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Moving towards sustainable living is not just an ecological obligation; it's a compassionate choice that benefits both us and our planet. Sustainability ensures that we leave a healthier, more harmonious world for future generations. By reducing our environmental footprint through responsible consumption, renewable energy, and mindful resource management, we can mitigate climate change, protect biodiversity, and foster resilient ecosystems.

Sustainable living also brings personal advantages. It promotes a healthier lifestyle, as it encourages fresh, locally sourced foods and active transportation. It fosters community connections and reduces stress, making us happier and more fulfilled. Moreover, it bolsters economic stability, as green industries create jobs and lower our energy bills.

#cleanenergy

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As we draw the curtain on our first year, I can safely say it has been nothing but remarkable year for our beloved PV+ Journal, I find myself reflecting on the extraordinary strides we've taken in the world of sustainability and green energy. This year, our collective journey has been one of discovery, inspiration, and a shared commitment to a greener future.

Each edition of PV+ Journal has been a testament to the incredible innovations, projects, and individuals driving the sustainable energy narrative forward in Pakistan and beyond. With the changing times and rising energy crisis, I believe the story behind this Journal is a essence of the hour, where the masses need to know what they're up against. The changing tides as changing fast, and not in our favor. Unless we change. It's been a privilege to showcase the transformative power of green initiatives and witness the positive impact they have on our planet. The stories we've uncovered, the insightful interviews we've conducted, and the emerging trends we've explored collectively shape the narrative of a more sustainable tomorrow.

I extend my heartfelt gratitude to our dedicated team, contributors, and, most importantly, to you—our readers. Your unwavering support and enthusiasm is what helps us do what we do on our mission to act as catalysts for positive change. As we close this chapter, let's carry the momentum forward into the new year, united in our pursuit of a more sustainable and resilient world. Wishing you all a joyous holiday season and a new year filled with hope, green innovations, and continued commitment to a brighter, greener future. Thank you for being part of the PV+ Journal community.

God Bless!

Local Scoop.

Here we bring you the latest updates on the green revolution happening in your region. Read about how your community is harnessing the power of renewables to shape a sustainable future and create positive environmental impact, one innovation at a time. We talk about breakthrough technologies, and local initiatives driving the renewable energy movement forward.



SCHOOL WINS \$100,000 ZAYED PRIZE FOR SUSTAINABILITY AT UAE'S COP28 CONFERENCE

A Pakistani school, operated by the Kashmir Orphan Relief Trust (KORT), clinched the esteemed Zayed Sustainability Prize of \$100,000 at the UN climate conference in Dubai. The school was declared the best Global School in South Asia for its inventive initiative focusing on water conservation and organic farming. Competing against finalists from India and Bangladesh, the KORT school received the award from UAE President Sheikh Mohamed bin Zayed at Expo City in Dubai.

The Zayed Sustainability Prize, dedicated to the legacy of UAE's founding father Sheikh Zayed bin Sultan Al Nahyan, recognizes and rewards small and medium enterprises, non-profit organizations, and high schools addressing challenges in health, food, energy, water, and climate. Over the past 15 years, the prize has been bestowed upon 106 recipients, positively impacting the lives of 384 million people worldwide.

Sumaiya Bibi, a 19-year-old representative of the trust, highlighted the urgency of their water conservation project, stating, "Our project is on water conservation because,

in 2025, clean drinking water will finish in Pakistan." Sumaiya, who lost her parents in the 2005 earthquake, expressed the trust's plans to establish water filtration plants, sensor taps, and a kitchen garden through organic farming in their school. The KORT School and College of Excellence, established in 2016 in Azad Kashmir for children orphaned in the earthquake, serves over 500 students. Another school opened in Swabi in October can accommodate 450 children. KORT has been providing education, boarding facilities, food, clothing, and medical care to orphaned children for several years.

Kinza Bibi, a 19-year-old student representing the trust, emphasized their goal for students to learn how to preserve clean water. Chaudhry Mohammed Akhtar, the founding chairman of KORT, revealed that the prize money would be utilized for projects related to clean water and organic farming in rural areas. The 11 winners of this year's Zayed Sustainability Prize, chosen in September by a panel of jury members, shared a total prize fund of \$3.6 million for their innovative solutions across health, food, energy, water, climate action, and global high schools.



SOLANGI ON PUTTING RE ENERGY SOURCES INTO PLAY

Murtaza Solangi, the Caretaker Minister for Information and Broadcasting, emphasized the government's commitment to reducing reliance on costly imported fuel by prioritizing alternative renewable energy sources, according to a report from state-run Radio Pakistan on Sunday.

During discussions with reporters in Lahore, Solangi highlighted that 60 percent of the country's electricity is currently produced through thermal sources, with one-fourth coming from hydropower. He underscored the adverse impact of generating electricity from expensive imported fuel, contributing to the circular debt that Pakistan cannot afford. Solangi pointed out China's global leadership in electricity generation through renewable energy resources and expressed gratitude for China's comprehensive cooperation in implementing renewable energy projects in Pakistan. The interim minister noted that the previous government had set a target of producing 10,000 MW of solar power and expressed optimism that the upcoming elected government would continue this policy. He emphasized Pakistan's significant potential for solar power generation, acknowledging the economic burden faced by the people due to expensive electricity.

PAKISTAN TO PRIORITIZE DOMESTIC AND SUSTAINABLE ENERGY SOURCES

During a meeting with the Ambassador of China to Pakistan, Jiang Zaidong, Caretaker Federal Minister Muhammad Ali conveyed Pakistan's dedication to shaping its future energy landscape with a strong focus on indigenous and renewable sources.

The minister outlined potential areas for collaboration between China and Pakistan, emphasizing renewables, transmission networks, and DISCOs (Distribution Companies) as key sectors for potential partnerships. He underscored the importance of harnessing advanced Chinese technology to enhance energy supply to the industry, particularly through the Coal Gasification plant in Thar. Ali expressed gratitude for China's ongoing involvement in Pakistan's energy sector and offered congratulations for the successful third Belt and Road Forum for International Cooperation recently held in China.

Ambassador Jiang Zaidong acknowledged that the Belt and Road Initiative (BRI) has become a guiding force for international development and suggested that industries in both countries could benefit from further cooperation.

PAKISTAN RAILWAYS INITIATES TRANSITION TO SOLAR POWER FOR ENTIRE STATION NETWORK

Pakistan Refinery Limited (PSX: PRL) announced the signing of pivotal license agreements with global industry leaders Honeywell UOP and Axens for its Refinery Expansion and Upgrade Project (REUP), as disclosed in a notice to the Pakistan Stock Exchange (PSX).

The primary objective of the project is to amplify PRL's refining capacity from 50kbpd to 100kbpd, transitioning from hydro skimming to a deep conversion refinery. This shift enables the production of value-added products and EURO V-compliant fuels, recognized for their environmentally friendly attributes compared to traditional automotive fuels.

For the bottom-of-the-barrel conversion technology and naphtha processing aspects, PRL has opted for cutting-edge process technologies from Honeywell UOP. These include the Residue Fluidized Catalytic Cracking Process, LPG Merox process, and a Naphtha complex. Axens, on the other hand, will provide Prime G+®, Prime D™, and Polynaphtham™ to achieve Euro V gasoline and diesel specifications.

Zahid Mir, Managing Director and CEO of PRL, highlighted the significance of this partnership as a significant milestone in the company's journey towards refinery modernization. Emphasizing the commitment to advanced technologies for sustainable and efficient operations.

HBL ALLOCATES RS1 BILLION TO FUND SOLAR TUBE WELLS

Farmers benefit from convenient and rapid access to credit through the extensive rural network of the Bank. This accomplishment underscores HBL's dedication to sustainable and climate-smart agriculture, aligning with the Aga Khan Development Network's (AKDN) Net Zero Goal for 2030.

As a participant in the Principles of Responsible Banking (PRB) and the Net Zero Banking Alliance (NZBA), HBL is actively working towards advancing renewable energy sources in the agricultural sector, aiming to reduce carbon emissions by curbing the reliance on fossil fuels.

Aamir Kureshi, Head of Consumer, Agriculture & SME Banking, expressed, "HBL is at the forefront of agricultural financing among commercial banks, collaborating closely with farmers across the agricultural spectrum to provide financial services promptly, contributing to the shared goal of improved crop yields and enhanced farm productivity."

He added, "This initiative plays a crucial role in ensuring food security and prosperity for farming communities. HBL remains steadfast in its commitment to support the agriculture sector through the application of technology and innovative financial solutions."

BYD, CHINESE AUTO GIANT, EXPLORES POTENTIAL IN PAKISTAN'S EV SECTOR

The progress follows a meeting between Sohail Rajput, Secretary at BoI, and a delegation from BYD Company China, including Cai Xiao Xu, Head of Dealer Division (South Asia), and Lei Jian, Country Head (Pakistan).

A statement shared on X, formerly Twitter, highlighted BYD Company's status as a Fortune 500 company and a prominent global player in electric vehicle manufacturing. The company is acknowledged for its significant presence across four key industries: automotive, rail transit, new energy, and electronics.

The current visit of the BYD delegation to Pakistan, organized by the BoI, involves important engagements with potential local partners. During the meeting, the Secretary of BOI extended a warm welcome to the company's interest in the country, underscoring the significance of electric vehicles (EVs) in Pakistan. He reassured the BYD delegation of the Government of Pakistan's dedicated commitment to

facilitating foreign investors BYD, the world's largest EV manufacturer, is a major player in the production of various vehicles (battery electric and hybrid cars, buses, trucks, etc.), battery-powered bicycles, forklifts, solar panels, and rechargeable batteries.

In the preceding month, Dr. Gohar Ejaz, the Caretaker Minister for Commerce & Industries, disclosed that BYD is actively exploring investment opportunities in Pakistan. At that time, the minister apprised the BYD delegation about the government's policies and the Special Investment Facilitation Council (SIFC), expressing full support for their upcoming ventures.

This aligns with Pakistan's objective to expand its presence in the renewable energy sector, diminish its energy import expenditures, and fulfill its climate change objectives. Additionally, Caretaker Prime Minister Anwaar-ul-Haq Kakar has separately extended invitations to Chinese businesses, urging them to invest in Pakistan's solar parks.



PROGRESS ON SAUDI ARAMCO OIL REFINERY PROJECT WITHIN TWO MONTHS

On Wednesday, Pakistani Energy Minister Muhammad Ali disclosed that the country is actively involved in discussions with Saudi authorities regarding the multibillion-dollar Aramco oil refinery project. He expressed optimism about witnessing progress within the next two months.

Back in February 2019, Pakistan and Saudi Arabia inked several investment agreements amounting to \$21 billion during a visit to Islamabad by Saudi Crown Prince Muhammad Bin Salman. These agreements included approximately \$10 billion allocated for an Aramco oil refinery and \$1 billion for a petrochemical complex project intended for construction at the strategic Gwadar Port in Balochistan province.

