Volume 8, Issue 2, Newsletter October 2016

WSSET World Society of Sustainable Energy Technologies NEWSLETTER

Inside this issue:

Featured WSSET article

The 16th International Conference on Sustainable Energy Technologies (SET 2017)

17 – 20th July 2016, Bologna Italy

We are very pleased to invite you to the '16th International Conference on Sustainable Energy Technologies (SET 2017)' scheduled from 17-20th July 2017 in Bologna, Italy. SET 2017 will be hosted by the Alma Mater Studiorum – Università di Bologna, the oldest university in the Western world in collaboration with the University of Nottingham and World Society of Sustainable Energy Technologies (WSSET). We look forward to seeing you in Bologna in July 2017 for the SET conference.

Key dates

10th February 2017 - Abstract submission
10th March 2017 - Notification of abstract acceptance
10th May 2017 - Full manuscript submission
31st May 2017 - Notification of manuscript acceptance

Please visit the SET 2017 conference website for more information and the first call for papers www.set2017.org

Call for papers

Contributions are invited on the topics within the conference scope of sustainable energy technologies, including:

- Energy Technology & Renewables
- Energy Storage & Conversion
- Policies & Management
- Sustainable Cities & Environment

All contributions should be of high quality, original and not published elsewhere or submitted for publication during the review period. All accepted papers will be presented orally or by poster, and included in the conference proceedings. Selected papers will be published in our partner journals. SET 2017 is a multi–disciplinary, peer-reviewed international conference on sustainable energy sources and technologies that provides a forum for the exchange of latest technical information, the dissemination of high-quality research results, the presentation of new developments in the area, and the debate and shaping of future directions and priorities for sustainable development and energy security.

Latest news from WSSET

WSSET innovation awards

Prof. Saffa Riffat

Industrial expansion, commissioning of new power plants and expansion of transport systems are changing our climate due to the emission of large quantities of carbon dioxide into the atmosphere. If greenhouse gas emissions are not brought under control, climate change will accelerate with devastating impact on civilisation. Urgent action is required if we are to avert the threat this poses to humans and the world's ecology. The 2015 United Nations Climate Change Conference held in Paris negotiated a global agreement on reducing climate change. The organisation committee has agreed to set a goal of limiting global warming to less than 2°C compared to pre-industrial level.

Sustainable development and innovative energy solutions are crucial to reducing climate change. The WSSET Innovation Awards recognise the achievements of private individuals and organisations in new sustainable technologies and encourage the wider application of these new developments. The WSSET Awards include innovations in the following categories:

- Renewable energy systems (e.g., solar, wind and biomass)
- Power generation technologies (e.g., CHP systems, fuel cells and anaerobic digestion plants)
- Energy efficiency (e.g., heat pumps and hybrid solar/gas systems)
- Low carbon buildings and future cities (e.g., low/zero carbon buildings, sustainable cities)
- Water treatment and desalination (e.g., solar water desalination)
- Sustainable materials (e.g., innovative composite materials and aerogels)
- Waste management and water recycling (e.g., households and construction waste management)
- Agri-food technologies (e.g., innovative greenhouses and food drying)

Please visit http://www.wsset.org/innovation-awards/ for a downloadable WSSET Innovation Award application form. You will need to provide a brief: project summary, project status, description of innovation, what makes your innovation distinctive, advantages/benefits of your innovation and innovation ownership. The Awards will be assessed by a panel of judges from academic institutions, industry and Government departments.

The second round of WSSET Innovation Awards are now open - deadline of entries Wednesday 1st March 2017. The winners will be announced at the SET 2017 conference in Bologna, Italy. A certificate and plaque will be awarded to the winners. The Awards will be widely publicised through WSSET website, newsletters and the media.

The first round WSSET Innovation award winners were announced at The 15th International Conference on Sustainable Energy Technologies (SET2016) in Singapore. The event was a great chance to celebrate outstanding work in the field of sustainable energy. Well done to all involved. Please see the WSSET website for photographs from the event.

