

U.S.-PAKISTAN CENTERS FOR ADVANCED STUDIES IN ENERGY

ENERGIZER

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USPCAS-E: THE POWER OF COLLABORATION REALIZED

The U.S.-Pakistan Centers for Advanced Studies in Energy (USPCAS-E) project launched in 2014 with an \$60 million investment from USAID. It was conceived as a five-year partnership between Arizona State University (ASU) and two leading Pakistani universities—the National University of Sciences and Technology (NUST) and the University of Engineering and Technology Peshawar (UET Peshawar)—together with supporting partner Oregon State University (OSU). Its charge: develop innovative solutions to Pakistan's energy challenges through a host of initiatives, from modernizing curriculum and infrastructure within NUST and UET Peshawar to facilitating enhanced learning opportunities for faculty and students through academic exchange programs and joint research projects at ASU and OSU. Additionally, the project sought to foster partnerships between public and private energy stakeholders in Pakistan, thereby ensuring that the initiative would continue to yield results long after its conclusion in 2019.

A STORY OF CONNECTIONS MADE

The origins of USPCAS-E stretch back to 2010, when representatives from Pakistan's Higher Education Commission and USAID first began discussing an energy-related education initiative. Over the next four years, risk assessments were done, RFPs were

developed, competitive bids were submitted, winners were chosen, and in 2015, the project launched.

In the intervening five years, partnership members have worked tirelessly to establish two centers of learning capable of making significant, long-term contributions to solving Pakistan's energy challenges. The results of their efforts are nothing short of astounding.

"In just five years, we have established two credible institutions for energy education in Pakistan, with healthy intakes of students, competent faculty and state-of-the-art facilities," observes NUST Deputy Director Ahmad Saeed. "I believe this is particularly impressive because when we started, NUST's Center of Energy Systems had no building, only rudimentary labs, and a single master's program in Energy Systems Engineering, and UET Peshawar had nothing."

Curriculum development was a major component in the undertaking, Saeed notes. A needs assessment was done, and courses were created based on the country's greatest challenges. Faculty from ASU, NUST and UET Peshawar worked jointly to develop the curriculum, with help from OSU Professors Kendra Sharp and Brian Fronk.

ASU faculty also engaged Pakistani energy stakeholders in the process, Saeed continues, and faculty from NUST and UET Peshawar were encouraged to query stakeholders as to how the centers could help in solving real-world problems through applied research projects.

"These relationships will help the centers continue to move forward after the project ends," he notes. "By working closely with stakeholders, we can identify research projects, cultivate funding sources, and help our graduates find work."

A SERIES OF GOALS SURPASSED

Initial results show the project is working just as the partners had hoped. "It rarely happens that projects such as these achieve their stated goals, but with the USPCAS-E program, NUST and ASU not only achieved their goals, they overshot them," notes Saeed proudly. For example, he says, NUST was charged with awarding 250 merit-based scholarships but gave over 300. Its center was challenged to start three new programs but launched seven, and when asked to identify 100 students to participate in the exchange program, NUST tapped 110.

ASU's dedication to the project was equally important, Saeed asserts. "From the outset, ASU faculty and administration were committed not just to do something, but to do something great."

The support provided by USAID throughout the five-year project was crucial as well, Saeed continues. "Anytime there was a problem, USAID staff was there to help. Their oversight and support throughout the project were exceptional."

Dr. Sayfe Kiaei, USPCAS-E Project Director at ASU, is also pleased. "Within five years, we have developed 13 new master's and Ph.D. degree programs and more than 150 new courses; graduated more than 300 master's students, nearly one-quarter of whom were females or underrepresented minorities; and enrolled more than 1,000 students in degree programs at NUST and UET Peshawar," he observes.