Despite the passage of almost four years, there has been limited advancement on the project. Minister Ali, speaking on the sidelines of the 7th edition of The Future Summit in Karachi, assured that work on the Aramco oil refinery is ongoing, and significant progress is anticipated in the next one to two months. In response to queries about the project's delay, Ali highlighted the complexities associated with a project of this magnitude, citing considerations such as investment funding, structuring, and policy framework. Regarding reports suggesting a potential shift of the project to Hub district in Balochistan near Karachi instead of Gwadar, Ali clarified that the decision would ultimately rest with Aramco.

ICCI TO FOCUS ON ENSURING RAPID REVIVAL OF ECONOMY

Faad Waheed emphasized the need for the government to prioritize renewable energy, asserting that it would significantly lower production costs and expedite the economic recovery. He noted that the heavy reliance on thermal power has led to a substantial circular debt, exceeding Rs. 2.30 trillion by the end of June 2023, despite substantial increases in power tariffs.

During a meeting with Muhammad Ali, the Federal Minister for Energy, Waheed conveyed that elevating the proportion of renewable energy in the energy mix would not only reduce electricity costs for industries but also enhance energy security, decrease carbon emissions, and enable substantial annual savings for Pakistan. He underscored the urgency of this shift to Minister Ali, emphasizing the potential for billions of dollars in savings annually.

Waheed pointed out that as of July-March 2023, thermal power constitutes over 58.8 percent of the total energy mix, hydropower makes up 25.8 percent, and renewables account for a mere 6.8 percent. He urged the government to implement robust measures to increase the renewable energy share to more than 50 percent, thereby lowering production costs, attracting investment, and fostering sustainable economic growth. Citing a World Bank report, he highlighted that utilizing just 0.071 percent of Pakistan's land for solar energy could meet the current electricity demand, urging the government to tap into this vast and cost-effective energy potential.

BRITAIN'S TOP DIPLOMAT TO PAKISTAN ANNOUNCES DOUBLING INVESTMENT TO FIGHT CLIMATE CHANGE

Announcing during an event commemorating King Charles's 76th birthday, British High Commissioner to Pakistan, Jane Marriott, revealed her country's decision to double its investment in Pakistan to address the impacts of climate change. The United Kingdom, which hosted the 26th UN Climate Change Conference (COP26) in Glasgow in 2021, emphasized the need for global efforts to limit global warming, reduce carbon emissions, and phase down coal use.

During the celebration, a Pakistani delegation outlined the government's ambitious plans, aiming to shift 30% of transportation to electric vehicles and generate 60% of energy from renewable sources by 2030. Pakistan, contributing 0.50% of global carbon emissions, ranks among the top ten countries most affected by climate change, experiencing severe floods and heatwaves in recent years.

The collaboration between Britain and Pakistan on climate change has gained significance for the South Asian nation. The British high commissioner stressed the UK's advocacy for a substantial, greener, and fairer international financial response to climate change. The increased investment aims to tackle climate change, enhance resilience, and promote adaptation, covering more areas in Khyber Pakhtunkhwa (KP) and the Federal Capital Territory, focusing on minimizing the risk of forest fires and safeguarding lives and biodiversity.

NPAK ENERGY INITIATES PUBLIC-PRIVATE PARTNERSHIP PROJECT IN HUNZA

In a historic development, NPAK Energy Ltd has embarked on a pioneering public-private partnership project for the establishment of a 1MW solar photovoltaic power plant (SPP) with 600kWh battery storage in the Hunza district of Gilgit-Baltistan.

According to a statement released by the Aga Khan Development Network (AKDN), the overseeing body of NPAK, this project sets a distinctive precedent as the first public-private partnership (PPP) in Gilgit-Baltistan, generating clean energy and actively contributing to the global initiative to mitigate the adverse effects of climate change. The recently inaugurated ceremony saw the presence of Chief Minister Gilgit-Baltistan Haji Gulbahar Khan, senior government officials, local community leaders, and NPAK delegates.

Situated at an altitude of 2,800m above sea level, the plant's 2,376 photovoltaic panels will contribute power to the Hunza district grid. It is anticipated to generate 1,600 MWh per year of electricity from solar energy resources, catering to local residences and businesses while addressing the acute energy deficit in the district. NPAK Energy has signed a 30-year concession agreement with the GB government, aiming to develop sufficient generation capacity, business and utility operations, ensuring a self-sustaining supply of clean, reliable, and affordable electricity to every household in the district.

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Global Scoop.

Here we dive into the latest developments in the industry as we explore the remarkable strides countries are making towards sustainable power sources, highlighting groundbreaking innovations and initiatives that promise a greener future for our planet.

From cutting-edge solar technologies to revolutionary wind farms, this is your gateway to staying informed on the global transition to clean energy.



ILMATAR SECURES A 500 MILLION FUND FOR RENEWABLE ENERGY INITIATIVES



Nordic power producer Iltamar has secured a €500 million debt financing package in a transaction led by Copenhagen Infrastructure Partners (CIP) through its Green Credit Fund 1. The financing involves participation from Kommunal Landspensjonskasse (KLP), P Capital Partners (PCP), and accounts managed by CIP. The package includes a day-one committed tranche of €325 million and an uncommitted increase option of €175 million.

This deal is set to accelerate Iltamar's growth in renewable energy production, aligning with the company's strategy of developing, constructing, owning, and operating its renewable energy sites. Iltamar's Chief Financial Officer, Antti Sallila, stated, "This debt package strengthens our position as an independent power producer as it enables us to accelerate building renewable energy production in Finland and Sweden in accordance with our strategy. We are pleased to partner with CIP and PCP in executing the green transition in the Nordics."

With this financing from CIP, its co-investors, and PCP, Iltamar has now secured over €1 billion in equity and debt funding for its growth strategy over the past five years. By the end of 2023, Iltamar aims to commission six onshore wind farms and one solar array in Finland, adding to its 1 GW portfolio of renewable energy in operation, under construction, or in ready-to-build phases.

CIP's Green Credit Fund 1 specializes in providing private project finance debt with subordinated risk characteristics, supporting renewable energy projects in Europe, North America, and select jurisdictions in the Asia Pacific region, with a focus on green and brownfield projects in renewable energy infrastructure. Jakob Groot, Partner at CIP and Co-head of the CI Green Credit Fund 1, expressed enthusiasm about partnering with Iltamar to accelerate the development and construction of renewable energy projects in Sweden and Finland, praising Iltamar's successful track record in the renewables space.

EU FINANCING MECHANISM: 40 MILLION AWARDED TO 8 SOLAR PV PROJECTS

After the effective completion of the inaugural tender of the EU renewable energy financing mechanism on September 27, 2023, funding has been granted to eight solar PV projects with a combined capacity of 282.77 MW. All applications that passed the eligibility check and met the minimum quality criteria were ranked based on their bid prices, starting from the lowest, until the total tender budget of €40 million was allocated.

The chosen projects are now urged by the European Climate, Infrastructure, and Environment Executive Agency (CINEA) to prepare a grant agreement and are required to initiate their solar PV projects within 24 months of the grant signature. Subsequently,

participating countries (Luxembourg and Finland) will share the renewable electricity generation statistics from these projects, contributing to the fulfillment of their national renewable targets.

This successful conclusion signifies the completion of the initial phase of the renewable energy financing mechanism, established by the Commission in 2020 to enhance support for renewable energy initiatives and promote increased adoption of renewables across the EU. The Commission is set to commence discussions with EU countries for the second tender, scheduled for launch in 2024.

THREE EIGHT SIX ELEVATES REGIONAL CAPACITY FOR SOLAR PV POWER TRANSITION

Three Eight Six, a regional energy company, is poised to enhance its green fuel capacity by leveraging solar energy assets within the GCC. The company aims to assist more businesses and government organizations in harnessing solar power, with flagship projects in Saudi Arabia and Dubai. This renewable energy investment platform is actively promoting the adoption of solar energy to align with national transition strategies and global net-zero targets.

At the forefront of the regional shift towards renewable power production and efficient consumption, Three Eight Six is engaged in constructing, owning, and operating photovoltaic (PV) assets. The company supports various sectors, including

commercial and industrial, as well as small and mid-utility scale, facilitating their transition to green energy. This approach not only helps reduce business operating costs but also ensures cost predictability for up to 30 years.

With the upcoming COP 28 in the UAE, Ahmad Al Khayyat, Chairman of Three Eight Six, emphasizes the importance of organizations reassessing their renewable energy strategies. He notes, "Given the recent emphasis on diversifying the energy mix and expanding renewable energy capacity by 2030, businesses with high-energy consumption will play a crucial role. We are committed to collaborating with the industry to achieve this ambitious target."

OSDG INITIATIVE MAKES TOP 100 AI PROJECTS

The OSDG initiative, led by UNDP in collaboration with PPMI, has achieved distinction as one of the top 100 AI initiatives driving progress towards Sustainable Development Goals (SDGs), as recognized annually by IRCAI under UNESCO's auspices. This accolade underscores OSDG's role in uniting cutting-edge AI solutions with a global volunteer community dedicated to SDGs.

Initially conceived as a basic online text analysis tool for SDG monitoring, OSDG has evolved into a sophisticated global resource. Developed by PPMI and SDG AI Lab, it efficiently assesses text relevance to the 17 SDGs in 17 languages, enabling comprehensive analyses. The OSDG Community Dataset, curated by the OSDG team, contributes significantly to academic publications, aided by a diverse online volunteer community of nearly 1000 UN Volunteers from over 50 countries.

OSDG's impact extends to academia, influencing curricula and research worldwide, and proves invaluable in government policy-making, exemplified by its use in Turkey's 11th Development Plan alignment with SDGs. The success of OSDG has inspired new tools and research initiatives, such as the UNDP's SDGs Push platform and the GIZ Policy Action Tracker, showcasing its transformative impact on innovations related to SDGs and global cooperation. Recognized among the top 100 initiatives advancing SDGs, OSDG underscores the pivotal role of digital technologies and volunteerism in sustainable development, supporting academia, researchers, and governments in their pursuit of the SDGs.

UK FALLS DOWN LIST OF RENEWABLE ENERGY INVESTMENT ATTRACTIVENESS

The UK has fallen to seventh place in EY's Renewable Energy Country Attractiveness Index (RECAI), slipping three positions. This decline is attributed to the UK losing its top spot in offshore wind attractiveness due to unsuccessful bids in the recent government CfD auction round.

Ben Warren, EY Renewables Corporate Finance and RECAI Chief Editor, suggests governments consider non-price factors like environmental impact and job creation in offshore wind auctions to boost developer interest. Despite challenges, the Aberdeen and Grampian Chamber of Commerce (AGCC) sees potential for the region to become a global renewable energy hub, with optimism in October reaching 22% for "Extremely/very optimistic" views.

AGCC advocates for an independent body overseeing UK energy security and the transition to net zero. Mr. Warren emphasizes the need for a more efficient grid connection process to enhance the UK's appeal as a renewables destination, citing prolonged waiting times hindering project initiation and capital contribution.