The recipients of the WSSET Innovation awards 2016 were as follows:

- Renewable Energy Systems (Hydro) - MOHD FARRIZ BIN HJ MD BASAR, Universiti Teknikal Malaysia Melaka
- Energy Efficiency (Absorption cooling) - AZHER M ABED, Universiti Kebangsaan Malaysia
- Energy Efficiency (HVAC) - CHUA KIAN JON ERNEST, National University of Singapore
- Power Generation Technologies - HONGXING YANG, Hong Kong Polytechnic University
- Renewable Energy Systems (Solar Energy) - JI JIE, University of Science and Technology, China and XUDONG ZHAO, University of Hull, UK
- Sustainable Materials - DAVID MARTIN, Onyx Solar Energy S.L.
- Renewable Energy Systems (Solar PV) - Hui Lv, Jun Liao, Qinghua Lv, Benyuan Chen, Hubei University of Technology, China

Articles WSSET recommends

Innovative energy saving and climate control system for greenhouses

Yate Ding, Saffa Riffat

The project aims to reduce the carbon emissions and the high running costs of the greenhouse sector by reducing its reliance on conventional fossil fuel energy resources. A sustainable and energy efficient system is proposed employing various innovative technologies including heat insulation solar glass, vacuum insulation panels, wind catchers and LED lights in addition to an underground soil-based seasonal thermal energy storage system. The smart greenhouse will be equipped with a fully automated control with internet connected monitoring and management. The summary clearly shows that the project addresses the TSB Agri-Tech Catalyst call to "demonstrate the potential to advance sustainable intensification of agriculture and deliver economic impact for the UK Agri-Tech industry by tackling domestic or international challenges."

a) Production will be intensified by establishing full control over the key factors affecting plant productivity, notably light levels, temperature, carbon dioxide humidity and exclusion of pests/diseases, to optimise the nutrient content and the production rate of food in a specific facility. Dynamic control of the technologies will allow the system to be tuned to suit the differing needs of various crops.

b) Year-round production will allow crops to be produced within the UK avoiding the "food–mile" carbon emissions associated with importing crops from warmer climates, especially during winter.

Fig 1 – The developed greenhouse

c) Although initially intended for the UK, the system can be adopted for other climates where the balance of heating and cooling required is different.

d) Despite the anticipated improvements in productivity the energy consumption, and thus carbon emissions, will be lower especially through the efficient and sustainable use of PV solar energy and seasonal heat/coolth storage.

Fig 2 – The project partners

The project has been underpinned by a large body of recent, peer reviewed, numerical and experimental work on the solar insulation glass units, vacuum insulation panels and soil-based underground thermal energy storage generated by the Built Environment Laboratories at the University of Nottingham, which has been published in journals and international conferences.

Website: www.novelgreenhouse.co.uk

Greenhouse location: Micropropagation Services, Ley Springs, Loughborough Rd East Leake, Loughborough, Leicester, LE12 6NZ

Lead Organisation: The University Of Nottingham

Project Partners: Cambridge Glasshouse Company Ltd; Geo Green Power Ltd; Micropropagation Services (EM) Ltd; TerOpta Ltd; Innovate UK (TSB)

Articles WSSET recommends

Importance of the inverter for Ground-Coupled Heat Pump (GCHP) systems

Claudia Naldi and Enzo Zanchini

By means of a new MATLAB code, we have analyzed the effects of the inverter on the seasonal COP and on the seasonal EER of GCHP systems for building heating and cooling. The code is based on the g-functions determined by Zanchini and Lazzari (2013 Energy 59 570–80, 2014 Energy 70 444–55). It allows the hourly simulation of both the heat pump and the coupled Borehole Heat Exchanger (BHE) field for several years with a few-minutes computational time, and applies both to on-off heat pumps and to inverter driven ones.

The code main inputs are: hourly building loads; heat pump power, COP and EER at different temperatures of the borehole fluid and of the water produced; BHE-field geometry and BHE thermal resistance per unit length; properties of the borehole fluid and of the ground. For each hour, the code evaluates the heat pump heating (or cooling) power and COP (or EER), the electric energy used by the heat pump and the mean temperature of the borehole fluid.

The code has been employed to analyze the effect of the inverter on the seasonal COP (SCOP) during winter and on the seasonal EER (SEER) during summer of a GCHP system designed for a residential house in Bologna (Italy) with dominant heating loads. The selected ground-coupled heat pump, used to provide heating (from October to April) and cooling (from May to September) to the building, is an inverter-driven unit. The BHE field is composed of 3 in-line double U-tube BHEs, with length L either 105 m or 75 m each. Ten-year hourly simulations of the GCHP system have been performed with both borehole lengths. To analyze the effects of the inverter, the simulations have been repeated forcing the heat pump to work only at its maximum frequency, as an on-off heat pump.

