

# Empowering Women through Solar Energy: A Case Study from Pakistan

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## Key insights

1. **Renewable energy and inclusion:** Renewable energy offers more inclusive career opportunities than traditional energy sectors. The Pakistani professional network Women in Energy (WiE), showcased in this report, has succeeded in creating jobs for 70 women from predominantly lower-middle class backgrounds.
2. **Leadership and barriers:** Effective leadership is needed to overcome entrenched barriers in energy sector employment. WiE's success is based on strong, strategic leadership from stakeholders and increased female representation in operations.
3. **Skills development:** Targeted skills training is vital for empowering marginalized groups. WiE illustrates how such programs can enhance career prospects for women and highlights the importance of ongoing investment in these areas.
4. **Inclusion and growth:** Including marginalized communities in renewable energy can drive sector growth and address energy security concerns. WiE shows that women's participation can substantially advance inclusivity goals.
5. **Addressing biases:** Systemic biases within the energy sector must be tackled through policy reforms. This will create fairer opportunities for women and other marginalized groups, as highlighted by the WiE initiative.
6. **Challenges for women:** Women face ongoing challenges in the corporate world due to family pressures, logistical issues, and societal norms. Addressing these barriers is essential for ensuring equal opportunities in the renewable energy sector.

## 1. Introduction

The growing field of renewable energy presents accessible opportunities not just for entrepreneurs, but also individuals seeking careers in clean technology. According to the International Energy Agency's global employment report, while jobs across all sectors were negatively impacted by the COVID pandemic, employment within renewable energy grew by over 5% in 2022. Over the same period, employment in the fossil fuel sector decreased by a rate of 4% [1].

As a result of growing energy insecurity, alongside the improved affordability of clean energy technologies, jobs within this sector are predicted to grow further in the near future. More than half of these developments are being supported by up-ward trends in the solar and wind markets.

In addition, there is growing recognition of the contribution a diversified workforce can bring to the clean energy sector. Notable efforts are being made to address up-scaling skills for under-represented groups, particularly women, in the clean energy sector. Specialized training programmes that provide women with technical and soft skills are playing a critical role in achieving greater gender parity within the sector.

An initiative that stands out in its efforts for assisting women in the energy sector is Women in Energy (WIE), a professional network in Pakistan dedicated to training women as solar power engineers. Such endeavors not only reflect the reduced entry barriers in the energy sector, but also underscore a growing interest in expanding the workforce within renewable energy technologies.

We conducted a focus group discussion with a dozen WIE participants to assess their hopes and experiences. A majority of participants felt empowered by the training, suggesting that jobs in solar energy can help to challenge societal norms and foster more inclusive growth in the energy sector.

Building upon the achievements of WIE and the burgeoning opportunities within the renewable energy sector, it is crucial to delve into the experiences of participants to glean insights into how these opportunities shape the careers of women in energy.

Initially, participants' motivations underscored a desire to engage with an initiative tailored specifically for women—an uncommon occurrence within the energy sector. Moreover, the training provided exposure to technologies, particularly in clean energy, which many viewed as pivotal for the future of the industry. Additionally, the female-only training program was

perceived as a unique avenue to advance their careers and empower themselves within the engineering field.

The practical, hands-on experience coupled with the development of soft skills during the program proved invaluable. These competencies not only bolstered their future career prospects but also provided clarity regarding their professional trajectories. Furthermore, many participants emerged from the program with a newfound motivation to assume leadership roles and support younger women entering the energy workforce. Notably, the presence of a female mentor leading the training had a profound impact, filling a critical gap in mentorship and leadership roles for women within the industry.

We argue that initiatives of this nature are essential in equipping women with the skills, knowledge, empowerment and resilience necessary to enter and navigate a historically male-dominated industry. Such training programs can significantly contribute to closing the gender gap within the sector, fostering a more inclusive and diverse energy workforce.

## **2. Solar Energy in South Asia**

The global shift to clean energy is intensifying, with investments in solar energy surpassing those of oil for the first time in 2023 [2]. Mirroring the global shift, South Asia is also focusing on up-scaling its renewable energy capacities, with particular focus on solar energy, to meet growing energy demands. With a population of almost two billion people, and some of the fastest emerging markets, South Asia is faced with ballooning demands for energy. Over the last twenty years, demand for electricity within the region has grown by an average of over 5% each year. Demand is expected to increase over two-fold by the year 2050 [3].