ZUELLIG PHARMA AND ACEN RES FORGE GREEN PARTNERSHIP IN THE PHILIPPINES

Zuellig Pharma, a prominent healthcare solutions company in Asia, has entered a strategic alliance with ACEN Renewable Energy Solutions (ACEN RES) to transition two major distribution facilities in the Philippines – the Santa Rosa Distribution Center and Canlubang Distribution Center – to 100% renewable energy sources. This move is aligned with Zuellig Pharma's commitment to sustainability and environmental responsibility.

The shift to entirely renewable energy is expected to annually reduce carbon dioxide (CO₂) emissions by 10,600 tons, equivalent to the CO₂ absorbed by about 92,739 trees throughout their lifespan. The Santa Rosa facility has already earned recognition as a Leadership in Energy and Environmental Design (LEED) facility for its use of renewable

energy.

Operating under the Retail Competition and Open Access (RCOA) program, this partnership allows high power-consuming end-users like Zuellig Pharma to choose their electricity suppliers. ACEN RES facilitates a seamless transition to renewable energy, supporting sustainability goals without additional costs or power interruptions. Miguel de Jesus, COO of ACEN's Philippine operations, expressed excitement about the collaboration, emphasizing ACEN's dedication to providing clean, renewable energy for Zuellig Pharma's operations. Jannette Jakosalem, Market Managing Director at Zuellig Pharma Philippines, highlighted the significance of this shift in reducing the company's environmental impact and carbon footprint.

CHINA EMISSIONS COULD FALL IN 2024 ON RENEWABLES JUMP

China's carbon emissions are poised to decline in 2024 due to a notable surge in renewable energy capacity, meeting heightened demand. As the leading global emitter of greenhouse gases, China remains committed to its 2060 carbon neutrality target despite calls for more ambition. The International Energy Agency projects China to contribute 45 percent of global emissions from existing fossil fuel assets between 2023 and 2050.

Highlighted in a recent Carbon Brief analysis, China is swiftly deploying renewable energy, with new solar capacity in 2023 surpassing twice the entire US capacity. Lauri Myllyvirta's

analysis indicates that added solar, wind, hydro, and nuclear capacity in 2023 will generate around 423 terawatt hours annually, equivalent to France's total electricity consumption.

The substantial increase in installations, alongside the expected recovery in hydropower as drought conditions ease, is anticipated to lead to a 2024 decline in fossil-fuel electricity generation and CO₂ emissions. The sustained decline is suggested as the expansion of low-carbon energy is now deemed sufficient not only to meet but to surpass the average annual increase in China's overall electricity demand.

PIONEERING FEDERAL FUNDING: ASCENT SOLAR'S MULTI-PRONGED PURSUIT FOR 2024 ALLOCATION

Ascent Solar Technologies (Nasdaq: ASTI), also known as ASTI, a leading innovator in the United States specializing in designing and manufacturing lightweight, flexible, and robust CIGS thin-film photovoltaic (PV) solutions, declared today its active pursuit of various federal funding opportunities through the Department of Energy (DOE) and the Small Business Administration. The determination and allocation of these funds are anticipated in 2024.

Having submitted applications and concept papers in Q4 2023, Ascent is well-prepared to spearhead groundbreaking research, particularly in agrivoltaics and on-orbit manufacturing. Additionally, the company is poised for the development and manufacturing of advanced solar cells if its proposals secure funding. As part of its strategy, Ascent plans to engage in these initiatives independently and collaboratively with industry peers whose technologies align with and complement Ascent's unique capabilities. Ongoing discussions regarding partnerships with other like-minded industry players are already in progress.

In line with DOE guidance, Ascent submitted an application on November 14, 2023, for the Silicon Solar Manufacturing and Dual-Use Photovoltaics Incubator program funding. This funding aims to support the development of Ascent's innovative agrivoltaic technology, designed to extend solar power to remote areas worldwide and optimize dual land use.

MASDAR'S INITIATIVE: 150MWAC SOLAR PLANT IN ANGOLA TO ENERGIZE 90,000 HOMES

Masdar, a leading renewable energy company, has unveiled plans for a significant 150 MW solar PV project in Angola. The project aims to provide renewable energy to 90,000 homes, create jobs, boost economic growth, and reduce carbon emissions. The agreement was formalized during the UN's COP28 climate change conference in Dubai, where Masdar signed a concession agreement with Angola's Ministry of Energy and Water.

Located in the Quipungo region, Hulia province, southern Angola, the solar project addresses the region's strong solar irradiation levels while addressing the challenge of unreliable electricity access. With less than half of Angola's population having access to electricity, particularly in rural areas, the project aligns with Angola's target to increase its national electrification rate to approximately 60 percent by 2025.

The agreement was signed by HE Joao Baptista Borges, Angola's Minister of Energy and Water, and Mohamed Jameel Al Ramahi, Masdar's Chief Executive Officer. HE Dr Sultan Al Jaber, UAE Minister of Industry and Advanced Technology, Chairman of Masdar, and COP28 President, expressed the UAE's commitment to supporting Africa in becoming a renewable energy powerhouse.

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Happen- ings.

Get ready to immerse yourself in a comprehensive exploration of the dynamic world of renewable energy and beyond. Here we will uncover the latest trends, breakthroughs, and impactful events shaping the global transition to sustainable practices, empowering you with the knowledge and inspiration to be at the forefront of the green revolution.





ELECTRICITY BILLS AND SOLAR COSTS: WORTH IT?

Several solar power companies in Pakistan have observed a notable increase in demand, particularly from well-off households, following the government's decision to raise electricity prices in July. However, the persistent challenge remains the high expenses associated with setting up solar systems. This information comes from officials and experts quoted in the report.

In an effort to address unsustainable public debt in the power and gas sectors, Pakistan implemented power tariff hikes in July as part of reforms agreed upon under an International Monetary Fund (IMF) loan agreement. These reforms, which also included the relaxation of import restrictions and the removal of subsidies, have already

contributed to annual inflation, reaching a record high of 38.0 percent in May. Additionally, interest rates have risen, and the Pakistani rupee has hit all-time lows. Just last month, the currency depreciated by 6.2 percent. Adding to these challenges, Pakistan recently announced a significant increase in petrol and diesel prices, marking the second substantial hike in two weeks, while the inflation rate remained above the target at 27.4 percent in August.

Given these difficult circumstances, many financially capable Pakistanis are now exploring the option of installing solar power generation systems in their homes. Ammar Zaheer, a manager for sales development at Sky Electric, a leading solar power company, mentioned, "In the last few



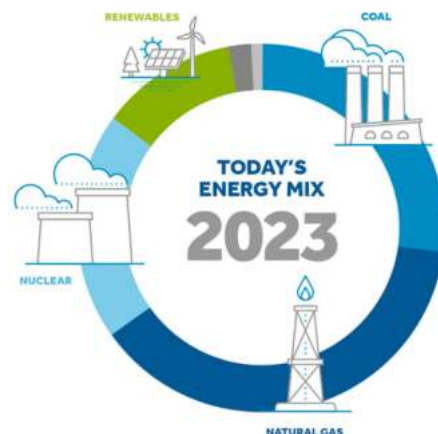
months, the [electricity] rates have changed around thirty percent, and the demand [for solar] has increased to more than sixty to seventy percent.”

Gulsher Khan, a director at Alpha Solar, a Pakistani solar systems provider, reported a 30 percent increase in solar installations over the past two months, stating, “With this [increasing] cost of electricity... those who have the investment available, they are getting the systems installed rapidly.”

Pakistan enjoys ideal climatic conditions for solar power generation, with over nine hours of sunlight in most regions. According to the World Bank, dedicating just 0.071 percent of the country’s land for solar photovoltaic (solar PV) power generation could fulfill Pakistan’s electricity needs. However, at present, only 5.4 percent of Pakistan’s total installed power generation capacity of 39,772 megawatts is derived from renewable sources such as wind, solar, and biomass. Fossil fuels still make up 63 percent of the energy mix, followed by hydropower at 25 percent, as per the National Electric Power Regulatory Authority’s (NEPRA) 2021 annual report. So, what is preventing Pakistan from

harnessing its solar power potential? Experts attribute this to procedural and bureaucratic delays in obtaining construction approvals, unattractive tariffs for selling power to the national grid, a lack of political commitment, and government reluctance to invest in the sector.

For households, a major hurdle is the substantial initial investment. Solar system providers estimate that a 5KW solar system, suitable for a family of four, costs around Rs1.2 million (\$4,114), while a 10KW system for up to six individuals can cost up to Rs3 million (\$9,836). Batteries, which need replacement



approximately every two years, add an extra cost of Rs300,000. On the other hand, solar panels typically come with a 10-15 year warranty and a lifespan of 25 years.

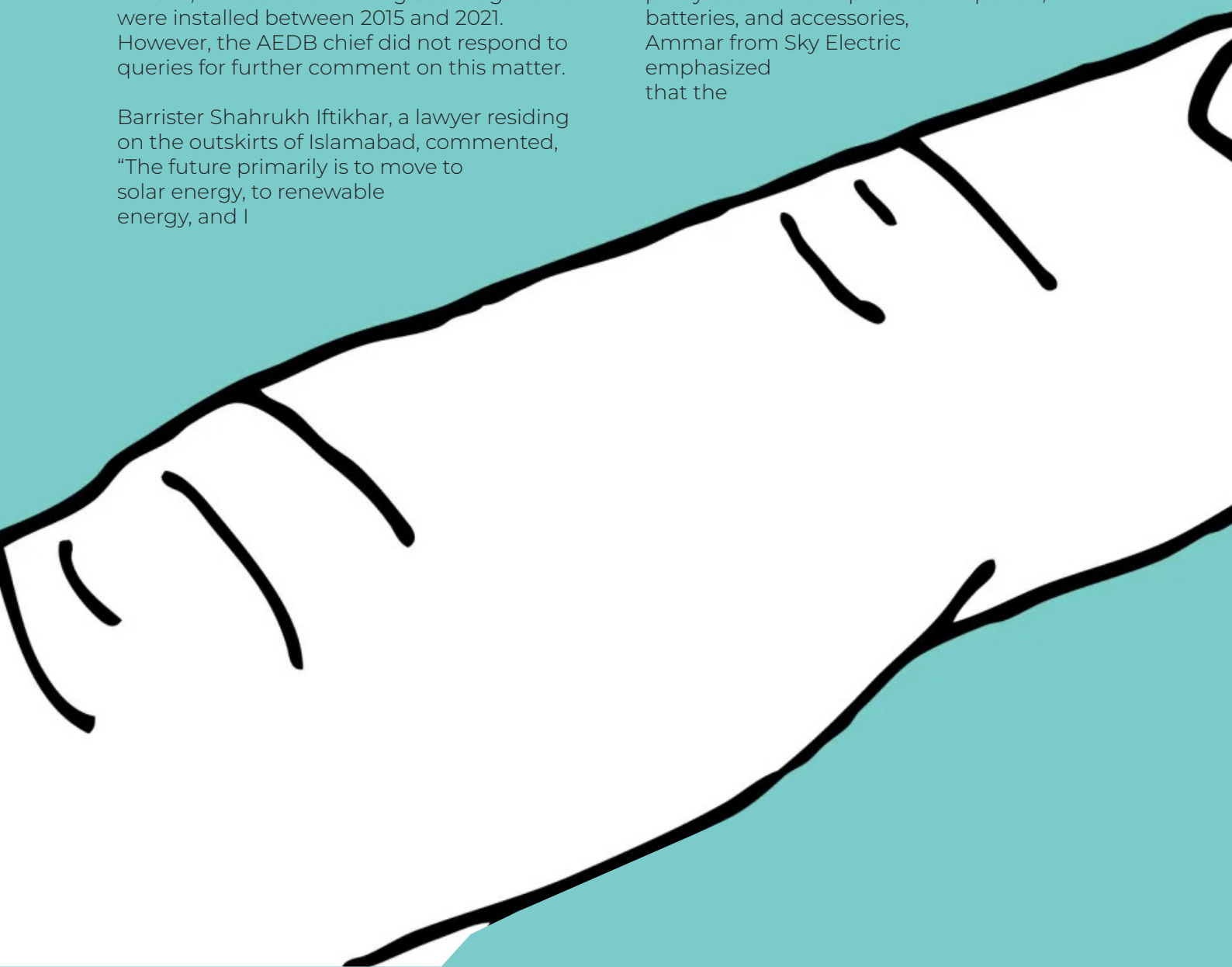
The long-term cost savings are realized through net metering, a billing mechanism that credits solar energy system owners for the surplus electricity they feed into the grid. Companies registered with the Alternative Energy Development Board (AEDB) install solar panels and set up the net metering process for their customers. Any excess electricity generated can be sold to the national grid.