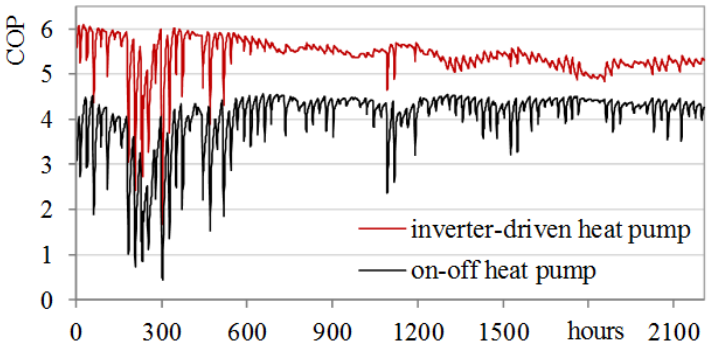

Fig 1 - Hourly trend of COP, for November–January of the 10th year, L=105 m

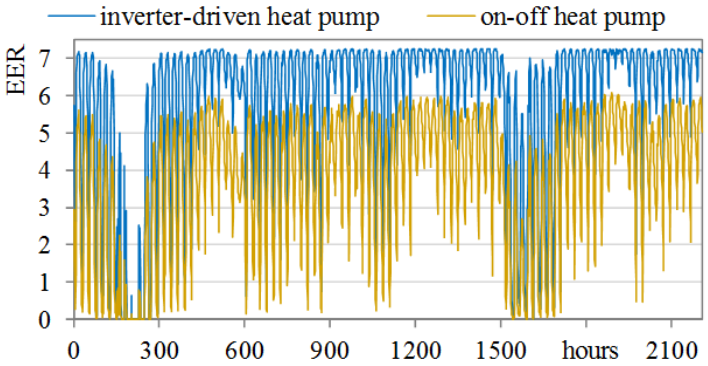

Fig 2 - Hourly trend of EER, for June–August of the 10th year, L=105 m.

The results show that, at the 10th year of operation, the inverter yields a 30% increase of SCOP (from 3.82 to 4.97 for L=75 m, from 4.00 to 5.32 for L=105 m) and a 50% increase of SEER (from 4.42 to 6.74 for L=75 m, from 4.45 to 6.74 for L=105 m). The performance enhancement produced by the inverter is much higher than that due to the BHE length increase (5÷7% for SCOP, nearly zero for SEER).

Thus, the effects of the inverter are very important, especially in summer operation, due to lower building loads and higher number of heat pump on-off cycles. Figures 1 and 2 show the hourly trends of COP and EER, for the period November–January and June–August of the 10th year, with and without inverter, for L=105 m. The Figures highlight the higher hourly efficiency of the inverter-driven heat pump with respect to the on-off one.

The results demonstrate the importance of employing inverter-driven heat pumps for GCHP systems.

For more information please contact: Dr. Claudia Naldi (claudia.naldi2@unibo.it) or Prof. Enzo Zanchini (enzo.zanchini@unibo.it), University of Bologna, Department of Industrial Engineering, Bologna, Italy.

Articles WSSET recommends

New shapes of tiles for a better above sheathing ventilation and greater energy savings

Michele Bottarelli, Giovanni Zannoni

In tiled pitched roofs, a ventilated layer is created by the arrangement of battens and counter-battens supporting the tiles, with air flowing from the eaves to the ridge and somewhat through the tiles. This so-called Above Sheathing Ventilation (ASV) reduces the heat transfer between tiles and roof structure by means of natural and forced convection, thereby also reducing the cooling energy requirement in summer season. The topic is relevant mainly in hot climates such as the Mediterranean regions, since the energy demand for air-conditioning in summer represents a significant financial and environmental cost. This effect mainly depends on the direction of the wind, more it is perpendicular to the eaves, better is the performance. But, the benefit could be also enhanced by increasing the air permeability between the overlapping tiles so that wind has more gaps through which flowing. Therefore, the design of new tile shapes becomes one of the strategy to enhance the air permeability independently from the wind direction, as proposed by the HEROTILE European project (LIFE14 CCA/IT/000939), which industrial, academic and public partners are involved.