Currently, energy production is largely met through fossil fuels, which account for 80% of aggregate energy production. Two-thirds of energy resources are imported [4], giving South Asian countries in a high-risk profile, as many of them, including Bangladesh, Pakistan and Sri Lanka, are struggling with balance of payment issues.

Amidst these challenges, South Asia is favored with an abundance of renewable energy resources providing countries with potential alternatives to fossil fuels. Historically, South Asian countries have been heavily dependent upon hydropower for renewable energy. However recent climate-related developments have prompted a diversification of energy resources, with growing emphasis on Solar PV. India in particular has emerged as a regional leader in the solar industry, thanks to successful supply-side fiscal policies, while other countries such as the Maldives are undertaking initial strides within this area.

Solar power offers great returns as a result of high levels of solar irradiance throughout the region. Cumulatively, South Asia has the potential to generate 939GW of energy from solar, 350GW from hydro power and 1,289GW from wind [5]. Afghanistan is endowed with the most average practical potential for energy generation from solar, followed by Pakistan, Maldives and India. Pakistan's maximum GHI (Global Horizontal Irradiance) of 2,337 Wh/m<sup>2</sup> suggests that utilizing only 0.017% of its land for solar energy could meet the energy demands of the country [6].

However, when looking at total installed capacity of PV solar, India leads the region with 26,869 MWp of installed capacity, followed by Pakistan that has installed 1,568 MWp of solar PV capacity and Bangladesh. The low performing countries within this region include Bhutan (1MWp), Maldives (9 MWp) followed by Afghanistan (22 MWp) as of 2018 [7].

## 2.1 Solar trends by country

In 2020, **Bhutan, Nepal** and **Sri Lanka** recorded the highest renewable energy consumption rates [8]. For Bhutan and Nepal, this regional standing is largely due to hydropower, with smaller contributions made by solar and wind energy resources. Both countries are actively encouraging diversification of their renewable energy resources by 2030. Bhutan aims to remain a carbon-neutral country and Nepal has announced its intentions to achieve net-zero emission by 2030 [9].

Through strategic national plans, such as the Renewable Energy Master Plan in Bhutan and the Renewable Energy Subsidy Policy in Nepal, both countries are striving to up-scale renewable energy generation. Bhutan's policy attracts public-private partnerships to increase renewable energy deployment while Nepal's subsidy-driven fiscal initiatives aim to up-scale solar deployment [10]. As a result, Bhutan has already constructed their first large-scale 17 MW solar plant with more plants planned for the future [11]. Similarly, Nepal has dedicated the greatest share of infrastructure subsidies for mini-grids connected to solar, wind and hydro energy sources [12].

Sri Lanka has seen success primarily through hydropower and rooftop solar [13]. Similar to its regional counterparts, Sri Lanka's ambitious aim is to generate 70% of its aggregate energy from renewable sources. The Sri Lankan government plans to leverage its strategic location in the equatorial region to construct mega solar plants in their Southern, Eastern and Northern localities. These initiatives are supported by supply-side economic policies that stimulate investment in solar plants connected to various grids across the nation through a process of competitive solicitation [14].

In contrast, **Afghanistan, Bangladesh** and **the Maldives** have the lowest renewable energy consumption rates in 2020, facing unique challenges such as infrastructure bottlenecks and limited monetary resources [15]. However, these nations are engaged in active efforts to shift this narrative. Bangladesh targets to derive 15% of its energy from renewable resources by 2030 [16]. Similar to Sri Lanka, hydro, solar and wind are the key drivers of this change. The country's 8th-five-year plan outlines objectives to generate 10% of electricity from renewables by 2025. In response to favorable solar market trends, the government was able to utilize demand-side policies installing 5.8 million solar home systems across the country in 2023 alone [17].

Parallel to this, Maldives has ambitious targets to achieve net-zero emissions by 2030 [18]. The government of Maldives plans to up-scale their renewable energy capacities through policy initiatives such as the Strategic Action Plan which seeks to attract public-private investments via domestic and international investors. They have already made significant efforts in deploying renewables, particularly solar, within their tourism industry as a result of attractive pricing [19]. Unfortunately, the same cannot be said about Afghanistan as a result of economic and political turbulence in the nation.

**Pakistan** has announced ambitious aims to generate 60% of its energy from renewable resources [20]. Through bi-lateral economic agreements such as CPEC (China-Pakistan Economic Corridor), Pakistan has been able to attract foreign investment to its renewable energy sector, an example being the construction of Quaid-e-Azam solar park and the Jhimpir wind power project. Balochistan has been identified as a key region for future renewable energy growth, capable of implementing over 14 GW of renewable energy within the next 5-10 years [21].

To further harness this potential, the government has introduced an array of measures. Initiatives like the Pakistan Private Sector Energy Project have successfully empowered SMEs, funneling \$27.1 million into the sector [22]. Another key measure is the Alternative and Renewable Energy Policy (ARE), which includes a multi-faceted stimulation plan for the renewable energy market, including lower grid-tied generation costs, liberalized energy markets and more private sector involvement and innovation [23]. As a result of these developments, in 2022, renewables primarily - biomass, solar, and wind - constituted 57% of total energy generation in Pakistan.

**India** is the regional trailblazer. India aims to generate 40% of its cumulative energy capacity from renewable energy by 2030 [24]. Through policy instruments such as the Green Corridor Initiative, Direct Benefit Transfer (DBT), India has been able to create a sustainable demand-driven circulation of renewable energy generation within its country. Furthermore, on the



manufacturing side, legislative measures such as the Production Linked Incentive, have boosted manufacturing levels [25].

As a result, currently, India holds 3% of the world market share in solar manufacturing and it is projected to remain a major hub for manufacturing in the upcoming years [26]. Such supply side policies have resulted in initial projections suggesting a potential decrease in solar deployments due to heightened import tariffs, however, there are outlooks of a real boom in solar deployment in 2025, driven by ample supply and reduced prices [27]. Furthermore, the investment outlook for India is positive, with favorable market conditions. For instance, in the third financial quarter of 2023, FDI (Foreign Direct Investment) in the country's renewable energy sector reached \$6.1 billion [28].

## **2.2 Policy challenges**

In terms of understanding the differences in progress across the region, Bhutan, Nepal and Sri Lanka's, high renewable energy consumption can be attributed not only to reforms focusing on stimulating investments and demand for renewable energy, but also to legislative and practical measures aimed at boosting the number of trained professionals alongside advancing research and development for increased energy efficiency. For instance, Bhutan's Sustainable Hydropower Development Policy involves comprehensive technical training programs [29]. Similar initiatives have been undertaken in Sri Lanka and Nepal.

Recognising the significance of human capacity building and its contributions to up-scaling renewable energy consumption, India has also taken such steps. Through the Skills Councils for Green Energy Jobs (SCGJ), more than 500,000 professionals have received training in the renewable energy sector alone [30]. Meanwhile, Pakistan has launched such training programmes within their Alternative and Renewable Energy Policy [31]. However, there persists variations in training capacities, for example, in 2020, India was able to invest about \$500 million in renewable energy capacity development programs, compared to \$10 million invested by Pakistan in the same year [32].

Furthermore, for countries such as Pakistan, Bangladesh, investment pipelines within the renewable energy markets remain in the early phases and are threatened by cancellations and delays. Similar issues affect Sri Lanka [33]. However, for Pakistan, additional challenges such as fluctuating exchange rates, sharp declines in consumer purchasing power, an unstable political government, severe economic crunch, and inconsistency in policies are hindering increased investments in the renewable energy sector. While Pakistan is focusing on increasing solar PV energy generation, heavy reliance on imported solar panels strains the nation's finances. Implementing import-subsidizing policies, akin to those in India, could

boost local production, foster technological advancement, stimulate employment and attract greater investments.

In summary, the South Asian landscape is marked by diverse challenges and progress across the various countries in the region. While Bhutan, Nepal and Sri Lanka are leaders in the renewable energy sector within the region as a result of substantial utilization of hydropower, India is taking the lead in solar development and is projected to forge ahead in deployments in the upcoming future. Conversely, countries such as Pakistan, Bangladesh, Maldives and Afghanistan are behind, facing hefty challenges but are gradually rolling out policies to increase their pace in renewable energy adoption. Overall, supportive policies, continued investments, and enhancing human capacities are needed to assist the region to achieve energy sustainability.

### **3. Employment Opportunities for Women**

The shift towards renewable energy has generated significant job opportunities. Since 2021, the sector has witnessed rapid employment growth, creating an additional 900,000 jobs globally, primarily fuelled by the expansion of solar and wind markets [34]. This transition presents countries with the unique opportunity to confront apparent gender gaps within the traditionally male-dominated energy sector. In 2022, women comprised only about 32% of the labor force within the clean energy sector. As a result of growing energy demands and increasing energy insecurity faced by many developing countries, nations are offered a chance to strengthen clean energy transitions while empowering women in this sector.

According to the International Renewable Energy Agency's (IRENA), there are a greater number of women employed within the solar PV sector than in other parts of the energy sector such as wind, gas and oil. However, a vast majority of them occupy administrative roles with very few working as technical staff. Integration of the female workforce would not only harness productive output but also leverage the best available talent in labor markets. Furthermore, empowering women is the linchpin for development and greater GDP growth levels.

Women worldwide face numerous barriers of entry in the energy sector. These include socio-cultural norms that promote gender-specific roles, lack of technical skills within women, inadequate assistance for increased mobility, alongside a shortage of female leadership within the industry [35]. Hence it is essential to address these issues via targeted efforts by challenging these socio-cultural perceptions, promoting women's technical and soft skills along with provisioning females with female mentors within the sector.

Globally, many countries are actively engaged in such efforts. For instance, Canada's Energy Advisor (EA), Recruitment, Training and Mentorship campaign has supported skills-enhancement for excluded groups including women in their efforts to assist their country's shift to renewables. Similarly, the Australian government has shown its support to empowering women in clean energy by investing AUD 11 million into subsidy-driven-apprenticeships, further education and professional monitoring programmes. Austria, women and disadvantaged groups are being supported through the Environmental Foundation which trains them with the required skills and qualifications needed to integrate into the clean energy market [36].

### **3.1 The South Asia picture**

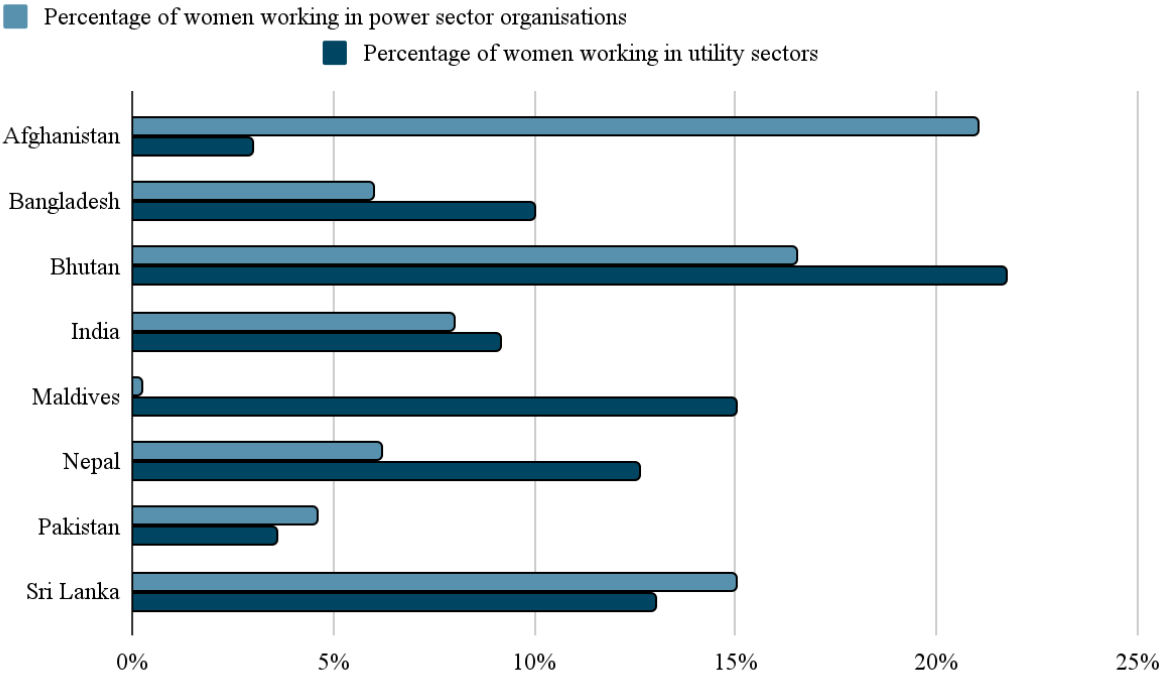
While all countries in the South Asia region constitutionally guarantee women's rights and liberties to work, specific policy frameworks aimed at encouraging female representation in the energy sector are uncommon. However, there are emerging strategic plans to tackle this issue. For example, Maldives' National Gender Equality Plan aims to increase female participation in critical engineering industries such as manufacturing, mariculture, and construction [37]. Similarly, Bangladesh and Bhutan have implemented national strategies and policies to promote gender equality, focusing on enhancing female participation in technical and non-traditional fields, although not specifically engineering [38]. In contrast, Pakistan lacks dedicated measures and primarily relies on theoretical efforts, such as introducing flexible reforms like the Federal Wedlock Policy and quotas for women in public sector offices, along with providing female-friendly facilities to facilitate ease of work.

India stands out in the region for its robust efforts to empower women engineers. The country has established numerous technology institutes aimed at empowering women from diverse socio-economic backgrounds, resulting in a significant increase in female enrolment from less than 10% to approximately 15% over five years [39]. Initiatives like WISE-SCOPE target gender stereotypes to alleviate social pressures on women pursuing careers in science. Additionally, programs such as WISE-PhD and WISE-PDH provide financial support for women to undertake further research and enhance their skill sets. India has also prioritized equipping all-women universities with state-of-the-art technologies and has implemented policies across institutions to promote gender inclusivity through incentivized frameworks [40].

To provide a regional overview, the employment of women in the energy sector varies from 3% to 15% across South Asia as of last year [41]. Figure 1 provides a breakdown of female employment in various public sector power organizations and utilities as of 2018. It is noteworthy that there were variations in the number of power sector organizations and

utilities across different countries; for instance, data from Maldives encompassed 3 public sector utilities, whereas India's data spanned 18 public sector utilities [42].

**Figure 1: Female participation in energy employment**



Source: ESMAP (ref [43]).

Further elaborating on the broader regional context, insights from the Gender Gap report 2023 were taken into account. According to the report, Bangladesh leads the region in overall gender parity, followed by Bhutan and Sri Lanka. For gender equality in economic participation and opportunities, Bhutan leads, followed by Sri Lanka and Maldives. In contrast, Afghanistan was among the lowest performers in this index [44].

**3.2 The situation in Pakistan**

Pakistan, endowed with a skilled youthful population, saw 31,741 female enrolments in engineering programs across higher education institutions in 2022 [45]. This demographic offers Pakistan a distinct opportunity to leverage its potential, foster gender parity in the energy sector, and drive advancements in renewable energy research and development to improve overall energy efficiency, thereby facilitating a seamless transition.

Despite the growing job market, supportive policies, and projected growth, gender equity remains a significant issue in Pakistan's energy sector. In 2023, a striking 70% of female engineering graduates were economically inactive or unemployed [46]. Moreover, employed women frequently find themselves in non-technical roles and rarely ascend to senior positions. For instance, research on female employment at K-electric, a major energy supplier, reveals a higher percentage of males in technical positions compared to females (4.6% vs. 3.2%) [47]. Similarly, studies on WAPDA (Water and Power Development Authority) indicate a dearth of women in senior leadership roles, attributed to perceptions of career abandonment, a shortage of skilled women, and insufficient support relative to men. Women cite lack of support as the primary reason for the scarcity of female leadership in the energy sector, while men point to career abandonment [48].

Gender stereotyping remains a significant impediment to women's engagement in Pakistan's energy sector, as highlighted by the World Bank's 'Baseline Assessment for Women Engineers in the Power Sector' report. Deep-rooted socio-cultural beliefs perpetuate the notion that women are ill-suited for roles in this dynamic field, which demands managing unpredictable shifts, remote postings, and challenging work conditions. Moreover, pervasive discrimination from male colleagues, educators, and supervisors, compounded by the absence of female-friendly policies and benefits, particularly within the private sector, exacerbates barriers to their meaningful participation [49].

In essence, while Pakistan is facing economic challenges, it is also presented with opportunities for enhancing gender equality within the power sector. Therefore, it is crucial for Pakistan to learn from its regional peers and implement effective strategies to overcome these challenges. By adopting best practices observed in countries like Bangladesh, Bhutan, and Sri Lanka, Pakistan can strengthen its efforts towards achieving greater gender parity in the sector. Emphasizing inclusive policies, targeted educational initiatives, and fostering a supportive environment for women in engineering and energy-related fields will be crucial steps in this endeavor.

## **4. Case Study: Pakistan's Women in Energy**

### **4.1 Background and context**

Originating in 2019, an initiative initially led by male stakeholders has evolved into a pioneering collaboration between Shams Power, Pakistan's foremost solar energy developer and investor, and Women in Energy (WiE), a professional network dedicated to promoting female leadership within the energy sector.

The first such training was conducted in Islamabad by SheinEnergy before its founder left to pursue a Masters scholarship abroad. She has continued to provide technical expertise for the program.

Recognizing the potential impact of this grassroots effort, Shams Power adopted and expanded upon the concept. The program was designed to empower women in the solar energy industry. WiE subsequently partnered to advance this vision, playing a pivotal role not only in recruiting but also in identifying promising talent and providing ongoing support through mentoring and job placements. This collaboration has been instrumental in ensuring the program's success.

In 2023, GuarantCo, established in 2005 to address infrastructure funding gaps and poverty in lower-income countries across Africa and Asia, joined forces to support the initiative. With GuarantCo's backing, the program is committed to sustaining its success and impact over the next two years.

#### **4.2 The programme**

WIE has so far completed five training cohorts, encompassing a total of 70 women predominantly from lower-middle-class backgrounds in Lahore and neighbouring vicinities. Participants typically originate from households where all members contribute to the economic sustenance, reflecting their industrious upbringing. The majority of participants are recent graduates, while a few possess limited experience in other industries. While some participants possessed theoretical knowledge, all lacked a practical understanding in solar panel installations prior to enrolment.

One participant in the focus group candidly reflected on her initial unfamiliarity with solar energy, *"Solar seemed like an alien world. It might be a bit embarrassing to admit, but honestly, it has been one and a half years for me in the energy sector, yet I did not have exposure to solar panel installation. However, the training really helped."*

Participants see working in the solar industry as an opportunity. They joined the programme not just for practical learning, but also career advancement. One focus group participant, who was initially rejected from the training due to logistical challenges, self-funded her boarding and lodging expenses for the training in Lahore, which was fully funded otherwise. Another participant described her journey as follows, *"I didn't know much about solar panel installation processes or the different types of solar panels. Although my home had a solar panel system, I had limited hands-on experience because my father managed it. When I heard about this female-only training opportunity, I knew I couldn't miss it. The training really allowed me to delve into renewables, and I particularly enjoyed the practical aspects."*

### **4.3 Skills development**

Structured as a compact six-day programme, the training includes comprehensive theoretical sessions alongside practical hands-on experience. A standout feature for many trainees is a full day dedicated to rooftop solar installation at Shams Power's headquarters. The curriculum was tailored to meet the specific needs of Shams Power's technical workforce, but is aligned with industry standards and expectations more broadly.

A participant who was already working in renewable energy, highlighted her initial skepticism about the training approach; *"Solar felt unfamiliar despite my experience. I admit, after 1.5 years in energy, practical installation was new. This training bridged that gap for me."*

Another participant, a recent trainee, underscored the discrepancy between university education and industry demands: *"In an interview, I stumbled on transformer-related questions. My education, despite being in the 6th semester, lacked practical relevance. Employers stressed the need for current knowledge and skills."*

### **4.4 Socio-cultural barriers**

Solar installation remains an unconventional career path for women in Pakistan, and participants often confronted entrenched cultural prejudices. A trainee from Peshawar highlighted the pervasive gender stereotypes that hinder women's advancement in the sector, noting that *"women encounter significant stigma in the sector. Many companies prefer women for presentations rather than fieldwork, which limits career opportunities."* Despite initiatives aimed at fostering gender diversity and empowerment within the industry, systematic barriers persist.

Not all participants were able to overcome them. One trainee who completed the programme ultimately chose not to pursue a career in the solar industry due to familial disapproval, opting instead to teach in a school. Another trainee had to forego a career in solar energy due to childcare responsibilities in a joint family setup, again opting for a teaching position instead. These cases highlight the complex intersection of cultural expectations, family dynamics, and professional aspirations that shape women's career choices in the renewable energy sector.

### **4.5 Career opportunities**

Despite prevalent barriers, solar power is seen as an easier entry point for a career in energy. Participants felt that the hands-on practical experience they had gained has enhanced their employability, skills, and confidence both personally and professionally. They

expressed empowerment and highlighted their improved employability, confidence, and development of practical skills.

A participant from the second training batch shared her journey; *“Being added to a network of women was a revelation. Through a job posted [via] Women in Energy, I secured a pivotal role. Two years later, I joined [an] international Women Mentorship Program, gaining not just a job but mentorship and recognition for women empowerment.”*

Another participant shared her progression from employee to Operations Manager, mentor and trainer. She is now managing 36 sites and overseeing 35 staff members. In doing so, she has broken significant barriers in a male-dominated field and has become a mentor and role model to numerous young female engineers. A participant from a later cohort described her as *“her greatest inspiration, ... exemplifying leadership for women in the energy sector”*.

#### **4.6 Looking ahead**

WIE has demonstrated significant strides in addressing critical gaps within Pakistan's renewable energy sector. Shams Power's initiative has effectively bolstered practical skills in solar panel installation and renewable technologies, contributing to a more skilled workforce. However, challenges persist, including entrenched gender stereotypes and limited industry acceptance of female workers.

Key lessons learned include the necessity for targeted educational reforms to align academia with industry demands, particularly in practical training for renewable technologies. Furthermore, efforts to upskill the existing workforce from conventional energy sectors are crucial for accelerating the transition towards renewable energy dominance.

Moving forward, strategic partnerships and continued support are essential to overcome these challenges. By enhancing educational frameworks and fostering inclusivity within the workforce, Pakistan can better position itself to capitalize on renewable energy opportunities, driving sustainable development and energy security. Pakistan's Nationally Determined Contributions (NDC) aims to shift to 60% renewable energy by 2030. Initiatives like the Women Solar Energy Training Program play a vital role in achieving this ambitious goal.

### **5. Recommendations**

Investing in human resource development is critical for renewable energy transitions. Pakistan has a unique opportunity to enhance its energy sector, improve employability, and increase energy efficiency by promoting greater gender equality. Drawing inspiration from



India's successful policies, Pakistan can elevate its regional standing in gender parity, bolster its economy, and expedite its clean energy transition.

This case study highlighted significant barriers faced by women in Pakistan's clean energy sector, rooted in socio-economic gender stereotypes. These barriers include a male-dominated workplace culture that presents challenges such as women often not receiving permission from their families to work in industries requiring remote location assignments, fieldwork, or irregular hours, compounded by limited access to gender-inclusive training and a scarcity of female leadership role models. To facilitate a smoother transition and address these challenges, we make three key recommendations.

- **Policy support:** Focus on equipping women with comprehensive training to compete effectively with men for roles based on merit rather than quotas. Efforts should include providing flexibility for childcare and other support systems both in the field and office spaces to facilitate women and encourage their participation in traditionally male-dominated positions. It is crucial to avoid perceptions that women hired under quotas are less competent, which hinders their acceptance and career advancement. Instead, reforms should promote a culture of meritocracy and address discrimination through rigorous monitoring and evaluation mechanisms in both public sector leadership roles and private sector workplaces.
- **Capacity development:** Expand access to specialized training programs tailored to female needs in technical and managerial competencies within the renewable energy sector. Incorporate hands-on practical training to enhance skills and prepare women for the demands of the energy industry.
- **Awareness and advocacy:** Conduct awareness campaigns targeting key stakeholders, policymakers, and the public to promote the benefits of gender diversity and inclusion in renewable energy. Foster a supportive environment that encourages women to pursue careers and leadership roles in the sector.

As the global energy markets shift to renewables and the clean energy sector is bustling with job opportunities, it is imperative to address gender gaps. Though supportive environments alongside opportunities for women, countries can accelerate their clean energy transitions and foster inclusive societies. While Pakistan navigates its path towards renewable energy generation, it must overcome existing challenges. By learning from regional peers and adopting best practices, Pakistan can achieve inclusive sustainable development and effectively contribute to the global shift towards clean energy.

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