According to the AEDB, Pakistan currently has 767 megawatts of net-metered capacity installed. Of this, 461 megawatts were added in 2022, while the remaining 305 megawatts were installed between 2015 and 2021. However, the AEDB chief did not respond to queries for further comment on this matter.

Barrister Shahrukh Iftikhar, a lawyer residing on the outskirts of Islamabad, commented, "The future primarily is to move to solar energy, to renewable energy, and I

think it gives you a very good cost relief." He opted for solar panels on his home's rooftop when his electricity bill skyrocketed from the usual Rs50,000 (\$171.43) to Rs150,000 (\$514.28) per month. He believes the Rs2 million investment is worthwhile and expects significant cost savings in the long run. Imran Mukhtar, an Islamabad resident who installed a 5KW solar system in December, shared his experience, stating, "My average electricity bill in summer reduced by over 60 percent after I installed a solar system without batteries." He pays around Rs10,000 (\$33.93) during the summer months, whereas other four-member households pay approximately Rs30,000 (\$101.78).

Despite the high initial costs, which are partly due to the importation of panels, batteries, and accessories, Ammar from Sky Electric emphasized that the



switch to solar power would substantially lower electricity bills for consumers. He explained, "If you are installing a typical system of 10KW, which is the requirement of most houses, you get the return on investment in just three-and-a-half years." He added that the savings would further increase if electricity rates continue to rise. Despite the benefits, including the environmental advantage of zero carbon emissions, Pakistan is still lagging

behind in achieving its goal of transitioning to 60 percent renewable energy by 2030 with a 50 percent reduction in projected emissions.

As of 2022, Pakistan's total solar installed capacity reached 1.24 GW, marking a 17 percent increase compared to 2021, according to Mordor Intelligence, a global market advisory firm. In May 2022, then Prime Minister Shehbaz Sharif announced the removal of a 17 percent general sales tax on solar panels. In September 2022, the Pakistani government approved the National Solar Energy Initiative, aiming to generate 10,000 megawatts (MW) of electricity through solar energy projects with the goal of reducing the costly importation of diesel and furnace oil.

However, Pakistan still derives only five percent of its energy from renewable sources, while coal's share in the energy mix has significantly increased over the past five years, according to Dr. Imran Khalid, director for governance and policy at the Worldwide Fund-Pakistan.

Aisha Khan, executive director at the Civil Society Coalition for Climate Change networking platform, noted that the installation of solar panels in Pakistan remains expensive despite incentives on imports provided by successive governments. She cited currency devaluation and rising freight costs as factors contributing to the increased cost of solar panels and accessories, emphasizing that cost remains the primary obstacle to expanding solar solutions even in urban areas, let alone remote regions of the country.



13.6%

increase compared to the same period last year when power generation stood at 14,053 GWh (18,888 MW).

SURGE IN NET-METERING SOLAR INSTALLATIONS



PPIB'S ROLE IN POWERING PUBLIC SECTOR BUILDINGS AND ADVANCING SOLAR INITIATIVES IN PAKISTAN

During the fiscal year 2022-23, the number of net-metering based solar installations in Pakistan witnessed a remarkable 108 percent increase, soaring from 508.1MW to 1055.03MW. The Ministry of Energy's Year Book 2022-23 highlighted this growth and revealed that the Private Power Infrastructure Board (PPIB) has tendered 85 public sector buildings to promote clean solar energy technology, aiming to meet electricity demands, reduce public office bills, and ease the burden on electricity utilities.

As of June 30, 2023, the total number of net-metering based solar installations reached 63,703, with a cumulative capacity of 1055.03MW. The report detailed an addition of 33,472 installations and a capacity increase of 546.93MW from July 1, 2022, to June 30, 2023. The number of PPIB certified installers also rose to 327, with 175 new certificates issued during the mentioned period.

To substitute expensive imported fossil fuels with solar power, the government's initiative includes the development of a 600MW

solar PV project in Kot Addu/Muzaffargarh, Punjab. However, the initial tender received no bids, prompting PPIB to revise the tariff benchmark with plans to refloat the tender.

The report emphasized that solarizing public sector buildings not only contributes to meeting electricity needs through clean energy but also reduces bills for public offices and eases the financial burden on electricity utilities. PPIB, tasked with solarizing public buildings through competitive bidding, has already tendered 85 public sector buildings at its own cost.

Another noteworthy initiative in fiscal year 2022-23 involves the introduction of solar PV generation on 11kV feeders. Recognizing the power quality challenges faced by electricity consumers, PPIB is preparing Request for Proposal (RFP) documents for solar PV projects of up to 4MW through competitive bidding at the 11kV feeder level, distributed among all distribution companies (DISCOs) in Pakistan.

SALT DESERTS ALONG THE PAKISTAN BORDER

INDIA'S LARGEST RENEWABLE ENERGY PROJECT TAKES SHAPE AT KHAVDA



Emerging from the vast salt desert that separates India and Pakistan is a project anticipated to become the world's largest renewable energy endeavor in three years.

Developers of the Khavda renewable energy park, named after the nearby village, claim that this solar and wind energy initiative will be so immense that it will be observable from space.

On the project grounds, numerous laborers are busy erecting pillars to support the forthcoming solar panels. These pillars resemble perfectly aligned concrete structures, extending as far as the eye can see, akin to cacti in a desert landscape.

Concurrently, other workers are constructing foundations for massive wind turbines, transporting construction materials, establishing substations, and laying wires across extensive distances.

Upon its completion, the project will encompass an area approximately equivalent to the size of Singapore, spanning 726 square kilometers (280 square miles). The Indian government anticipates a minimum cost of \$2.26 billion for this ambitious undertaking. Transitioning to renewable energy takes center stage at the ongoing COP28 climate summit. Some leaders have expressed backing for a goal that involves tripling global renewable energy capacity in any conclusive

agreement, coupled with efforts to reduce the consumption of coal, oil, and natural gas, significant sources of planet-warming emissions.

What sets this heavy industrial activity apart is its occurrence in the heart of the Rann of Kutch, situated in the Gujarat state of western

India. The Rann is a harsh salt desert and marshland, lying at least 70 kilometers (43.5 miles) from the nearest human settlement. However, it is merely a short army truck ride away from one of the world’s most volatile international borders, dividing the two South Asian nations.

GROUND ZERO OF INDIA’S CLEAN ENERGY TRANSITION

When The Associated Press visited the renewable energy park, two days of unseasonal heavy rains had left the ground muddy and water logged since the only escape for water in this rough terrain is evaporation. This made it even harder for the workers to do their job.

Notwithstanding the tough conditions, an estimated 4,000 workers and 500 engineers have been living in makeshift camps for the better part of the past year toiling to get this project up and running.

Once completed, it will supply 30 gigawatts of renewable energy annually, enough to power nearly 18 million Indian homes. As India aims to install 500 gigawatts of clean energy by the end of the decade and to

reach net zero emissions by 2070, this project site will likely contribute significantly to the world’s most populous country’s transition to producing energy from non-carbon spewing sources.

As things stand, India is still mostly powered by fossil fuels, especially coal, which generate more than 70% of India’s electricity. Renewable energy currently contributes about 10% of India’s electricity needs. The country is also currently the third-largest emitter of planet-warming gases behind China and the United States.

“There are people working here from all over India,” said KSRK Verma, Khavda project head for Adani Green Energy Limited, the renewable energy arm of the Adani Group, which the Indian government has contracted





to build 20 gigawatts of the project. Verma, with over 35 years of experience building dams across turbulent South Asian rivers and enormous natural gas tanks under the Bay of Bengal, says this is one of the most difficult projects he's undertaken.

"It's not at all (an) easy site to work at, there is no habitation, the land is marshy, there are a lot of high winds, rains and this is a high earthquake prone area," said Vneet Jaain, managing director of Adani Green at its headquarters in the city of Ahmedabad.

Meanwhile, residents who have lived in the area for an extended period are still anticipating the impact of the substantial project near their village.

Hirelal Rajde, aged 75 and a lifelong resident of Khavda, is keeping a close eye on the upcoming energy project and the surge in tourism that has occurred in this otherwise deserted region in recent years. Reflecting on these developments, Rajde stated, "I perceive both positive and negative aspects to these changes."

"I believe, however, that on the whole, the benefits will outweigh the challenges," he added. "I advise all residents here to retain their land and avoid selling it. In a few years, I assure them that there will be such a boom in business that they won't find peace even at night."



LONGi TAKES LEAD

The global leader (LONGi) in solar technology has taken a crucial step toward a green and sustainable future in Pakistan, said Ali Majid, General Manager of Pakistan, LONGi Solar.



We know harnessing solar power across the globe will improve local economies and the lives of billions of people.” Li Zhenguo, founder and president of LONGi, noted, also as a featured speaker at the ongoing Asia Pacific Economic Cooperation (APEC) CEO Summit in San Francisco on November 15.



“Our team will remain steadfast in working towards a sustainable future for the country,” Ali Majid pledged at the launching ceremony of the MEA&CA Office in Pakistan in Lahore.

According to the National Electric Power Regulatory Authority’s (NEPRA) 2021 yearly report, Pakistan’s total installed power generation capacity is 39772 MW, of which 63 percent of energy comes from thermal (fossil fuels), 25 percent from hydro, 5.4 percent from renewable (wind, solar and biomass) and 6.5 percent from nuclear.

The current proportion of renewable energy is far from enough. According to the revised Renewable Energy (RE) Policy, the government of Pakistan aims to derive 30 percent of energy from renewable sources by 2030 which would wean Pakistan’s dependence on imported fuel products.

