2001-02	Heang	Bora	Mr.	Cambodia
2001-02	Ochieng	Xavier	Mr.	Kenya
2001-02	Dhital	Ram Prasad	Mr.	Nepal
2001-02	Poudel	Om Prasad	Mr.	Nepal
2001-02	Mazimpaka	Ernest	Mr.	Rwanda
2001-02	Abd El Messih	Bahy Saad Abdalla	Mr.	Egypt
2001-02	Umana	Alejandro	Mr.	Colombia
2001-02	Pilalas	Loukas	Mr.	Greece
2001-02	Triantafyllos	Panagiotis	Mr.	Greece
2001-02	Manssen	Thomas	Mr.	Germany
2001-02	Winterfeldt	Jörg	Mr.	Germany
2001-02	Avellaneda de la Calle	Jordi	Mr.	Spain
2001-02	Shah	Sayed Faruque	Mr.	Bangladesh

2001-02	Komilov	Asliddin	Mr.	Usbekistan
2002-03	Asaah	Alice Ghopai	Ms.	Camerroon
2002-03	Saha	Jhantu Kumar	Mr.	Bangladesh
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2002-03	Vega	Fernando Alberto	Mr.	Honduras
2002-03	Irasari	Pudji	Ms.	Indonesia
2002-03	Lee	Joo Yeol	Mr.	Korea
2002-03	Kumar Khadka	Manoj	Mr.	Nepal
2002-03	Mishra	Subhash Kumar	Mr.	Nepal
2002-03	Shao	Jie	Ms.	China
2002-03	Trujillo Quintero	Juan José	Mr.	Colombia
2002-03	Peter	Marco	Mr.	Germany
2002-03	Nacci	Gianpiero	Mr.	Italy
2002-03	Choudhry	Ihtsham Farooq	Mr.	Pakistan
2002-03	Bango Cascon	Alejandro	Mr.	Spain
2002-03	Galsan	Sevjidsuren	Ms.	Mongolia
2003-04	Veneranda Mola	Nicolás Enrique	Mr.	Argentina
2003-04	Ahmed	Firoz Uddin	Mr.	Bangladesh
2003-04	Aman	Julia	Ms.	Bangladesh
2003-04	Ferdinand	Ajamah	Mr.	Cameroon
2003-04	Sanchez Contreras	Julio Rene	Mr.	Colombia
2003-04	Mitra	Indradip	Mr.	India
2003-04	Lawless	Richard	Mr.	Ireland
2003-04	Han	Seong-sook	Ms.	Korea
2003-04	Trinh Viet	Hieu	Ms.	Vietnam
2003-04	Sarran	Mathieu	Mr.	France
2003-04	Bröer	Torsten	Mr.	Germany
2003-04	Michel	Andreas	Mr.	Germany
2003-04	Bandlamudi	George-Chakravarthy	Mr.	India
2003-04	Joppich	Farida Damirovna	Ms.	Kyrgyzstan
2003-04	Dosmailov	Meirzhan A.	Mr.	Kazakhstan
2003-04	Possamai	Everson	Mr.	Brazil
2003-04	Palle Badalge	Iresha Somarathna	Mr.	Sri Lanka
2003-04	Bajracharya	Prashun Ratna	Mr.	Nepal
2003-04	Yandri	Erkata	Mr.	Indonesia
2004-06	Chowdhury	Mohammad Shahriar Ahmed	Mr.	Bangladesh
2004-06	Zobayer	A.N.M.	Mr.	Bangladesh
2004-06	Pena Diaz	Alfredo	Mr.	Colombia
2004-06	Toropov	Maksim	Mr.	Kyrgyzstan
2004-06	Sapkota	Prakash	Mr.	Nepal
2004-06	Aderinto	Suraju	Mr.	Nigeria
2004-06	Henriquez Prevoo	Christian	Mr.	Peru
2004-06	Limsoontorn	Tubtim	Ms.	Thailand
2004-06	Ochieng	David Otieno	Mr.	Kenya
2004-06	Akhtar	Naveed	Mr.	Pakistan
2004-06	Brudler	Evelyn	Ms.	Germany
2004-06	Hermann	Sebastian	Mr.	Germany
2004-06	Tek	Boon Jin	Mr.	Malaysia
2004-06	Moreno M.	Juan Carlos	Mr.	Venezuela
2005-07	Khan	Ahmed Jahir	Mr.	Bangladesh
2005-07	Boruah	Dwipen	Mr.	Indien
2005-07	Maharjan	Bhai Raja	Mr.	Nepal
2005-07	Vera Tudela Carreno	Luis Enrique Domingo	Mr.	Peru
2005-07	Caag Cabaces	Donnalyn Atienza	Ms.	Philippines
2005-07	Jagwe	Wyclif	Mr.	Uganda

