

# U.S.-Pakistan Centers for Advanced Studies in Energy

Newsletter | Summer 2017

# Energizer



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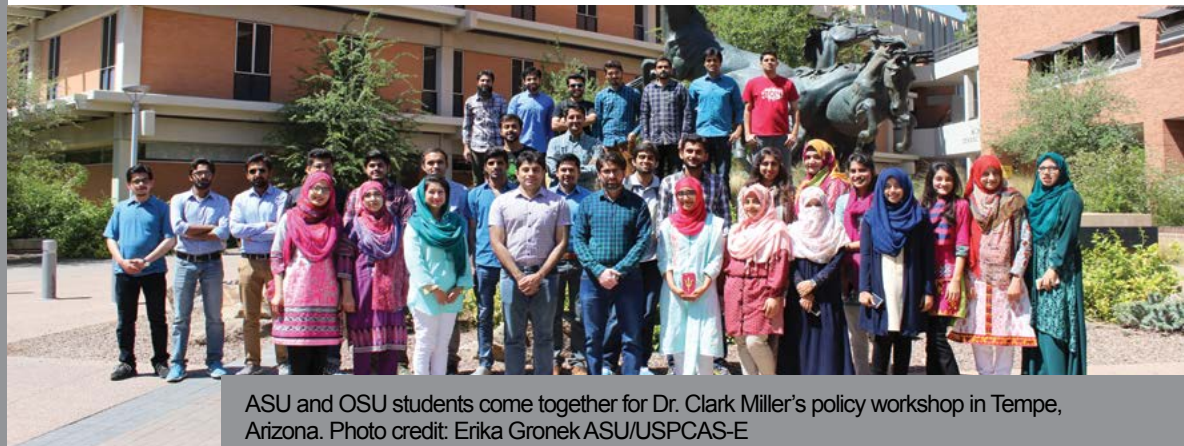
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## Third cohort of exchange scholars departs U.S.

The third cohort of USPCAS-E scholars returned to Pakistan in May. The cohort consisted of 28 scholars who were based at Arizona State University (ASU) with six at Oregon State University (OSU). The make-up of the cohort was comprised of 21 men and 13 women from both the National University of Science and Technology (NUST) and the University of Engineering and Technology (UET), having the largest number of female participants in the program thus far.

During April, the entire cohort joined ASU's Dr. Clark Miller for a two day workshop on energy policy. The workshop helped them develop their understanding of energy policy and they learned how to apply it in their field and future careers. The scholars continued to work with Professor Kenneth Mulligan on the finer points of entrepreneurship in engineering. Students were placed in groups and asked to create a request for venture capital to fund their projects. They refined their presentation skills and exercised their networking, public speaking and applied target research skills. These efforts culminated in the creation of a course of action to move their entrepreneurship plans forward towards real world applications.



ASU and OSU students come together for Dr. Clark Miller's policy workshop in Tempe, Arizona. Photo credit: Erika Gronek ASU/USPCAS-E

## Message from the Project Director

"USPCAS-E has reached a pivotal point in the course of the project. With the third cohort now back home, we are preparing for the fourth cohort to arrive. We can now circle back and begin to see results from our efforts from earlier cohorts. Some of our scholars are now graduating, publishing research and are making an impact in academia, industry and within their country. USPCAS-E has empowered scholars to make a difference and we look forward to continuing to do this in the fall!"

-**Dr. Sayfe Kiaei**, Project Director, USPCAS-E



## Cultural excursions foster international kinship

### Students and faculty exchange culture and create lasting impressions

Cultural excursions are part of the valuable knowledge exchange between Pakistan and the U.S. Here's a snapshot of some of their adventures:

**The Grand Canyon:** Scholars visited one of the seven wonders of the natural world and learned about the geography and history of the area as well as how forces of nature have transformed the Arizona landscape. They also learned about surrounding Native American tribes and were able to share their own culture with tourists.

**The Heard Museum:** Scholars had the chance to visit one of the best exhibits of traditional and contemporary Native American art at the Heard Museum. They learned

about Native American history, culture and traditions. The trip gave them the opportunity to reflect on Pakistani culture in comparison and contrast to Native American cultures.

**Native American Pow-Wow:** Scholars witnessed an authentic Native American Pow-Wow, experiencing a myriad of cultures from more than 150 tribes from all over the United States.

**Arizona Diamondbacks Game:** Play ball! Scholars attended a professional American baseball game and had a bit of fun comparing baseball with cricket. They got into the spirit and cheered for the Diamondbacks along with other fans.