These impressive gains were realized in part due to the technical expertise and research capabilities available through ASU's multidisciplinary energy centers, says Kiaei. ASU faculty also brought their expertise to bear on issues of energy policy and governance. "Here at ASU, we're working to transform energy systems by tackling issues from research and regulation to strategy, entrepreneurship, policy and pedagogy," Kiaei says, "and through the USPCAS-E project, we were able to share that knowledge with our partners in Pakistan."

AN EXPERIENCE OF LEARNING SHARED

ASU Professor Zachary Holman was among those who travelled to Pakistan to lead technical training workshops for faculty, staff and stakeholders.



He also hosted exchange scholars in his ASU laboratory.

"I was perhaps most surprised by what my Pakistani exchange students found valuable," says Holman. "It turns out that the hands-on learning component of working in my lab was critical. To be trusted to use extremely expensive equipment on their own, anytime, was incredibly important to the students, and quite different from their experiences in Pakistan," he explains.

Empowering the exchange students with intellectual responsibility was another important step, says Holman. In Pakistan, faculty typically remain more distant from students, dispensing wisdom in a one-way relationship, whereas at ASU, faculty and graduate students interacted with the Pakistani exchange students on a first-name basis and expected them to carry their weight on research projects. "This level of responsibility was new to them and transformative," says Holman. "Many left with a new attitude: 'I can do more than I realized, I just need to be trusted and trust myself.'"

Holman also benefited. The professor gained a new doctoral student—after spending a semester in Holman's lab, Warda Mushtaq elected to return to ASU to pursue her Ph.D.—and his graduate students and post-docs learned more about themselves. "Several members of my lab mentored our exchange students," he explains. "Some realized they liked teaching, and others discovered it wasn't their calling. In both cases, they got a better sense of what they'd like to do in their own careers."

In short, says Holman, the USPCAS-E project was tremendously valuable to everyone involved. "The research relationships that have been formed will persist long after the project is completed," he observes.



A PATH FORWARD SET

"Research is an ongoing effort that links faculty on both ends of the project," agrees ASU Professor A.M. Kannan, the research component lead and joint research project principal investigator for the initiative. "Sustainability was a major component of this initiative, so we wanted to ensure that we helped NUST and UET Peshawar faculty master the elements of a successful research program."

For example, says Kannan, Pakistani faculty wanted training in writing a successful research proposal, so ASU held a proposal writing workshop at NUST. ASU also assessed the universities' research facilities and made recommendations as to the equipment they should procure. And when exchange students came to work in ASU's labs, faculty members guided them in proper protocols. "Our students returned with a sense of confidence and a determination to pursue research more aggressively," observes NUST Deputy Director Saeed.

Pakistani exchange scholar Maria Kanwal puts it more bluntly. "Spending a semester working in the lab of Professor Zachary Holman was life-changing," she asserts. "Working with Ph.D. students and post-docs, I learned how research is conducted in a focused environment, helping me become immersed in my work and improving my ability to approach problems in the lab."

Now back in Pakistan, Kanwal has permanently altered her plans for the future. She has applied for a scholarship and hopes to begin working on her Ph.D. in a U.S. or European graduate program in September of 2020. After completing her doctorate, she plans to return to Pakistan and implement what she has learned. "My degree won't just be hanging on my wall," she insists.

ASU graduate student Warda Mushtaq is similarly enthusiastic. She, too, spent a semester in the states as

an exchange scholar in Professor Holman's lab and has now returned to complete her Ph.D. under his tutelage. "The main challenge I faced during my research work in Pakistan was limited availability of resources—I wasn't even sure I wanted to participate in the exchange program when the opportunity arose—but my experience with the faculty, equipment and lab facilities at ASU helped me to focus and determine next steps," says Mushtaq. After completing her doctorate, she plans to return to Pakistan and pursue a faculty position at NUST.