More than thirty new shapes of two traditional tiles (Portoghese and Marsigliese tiles) were designed and a preliminary air permeability analysis was carried out by a three-dimensional CFD model. The model was calibrated using an experimental rig, where the performance of existing tiles were measured and used as benchmark. This allowed to select the best three tiles for each type, to be tested in a wind tunnel to verify the water permeability. Then, the two best ones were produced with a temporary production line by industrial partners of HEROTILE. These two new "HEROTILE" tiles are now under testing on a real scale mock-up in two different weather conditions: Italy (Ferrara) and Israel (Yeruham). Every mock-up is composed by several rooms, all of them air-conditioned and widely monitored by means of anemometers, heat flux meters and thermocouples, to evaluate the benefits of a better above sheathing ventilation allowed by the "HEROTILE" tiles, in comparison with existing tiles and other roof typologies such as metal roof, flat roof, etc.

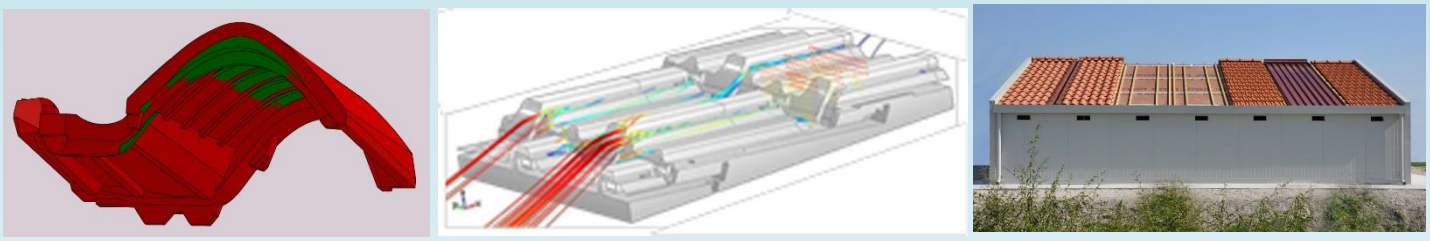

Fig 1 – (a) New tile design, (b) CFD analysis, and (c) Italian mock-up

Partners: University of Ferrara, Industrie Cotto Possagno, Braas Monier, Terreal, ACER, Andil

Website: http://www.lifeherotile.eu/

Integrated system of vapour compression and thermosyphon based on three-fluid heat exchanger for free cooling of data centres

Shuangquan Shao

The number and energy consumption of data centres are increasing rapidly. In a data centre, the cooling equipment consumes about 40% of the total energy. Cutting down the cooling energy consumption becomes an urgent demand. Free cooling, which means using natural cold source to cool data centres, is an ideal solution. Integrated system of vapour compression and thermosyphon (ISVT) integrates the function of free cooling and vapour compression refrigeration therefore has great application potential. However, the application of existing integrated systems is limited by fluid distribution and flow control problems. In existing ISVTs, series and parallel connection of heat exchangers often exists to utilize mechanical and natural cold source optionally. The fluid mass and the flow rate in each heat exchanger and circuit is difficult to forecast and control. Meanwhile, the use of solenoid valves for mode switching brings reliability risk.

To solve the problems of existing ISVTs and achieve efficient cooling of data centres, a new type ISVT based on three-fluid heat exchanger is proposed as shown in Fig. 1. The system includes two circulation loops: a vapour compression loop and a thermosyphon loop. A fin-tube three-fluid heat exchanger is used to connect the two loops. It has three flow channels, for the fluid of the vapour compression loop, the fluid of thermosyphon loop and outdoor air respectively. The use of three-fluid heat exchanger avoids utilization of series and parallel connection of heat exchangers and solenoid valves. It is a stable and efficient way of free cooling for data centres.