Pakistan is located on a sunny belt with almost 300 days of sunshine per year and almost about 3000-3300 hours of sunshine per year. Receiving all this sunlight all year round, Pakistan has 2.9 million MW of solar power potential. Such unique conditions urgently require solar energy enterprises to promote transformation. In recent years, Pakistan has witnessed substantial investments in solar power projects, both domestic and foreign.

It has introduced a financing scheme for renewable energy to make financing available for consumers in the private sector to invest in renewable electricity generation. Until February 2022, SBP had provided Rs74 billion (about USD 400 million) in financing to over 1,175 projects with a combined capacity of 1,375 MW in renewable energy.

“The world needs an energy transition to more solar power. Currently, even though the sun shines everywhere, 80 percent of the world’s energy is consumed by just 20 percent of the population, nearly 11 percent of people have no access to electricity and one-third of the population has no access to clean energy for cooking.

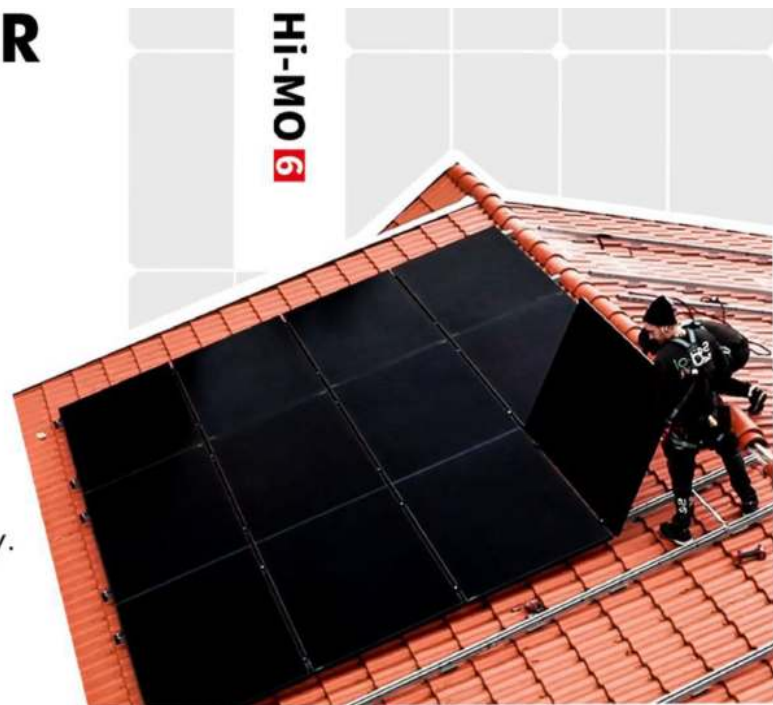
As solar energy attracts more capital than oil for the first time ever, Pakistan stands at a crucial juncture. By embracing the potential of solar energy and implementing the necessary measures, Pakistan can secure a sustainable, clean, and reliable energy future while reaping the economic benefits that come with the global shift towards renewable energy sources.

The energy crisis has always been an indispensable issue that needs to be solved by successive Pakistani governments,” Murtaza Solangi, Minister for Information and Broadcasting of Pakistan who attended the launching ceremony, emphasized in his speech on the occasion.

“Since the establishment of the China-Pakistan Economic Corridor (CPEC) a decade ago, Chinese enterprises have continued to invest in the field of renewable energy,” the Minister mentioned, “we’re deeply grateful for their increased investment to help Pakistan get out of its energy dilemma and hope that the new office will play a pivotal role in not only promoting employment, but also further optimizing Pakistan’s existing energy structure.”

NO VISIBLE BUSBAR TECHNOLOGY

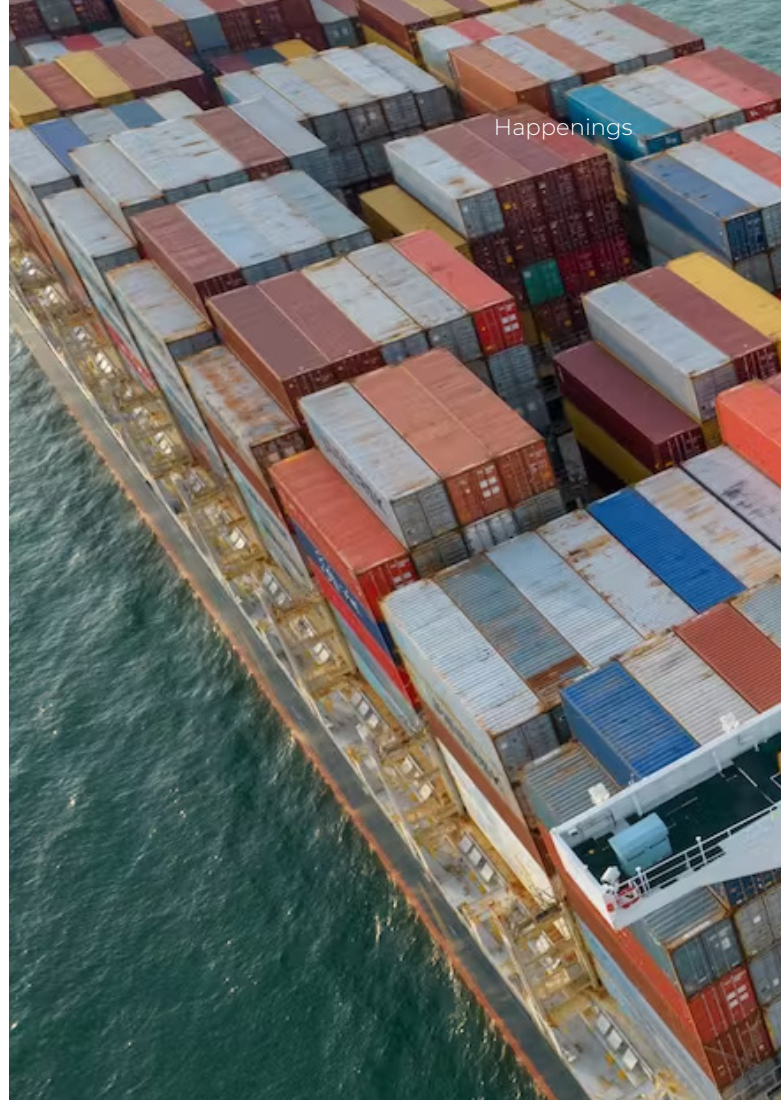
The fancy design of the **Hi-MO 6** modules enhances the overall appearance, light absorption and power-generation efficiency.



SIGNIFICANT HURDLES CONFRONT GREEN SHIPPING FUELS ON THE PATH TO ACHIEVING NET ZERO BY 2050

Ships transport approximately 90% of the world's traded goods and are responsible for emitting approximately 3% of the global carbon dioxide (CO₂) emissions. The International Maritime Organization (IMO), which is the United Nations agency overseeing the regulation of the shipping industry, has recently outlined plans for the sector to achieve net-zero emissions by the year 2050.

In a manner reminiscent of their ancient predecessors, modern vessels can be partially propelled by wind energy. Notably, a British cargo ship recently embarked on its inaugural voyage using sails constructed from the same materials found in wind turbines. While this approach can help decrease a ship's overall emissions over its operational lifetime, it has limitations due to the reliance on traditional propeller systems, which can supply only up to 30% of the energy needed for navigation—especially in adverse weather conditions. While wind propellers can contribute to the



propulsion of cargo ships, they are unlikely to entirely replace conventional fuel engines. The shipping industry's real imperative lies in substituting traditional fossil fuels with alternative and environmentally friendly options.

The transition of the shipping industry to sustainable fuels like ammonia, hydrogen, and methanol presents significant challenges. Although some companies, such as Maersk, have initiated testing of these green fuels, achieving a comprehensive transformation across the industry necessitates scaling up renewable energy production, establishing extensive global distribution networks for green fuels, revising regulatory frameworks, and designing ship engines capable of utilizing these eco-friendly alternatives. While progress has been made on some of these fronts, much work remains to be done to achieve a truly sustainable shipping industry.



What makes shipping fuel green?

What characterizes green shipping fuels? Green hydrogen is generated by using electricity from renewable sources like wind or solar power to split water into hydrogen and oxygen. Green ammonia is produced by combining nitrogen from the atmosphere with green hydrogen through the Haber-Bosch process. Green methanol can be derived either by heating plant or organic waste to create a gas, which is then converted into bio-methanol, or by combining green hydrogen with captured carbon dioxide (CO₂) to produce e-methanol.

When evaluating the environmental impact of a fuel, it's crucial to consider not only the emissions produced when it's burned in a ship's engine but also the emissions associated with its extraction,

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production, transportation, and storage. This comprehensive assessment of emissions throughout a fuel's lifecycle is referred to as "well-to-wake." Just as an electric car cannot be considered carbon-neutral if it relies on power generated from fossil fuels, a ship using ammonia or methanol produced by burning natural gas also falls short of being environmentally friendly.

This assessment underscores the necessity for these three fuels to be generated exclusively using renewable energy sources. Achieving this goal will entail substantial investments. According to a 2022 study conducted by the International Chamber of Shipping, the shipping industry will require an annual supply of up to 3,000 terawatt-hours (TWh) of renewable electricity, which

is nearly equivalent to the current global combined output of wind and solar electricity (approximately 3,444 TWh).

This increased renewable energy output must be scaled up to meet the demands of other industries like steel and cement, which are also striving for zero-emission energy solutions by 2050. In fact, an investment of up to \$1.9 trillion (£1.5 trillion) will be necessary to fully decarbonize the shipping industry, with more than half of this amount allocated to the production of green hydrogen—an essential component for generating green methanol and ammonia.

Ships with compatible engines needed...

In order to transition to green fuels, ships with compatible engines are essential. Vessels currently running on oil and diesel cannot simply switch to using green fuels. The global fleet of approximately 61,000 ships will need to be upgraded or replaced before 2050.

While retrofitting can enable existing vessels to run on methanol and ammonia, it comes with a substantial cost, ranging from \$5 million to \$15 million per ship depending on the chosen fuel. Older vessels may reach the end of their service life before such investments pay off, and this cost remains significant even for smaller ships.

Some container shipping lines, such as Maersk, Evergreen, CMA CGM, and COSCO, have already placed orders for ships capable of burning both methanol and methane. Maersk, for example, has received its first dual-fuel vessel that can burn green methanol and fuel oil, and it completed a voyage from South Korea to Denmark with cargo in August 2023.

The first ammonia-ready vessel, the Kriti Future, is already navigating the oceans, although it has not yet started using ammonia as fuel. Hydrogen fuel cell-powered

vessels are lagging behind the other two fuels, but MSC Cruises has placed orders for two hydrogen-ready vessels scheduled for delivery in 2028.

While these orders for eco-friendly vessels offer a glimmer of hope for decarbonization, they represent only a tiny fraction of the global shipping fleet.

...and so are safety regulations

The absence of adequate safety regulations has played a significant role in hindering the widespread adoption of alternative fuels. While the International Energy Agency predicts that green ammonia will become the most prevalent fuel by 2050, shipping companies have exhibited a stronger inclination toward ordering vessels powered by methanol and methane. One contributing factor to this preference is that the International Maritime Organization (IMO) has established safety regulations for the use of methanol as a fuel, while similar regulations for ammonia and hydrogen are lacking. This regulatory gap has raised uncertainty among shipowners about the viability of ammonia and hydrogen as future fuel options.