Faculty members in Pakistan have also benefited from the exchange program. Dr. Affaq Qamar, an assistant professor under an electrical energy system engineering program at UET Peshawar, spent four and a half months at ASU, conducting a joint research project with ASU Professor Bertan Bakkaloglu, participating in the Technology Entrepreneurship Lab under the guidance of Start-Up Program Faculty Associate Kenneth Mulligan, and bolstering his teaching skills through completion of the Advancing Instructional Methods (AIM) certification program with Professor Peter Rillero. "I learned how to organize lectures, introduce concepts and more actively engage my students in the learning process."

Back in Pakistan, Qamar says, the change in his classroom was profound. "Before the AIM training, my interactions with students were pretty basic—I asked questions and they answered. But when I began applying the concepts I learned while at ASU, the whole dynamic changed. My students began to participate actively in the learning process, challenging me and gaining confidence in their knowledge." And that confidence has translated into higher post-graduate job placements, Qamar says. "Electrical engineers here are going through tough times in terms of job placement, but my students are getting jobs because they know their field and believe in their abilities."

A FUTURE OF ENDLESS POSSIBILITIES

“Through the USPCAS-E program, we’ve given individual students in Pakistan opportunities that they never would have had,” observes ASU Project Director Kiaei. “We’ve established two centers that deliver state-of-the-art, 21st century energy education, and as graduates begin their careers, this knowledge will propagate throughout the country.”

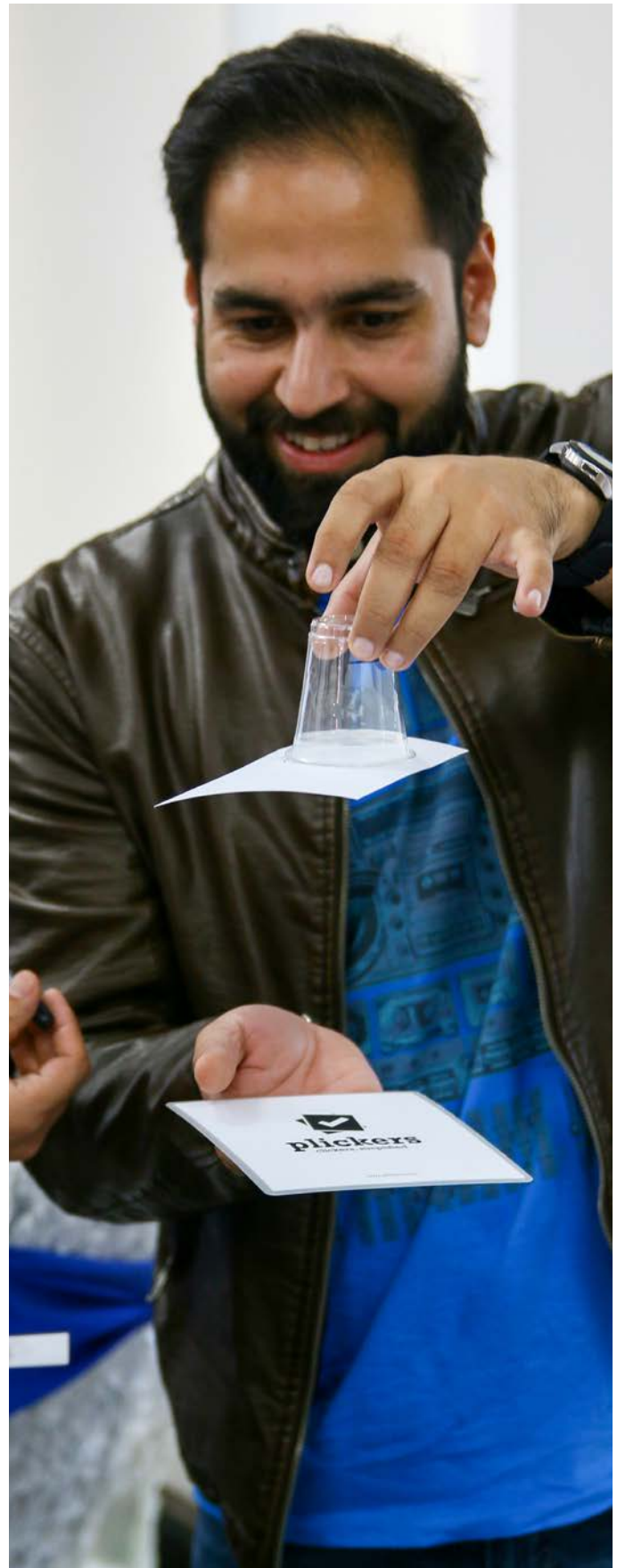
Initiatives within the program have also helped to lay the groundwork to develop hybrid energy sources in Pakistan’s rural areas and decrease the number of regularly scheduled power outages, work that Kiaei is confident will continue.