OSU students surveying a map of the Grand Canyon. Photo credit: USPCAS-E

## USPCAS-E Scholars visit the Sanjwal Power Plant

Scholars at the University of Engineering and Technology (UET) Peshawar had the opportunity to visit the Sanjwal PV power plant. This plant produces 5 megawatts of electricity for nearby industries during weekdays. The plant sells power to the national grid in Pakistan after hours and during weekends. The visit educated scholars

about power generation and transmission from photovoltaics.

The scholars were given an in-depth look at control room operations inside a PV power plant. They got to see first hand the bus bars as well as the plant's inverters.

The visit was valuable for the students from the Electrical Energy System Engineering (EESE) track at UET. Industry visits such as these are a vital part of the USPCAS-E program and relates directly to scholars' coursework.



Sanjwal Power Plant

## Class Notes: Where are our scholars now?

**Akif Zia Khan**, one of our first visiting faculty members is now in Hong Kong working on his PhD.

**Mahmood Jamil**, a scholar from NUST is now a lecturer and may be going to New Zealand for his PhD.

**Asad Ali**, from Zachary Holman's Lab at ASU, published, "Improved light management in planar silicon and perovskite solar cells using PDMS scattering layer" in a journal called Solar Energy Materials and Solar Cells.

**Abdul Kashif Janjua** collaborated on the paper, "Customer Benefit Optimization for Residential PV with Energy Storage System" which will be presented at the IEEE Power Engineering Society's (PES) general meeting in Chicago.

## The Big Move

### NUST inaugurates new energy research center

Pakistan's Federal Minister for Water and Power, Khawaja Muhammad Asif and John Groarke, from the United States Agency for International Development (USAID) Mission Director in Pakistan, inaugurated a state-of-the-art research center for energy at National University of Sciences and Technology (NUST) in May. Lieutenant General Naweed Zaman, HI (M), (retired), Rector of NUST, was also in attendance.

The research center was constructed with support from the U.S. Government. The new four-story, 60,000 square foot building includes five classrooms, eight high-tech energy laboratories, a seminar hall, conference rooms, a library, multiple office spaces and elevator access for the handicapped.

Speaking at the event, Federal Minister, Khawaja Muhammad Asif, expressed his appreciation for the assistance provided by the American government and people, saying that, "the provision of better-equipped research facilities with assistance from the U.S. government is a testimony to our continued efforts and commitment to improving the quality of education in Pakistan and addressing the energy issues facing it."

Highlighting the United States' long-term commitment to strengthen Pakistan's education sector and help find practical solutions for the country's energy challenges, Mission

Director Groarke said, "These new buildings will house academic programs that will help shape the future of Pakistan and set new standards for the success for both women and disadvantaged youth, especially in the energy engineering profession."

Expressing his views at the launch, Lieutenant General Zaman, said that the role of USAID in the promotion of education is admirable, adding, the center would help produce 250 skilled graduates by 2019 which would boost the energy sector in Pakistan.

He hoped that the state-of-the-art facilities of this center would add value to the existing academic and applied research culture at NUST.

Another similar center has been constructed at the University of Engineering and Technology (UET), Peshawar, Pakistan.

This initiative is part of USAID's larger \$127 million investment to harness applied research in order to find innovative solutions for Pakistan's energy, water, agriculture, and food security challenges.

**"These new buildings will house academic programs that will help shape the future of Pakistan."**

**John Groarke, USAID Mission Director**



Dr. Rabia Liaquat, a faculty member for energy engineering at National University of Sciences and Technology (NUST), spoke on behalf of the faculty and students at the inauguration ceremony to extend a vote of thanks.



John Groarke, Mission Director USAID/Pakistan and Khawaja Muhammad Asif, Minister of Water and Power, Pakistan inaugurated the new research center at the National University of Sciences and Technology (NUST).

## Scholar collaborates on solar research which benefits Arizona and Pakistan

USPCAS-E scholar Abdul Kashif Janjua, who was part of the second cohort to visit Arizona State University has collaborated on a research paper that will be presented at the IEEE Power Engineering Society's (PES) general meeting in Chicago this July.

Presenting the paper at PES is significant because the society provides the world's largest forum for sharing the latest in technological developments in the electric power industry, for developing standards that guide the development and construction of equipment and systems, and for educating members of the industry and the general public.

Mr. Janjua collaborated on a paper entitled, "Customer Benefit Optimization for Residential PV with Energy Storage System" under the tutelage of Dr. George G. Karady at Arizona State University.

The paper shows that solar energy can benefit residential customers in Arizona. Photovoltaic energy storage could be optimized to maximize profit as well as minimize utility bills for customers. The analysis in the paper used data and patterns involving variables like load, temperature, anticipated temperature and battery discharge rates to achieve optimal results.

Mr. Janjua said that, "The climate of Arizona and [the] summers in Pakistan are quite similar so PV systems are feasible in both areas. The same research can be used to optimize the size of a PV system and the charging strategies [with] the only difference being the tariffs which can be programmed into the developed algorithm with little effort."

The mentorship and collaboration process from his time at ASU has been an invaluable asset to his education. Of Dr. Karady he states that, "he was [the] most supportive, helpful and encouraging professor."

He went on to say that Karady's, "knowledge and experience with electrical systems can be rarely found even in the best universities

of the world and he was not reluctant to share each of his experiences related to our field. This enhanced and enabled me to not only excel in research but also groom myself in the subject." Abdul Kashif Janjua received his bachelor's degree in electrical engineering from Air University Islamabad in 2013. He worked as a research assistant at SEecs NUST Pakistan from 2013-14. Currently he is pursuing his master's degree at NUST in energy systems engineering. His research has focused on smart Micro and Nano scale grid architecture and economic dispatch problems.

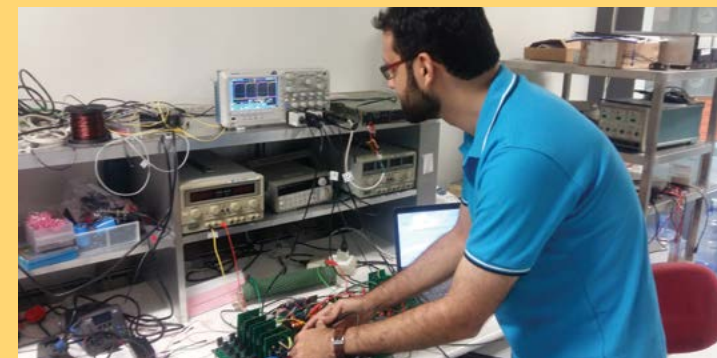
Plans are in the works for Mr. Janjua to pursue a doctorate and then potentially apply his research in the commercial sector. In the meantime he is in the process of publishing another research paper along similar lines in Pakistan.

The USPCAS-E project has now reached a point in its evolution where the return from this type of education is now resulting in exciting research findings.



(Above) Abdul Kashif Janjua is seen here receiving his certificate of completion in entrepreneurship at ASU's Generator Lab. Photo credit: Nathan Dascasin ASU/USPCAS-E

## NUST faculty member now lecturing in Hong Kong



Akif Zia Khan, affiliated with USPCAS-E NUST as a faculty member, worked with Dr. Karady on the curriculum for the Electrical Energy Engineering master's track as well as lab equipment for the Smart Grids lab.

Khan has been chosen as a recipient of a PhD research studentship from the University Grants Council of Hong Kong Polytechnic University.

After completion of his PhD he plans to return to USPCAS-E and resume his responsibilities to strengthen the center.

## ASU holds workshop on Solar Photovoltaic Certification and Reliability in Pakistan

Arizona State University (ASU) organized a three-day technical workshop on Solar Photovoltaic (PV) Certification and Reliability in Islamabad this May.

It was the sixth workshop of the series of technical workshops that ASU plans to organize over the course of the project. Dr. Govindasamy Tamizhmani, Director of the Photovoltaics Reliability Laboratory, ASU – a world renowned expert on PV reliability, conducted the workshop.

The workshop was attended by 133 participants from National University of Sciences and Technology, the University of Engineering and Technology Peshawar, industry and relevant governmental departments.

The first day of the workshop focused on PV

standards and certification and the second and third days focused on PV reliability.

The workshop covered major international performance, safety and design standards for solar PV modules, key requirements for establishing an accredited certification laboratory in Pakistan, the difference between field testing and accelerated testing and addressed the equipment and space needed for reliability research.

On the third day, participants were taken on two field visits. The first was to a grid solar power plant (178 kWp) at the Pakistan Engineering Council. The second visit was to a high-precision meteorological station at NUST.

Four guest speakers, 30 stakeholders and

industry members, five industrial booths and two site visits were involved in the workshop.

The workshop was attended by the "who's who" of the solar industry in Pakistan namely: Q.A. Solar, Sanjwal Solar, Elan Partners, the Pakistan Engineering Council, PCRET, SAARC Energy Center, the Renewable Energy Association of Pakistan, the Center for Energy Research and Development, the Alternative Energy Development Board and the National Electric Power Regulator Authority, among others.

In addition, five industries setup their booths at the workshop and displayed their products. The overall feedback from participants about the workshop was quite positive.



## Seminar Heats Up Oregon

This past semester Oregon State University (OSU) organized a seminar on the, "Recent Advances in High Temperature Solar Thermal Power Generation."

This seminar was dedicated to introducing concepts in concentrated solar thermal power production technology, while focusing on central receiver systems.

Recent developments in concentrated solar thermal power plants in the U.S. and continuing barriers to deployment were also discussed at the seminar.

Particular attention at OSU was honed on developing high temperature, supercritical carbon dioxide solar thermal systems. Supercritical carbon dioxide (sCO<sub>2</sub>) is an attractive working fluid in power and refrigeration cycles due to its favorable thermophysical properties, high volumetric heat capacity and low global warming potential.

For power cycle applications, sCO<sub>2</sub> can yield higher efficiency and smaller components than conventional steam Rankine cycles.

The seminar concluded with a discussion of the practical challenges of utilizing sCO<sub>2</sub> for solar thermal applications and how microchannel devices can mitigate some of these.



(Above) USPCAS-E scholars who studied at Oregon State University in the spring of 2017. Photo credit: OSU

# ASU professor leads gender workshop for STEM careers in Pakistan

The U.S.-Pakistan Centers for Advanced Studies in Energy (USPCAS-E) held a workshop in Islamabad, Pakistan with the hopes of improving gender equity for women in science, technology, engineering and math fields.

The three-day workshop was helmed by Professor Chad Haines of Arizona State University, who specializes in cultural anthropology and topics related to the contemporary Muslim world. The prominence of women in STEM fields from Pakistan differs greatly depending on the region according to Haines. In the Punjab region for example, 20-30 percent of STEM students are women. In the Khyber Pakhtunkhwa region, the percentage of women is actually much lower.

Dr. Haines summarized that the challenge in the region, “is creating a foothold where women are encouraged and supported and based on that, there is much greater potential for increasing the number of Pakistani women in the STEM fields.”

The workshop attracted a variety of participants including students, educational administrators, professors, researchers as well as professionals from the engineering field. Muhammad Asad, a professional engineer who attended the workshop said that the subject of gender equality was eye-opening for him. “I [had] never heard about this type of topic being discussed on this kind of platform before.” Asad had high hopes about the workshop saying, “it

all starts from self-development you know. If you learn something then you practice it yourself.” The workshop has the potential to ripple beyond its original audience. Asad has plans to disseminate what he has learned throughout his social circles.

There was a mix of both men and women attending the event, some of whom were seeking role models and others, inspiration. H. Masooma Naseer Cheema, a scientist and assistant professor said she attended to, “revitalize my passion and keep my spirit high by knowing that I am not alone in the journey of becoming a successful professional female.” Speaking from experience she said, “the life of a professional career women is not an easy task.”

Following the workshop, another attendee, Anaiz Gul Fareed, who is a graduate student at NUST hoped to spread, “awareness to different localities and [various] under-developed areas of my country regarding girls education.”

Ishtiaq Hussain, who is self-described as being from a very conservative family expressed that, “Before attending the workshop I was not really in favor of females getting an equal opportunity everywhere, but now I have learned how to help females and provide them with an equal opportunity to become a successful.”

Cheema praised the event saying that, “most of the gender equity-related workshops usually address women. But

[the] good thing about this workshop is that it addressed both genders.”

Participants weighed and analyzed the difference between, equality, equity and justice. “I would like to get justice rather than equity and equality,” said Cheema.

Anaiz Gul Fareed reflected on several examples of gender inequity, citing, “that there are several offices in Pakistan where there are no facilities for women restrooms.” He also learned that, “more than 50 percent of girls who opt for medical sciences,” may do so, “just because they can get a well-settled boy to marry.”

“While attending this session, I decided to help my three daughters to grow without limiting them,” continued Fareed. “I promised myself that I would help them to achieve whatever they want to.”

Gender issues in Pakistan are also addressed by the project through a scholar exchange program in which ASU which has had an exponential growth of female participants.

To date, this was the fifth workshop that USPCAS-E and ASU has held in Pakistan on various topics related to the project, including green building practices and photovoltaics to name a few.

USPCAS-E will continue to deliver workshops in Pakistan through 2019.