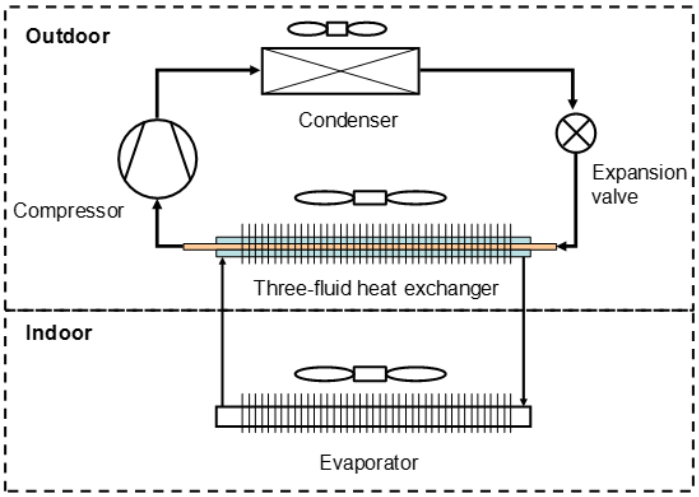

Fig 1 – Schematic diagram

This system can work in three modes determined by the outdoor temperature. In cold weather it works in thermosyphon mode, only the fans of three-fluid heat exchanger and evaporator work to cool the data centre using natural cold source of air. In hot weather it works in vapour compression mode, the fan of the three-fluid heat exchanger stops and the compressor starts to cool the thermosyphon working fluid. In mild weather it works in dual mode, all the fans and the compressor work to utilize both natural cold source and mechanical cold source. The cooling capacity of the three modes is investigated experimentally and the results are shown in Fig. 2. The cooling capacity of thermosyphon mode is 1.8 kW when the temperature difference is only 4°C. This cooling capacity in small temperature difference is helpful for utilizing outdoor cold source in transition seasons.

With the increase of temperature difference, the cooling capacity of themosyphon mode almost increases linearly and it reaches 8.1 kW when the temperature difference is 19°C. As only two fans consume energy in thermosyphon mode and the input power is only 0.48 kW, the EER is 16.9, much higher than traditional air conditioners. The cooling capacity of refrigeration mode increases slightly with increasing temperature difference and it is higher than 5.0 kW in the tested temperature range. The cooling capacity of dual mode also increases with increasing temperature difference while the slope is lower than that of thermosyphon mode. A field test is also conducted in a data centre in Beijing, and the results show that the system can work reliably for long time. The average EER in summer, autumn and winter is 3.52, 5.19 and 12.25, respectively.

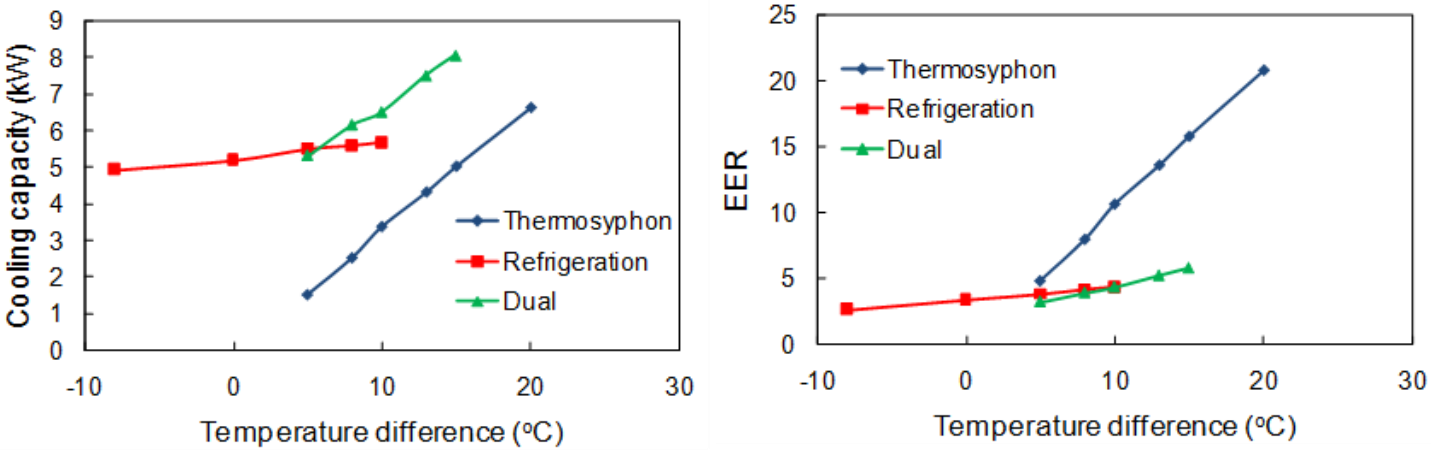

Fig 2 – Performance with indoor and outdoor temperature difference (a) cooling capacity, and (b) Energy efficiency ratio

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Seminars WSSET recommends

Seminar and Exhibition Technologies on Energy Efficiency Buildings -Taiwan and EU countries

26 October 2016, Albert Hall Conference Centre, Nottingham, UK

The main objective of this seminar is to set up a cooperation platform between Taiwan and European countries to exchange the technology on energy efficiency in buildings among these countries as well as the cooperation between academic and industry. It is expected to sign some international cooperation projects and technical transfers after this seminar. An information database for energy efficiency in buildings will be established after this seminar to keep on promoting the cooperation between Taiwan and EU countries on the technology of energy efficiency buildings and the cooperation among academic organisations and industrial companies. In additions, it is most significant that we will introduce the outstanding exist research output from NEP-I and NEP-II of Taiwan to EU countries in this seminar to exhibit the technologies on energy efficiency buildings of Taiwan. As well, we will also invite some EU companies to present their technologies on energy efficiency buildings in this seminar for technical exchange. Exhibition of related technologies is also held in this seminar. We deeply welcome all the related companies in EU to attend this seminar to exchange the technologies on energy efficiency buildings and industry.

For more information please visit - http://web.ntust.edu.tw/~young/nep2/nep2.htm

Alternatively please contact Saffa Riffat – saffa.riffat@nottingham.ac.uk or Benson Lau - Benson.Lau@nottingham.ac.uk

WSSET magazine

WSSET magazine of sustainable technologies and products

Prof. Saffa Riffat

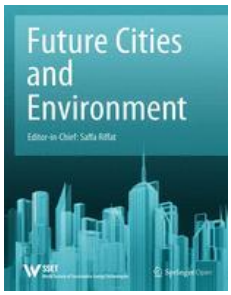
WSSET Magazine of Sustainable Technologies and Products provides a platform for information and promotion of innovative technologies and products. In addition, the magazine provides information about new inventions and patents which could be exploited by industry. The areas covered by the magazine include: renewable energy systems, power generation technologies, energy efficiency and much more. The authors will need to provide information including: name of the technology/product/invention, brief description, benefits (environmental, cost, etc.), 1-2 images, funding/support, case study examples, contact details, website link.

See WSSET website for more details | send all applications to: secretary@wsset.org

Journals WSSET recommends - Future Cities & Environment

Along with the successful ***International Journal of Low Carbon Technologies*** (http://ijlct.oxfordjournals.org/), Professor Saffa Riffat would like to invite you to submit articles to his newest Journal from Springer publishers: ***Future Cities & Environment*** *http://www.futurecitiesenviro.com/*

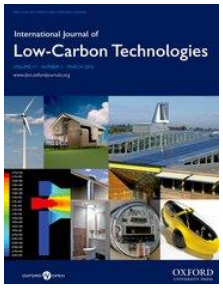
Scope of the journal - Future Cities and Environment publishes high quality multi-disciplinary research which aims to reduce the environmental impact of cities. Considering research in the areas of transport, urban planning, architecture and design, and energy and infrastructure, it publishes fundamental and applied research, critical reviews and case studies. This includes experimental development, demonstration and computer modelling. Future Cities & Environment is an open access journal. Articles related to the topics of Future Cities & Environment are all welcome, and should be submitted using the above link.



WSSET exclusive offer – IJLCT

Exclusive article processing charges for WSSET members

WSSET in conjunction with the International Journal of Low-Carbon Technologies (IJLCT) are introducing a 50% discount to the APC (article processing charge) for WSSET members wishing to publish a paper in IJLCT (open access). This would cost WSSET members £375 as opposed to the full charge of £750. The authors will need to quote they are WSSET members when it comes to payment. Please visit: http://ijlct.oxfordjournals.org/



Contributing to WSSET newsletters and e-bulletins

All WSSET members are kindly invited to submit articles for publication in future WSSET newsletters. Articles can be on a range of topics surrounding the word of sustainable energy technologies. With over 1000 active members, the WSSET newsletter provides a great opportunity to publicise new ideas, technologies or products – all free of charge!

Articles should be no more than 400-500 words and one or two photographs would be very much appreciated. Submissions should be emailed to secretay@wsset.org

Furthermore please contact secretay@wsset.org regarding any conferences, seminar or symposiums relating to topics of sustainable energy technologies that wished to be advertised in the newsletter.

Once again WSSET wishes to thank the continued support of its members.

Donations are welcomed and greatly appreciated!
We would like to remind our members that WSSET is a non-profit organisation, hence providing free membership. We would not be able to play a significant role in consolidating practical partnerships between academic and industrial organisations without the help of our members.
Whether you would like to get more involved or contribute financially, please get in touch with us at secretary@wsset.org.