Faculty and administrators at ASU have profited from the experience as well, says Kiaei. “The USPCAS-E project gave us the opportunity to execute an international project and we learned a lot. Our success underscores the fact that ASU’s outreach is global.”

Clark Miller, a professor in the School for the Future of Innovation in Society and director of ASU’s Center for Energy and Society, served as the USPCAS-E program’s joint research project principal investigator and witnessed firsthand the positive impact of the project on all parties. Miller hosted three Pakistani faculty and 30 students in his lab over the course of the five years, held video conferences with Pakistani faculty every other week throughout the project, and travelled to Pakistan twice.

The program has allowed structures to be put in place in Pakistan that can drive long-term change in the country’s energy systems, Miller observes.

“NUST and UET Peshawar are institutions with durability. Now they have an integrated perspective on energy, together with the knowledge and tools, that will allow them to advance the energy goals of the nation.”



Project Accomplishments

USPCAS-E Project Progress: Fiscal Year 2019

The USAID-funded U.S.-Pakistan Centers for Advanced Studies in Energy, USPCAS-E, created a partnership between Arizona State University (ASU) and two leading Pakistani universities: National University of Sciences and Technology (NUST) and University of Engineering and Technology Peshawar (UET Peshawar) along with partner Oregon State University (OSU).

PROJECT GOALS

BUILD NEW CENTERS OF ADVANCED STUDIES IN ENERGY

New buildings at the National University of Sciences and Technology (NUST) and the University of Engineering and Technology Peshawar (UET Peshawar) have created a catalyst for change in energy education in Pakistan. These modern facilities feature new labs and libraries plus the tools, environment and mindset needed for transformative change.



CURRICULUM

CREATE A MODERN, RELEVANT CURRICULUM

ASU supported NUST and UET Peshawar in developing new master's and Ph.D. programs and new courses. These new degree programs translate work in the classroom and lab into the public and private sector in a pragmatic and applied manner with a focus on immediate real-world applications.



RESEARCH

FOCUS ON HIGH-IMPACT APPLIED RESEARCH

The USPCAS-E project focused on energy research that directly relates to ongoing and future energy challenges that affect the lives of all Pakistanis and impede economic growth. These efforts include 36 applied research projects and 12 joint research projects with U.S.-based faculty at ASU and OSU.



EXCHANGE & SCHOLARSHIPS

FACILITATE LEARNING THROUGH EXCHANGE PROGRAMS

USPCAS-E supported the academic and research advancement of Pakistani students and faculty by hosting more than 200 exchange students and faculty at ASU and OSU to conduct cutting-edge energy research in state-of-the-art labs.



SUSTAINABILITY

ENSURE LONG-TERM SUSTAINABILITY OF THE CENTERS

USPCAS-E worked to ensure the sustainability of initiatives at NUST and UET Peshawar through fundraising strategies and the cultivation of public-private partnerships by raising more than \$2M in funding, creating new labs and two libraries, and securing internships.