For green fuels to gain broad acceptance, they must be readily available at ports around the world. However, currently, none of these green fuels are widely accessible. While approximately 120 ports have the capability to store and distribute methanol, the supply of green methanol is insufficient. In cases where this fuel is accessible, it is often the result of private agreements between a select group of major shipowners and methanol producers.

According to the Green Methanol Institute, the global production of green methanol is projected to reach about 0.7 million tonnes by the conclusion of 2023. Production capacity is expected to increase to 8 million tonnes annually by 2027. Nevertheless, the global shipping industry will require a staggering 550 million tonnes of green methanol by

2050 to replace traditional oil-based fuels. The challenge arises from the potential insufficiency of agricultural and food waste as feedstock to decarbonize all sectors of the global economy. Therefore, there is an imperative need to escalate the production of fuels derived from renewable electricity.

Lots to build

The widespread adoption of green fuels will necessitate the construction of pipelines, storage facilities, and refuelling stations at ports. In the case of green hydrogen, which serves as a crucial component for other fuels, substantial investment will be required due to its need for specialized containers maintained at temperatures around -253°C . The shipping sector has yet to determine its choice of future fuel. However, it is evident that multiple options are essential, given the limited availability of renewable energy.

The encouraging aspect is that the decarbonization of international shipping will yield benefits beyond the industry itself. It will accelerate investments in renewable energy and provide sun-rich emerging economies with the opportunity to thrive by producing cost-effective green hydrogen on a significant scale.



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MOMENT IN THE HISTORY
OF OUR PLANET**



A NEW TYPE OF SOLAR CELL ON THE HORIZON?

COULD THIS BE THE ULTIMATE GATEWAY TO GREEN ENERGY?



FIRMS COMMERCIALIZING PEROVSKITE-SILICON ‘TANDEM’ PHOTOVOLTAICS SAY THAT THE PANELS WILL BE MORE EFFICIENT AND COULD LEAD TO CHEAPER ELECTRICITY.

Situated on the outskirts of Brandenburg an der Havel, Germany, amid car dealerships and hardware stores, stands a two-story factory brimming with solar-power innovations. Here, the UK-based company Oxford PV is manufacturing commercial solar cells utilizing perovskites, cost-effective and abundant photovoltaic (PV) materials hailed by some as the future of green energy. Despite its unassuming location surrounded by disheveled grass and a weed-strewn parking lot, the factory serves as a humble birthplace for a potentially revolutionary technology, a sentiment passionately expressed by the firm’s Chief Technology Officer, Chris Case. “This is the realization of my dreams,” he enthuses.

Oxford PV is among several companies placing their bets on perovskites to accelerate the global shift to renewable energy. While a few perovskite-based PV products have already hit the market, recent announcements indicate that many more are poised to follow suit. Case predicts that consumers will be able to acquire solar panels featuring Oxford PV’s cells by the middle of the upcoming year. Additionally, in May, the Seoul-based silicon PV manufacturer Hanwha Qcells declared its intention to invest \$100 million in a pilot production line slated to be operational by the end of 2024.

Silicon currently serves as the predominant material in 95% of solar panels. Instead of



generates enthusiasm, been quick “revolutionary” material” that is increasing headlines have to predict a and “miracle” poised to “change the world.” However, the industry grapples with at least two significant challenges as it strives to revolutionize the solar market.

Firstly, research findings indicate that the performance of perovskites deteriorates more rapidly than silicon when exposed to moisture, heat, and even light. While Oxford PV claims to have addressed this issue through private research, Fabian Fertig, Qcells’ Director of Research and Development for wafers and cells, emphasizes that “stability is the key challenge that still remains” for commercial manufacturing of perovskite–silicon tandems.

Secondly, some analysts view perovskites, at least in the short term, as largely inconsequential to the growth of solar power. The cost-effectiveness and efficiency of silicon modules have significantly improved over the past decade, with Chinese companies rapidly expanding manufacturing capacity. In 2022, the world boasted approximately 1.2 terawatts (TW) of generating capacity from solar power, contributing around 5% to global electricity generation. Meeting climate goals necessitates reaching 75 TW by 2050, requiring installations to surpass 3 TW per year by the mid-2030s. While the silicon PV industry is projected to achieve this, it remains one of the rare green-technology sectors that is on track.

Jenny Chase, a solar analyst at the consultancy BloombergNEF in Zurich, Switzerland, asserts, “The technology we currently possess is certainly capable of producing as much solar electricity as the world needs.” Consequently, perovskites are on the brink of encountering their most formidable challenge: navigating the harsh economic realities of the fiercely competitive photovoltaic (PV) market.

replacing it, Oxford PV, Qcells, and other companies are integrating perovskite onto silicon to create tandem cells. These tandem cells, leveraging the fact that each material absorbs energy from different sunlight wavelengths, have the potential to deliver at least 20% more power than a standalone silicon cell, with some scientists projecting even greater efficiency gains.

Supporters of perovskite technology argue that the additional electricity generated could offset the extra costs associated with tandem cells, particularly in densely populated urban areas or industrial sites where available space is limited. Case notes, “Our primary demand initially comes from utilities because they simply lack sufficient accessible land.” As the prospect of perovskite–silicon tandem technology approaching the market



VEOLIA RECYCLES LANDFILL SITE INTO UK'S LARGEST SOLAR SITE

These projects are crucial to meet renewable energy targets says Matt Partridge, Development Director, REG Power Management who have partnered with Veolia

Veolia, a company specializing in water management, waste management, and energy services, facilitates environmental transformation for its clients by focusing on decarbonization, pollution reduction, and resource generation. This French multinational corporation is currently in the process of converting the rehabilitated landfill site at its Ockendon facility in Essex into the United Kingdom's largest solar array. With a capacity of 59MWp, this solar array has the capability to generate electricity equivalent to the demands of over 15,000 homes.

Donald Macphail, Chief Operating Officer, Treatment at Veolia, stated, "This recent development in renewable energy represents another stride towards achieving a net-zero carbon future for the UK. It serves as a testament to our ability to revitalize this restored landfill site and give it a new purpose."

This project is a collaborative effort with REG Power Management, a technology provider established in 2005, dedicated to creating new renewable energy projects that contribute to the transition to a zero-carbon future. Matt Partridge, Development Director at REG Power Management, expressed his satisfaction with the collaboration, stating, "We are pleased to have worked alongside Veolia in bringing forth this significant clean

energy project. Initiatives like these are crucial in meeting our objectives for low-cost, zero-emission electricity generation, utilizing the abundant renewable energy resources available in the UK."

The site is equipped with approximately 107,000 solar modules rated at 540Wp or 545Wp, designed to optimize power density by capturing sunlight on both sides. This initiative is part of Veolia's landfill restoration program that commenced in 2017 and follows the installation of solar panels across multiple sites in 2021. In total, Veolia generates 800GWh of electricity through a combination of solar power, biomass, biogas, and Energy Recovery facilities (ERF), all meeting the criteria under the Renewable Energy Guarantees of Origin (REGO) scheme, equivalent to powering 240,000 homes.

Donald Macphail emphasized the significance of harnessing solar power for renewable electricity, stating, "By harnessing the power of the sun to produce renewable electricity, we are advancing our mission of achieving environmental transformation and addressing climate change. Additionally, this project is noteworthy as the solar arrays have minimal ground-level impact, allowing the wildlife that has returned to the restored land to coexist harmoniously with the technology."

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DOES IT MATTER WHAT HAPPENS AT COP28, THE UN CLIMATE CONFERENCE BEING HELD IN DUBAI

The most crucial discussions around climate change began in the United Arab Emirates, where world leaders, scientists, and environmental advocates discussed strategies for the most efficient ways to mitigate climate change in the coming years.

The 2023 United Nations Climate Change Conference, COP28, kicked off Thursday in Dubai. The conference was at the forefront of establishing ambitious policies on a global scale to promote the rapid mitigation of warming temperatures.

The awareness and accountability established at the climate conference were among its most important purposes.

In 2023, headline after headline from scientific reports confirmed how the effects of climate change were already present. Earlier that month, the Fifth National Climate Assessment, issued every five years by the U.S. government, had found that climate change was making it harder to “maintain

safe homes and healthy families.” Earth had capped off its hottest 12-month span on record at the close of October, as reported by nonprofit Climate Central, which analyzed international climate data. A study published in *Nature Climate Change* in October had found that the planet might be unable to remain below the threshold of 1.5 degrees Celsius of global warming at current emissions projections.

Extreme weather events such as record-breaking wildfires, coastal erosion, more intense storms, and droughts had been plaguing regions all over the world in recent years.

“Over the past year, everyone around the world witnessed the effects of climate change,” disclosed Austin Whitman, CEO and founder of The Change Climate Project, a nonprofit dedicated to driving the demand for voluntary decarbonization, primarily with consumer brands.

WHAT IS COP 28?

COP, an acronym for Conference of the Parties, designates the annual gathering of countries participating in the U.N. Framework Convention on Climate Change (UNFCCC). This year marks the 28th occurrence, denoted as COP28.

While the Cop28 climate conference in the UAE featured prominent billion-dollar clean energy agreements and ambitious climate funds, numerous regional and global companies also seized the opportunity to unveil initiatives focused on enhancing sustainability and reducing their carbon footprint.

At Cop28, the UAE committed to establishing a \$30 billion climate-focused fund, and the World Bank, the largest multilateral development bank, pledged to increase its climate finance target to \$40 billion by 2025, allocating 50 percent to mitigation and the rest to adaptation.

Here's a summary of the announcements from major companies on the sidelines of the UN summit:

MasterCard:

Global payment company MasterCard announced that 80 percent of its cards in the UAE market issued from 2025 would be sustainable, surpassing the company's global target set for 2028.

E&:

UAE's technology conglomerate e& introduced the Sustainability Consultancy Programme in the UAE and Saudi Arabia,



offering free sustainability consultancy, including a greenhouse gas assessment, to the first eight qualifying organizations. Additionally, 15 other companies will be selected for the program with preferential rates. e& also partnered with World Wide Generation to launch the “world’s largest” global sustainability exchange platform.

Red Sea Global: Saudi Arabia's Red Sea Global, the developer of mega-tourism projects, announced a “coral commitment,” pledging to protect and regenerate corals in the Red Sea and other regions.

Enec:

The Emirates Nuclear Energy Corporation signed agreements with US-based X-energy, Moltex FLEX, Ultrasafe Nuclear Corporation, and Terrestrial Energy to advance small modular nuclear reactor technologies and expedite the UAE's approach to nuclear technology.

Tadweer:

Abu Dhabi Waste Management Company, Tadweer, launched the Integrated Textile Circularity Initiative across the UAE to increase consumer awareness and encourage collective efforts throughout the entire value chain.



Beeh Group:

Sharjah-based Beeh Group, along with Peec Mobility and the Sharjah Research, Technology and Innovation Park, formed a partnership to advance the electrification of major vehicle fleets in the emirate.

Tabreed:

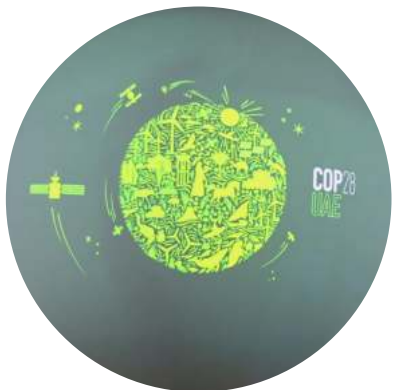
The National Central Cooling Company, Tabreed, closed a Dh600 million (\$163.3 million) green revolving credit facility in partnership with First Abu Dhabi Bank, Abu Dhabi Commercial Bank, and Emirates NBD. The financing aims to introduce “highly efficient” cooling solutions into the GCC market over five years.

Emirates NBD:

Dubai’s largest lender, Emirates NBD, facilitated a bilateral loan for Chalhoub Group, marking the luxury retailer’s first sustainability-linked loan with a one-year tenure and the option to be rolled over at maturity.

First Abu Dhabi Bank:

The UAE’s largest lender, First Abu Dhabi Bank, launched its first ESG-oriented fund for private banking clients, managed by FAB Private Bank, targeting long-term investment opportunities aligned with the UN Sustainable Development Goals. Enoc: Emirates National Oil Company and Japan’s IHI Corporation initiated a feasibility study for a green ammonia production project.





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2

3



PV+ JOURNAL: A YEAR IN RETROSPECT

Over the past year, PV+ Journal has emerged as a pivotal source of insight and knowledge in the realm of alternative energy. Our commitment to delivering comprehensive and up-to-date information led us to conduct interviews with some of the most prominent figures in the industry. We engaged with top professionals, seasoned experts, and esteemed academics to bring a diverse and comprehensive perspective to our readers.

The goal of PV+ has remained steadfast: to educate and inform our readers about all developments in the world of alternative energy. Through these interviews, we have delved into the latest advancements, emerging trends, and critical issues facing the industry.

People we sat down with

We had the privilege of conducting insightful interviews with key industry figures, including **Tauseef H Farooqui**, the Chairman of NEPRA,

he shared valuable perspectives on the regulatory landscape and future directions for alternative energy in Pakistan. His insights shed light on NEPRA's role in shaping policies and fostering sustainable energy development in the region.

Tauseef said “we are planning to make solar act as a gateway to modern energy in Pakistan. We are planning to add cumulative capacity of 10,062 MW by the end of year 2030. Weve also got a number of consumers in Pakistan opting for net metering”.

Ali Majid, the Director of Marketing at LONGi provided a unique opportunity to gain firsthand insights into the strategic vision and groundbreaking initiatives within the alternative energy landscape.

Additionally, he talked about upcoming projects in Pakistan and the cutting-edge technologies the company is spearheading. Mr. Majid's discussion provided a glimpse into the innovative strides LONGi is making and the role it envisions playing in Pakistan's renewable energy sector.

In another enlightening series of interviews, PV+ Journal had the privilege of engaging with **Abu Bakar Ahmed Madani**, the Secretary of Energy in the Government of Sindh. Mr. Madani shared valuable insights into the energy landscape, policies, and future initiatives in Sindh, providing a comprehensive view of the region's commitment to sustainable development.

Furthermore, our discussion with **Engineer Faiz Bhutta**, a distinguished solar PV expert, added a technical dimension to our coverage. Engineer Bhutta's expertise offered readers an in-depth understanding of solar PV technologies, advancements in the field, and the potential for solar energy in driving a cleaner and more sustainable energy future..

Adding another layer to our commitment to comprehensive coverage, the PV+ team had the privilege of conducting insightful interviews with influential figures in the energy sector. Among these interviews, one notable conversation was with **Zaigham Rizvi**, a seasoned professional in the energy industry. Rizvi's wealth of experience provided our readers with unique perspectives on the challenges and opportunities within the dynamic landscape of sustainable energy.

In our previous edition, we broadened our scope to include voices from the educational sector. The interview with **Prof. Dr. Vali Uddin**, the Vice Chancellor of UIT shed light on the pivotal role that universities can play in advancing sustainability. Dr. Uddin eloquently discussed the significance of educational institutions in shaping a sustainable future and the responsibility they bear in nurturing the next generation of professionals who will drive positive change in the energy sector and beyond.



From the 7th to the 9th of September, the Expo Center in Karachi was abuzz with innovation and enthusiasm as it played host to the much-anticipated Pakistan Sustainability Week Exhibition. This three-day event brought together industry leaders, government representatives, researchers, and the public to celebrate and promote sustainable practices in the domains of energy and environmental conservation.

The Exhibition served as a valuable platform for networking, knowledge exchange, and collaboration. It brought together experts, policymakers, industry leaders, and the youth to discuss and address the pressing sustainability issues facing Pakistan today. The event highlighted the potential of renewable energy, efficient electricity generation, and sustainable practices in meeting the country's energy demands while reducing its carbon footprint.

Successful Solar Show 2023 Shines in Peshawar

On Dec 12th 2023 – The PV+ Journal team had the opportunity to attend The Solar Show 2023, held on December 1st and 2nd in Peshawar. The event was a triumph, drawing visitors from diverse industries like textile, cement, packaging, plastic, hospitals, and malls. The event highlighted cutting-edge solar technology and facilitated impactful networking.



Places We Visited

Saleem Khana Tanoli, our dedicated Editor-in-Chief, embarked on a global journey this year to learn, understand and promote sustainability in order to contribute to the advancement of our nation. His travels took him to key expos, starting with the RE+ event in Las Vegas. At this prestigious gathering, we engaged with industry professionals in the United States, fostering connections and sharing the PV+ journal with experts shaping the future of renewable energy in the American market.

Continuing our quest for knowledge and collaboration, we also visited Intersolar Europe which happened in Munich, Germany, one of the largest solar energy expos in the region. Here, surrounded by cutting-edge innovations and forward-thinking minds, we not only absorbed valuable insights but also promoted the importance of the PV+ journal among the influential players in the European solar energy landscape.

In a more recent endeavor, we attended WETEX Dubai, further extending the reach of the PV+ journal. Serving as a beacon for green energy news from Pakistan, the journal became a symbol of our commitment to sustainability. The Middle Eastern region, a significant player in the global energy landscape, was introduced to the strides Pakistan is making towards a greener and more sustainable future. Saleem's presence and the distribution of the journal at WETEX Dubai marked yet another milestone in our mission to promote sustainability on an international stage.

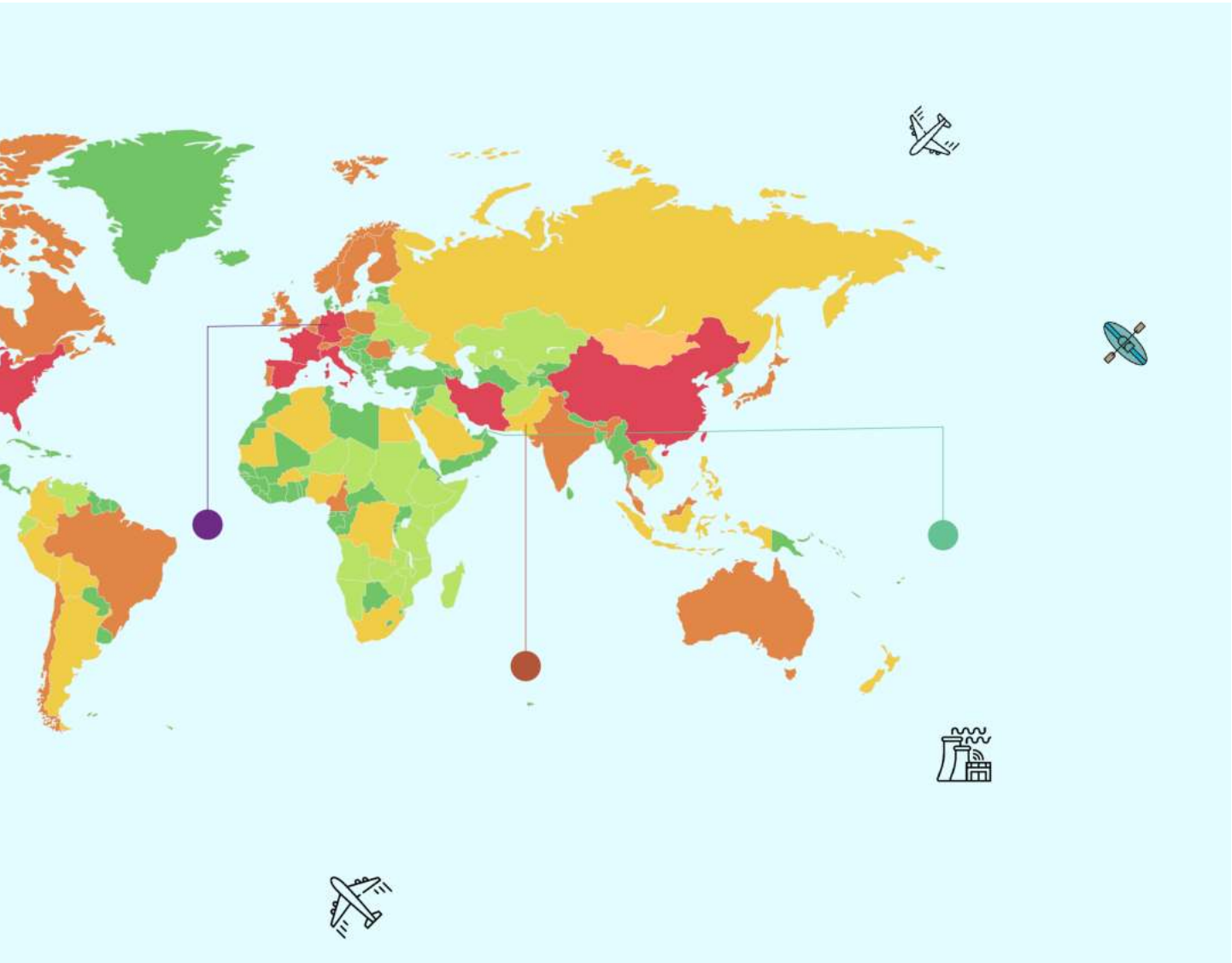
The Youth - SOLECT

The spotlight shone brightly on SOLECT during Pakistan Sustainability Week, serving as a remarkable platform for the nation's youth to showcase their innovative green



energy technologies. Hailing from 10 participating universities, three outstanding projects emerged triumphant in this spirited competition. The pinnacle of success was claimed by NUST, whose electric vehicle Eurovision captured the imagination and secured the first-place honor.

Ziauddin and UIT secured their well-deserved positions, clinching second and third place, respectively, with their impressive solar and wind projects. The event not only celebrated the ingenuity of these young minds but also provided an invaluable opportunity for students to forge connections with industry leaders. Beyond the accolades, SOLECT became a dynamic arena for networking, paving the way for promising partnerships and future opportunities. The enthusiasm and dedication exhibited by these students



underscored the potential of the next generation in propelling Pakistan towards a sustainable and green future. SOLECT, in essence, became a catalyst for excellence, innovation, and meaningful connections in the realm of green energy.

Moving Forward

Next year we aspire have a heightened focus on sustainability, aiming to deepen our connection with readers. Our goal is to curate content that informs and inspires actionable change, positioning ourselves as a knowledge beacon guiding readers towards a greener future. We will explore emerging trends in renewable energy, providing insightful analyses on global challenges and innovative

solutions. Through articles, interviews, and features, we seek to kindle a passion for sustainability, urging readers to actively participate in the transition to cleaner energy.

Additionally, we will spotlight impactful projects and collaborations, showcasing individuals and organizations driving positive change in sustainability. Collaborations with industry experts and policymakers will offer diverse perspectives, enriching our readers' understanding of complex sustainability issues. Our commitment to inclusivity aims to engage readers across demographics, making sustainability accessible to all.

Through interactive features and community initiatives, we aim to build a like-minded community committed to sustainable living.



PSW- PAKISTAN



INTERSOLAR - GERMANY



WETEX - UAE



RE+ - USA



Unleash the Sun's Energy with Our KNOX Inverters!



ARGON
STOCK AVAILABLE

KRYPTON
STOCK AVAILABLE

XENON
STOCK AVAILABLE

ASW 80-110KW
STOCK AVAILABLE

ASW 5-50KW
STOCK AVAILABLE

ASW H-S2
STOCK AVAILABLE

Rechargeable Li-ion Battery **H-U4850G**



Intelligent Load Management



In Built Wifi



Dual Output



Batteryless Operation



Grid Feeding



Battery Management System

Dialogue.

In this edition, we interviewed Saleem Khan Tanoli, CEO of Fakt Exhibitions and pioneer of Pakistan Sustainability Week, his work towards a more sustainable Pakistan has been a beacon for others to follow in a time where rising crisis has undoubtedly troubled many. We also had Mian Waqas Azfar share his thoughts regarding the ever changing energy landscape of Pakistan.





INTERVIEW WITH SALEEM KHAN TANOLI

CEO, Fakt Exhibitions (Pvt.) Ltd.
Editor in Chief, PV+ Journal

Can you share the inspiration or driving force behind establishing Pakistan Sustainability Week? What motivated you to contribute to the sustainability landscape through this platform?

Certainly! Establishing Pakistan Sustainability Week was fueled by a deep-rooted passion for fostering positive change in the sustainability landscape of Pakistan. As a green energy enthusiast and organizer of Solar Pakistan, I recognized the need for a dedicated platform that could bring together stakeholders, innovators, and enthusiasts to

collectively address the pressing challenges and opportunities within the sustainable energy sector. Having Solar Pakistan and Electricity Pakistan run for years, we set them under the PSW umbrella this year to have all the energy enthusiasts under one roof. And it came at a very necessary time when the energy crisis in Pakistan are still anything but a hurdle.

The motivation behind creating Pakistan Sustainability Week stemmed from the understanding that sustainable practices are not just a choice but a necessity for our country's future. Witnessing the global shift

towards renewable energy and sustainable practices, I felt a strong desire to contribute to this momentum within the Pakistani context. The aim was to create a space where ideas could flourish, innovations could be showcased, and meaningful dialogues could take place, ultimately steering our nation towards a more sustainable and greener future.

Given the evolving landscape of the energy industry, what key trends or developments do you foresee for the future of sustainable energy in Pakistan? How do you envision these expos contributing to the industry's growth and innovation?

I foresee significant trends shaping the future of sustainable energy in Pakistan. I'm most excited about developments that include technological advancements in solar power, the integration of smart grids, a growing emphasis on decentralized energy systems, and increased adoption of electric vehicles. These trends fuel my commitment to advancing sustainability.

Technologically, solar panels and energy storage solutions are expected to become more efficient and affordable. Smart grids will enhance the efficiency of renewable energy sources, managing distribution and integrating various renewables into existing infrastructure. The rise of decentralized energy systems, facilitated by microgrid technologies, reduces reliance on centralized power grids and boosts resilience.

Energy efficiency remains crucial, with a focus on innovations in smart buildings and energy-efficient appliances. The future of sustainable energy is closely tied to transportation, with the widespread adoption of electric vehicles requiring the development of infrastructure and charging networks.

What inspired your personal commitment to promoting sustainability in Pakistan? Was there a particular moment or idea that sparked your interest in championing this cause on a personal level?

My personal commitment to promoting sustainability in Pakistan stems from a culmination of experiences and a deep-rooted belief in the transformative power of sustainable practices. While there wasn't a singular moment that sparked this commitment, a series of realizations and observations contributed to my passionate advocacy for sustainability.

Living in a world increasingly affected by environmental challenges, I became acutely aware of the pressing need for collective action to address issues such as climate change, resource depletion, and pollution. Witnessing the impact of these global challenges on a local scale in Pakistan served as a wake-up call. The recognition that our actions today profoundly influence the well-being of future generations fueled my desire to contribute positively to our country's environmental future.

Moreover, the rapid advancements in renewable energy technologies and their potential to reshape our energy landscape captured my imagination. The realization that we possess the tools and knowledge to transition towards cleaner, more sustainable energy sources was a motivating factor. This awareness prompted me to explore ways to amplify these solutions and advocate for their widespread adoption in Pakistan.

I think engaging with communities and understanding the intricate connection between environmental sustainability and social well-being played a pivotal role. Recognizing that sustainable practices not only preserve the environment but also contribute to economic development and social equity deepened my commitment.

By switching to renewables, you'll help reduce emissions into the atmosphere and set an example for others to follow





Green Horizons: PAEA's Impact on Shaping Pakistan's Renewable Future

Mian Waqas Azfar

Vice chairman (Research and Development), Pakistan Alternative Energy Association

Pakistan's energy sector remains one of the main obstacles to economic growth for last few decades, Pakistan Alternative and Renewable Energy (ARE) Policy 2019 is a government policy aimed at promoting and supporting the development and utilization of alternative and renewable energy sources in Pakistan.

Pakistan Alternative Energy Association
PAEA is a registered trade organization dedicated to supporting the Government of Pakistan in the green energy sector. We are committed to advancing the Alternative and Renewable Energy sector within Pakistan for a sustainable and environmentally friendly future by supporting the Government of Pakistan in achieving its ARE policy 2019 and world's Sustainable development (SDGs) goal of clean and affordable energy.

Our mission is both ambitious and vital: to transform the country's energy panorama by

advocating for the widespread adoption of alternative and renewable energy sources. In the face of swiftly changing energy dynamics and environmental imperatives, our vision is for a Pakistan that is not only secure in its energy resources and economically resilient but also committed to environmental responsibility.

at PAEA, we're dedicated to making big changes in how we get our energy. We work in different ways: we push for helpful rules, team up with others in the industry, and talk with everyone involved to push forward renewable energy. Our goal is to mix up the types of energy we use—like wind, solar, hydro, and biomass. This way, we're not relying too much on things like coal or oil, and we're also helping the environment. PAEA aim to educate, advocate for policy change, and foster industry collaboration. PAEA promote renewables for a cleaner environment, support research, and drive

sustainable practices. PAEA is dedicated to contributing to global SDGs (sustainable development goals) in green energy.

Solar energy plays a vital role in diversifying Pakistan's energy generation mix and offers several compelling advantages:

Abundant Resource: Pakistan is blessed with a geographic location that provides ample sunlight throughout the year. The country receives an average of 5 to 7 kWh of solar radiation per square meter per day, making it highly conducive to solar energy generation.

Energy Independence: Solar power reduces Pakistan's dependence on imported fossil fuels, enhancing energy security and mitigating the impact of global energy price fluctuations.

Environmentally Friendly: Solar energy is a clean, renewable resource that produces zero emissions during electricity generation, reducing the nation's carbon footprint and mitigating climate change impacts.

Accessible to Remote Areas: Solar installations can provide electricity to remote and off-grid areas where conventional grid infrastructure is not cost-effective, improving living standards and socio-economic development.

Job Creation: The solar energy sector has the potential to create jobs across the value chain, from manufacturing and installation to maintenance and research and development.

Wind energy plays a pivotal role in Pakistan's energy generation strategy, offering numerous benefits aligned with the objectives of the Pakistan Alternative and Renewable Energy policy 2019.

Abundant Wind Resources: Pakistan's geographical diversity is characterized by substantial wind resources, particularly along its extensive coastline and certain inland regions. These areas experience consistent and strong wind patterns, making them prime locations for harnessing wind energy.

Diversification of Energy Mix: Wind power serves as a vital component in diversifying Pakistan's energy mix. By integrating wind energy into the grid, Pakistan reduces its reliance on fossil fuels, enhances energy security, and contributes to a cleaner and more sustainable energy portfolio.

Environmental Sustainability: Wind energy projects resonate with Pakistan's commitment to environmental sustainability. Wind turbines produce electricity without emitting greenhouse gases or pollutants, thereby reducing the nation's carbon footprint and helping to mitigate the adverse effects of climate change.

Energy Independence: The adoption of wind energy decreases Pakistan's dependency on imported fossil fuels, thereby enhancing energy independence and reducing vulnerability to international energy price fluctuations.

Economic Growth: The development and operation of wind energy projects stimulate economic growth. These projects create job opportunities during construction, maintenance, and operation phases, while also attracting local and foreign investment. These alternative energy sources are critical components of sustainable energy systems and play a vital role in reducing greenhouse gas emissions, mitigating climate change, and ensuring a cleaner and more sustainable future. The choice of energy source often depends on geographical location, technological advancements, and local resource availability.

In conclusion, let's keep in mind that selecting alternative and renewable energy, with the support of organizations like PAEA, is like choosing a cleaner and more sustainable way to power our world. By embracing these sources, we're not only contributing to a healthier environment but also ensuring a long-lasting supply of energy. With the efforts of groups like PAEA, even small changes can make a significant positive impact!.

GLOBAL EVENTS



Pakistan Sustainability Week
Date: 27 - 29 February 2024
Venue: Expo Center, Lahore
Pakistan



Electricity Pakistan
Date: 27 - 29 February 2024
Venue: Expo Center, Lahore
Pakistan



ASEAN Sustainable Energy Week
Date: 5 - 3 July, 2024
Venue: Bangkok, Thailand



iGEM
Date: 9 - 11 October, 2024
Venue: Kuala Lumpur
Convention Center Malaysia



Solar Pakistan
Date: 27 - 29 February 2024
Venue: Expo Center, Lahore
Pakistan



Intersolar South America
Date: 19 - 21 June, 2024
Venue: Messe, München



RE+
Date: 9 - 12 September, 2024
Venue: ANAHEIM, CA



WETEX & DSS
Date: 1 - 3 October, 2024
Venue: Dubai World Trade
Centre (DWTC)



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**PAKISTAN
SUSTAINABILITY
WEEK**

#PSW2024
AN EVENT ON
ALTERNATIVE ENERGY

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