2005-07	Mahu	Seth Agbeve	Mr.	Ghana
2005-07	Wickramarathne	Widana G. Hashini K.	Ms.	Sri Lanka
2005-07	Paula Chaves	Patricia Castello Branco	Ms.	Brasil
2005-07	Sanchez Herrera	Diego Alejandro	Mr.	Columbia
2005-07	Wilches Tamayo	Camilo Andres	Mr.	Colombia
2005-07	Beyn	Mulugeta Weldetnsae	Mr.	Eritrea
2005-07	Sterner	Michael	Mr.	Germany
2005-07	Hegel Pellecer	Rodolfo	Mr.	Guatemala
2005-07	Pechlivanoglou	Georgios	Mr.	Greece
2005-07	Peel	Andrew	Mr.	Canada
2005-07	Randig	Sebastian	Mr.	Germany
2005-07	Rojas	Carlos Mauricio	Mr.	Colombian
2005-07	Herráez Hernández	Iván	Mr.	Spain
2005-07	Torio Blanco	Herena	Mr.	Spain
2006-08	Khatun	Jorifa	Ms.	Bangladesh
2006-08	Khatiwora	Nar Bahadur	Mr.	Bhutan
2006-08	Vasconcellos	Marcelo de Lima	Mr.	Brazil
2006-08	Nafiri	Faraida	Ms.	Indonesia
2006-08	Lohani	Sunil Prasad	Mr.	Nepal
2006-08	Singh	Nanik	Mr.	Panama
2006-08	Mekki	Nada Mohamed	Ms.	Sudan
2006-08	Mwakatage	Edwin Sithole	Mr.	Tanzania
2006-08	Patschke	Erik	Mr.	Germany
2006-08	Türker	Burak	Mr.	Turkey
2006-08	McGraw	Sabin	Mr.	USA
2006-08	Wu	Caiyang	Ms.	China
2006-08	Zhang	Wendi	Ms.	China
2006-08	Kaklamanakis	Emmanouel	Mr.	Greek
2006-08	Surkute	Dnyanoba M.	Mr.	India
2006-08	Richert	Bodo	Mr.	Germany
2006-08	Karampela	Panagiota	Ms.	Greece
2007-09	Anwar Hossain	Mohammad	Mr.	Bangladesh
2007-09	Prakash K.C.	Chandra	Mr.	Nepal
2007-09	Nwaogaidu	Simeon Obinna	Mr.	Nigeria
2007-09	Elhadi Adam	Rania Mohammad	Ms.	Sudan
2007-09	Parinyacupt	Unchalee	Ms.	Thailand
2007-09	Mubbala	Ritah M.	Ms.	Uganda
2007-09	Cendrawati	Dian Galuh	Ms.	Indonesia
2007-09	Garcia da Fonseca	Leila	Ms.	Brazil
2007-09	Pabon Restrepo	Giovanni Andres	Mr.	Colombia
2007-09	Achibiri	Nnadozie Stanley	Mr.	Nigeria
2007-09	Potzmann	Silvia	Ms.	Austria
2007-09	Günther	Andreas	Mr.	Germany
2007-09	Bachtiar	Ibnu Kahfi	Mr.	Indonesia
2007-09	Millan	Rosiel	Ms.	Mexico
2007-09	Güner	Bedrettin	Mr.	Turkey
2007-09	Sandris	Georgios	Mr.	Greece
2008-10	Alcazar	Freddy	Mr.	Venezuela
2008-10	Binda Pereira	Mariana	Ms.	Brazil
2008-10	Butler	Blake Allan	Mr.	USA
2008-10	Chakanga	Kambulakwao	Ms.	Zambia
2008-10	Farmani Marzankalateh	Issa	Mr.	Iran
2008-10	Goepfert	Tyler	Mr.	USA
2008-10	Hossain	Md. Motaher	Mr.	Bangladesh
2008-10	Javed	Ahsan	Mr.	Pakistan

2008-10	Mahmud	Abdul Muhaimin	Mr.	Malaysia
2008-10	Njoka	Francis Namu	Mr.	Kenya
2008-10	Paradine	Martin D.	Mr.	Canada
2008-10	Pereira Santos	Rafael	Mr.	Brazil
2008-10	Semere Tesfaselasie	Russom	Mr.	Eritrea
2008-10	Shah	Adnan	Mr.	Bangladesh
2008-10	Tchiemogo	Hamadou	Mr.	Niger
2008-10	Temponeras	Dionysios	Mr.	Greece
2008-10	Thakuri	Sujit	Mr.	Nepal
2008-10	Ullrich	Cédric	Mr.	France
2008-10	Wannapin	Sirinya	Ms.	Thailand
2008-10	Agarwal	Ankur	Mr.	India
2009-11	Cuellar	Alberto	Mr.	Spain
2009-11	Al-Hammad	Hirak	Mr.	Bangladesh
2009-11	Arroyo Klein	Sebastián Allejandro	Mr.	Chile
2009-11	Brown	Nicholas	Mr.	USA
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2009-11	De Vecchi	Rafael	Mr.	Brasil
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2009-11	Hamzeh	Ahmad	Mr.	Palästina
2009-11	Ramon Suarez	Juan Luis	Mr.	Spain
2009-11	Martin Gomez	Juan Pablo	Mr.	Mexico
2009-11	Montealegre	Federico	Mr.	Costa Rica
2009-11	Montoya Rojas	Juan Pablo	Mr.	Venezuela
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2009-11	Ngoma	Daniel H.	Mr.	Tanzania
2009-11	Noureddine	Ibrahim	Mr.	Lebanon
2009-11	Rodriguez Sanchez	Diana Elisa	Ms.	Mexico
2009-11	Rudenko	Vladislav	Mr.	Russia
2009-11	Weldemicael	Yonas Tesfay	Mr.	Eritrea
2009-11	Wen	Chia Chia	Ms.	Taiwan
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2010-12	Braden	Claudia	Ms.	Germany
2010-12	Campero Anchondo	German Fernando	Mr.	Mexico
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2010-12	Chávez Velázquez	Sandra Laura	Ms.	Mexico
2010-12	Cordes	Johannes	Mr.	Germany
2010-12	De Brito Lima	Danilo	Mr.	Brazil
2010-12	Do Duc	Tuong	Mr.	Vietnam
2010-12	EL-Sayed	Mahmoud Rajeh	Mr.	Palestine
2010-12	Han	Myo Min	Mr.	Myanmar
2010-12	Kipruto	Walter	Mr.	Kenya
2010-12	Kumaraswamy Sivaprakasam	Rangini	Ms.	India
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2010-12	Lüer	Stefan Michael	Mr.	Germany
2010-12	Mashnik	Daria	Ms.	USA
2010-12	Ramírez Acosta	Rebeca Priscilla	Ms.	Panama
2010-12	Ramirez Pineros	Alvaro Andres	Mr.	Colombia
2010-12	Rodriguez Bonilla	Javier Eduardo	Mr.	Colombia
2010-12	Sequeda Pinero	Miguelángel	Mr.	Venezuela
2010-12	Venegas	Orlando	Mr.	Chile
2010-12	Villa	Juan Pablo	Mr.	Argentina

2011-13	Arias Pérez	Alfonso	Mr.	Costa Rica
2011-13	Beyene	Mehari Siltan	Mr.	Eritrea
2011-13	Candra	Dodiek Ika	Mr.	Indonesia
2011-13	de Oliveira Nascimento	Paulo Eduardo	Mr.	Brazil
2011-13	Dhir	Harpeet Singh	Mr.	India
2011-13	Faerron	Ricardo	Mr.	Costa Rica
2011-13	Gaur	Varun	Mr.	India
2011-13	Herrerías Azcué	Martín	Mr.	Mexico
2011-13	Kaminski Küster	Kristie	Ms.	Kenya
2011-13	Kigima	David Thamaini	Mr.	Kenya
2011-13	Kühnel	Sven	Mr.	Germany
2011-13	Landwehr	Gregory Brent	Mr.	South Africa
2011-13	Lopez Escoto	Christian David	Mr.	Honduras
2011-13	Mancera Guevara	Diana Rocio	Ms.	Colombia
2011-13	Nugusse	Habtom	Mr.	Eritrea
2011-13	Nurmukhanbetova	Karakoz	Ms.	Kazakhstan
2011-13	Parikh	Dishant	Mr.	India
2011-13	Pernía Rodríguez	Yutriz Yusely	Ms.	Venezuela
2011-13	Sahin	Nuran Pinar	Ms.	Turkey
2011-13	Vega Alzate	Daniela	Ms.	Panama
2012-14	Abdelrazik	Mohamed	Mr.	Egypt
2012-14	Armeni	Alexandra	Ms.	Greece
2012-14	Ballarin	Andrea	Mr.	Italy
2012-14	Ernst	Eva-Christin	Ms.	Germany
2012-14	Fred	Fidelia Olga	Ms.	Malaysia
2012-14	Goda Asebey	Samuel Jorge	Mr.	Bolivia
2012-14	Gogoi	Madhumita Gogoi	Ms.	India
2012-14	Hiremath	Mitavachan	Mr.	India
2012-14	Jimenez Martinez	Cuauhtemoc Adrian	Mr.	Mexico
2012-14	Ketter	Ronald	Mr.	Kenya
2012-14	Labib	Mohamed Mamdouh	Mr.	Egypt
2012-14	Migadde	Johnmary	Mr.	Uganda
2012-14	Morales Ardila	Diana Milena	Ms.	Colombia
2012-14	Palacios E.	José Luis	Mr.	Ecuador
2012-14	Preissler	Natalie	Ms.	Germany
2012-14	Rodríguez Urdaneta	Héctor Raúl	Mr.	Venezuela
2012-14	Shrestha	Binita	Ms.	Nepal
2012-14	Stührenberg	Jonas	Mr.	Germany
2012-14	van Someren	Christian	Mr.	Canada
2012-14	VanderMeer	Jeremy	Mr.	Canada
2012-14	Wassie	Alexander Tsegai	Mr.	Eritrea

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Course	Family Name	1st Name	Tit.	Origin
2004/05	Aymard	Caroline	Ms.	France
2004/05	Thomas	Denis	Mr.	Belgium
2004/05	Lermitte	Tristan Eugene William	Mr.	UK
2004/05	Clauzonnier	Adrien	Mr.	France
2004/05	Ansell	Duncan Peter	Mr.	UK
2004/05	Adler Gomes Dacosta	João Paulo	Mr.	Portugal

2004/05	Lecesve	Laurent	Mr.	France
2004/05	Avraamides	Stelios	Mr.	Cypress
2004/05	Correia	Stélio	Mr.	Portugual
2004/05	Carrell	Justin	Mr.	UK
2004/05	Mantas	Panagiotis	Mr.	Greece
2004/05	Dimopoulos	Aris	Mr.	Greece
2004/05	Stromboni-Prevost	Estelle	Ms.	France
2004/05	Thiebaut	Romaric	Mr.	France
2005/06	Adnan	Mohammad	Ms.	Pakistan
2005/06	McCracken	Philippe	Ms.	Canada
2005/06	Xuereb	Steven	Ms.	Malta / Canada
2005/06	Lopez Alcala	Leodegario	Ms.	Mexico
2005/06	Sader	Hadi	Ms.	Lebanon
2005/06	Rouze	Jerome	Ms.	France
2005/06	Antonopoulos	Antonios	Ms.	Canada
2005/06	Polizois	Theodoros-Theodoritos	Ms.	Greece
2005/06	Gulliot	Bertrand	Ms.	France
2005/06	Montes De Oca Arjon	Luis	Ms.	Spain
2005/06	Singlehurst	Robert	Ms.	Canada
2006/07	Skarvelis-Kazakos	Spyros	Ms.	Greece
2006/07	Roycroft	Patrick (Paddy)	Ms.	Germany /Ireland
2006/07	Craig	Mark Kenton	Ms.	Canada
2006/07	Bennett	Valerie	Ms.	UK / Canada
2006/07	Perini	Leonardo	Ms.	Italy
2006/07	Di Lorenzo	Lisa	Ms.	Canada/Italy
2006/07	Martinez-Streignard Viana	Vanesa	Ms.	Venezuela
2006/07	Gil Zapata	Miguel	Ms.	Spain
2006/07	Edge	Tad Michael	Ms.	USA
2006/07	Troncoso Lago	Juan Antonio	Ms.	Spain
2006/07	Marques Malcato	Silvia	Ms.	Portugal
2006/07	Teksan	Yunus	Ms.	Turkey
2007/08	Tanguy	Yann	Mr.	France
2007/08	Chacon Calderon	Nancy	Ms.	Guatemala
2007/08	Del Cid Lemus	César Roberto	Mr.	Guatemala
2007/08	Townsend	Michael	Mr.	US
2007/08	Phillips	Ian	Mr.	US
2007/08	Veynandt	François Charles A.	Mr.	France
2007/08	Goy	Solène	Ms.	France
2007/08	Wong	Craig John	Mr.	US
2007/08	Baldus-Jeursen	Christopher	Mr.	Canada
2007/08	Cuddihy	Alan	Mr.	Ireland
2007/08	Paterakis	Petros	Mr.	Greece
2007/08	Qwen	Emma Louise	Ms.	UK
2007/08	Lynch	Mairead	Ms.	Ireland
2007/08	Gillard	Xavier	Ms.	France
2007/08	Manginas	Georgios	Ms.	Greece
2008/09	Adams	Brian	Ms.	USA
2008/09	Arapogianni	Athanasia	Ms.	Greece
2008/09	Chatzipanagi	Anatoli	Ms.	Greece
2008/09	Emmerich	Roy	Ms.	South Africa
2008/09	Gammoh	Omar	Ms.	Jordan
2008/09	Gkinis	Ioannis	Ms.	Greece
2008/09	Hernandez Rodriguez	Juan Esteban	Ms.	Columbia
2008/09	Kwapis	Elke	Ms.	Germany

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2008/09	Rojas	Sergio	Ms.	Costa Rica
2008/09	Teixeirinha	Patricia Alexandra	Ms.	Portugal
2008/09	Thomas	Jaimie	Ms.	Costa Rica
2009/10	Jalia	Aquil A	Mr.	India
2009/10	Konstantinos	Asproulakis	Mr.	Greece
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2009/10	Paola	Cadau	Ms.	Italy
2009/10	Andreea	Costache	Ms.	Romania
2009/10	Luis Felipe	Gonzalez Munoz	Mr.	Mexico
2009/10	Can	Ibrahimoglu	Mr.	Turkey
2009/10	Theodoros	Kotsonis	Mr.	Greece
2009/10	Pedro	Peno Gama	Mr.	Spain
2009/10	Giuseppe	Petrazzuolo	Mr.	Italy
2009/10	Sundus	Ramli C.	Ms.	Malaysia
2009/10	Etienne	Thomassin	Mr.	France
2009/10	Jose F.	Zuniga	Mr.	Mexico

2010/11	Angelucci	Massimo	Mr.	Italy
2010/11	Briones Martinez	Maria Gabriela	Ms.	Germany / Ecuador
2010/11	Buyukcoskun	Murat	Mr.	Turkey/Canada
2010/11	Farrés Antúnez	Pau	Mr.	Spain
2010/11	Gröger	Katharina	Ms.	Germany
2010/11	Guevara	Edison	Mr.	Venezuela
2010/11	Henningsgaard	Elizabeth	Ms.	US
2010/11	McKinley	Alex R.	Mr.	US
2010/11	Merchán Millán	Daniel	Mr.	Spain
2010/11	Mouchtidiotis	Nikolaos	Mr.	Greece
2010/11	Norton	Michael F.	Mr.	Ireland
2010/11	Ramesh	Vinodh	Mr.	India
2010/11	Seethapathy	Poorana K.	Ms.	India
2010/11	Wasajja	Henry	Mr.	Uganda
2011/12	Ayoubi	Amjad	Mr.	Syria
2011/12	Benberrah	Abdelhalim	Mr.	Algeria
2011/12	Gonzalez	Ricardo Sebastian	Mr.	Colombia
2011/12	Gonzalez	Antonio	Mr.	Mexico
2011/12	K R	Bhargav	Mr.	India
2011/12	Liu	Ke-hsuan	Ms.	Taiwan
2011/12	Mittal	Ankit	Ms.	India
2011/12	Nikolis	Charalampos	Mr.	Greece
2011/12	Ottaviano	Dimitri	Mr.	Italy
2011/12	Pablo	Berges del Arco	Mr.	Spain
2011/12	Parekh	Varun	Mr.	India
2011/12	Perez Rodarte	Aldo	Mr.	Mexico
2011/12	Saenz	Cesar	Mr.	Chile
2011/12	Staffolani	Nicola	Mr.	Italy
2012-13	Adiloglu	Savas	Mr.	Turkey
2012-13	Aguilera	Francisco	Mr.	Spain
2012-13	Eid	Michael	Mr.	Lebanon
2012-13	Garza	Jennifer	Ms.	USA
2012-13	Hemanth	Kasina	Mr.	India
2012-13	Posada Bolaño	Wenceslao	Mr.	Spain
2012-13	Ruiz Albacete	Virginia	Ms.	Spain
2012-13	Salazar Mora	Sofia	Ms.	Ecuador
2012-13	Trivedi	Vivek	Mr.	India

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