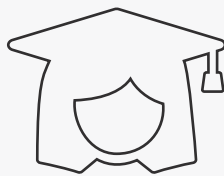
GOVERNANCE

FACILITATE INDUSTRY COLLABORATION AND STAKEHOLDER ENGAGEMENT

USPCAS-E is focused on the collaboration needed to develop world-class centers of energy engineering that will serve as Pakistan's go-to think tanks with the technical expertise to close the energy gap. As part of this effort, USPCAS-E worked to actively engage stakeholders throughout the life of the project.

13

New Master's & Ph.D. degree programs



Nearly
300+
Graduates

1000+ M.S./Ph.D. students enrolled to date

150+ New Courses Offered

36

Applied Research Projects



9

Virtual seminars

12

Joint Research Projects with U.S. & Pakistani researchers

14

Technical workshops and visiting experts

217

Exchange Visitors



25% female

555

Scholarships awarded



Entrepreneurial training



Cultural and academic excursions



Semester-long research experience



472

Stakeholders engaged



70+

Meetings to build engagement with the Public/Private Energy Sector

121

Internships

\$2.2

Million raised in external funding



2

 Technology Centers formed

21

 Public-private partnerships



BUILDING A NETWORK OF ENERGY ENGINEERS FOR PAKISTAN'S FUTURE

Sara Sultan has come a long way from Haripur, Pakistan: 11,865 kilometers or 7,372 miles to be exact. The former USPCAS-E scholar from NUST is currently pursuing a Ph.D. in Energy Science and Engineering (with an entrepreneurship minor) at the University of Tennessee, Knoxville. As part of her studies, she works at Oak Ridge National Laboratory (ORNL) in the Building Science Division. She's also enrolled in a concurrent master's degree program in the Mechanical Engineering Department.

Something immediately apparent is that Sara is busy. She is on a mission to improve energy efficiency and to create opportunity and connection for students in Pakistan.

"I'm an executive member of the Environment and Sustainability Committee of the Student Government Association at my

university and also founder and president of the Pakistan Students Association."

Sara is also committed to helping other students seeking to study in the United States.

"I'm a mentor with an organization based in Pakistan that helps students with the U.S. admissions process and applying for Fulbright scholarships."

She's also connecting USPCAS-E students and alumni from NUST.

"I also founded the USPCAS-E NUST Society to bring all the students and alumni together and guide each other for both professional growth and personal skill development. I have been leading some advisory sessions on research, technical writing, communication skills, and higher education and scholarships."

Sara knew she wanted to be an engineer from a very young age. It turns out that she had a passion for an engineering discipline without knowing what it was called: mechanical engineering.

"I hail from a small village in Khyber Pakhtunkhwa province, where females are not supposed to pursue higher education—especially for STEM degrees. There was always a misconception that engineering is not for girls."

Many girls face limited educational resources and a non-supportive family environment, but Sara's family was different.

"I feel proud to have supportive parents who let me break all these stereotypes."

Sara is trying to raise awareness about renewable energy and encourage everyone to do what they can on a personal level to adopt behaviors that increase energy conservation and efficiency in homes.

"I delivered some awareness-raising seminars to promote renewable energy research at universities in Pakistan, especially the ones in underdeveloped areas. I served as a volunteer instructor at two universities in my city to promote energy engineering and to encourage students to pursue research in energy."

Sara loves to share her journey to energy engineering.

"During my bachelor's program, I used to ponder my research career and would say to myself, 'It should be something that will solve one of Pakistan's biggest issues.'"

But the specifics were unclear to her until she took an energy course online via edX offered by Delft University of Technology (TU Delft).

"It inspired me to search all of the graduate programs in energy at NUST, which was my dream school in Pakistan. I wrote a statement of interest, did the interview, and got into the Energy Systems Engineering program."

Sara visited Oregon State University as a USPCAS-E exchange scholar in fall 2016 and worked on a hydropower project. The project had two parts: data analysis to assess the hydropower potential in Pakistan and an evaluation of the efficiency of a pico hydropower system (for power generation of under 5 kW) with an AC generator and an impulse turbine. In addition to contributing to the group's efforts, Sara also designed the system for a cross-flow turbine.

"I took many research design and methodology seminars, communication skills development sessions and interdisciplinary workshops at the library and in different departments at OSU, all of which helped me a lot during my thesis phase," she explains. "I'm an explorer, a dreamer, and always open to learning and improving myself, taking any criticism positively. The experience with the USPCAS-E exchange program was significant in all aspects, from research to personal development."

Sara says that she explored a new culture, but most importantly, she says she realized her true potential and discovered her ability to make independent decisions, even under society's influence and with financial pressures.

Sara has worked in the areas of water desalination, solar power, and hydropower and wanted to combine aspects of all three in her work.

"I decided to work on energy-efficient buildings with sustainable thermal energy storage.

Incorporating small-scale renewable energy systems to replace fossil fuels and shifting the energy load from peak hours provides a solution with economic and environmental benefits."

Sara is also working on developing an energy consumption policy for residential buildings in the U.S.

"I want people to adopt energy-efficient behaviors and incorporate renewables in their homes, not just for the environment, but for themselves. Start with saving energy and reducing utility costs," she says.

Where does Sara see herself in the future?

"I see myself as an influential energy entrepreneur, a well-known energy researcher, and an ambassador of U.S.-Pakistan cultural exchange. I hope to conduct some innovative research and take a lead role in ORNL's innovation crossroads program by converting my research into a successful entrepreneurial venture. I also see our USPCAS-E NUST Society growing into a big collaborative effort between our alumni and students in Pakistan."

Sara hopes that in the near future, the USPCAS-E scholars will be able to create more awareness about energy and higher education in Pakistan, an awareness that will eventually lead to more energy enthusiasts, researchers, entrepreneurs and policymakers.

In addition to researcher and mentor, Sara is also an artist, a traveler, and a writer. Sara wants people to look beyond stereotypes to see women as multifaceted, complex individuals, who are ready to make things happen. She also wants people to know that she is prepared to tackle anything, even the impossible.

"I'm always misinterpreted as a delicate emotional girl and judged

by a stereotype that says women can't do great things like men. I think there's much more to women and especially to me. I don't go by 'this is not possible' instead of by 'if no one has been able to do this, this is definitely my chance to become a pioneer.'"

Sara wants to inspire people and help them find ways to utilize their true potential.

"I believe that individual and personal growth is critical to creating a strong society, and that's my strength."

Sara applied to the Fulbright program, but she felt that the local interview panel had concerns about her hijab and she later received a rejection letter. It was a demoralizing and disappointing experience. Sara thought that she would need a Fulbright to pursue a Ph.D. in the United States and couldn't see another path forward. But then she applied to an interdisciplinary program offered through the Bredesen Center at the University of Tennessee, Knoxville. She was accepted and received a DOE fellowship and a chance to work at one of the most prestigious energy labs in the United States. Her message to fellow students who are navigating the application process: persevere and believe in yourself.

"I never give up and never stop believing in myself. I think it helps me dealing with stress and moving on from failures. So, I believe, what happens, happens for the best."



THIS START-UP FOUNDER WANTS TO HELP HER FELLOW PAKISTANIS REALIZE THEIR FULL POTENTIAL

Samia Subhan Qureshi is committed to finding efficient energy solutions for her country so that everyone can realize their full potential.

Samia is from Bannu in the Bannu District in southern Khyber Pakhtunkhwa. She currently lives in Peshawar where she is pursuing a master's degree in the USPCAS-E Electrical Energy Systems Engineering program at the University of Engineering and Technology (UET) Peshawar.

She learned about USPCAS-E while pursuing her bachelor's degree at UET Peshawar after attending a workshop organized by USPCAS-E.

Samia was part of the last cohort of USPCAS-E exchange scholars to visit the U.S. in spring 2019. She conducted her research at ASU's Photovoltaic Reliability Lab (PRL-ASU).

When asked to describe the importance of her research, Samia explained: "According to Dr. Govindasamy Tamizhmani (founder of PRL-ASU), if the concept that I used in my research is implemented in real-time calculations, it will change the solar photovoltaic industry."

She says that by eliminating the use of pyranometers, pyrhelimeters and two-axis trackers for outdoor angle of incidence (AOI) measurement, their proposed model

offers a cost effective outdoor AOI measurement. This new method combines attributes of older models through an AOI correction model that accounts for direct as well as diffuse light.

Samia is also one of the founders of a solar startup, the GreenWend Company.

"I want to promote clean energy solutions in my country. On the way back to Pakistan from the U.S., I realized that my passion for contributing some benefit to society and playing a positive role had increased. Because of my exchange experience, I realized that if you don't get your basic needs met, you might survive, but will not live your life in a meaningful way. Many people are suffering from power outages and load shedding and they can neither run their businesses in a proper way nor light up their homes."

During her exchange experience, Samia participated in entrepreneurship training. Entrepreneurship instructor Ken Mulligan tells the exchange scholars that Pakistan needs to move beyond being a nation of job seekers to become a nation of job creators, advice that Samia took to heart.

“After my arrival back to Pakistan in May 2019, I thought that if I just sat and waited for a job then I would become a part of a problem. Instead I decided that I should take the initiative and become a part of a solution!”

She started GreenWend with other energy engineers. She says that her USPCAS-E experiences played an important role in enabling her to think like an entrepreneur.

Samia also completed an internship at PTCL Peshawar, a telecommunications company, where she worked in the switching center.

From a very young age, Samia says that she “loved to play with equations.” She explains, “My favorite subject was mathematics and I always succeeded in getting the highest grade.”

Growing up, she realized that many people didn't consider women for technical or field work.

“I wanted to break this stereotype. My family gave me an open choice for selecting any field and luckily, I am the first female engineer of my family. I always find it fun working in the field.”

Samia noticed many small differences between Pakistan and the U.S. during her exchange experience but she also realized the potential in her home country.

“I just felt that if they can be so much ahead in technologies, then why can't we? There is no difference between people when they are born. It's just that how they utilize their energy. Without proper management, nothing can be successful.”

During her exchange visit in the U.S., Samia lost her mom. Samia beautifully describes mothers as “the precious gem in every human being's life.”

She said her father was her biggest supporter during this difficult time.

“It was really a hard time for me being away from my family. But my father was my greatest supporter, as always. He encouraged me to complete my research at ASU and guided me to make every decision calmly. I learned that if God gives us hard times, He also gives us power to get through the situation.”

Samia also expressed gratitude for the support from her fiancé, Zeeshan Saeed Shah, a USPCAS-E scholar from the spring 2018 cohort who offered guidance on selecting a lab and strategies for their startup.



Five years from now, Samia hopes to see her start-up among the top companies of Pakistan. She says acknowledges that there are initial challenges with startups and sometimes big risks, but she is ready for the challenge.

“I strongly believe that hard work will always pay off,” she explains.



GROWING UP OFF-GRID INSPIRED THIS ENGINEER TO IMPROVE ACCESS TO ENERGY AND ENERGY-RELATED EMPLOYMENT

As a child, Zeeshan Saeed Shah says that he was always curious and interested in math and science. He represented his school in exam competitions.

“I used to think a lot about electric circuits and electron motions which drew me towards engineering. As I got older, I was drawn to electronics and other electric stuff.”

But electricity is in short supply in his hometown of Bannu in the Bannu District in southern Khyber Pakhtunkhwa.

“I completed my higher secondary education in Bannu, where we were barely able to light our homes for an hour in a day. Places like my hometown are considered to be off-grid areas, and the lack of energy access directly impacts education and business.”

This first-hand experience with severe energy shortages and an overall lack of energy availability shaped Zeeshan Saeed’s future. As an undergraduate student at the University of Engineering and Technology (UET) Peshawar, Zeeshan Saeed saw some posters about an upcoming workshop arranged

by USPCAS-E. After attending that workshop, he wanted to join the center.

He is now pursuing a master’s in the USPCAS-E Electrical Energy Systems Engineering program at UET Peshawar.

At USPCAS-E, Zeeshan Saeed learned about renewable energy, specifically solar power, a clean source of energy that is environmentally friendly.

Zeeshan Saeed visited Arizona State University as part of the fifth cohort of exchange scholars in spring 2018. During his exchange training, Zeeshan Saeed conducted research in the power electronics lab under the supervision of ASU Professor Bertan Bakkaloglu. He was the team leader and worked on analyzing fundamental characteristics of inverters for a photovoltaic system. He also interned with the “Defend Our Future” club which arranged workshops on recycling and exploring different ideas on how to clean up the environment.

Zeeshan Saeed says he considers himself lucky to have been a USPCAS-E student.

“The most important experience was my exchange visit to Arizona State University. I spent my time in a research laboratory where I learned research skills and technical skills. During my internship at the Defend Our Future club, I learned management and marketing skills.”

As an exchange scholar, Zeeshan Saeed also took classes in energy policy and entrepreneurship, experiences that changed his trajectory.

“We had a lot of fun in the energy policy class where we worked on designing policy for the energy sector of Pakistan. I met some great entrepreneurs through our entrepreneurship class, and we learned how to articulate an idea and how to present it. This class drew me towards entrepreneurship.”

His research became a building block of his future work in GreenWend, a startup he launched with colleagues that will provide solar services in both the private and government sectors. Its mission is to decrease electricity costs, eliminate load shedding, and provide employment and training opportunities.

“We hired around 15 employees, including engineers, managers and technicians. In 2020, we are arranging seminars and workshops in schools, colleges and universities to promote solar energy in Khyber Pakhtunkhwa including newly merged areas.”

“At ASU, I was working in a group project where we analyzed the fundamental characteristics of an inverter for a photovoltaic system. We also studied practical approaches for a Maximum Power Point Tracking (MPPT) system and the modeling and characterization of MPPT-based boost converters. I used the same MPPT techniques in my final year project which was about photovoltaic efficiency improvement. Now, we are using practically the same approach in our startup.”

When Zeeshan Saeed thinks about the future, he starts with the present, working on the GreenWend startup. In two years, his goal is to provide at least



20MW solar power in the private and public sectors and provide employment for more than 100 engineers and technicians in all districts of Khyber Pakhtunkhwa and newly merged areas.

“I want to train people through seminars and workshops and steer them towards green energy. After two years, I plan to launch another startup, currently in the feasibility planning stage, which will bring more employment all over Pakistan.”

When asked what most people don't know about him, Zeeshan Saeed said simply, “My capabilities.” He explained that opportunity is created not granted and that your success doesn't depend on your location or environment.

“A person living in Bannu can become the next Bill Gates or Mark Zuckerberg if he or she utilizes time and energy the way they do.”

Zeeshan Saeed encourages others not to take the easy route with a job and instead to become a value creator as an entrepreneur.

“Together we can contribute to society, and we together can bring happiness.”

U.S.-PAKISTAN CENTERS FOR ADVANCED STUDIES IN ENERGY (USPCAS-E)

The U.S.-Pakistan Centers for Advanced Studies in Energy (USPCAS-E) was a five-year program implemented by partners National University of Sciences and Technology (NUST), University of Engineering and Technology (UET) Peshawar and Arizona State University (ASU) from 2014-2019.

The USAID funded portion of the project concluded November 20, 2019.



The USPCAS-E closing ceremony on November 14, 2019 marked the successful completion of project life (2014-2019) with ASU support to NUST and UET Peshawar. The centers are offering 13 new energy engineering programs, 1000+ students are enrolled and over 300 graduates with diverse research experience in world class energy labs.

**QUESTIONS AND
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Partnering Universities:

