مدينة الملك عبد الله للطاقة
الذرية والمتجددة K•A•CARE

# Energy Observatory
# JOURNAL

March 2024

## Renewable Energy News

### Saudi Arabia, Kazakhstan Sign Cooperation Deal in Renewable Energy

Saudi Energy Minister Prince Abdulaziz bin Salman. (Reuters)

Saudi Arabia and Kazakhstan have deepened their energy cooperation with the signing of an executive program under a Memorandum of Understanding (MoU) from June 2023. Led by Saudi Energy Minister Prince Abdulaziz bin Salman and his Kazakh counterpart, Almasadam Satkaliyev, the program encompasses a wide range of energy sectors including oil, gas, petrochemicals, renewables, and clean hydrogen.

Endorsed by Kazakhstan's President Kassym-Jomart Kemeluly, the initiative aims to foster renewable energy projects, combat global warming, and support Kazakhstan's carbon neutrality goal by 2060. It focuses on significant energy production and storage projects to bolster energy security and transformation commitments of both nations.

Source

## Renewable Energy News

### Researchers claim record efficiency for roll-to-roll fabricated perovskite PV cell

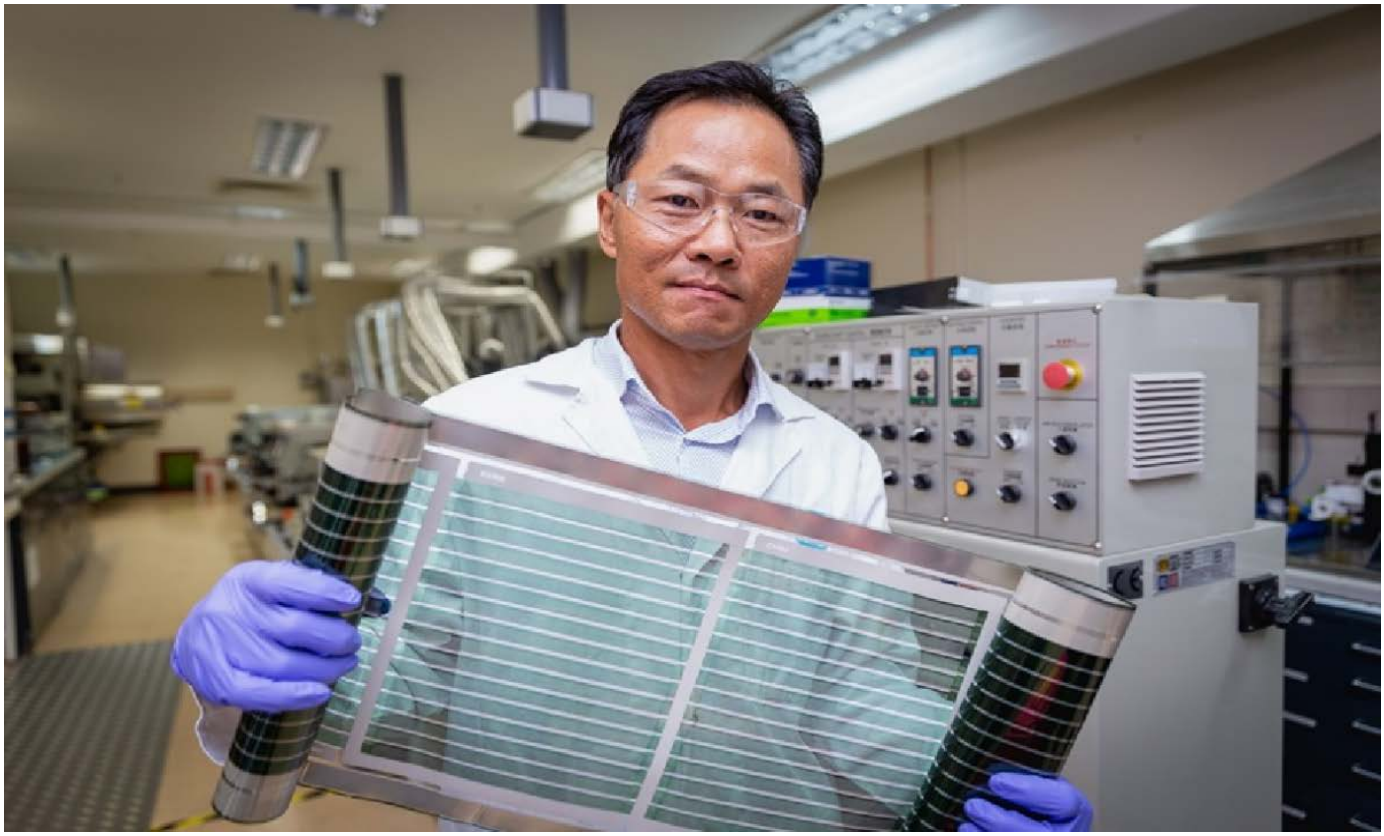


Image: CSIRO

CSIRO and international researchers have achieved groundbreaking efficiencies in large-scale and small-area flexible solar cells through roll-to-roll printing, achieving up to 15.5% efficiency. Overcoming historical challenges of scaling production while maintaining efficiency, this innovation utilizes hybrid perovskite solar cells with carbon electrodes, significantly improving outcomes.

The achievement marks over a decade of research and development, with CSIRO now seeking partners for commercialization. Promising for diverse industries and with an estimated production cost of $0.70 per square meter at scale in Australia, these flexible solar cells offer an economical and environmentally friendly energy solution. The collaboration included major universities and was published in Nature Communications.

Source

## Renewable Energy News

### Vehicle-integrated photovoltaics for electric ground transport

Image: The precursor to the Fraunhofer research team's planned M12 sized device is shown here
Image: Fraunhofer ISE

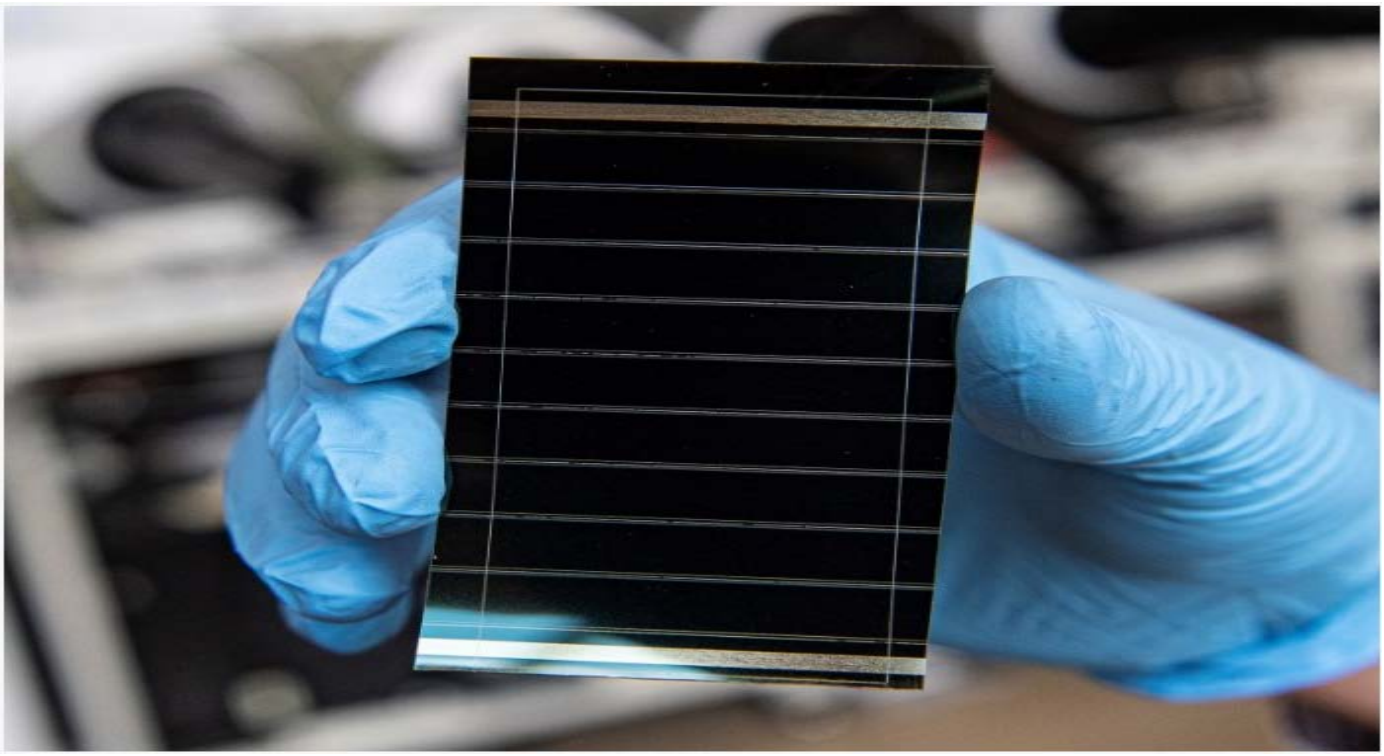
Capsolar, a Canadian company specializing in vehicle-integrated photovoltaic (VIPV) systems, has innovated an electric material towing application that boosts battery range by 30% to 40% per charge. This VIPV system, integrating 5.6 kW from 20 solar panels with a high-efficiency controller and data management, was installed on electric tow tractors for a major US automotive OEM. Capsolar, established in 2020, has evolved from creating PV systems for small electric vehicles to encompassing passenger vehicles and ground transport applications.

Utilizing Maxeon cells with 24% efficiency, Capsolar optimizes power output through advanced charge controllers and offers customizable module aesthetics. Following the success of this project and the construction of a 3 MW pilot line in Montreal, discussions are underway to expand the system across the OEM's fleet.

Source

## Renewable Energy News

### Perovskites: A Revolutionary Path Forward for Solar Energy?



A perovskite solar cell (Photo credit: Dennis Schroeder / National Renewable Energy Laboratory)

The year 2023 witnessed a remarkable surge in solar power, with strong residential demand and record-breaking installations in the United States. Amidst this growth, there's a pivotal shift towards perovskites, synthetic metal-halide nanomaterials, in solar technology. Unlike traditional silicon-based cells, perovskites offer cost-effective production, lower energy consumption, and enhanced efficiency. They promise a future of highly efficient, regionally produced solar panels, potentially revolutionizing the industry.

However, challenges remain, including competition from established technologies and the need for ongoing research. Learning from past experiences, Western firms must transition from research to large-scale production, emphasize practical testing, and invest in skill development. With support from policymakers, perovskites could accelerate the transition to a decarbonized future powered by solar energy.

Source

## Renewable Energy News

### Agrivoltaics: Revolutionizing Solar Energy with Crop Integration

Combining solar panels with 'shadow-friendly' crops can significantly increase a land's production potential, researchers say (iStock/ Getty images)

Researchers propose a groundbreaking renewable energy approach that could slash solar panel payback periods to less than five years. Dubbed agrivoltaics or Agri-PV, this innovative system involves integrating solar farms with "shadow-friendly" crops, maximizing land productivity. The concept not only boosts green energy generation but also enhances agricultural output, surpassing the benefits of standalone solar or farming operations.

Declining solar panel costs and burgeoning population drive the urgency for such dual-purpose solutions. Detailed in a study published in Energy for Sustainable Development, the Agri-PV model proves adaptable to various agricultural contexts, offering multifaceted benefits for energy and food production. International interest, particularly in China, Germany, Japan, and the US, underscores the global potential of agrivoltaic systems, validated by successful trials yielding high-quality crops like broccoli.

Source

## Renewable Energy News

### Breakthrough Funding for Deep Geothermal Energy

Image: The precursor to the Fraunhofer research team's planned M12 sized device is shown here
Image: Fraunhofer ISE

Quaise Energy secured $21 million in a Series A1 financing round led by Prelude Ventures and Safar Partners, with Mitsubishi Corporation and Standard Investments among new investors. The funding will bolster field operations, supply chain, and ongoing product development for their deep geothermal technology.

Claiming potential for 10x more energy output than traditional geothermal, Quaise aims to provide continuous, low-impact power generation. Their innovative technique, developed from over a decade of MIT research, employs microwaves to vaporize rock. With scaled-up experiments and upcoming field trials, Quaise plans to identify optimal drilling sites and enhance drilling technology through joint development efforts. Additionally, they aim to repurpose existing fossil fuel infrastructure for geothermal deployment. Meanwhile, competitor Fervo Energy secured $244 million to advance its geothermal projects, emphasizing reduced costs and enhanced drilling efficiency.

Source

## Nuclear Energy News

### Ministry of Energy: Saudi Arabia will extend the voluntary cut of one million barrels per day starting from July to the end of the first quarter of 2024


The European Commission (Pixabay)

According to a Ministry of Energy official, the Kingdom of Saudi Arabia would cooperate with some OPEC+ members to prolong its voluntary reduction of one million barrels per day, which was put into effect in July 2023, to the end of the first quarter of 2024.

As a result, until the end of March 2024, the Kingdom will produce about 9 million barrels per day. These additional cut volumes will then be gradually recovered, according to market conditions, to promote market stability.

Source

## Nuclear Energy News

### International Women's Day – Nuclear Needs More Women

Type One Energy's concept for a stellarator fusion reactor (Type One Energy)

On International Women's Day, almost 400 female scientists spoke about their common goal of a more diverse future in nuclear research and technology at an event hosted by the IAEA in Vienna. Participants came up with a statement together advocating for a more diverse and inclusive workplace in the nuclear industry. Women only make up around 20% of the nuclear workforce at the moment.

Source

## Nuclear Energy News

### X-energy opens first training centre for SMR operators


A control room simulator is the centrepiece of the state-of-the-art facility (X-energy)

X-energy introduces its Plant Support Center (PSC) to train operators for the Xe-100 advanced small modular reactors. The center features a control room simulator, Reactor Protection System prototype, and virtual reality experiences, accommodating up to 52 operators at once. Powered by automated digital systems, the simulator replicates real-world scenarios, optimizing operator training and cost efficiency.

The Xe-100, backed by USD80 million in funding from the US Department of Energy, utilizes TRISO fuel particles for a thermal output of 200 MW. The PSC will validate training programs and procedures for deployment at Dow's Seadrift facility, with plans for additional regional centers to support X-energy's expanding reactor fleet and revolutionize nuclear operator training methods.

Source

## Nuclear Energy News

### UK-Polish partnership for SMR deployment in Poland


CVG CEO Chris Turner (left) and Industria President Szczepan Ruman (right) shakes hands after signingthe letter of intent, watched by IDA President Cezariusz Lesisz (centre) (IDA)

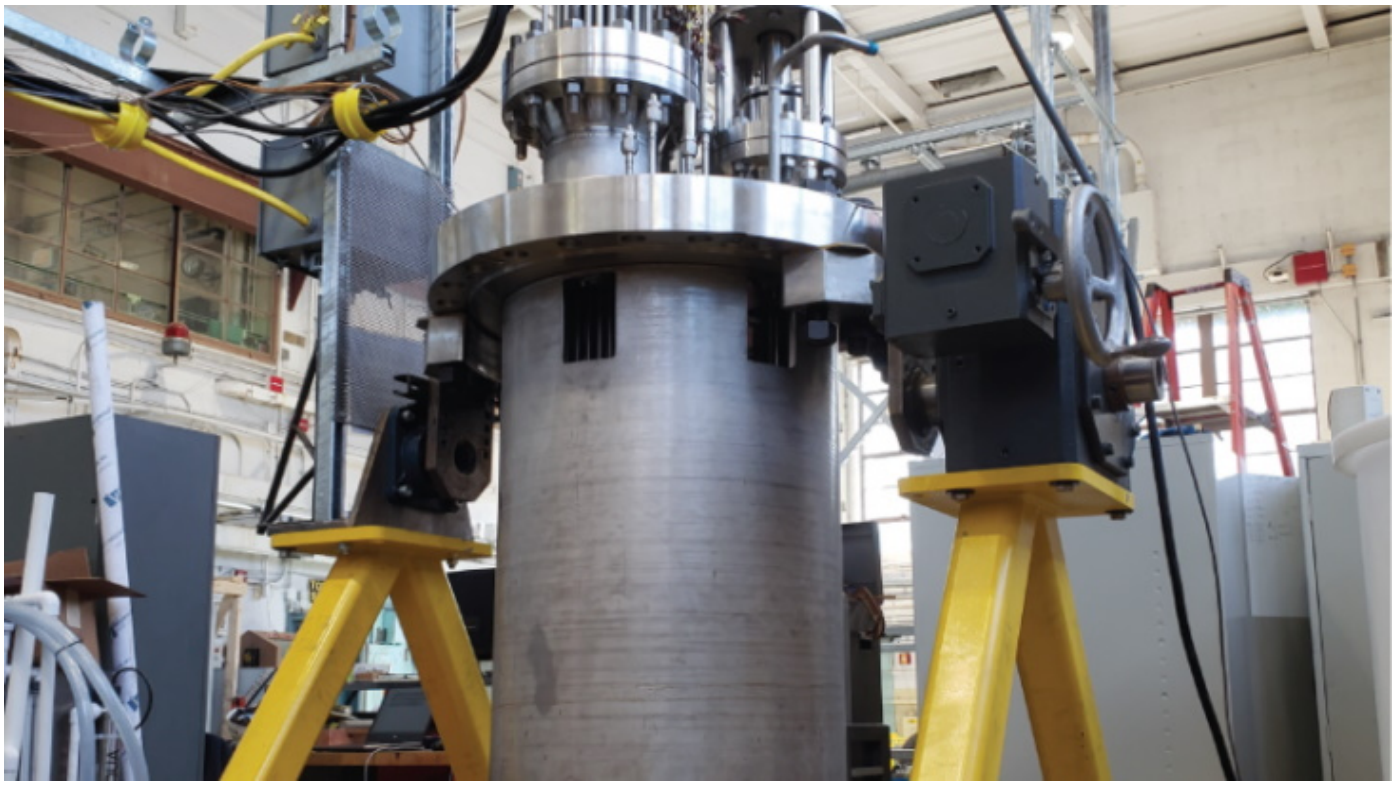
Polish industrial group Industria and UK-based Chiltern Vital Group have inked a letter of intent to collaborate on deploying Rolls-Royce small modular reactors (SMRs) in Poland. This partnership aims to support Industria's energy goals, including producing low-carbon hydrogen. CVG's expertise in net-zero technology clusters aligns with Industria's ambitions for the Central Hydrogen Valley.

The agreement outlines cooperation in training, technology exchange, and financing models for SMR projects. Both parties emphasize the significance of public-private partnerships for scaling up SMR technology internationally. Rolls-Royce SMR's Director of Strategy, Alan Woods, commended the collaboration, highlighting the potential for delivering low-carbon energy projects with Industria and CVG.

Source

## Nuclear Energy News

### Oklo and Argonne complete second THETA testing campaign



THETA (DOE)

California-based Oklo Inc has completed the second phase of the Thermal Hydraulic Experimental Test Article (THETA) testing campaign in collaboration with Argonne National Laboratory. THETA, housed in Argonne's Mechanisms Engineering Test Loop facility, features a primary and secondary system immersed in a sodium pool, providing insights into coolant flow and reactor behavior.

Through a voucher from the US Department of Energy's Gateway for Accelerated Innovation in Nuclear initiative, Oklo utilizes THETA to optimize its fast fission reactor design, aiming to enhance safety and economic viability. The completion of THETA's second phase marks a significant milestone in Oklo's journey towards commercializing its Aurora Powerhouses.

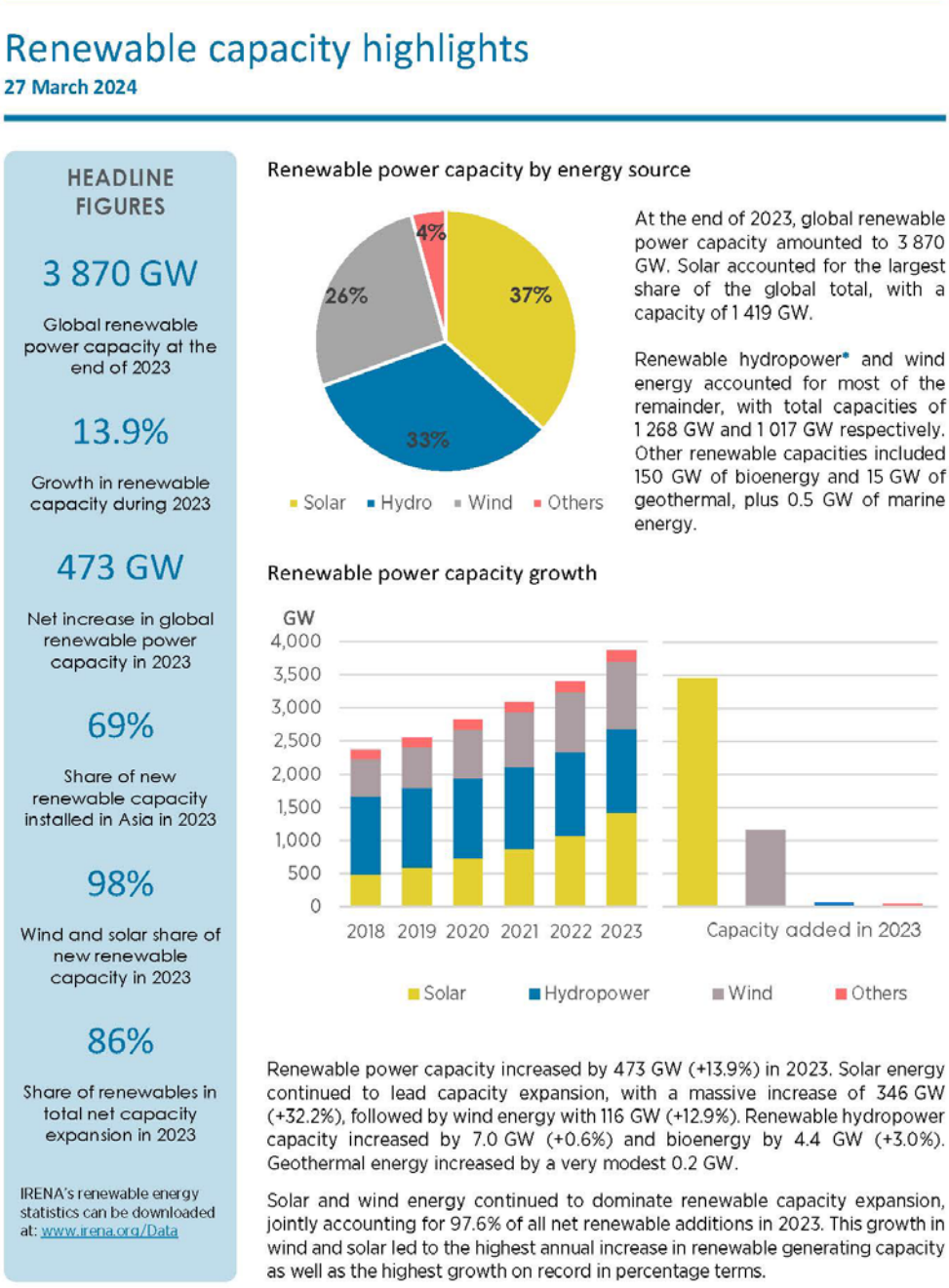
Source

# 2 REPORT HIGHLIGHT

Report title: Renewable capacity statistics 2024


Prepared by: Ahmed Alshehri

Source



Renewable capacity highlights

27 March 2024

HEADLINE FIGURES

3 870 GW

Global renewable power capacity at the end of 2023

13.9%

Growth in renewable capacity during 2023

473 GW

Net increase in global renewable power capacity in 2023

69%

Share of new renewable capacity installed in Asia in 2023

98%

Wind and solar share of new renewable capacity in 2023

86%

Share of renewables in total net capacity expansion in 2023

IRENA's renewable energy statistics can be downloaded at: www.irena.org/Data

Renewable power capacity by energy source



At the end of 2023, global renewable power capacity amounted to 3 870 GW. Solar accounted for the largest share of the global total, with a capacity of 1 419 GW.

Renewable hydropower* and wind energy accounted for most of the remainder, with total capacities of 1 268 GW and 1 017 GW respectively. Other renewable capacities included 150 GW of bioenergy and 15 GW of geothermal, plus 0.5 GW of marine energy.

Renewable power capacity growth



Renewable power capacity increased by 473 GW (+13.9%) in 2023. Solar energy continued to lead capacity expansion, with a massive increase of 346 GW (+32.2%), followed by wind energy with 116 GW (+12.9%). Renewable hydropower capacity increased by 7.0 GW (+0.6%) and bioenergy by 4.4 GW (+3.0%). Geothermal energy increased by a very modest 0.2 GW.

Solar and wind energy continued to dominate renewable capacity expansion, jointly accounting for 97.6% of all net renewable additions in 2023. This growth in wind and solar led to the highest annual increase in renewable generating capacity as well as the highest growth on record in percentage terms.

The "Renewable Capacity Statistics 2024" report provides a decade of data on global renewable power generation capacity, covering years 2013 to 2023. This extensive publication compiles maximum net generating capacity figures from renewable sources, including details from the end of each year.

Various reliable sources such as IRENA questionnaires, national statistics, industry reports, and news articles contribute to the comprehensive data presented. The statistics include a range of renewable energy technologies across numerous countries. The report is accessible in three languages, ensuring a broad usability for stakeholders in the renewable energy sector.

Prepared by: Ahmed Alshehri

Source

## Forecast of radioactive waste volume in France from 2016 to 2040, by level of radioactivity


Forecast of radioactive waste volume in France from 2016 to 2040, by level of radioactivity(in cubic meters) (Statista.com)

Low-level radioactive waste constitutes up to 90% of the total global radioactive waste. While high radioactive waste constitutes for 3%, and intermediate radioactive waste represents about 7% of the total radioactive waste generated in the world. The graph shows the volume of radioactive waste per cubic meter based on the classification of its radioactivity over time periods starting from 2016 to 2040.

It is also noted that the volume of the very low-level radioactive waste will increase by more than 50% between 2030 and 2040, the percentage of low radioactive waste also will increase around 25% in the same period. However, highly radioactive waste did not increase by more than 1,200 cubic meters during the period between 2030 and 2040. Regarding intermediate radioactive waste, it will be 51,000 cubic meters in 2030 and will become 58,000 cubic meters in 2040.

Prepared by: Aseel Zamzami

Source

## 1. Investigation of a new solar-wind energy-based heat pump dryer for food waste drying based on different weather conditions

Mahdi Deymi-Dashtebayaz, Majid Kheir Abadi Mostafa Asadi, Julia Khutornaya , Olga Sergienko

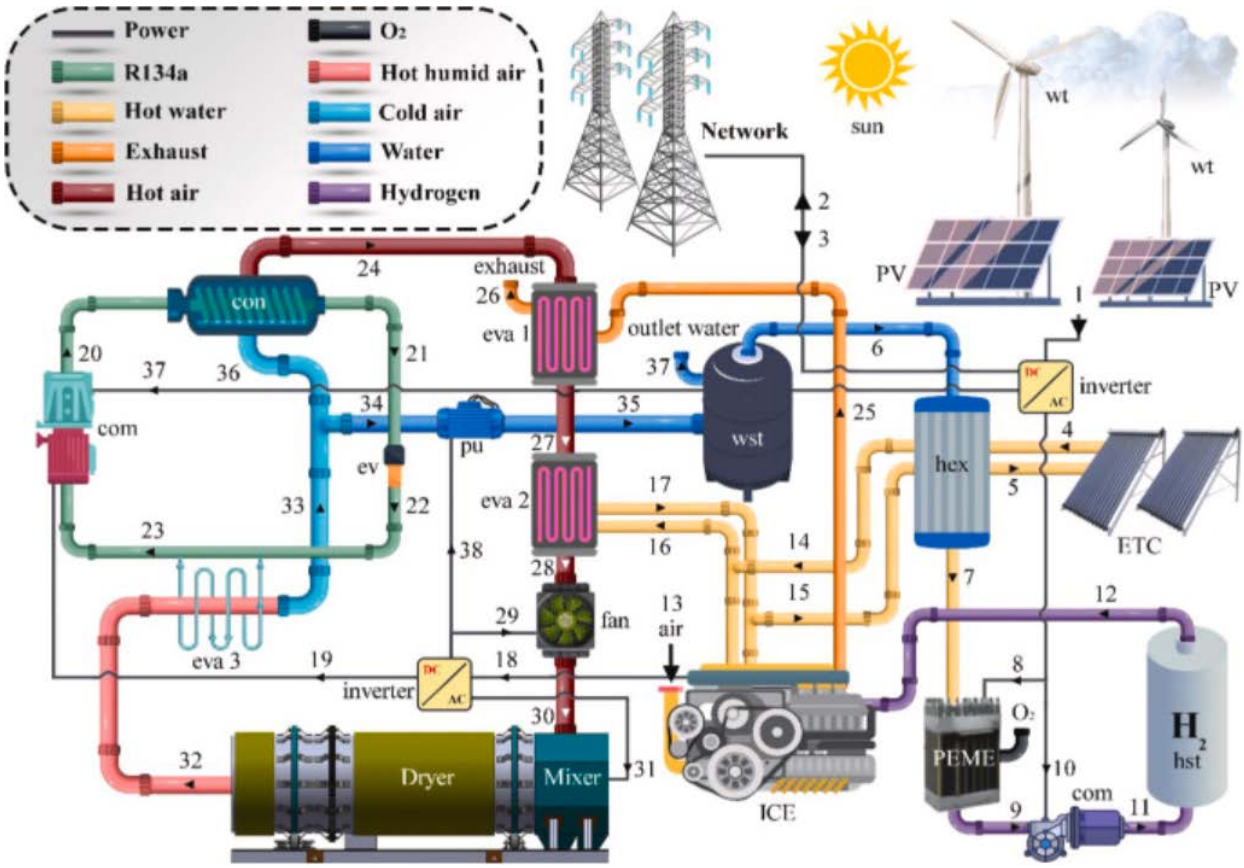



Fig. 1. Schematic of proposed system.

Numerous studies have explored powering heat pump drying systems with renewable energy. However, the intermittent availability of these sources necessitates a mix of renewables. This study assesses combining photovoltaic, thermal collectors, and wind turbines to meet energy demands for food waste drying. Evaluating a 100 kg dryer across St. Petersburg, Yekaterinburg, Yakutsk, and Khabarovsk in Russia over a year, it considers energy, exergy, economy, and environment.

Results show dryer usage affects energy efficiency and expenditure, with Khabarovsk optimal due to favorable climate, extracting 51850.92 kg/year. Yakutsk saw minimal usage (27996.64 kg/year) due to adverse conditions. Clean electricity production in Khabarovsk and Yakutsk led to significant CO2 emission reductions. Economic evaluation yields repayment periods of 12.9, 12.6, 18, and 9.6 years for the respective cities.

Prepared by: Bandar Bahattab

Source

## 2. Evolution of floating offshore wind platforms: A review of at-sea devices

(Emma C. Edwards, Anna Holcombe, Scott Brown, Edward Ransley, Martyn Hann, Deborah Greaves)

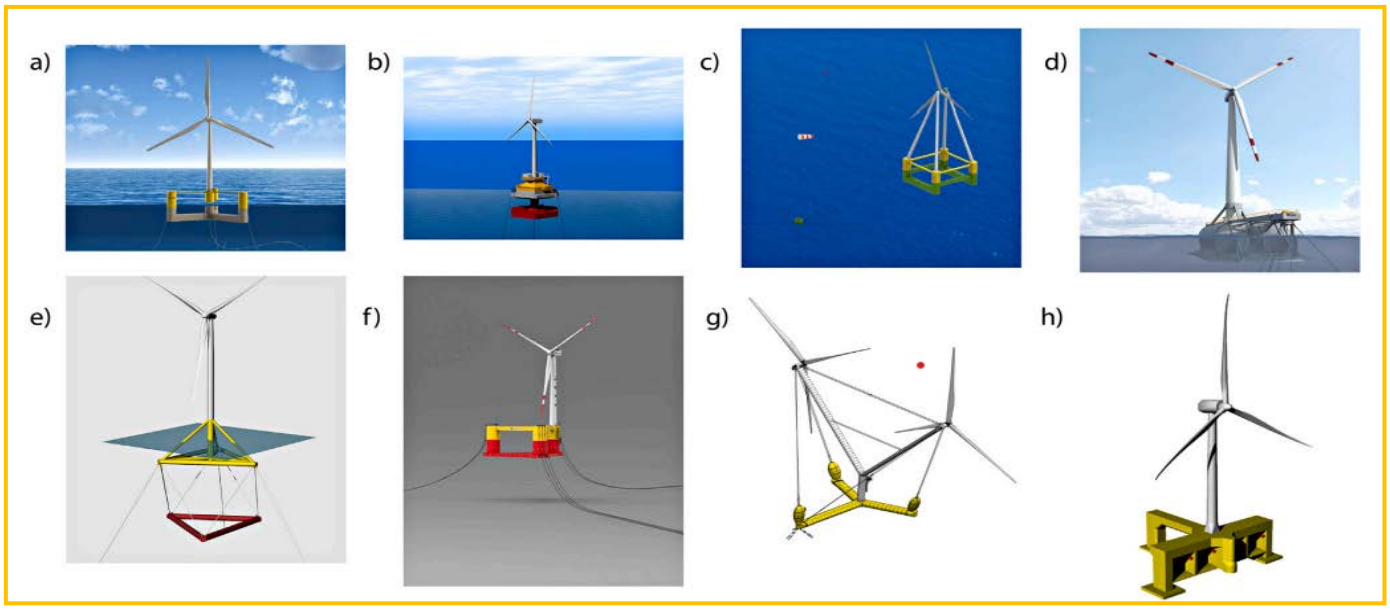



Fig. 7.(a) Innovative platform designs deployed in different projects globally.

This article examines the designs of floating offshore wind turbine (FOWT) platforms that have been deployed at sea or have undergone prototype, demonstration, or farm-scale testing. It evaluates the common design objectives and features of these platforms. The analysis includes a review of the levelized cost of energy for FOWTs, discussing anticipated cost reductions per megawatt-hour (MWh) due to factors such as turbine size, farm scale, technological maturity, and operational enhancements. The evolution of design goals and features for farm-scale and prototype/demonstration-scale devices is explored, along with an explanation of trends in design drivers and resulting platform designs.

The influence of the oil and gas industry on early FOWT designs is noted, with a shift towards specialization in the floating offshore wind sector leading to the development of unique platform features. The article highlights the emergence of various platform designs tailored to specific local environments. Two platform designs that have been successfully deployed at farm scale are identified: the Hywind Spar, a cylindrical spar platform, and the WindFloat, a three-column semi-submersible. The three-column semi-submersible design is recognized as a promising direction for the industry, with eight out of 22 deployed platforms following this configuration.

Prepared by: Fahad Alharbi

Source

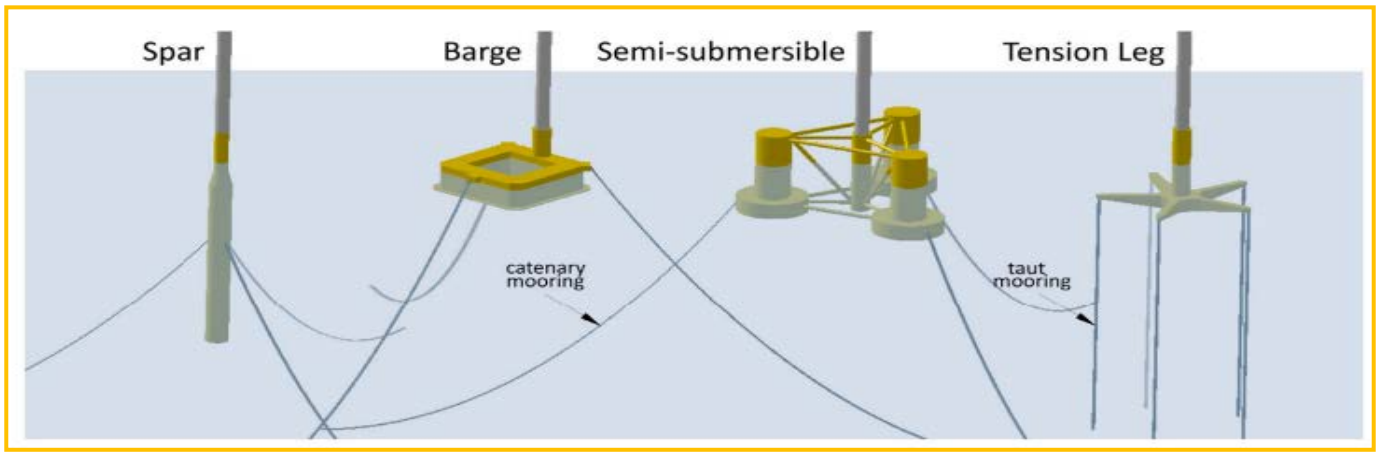



Fig. 3. Types of platforms used for floating offshore wind turbines.

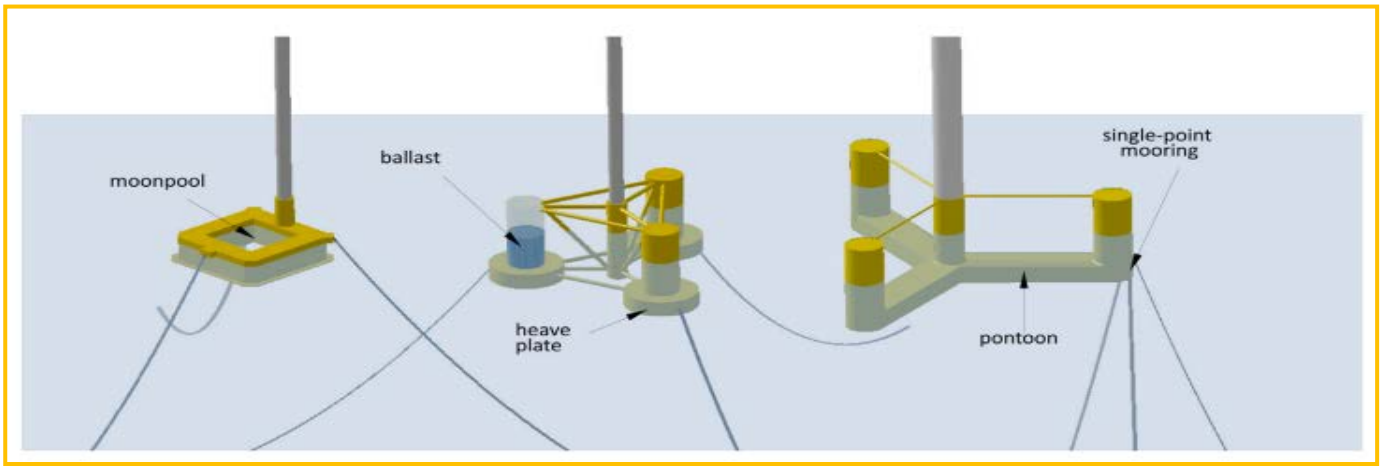



Fig. 4. Common design features of floating offshore wind turbine platforms.

In addition to traditional cylindrical spar platforms, newer designs incorporating innovative features have emerged. Examples include the SATH, DampingPool, TetraSpar, and Eolink platforms, which incorporate elements such as horizontal weathervaning, moonpools for wave suppression, lowerable ballast systems, and multiple masts for enhanced efficiency and stability. These innovative designs reflect a recent divergence in platform design strategies aimed at reducing costs, adapting to specific environments, and enhancing performance.

The review emphasizes the importance of ongoing research and development in the FOWT sector to drive cost reduction and performance improvement. Policy-makers can utilize the insights from this review to support technological advancement, while industry and academic researchers can focus their efforts on structural design, port infrastructure, installation methods, wind farm layout, and environmental impact assessments. The article concludes that FOWT platform technology has made significant progress and is poised for further advancements to meet future energy targets. The balance between standardization and specialization in platform design, as well as emerging design drivers like energy storage integration, will continue to shape the evolution of FOWT platforms in the coming years.

Prepared by: Fahad Alharbi

Source

# Striving for Excellence - WANO's 2025 Performance Targets

Anzil Maree

## Introduction

The World Association of Nuclear Operators (WANO) has updated its performance targets for 2025, signaling a continued commitment to enhancing nuclear safety and operational excellence. This concise commentary evaluates the implications of these targets, emphasizing their role in driving industry-wide improvements.

## Key Insights into WANO's 2025 Targets

WANO's integration of performance indicators, including a new measure for unplanned total scrams, marks a strategic approach to minimizing operational disruptions and enhancing safety protocols. Collaborating with the IAEA ensures data integrity, essential for setting realistic and challenging benchmarks. Besides the five key performance indicators that are discussed here, there are several more non-key indicators affecting Nuclear Power Plant Performance, namely Fuel Reliability (FRI), Chemistry Performance Indicator (CPI), Grid Related Loss Factor (GRLF), Unplanned Capability Loss Factor (UCLF), Industrial Safety Accident Rate (ISA) Unit Capability Factor (UCF) and Contractor Industrial Safety Accident Rate (CISA).

The 2025 targets for the five key performance indicators reflect a nuanced understanding of the diverse reactor technologies in use globally. By tailoring goals to specific reactor types, WANO acknowledges the varied challenges faced by operators. However, this differentiation also necessitates a careful balance to ensure it does not inadvertently hinder the benchmarking process across the industry.

Critical analysis suggests that while the targets are ambitious, there is room for pushing the envelope further, especially in rapidly advancing areas like operational technology and safety culture. The real value of these indicators lies in their ability to inspire beyond compliance, fostering a culture of innovation and continuous improvement.

| Performance Indicator | Description | 2015 Target | 2025 Target | Notes |
|---|---|---|---|---|
| Forced Loss Rate (FLR) (%) | This indicator is the ratio of all unplanned forced energy losses to the reference energy generation minus energy generation losses corresponding to planned outages and any unplanned outage extensions during a given period of time, expressed as a percentage. | 2.0 | 2.0 | Targets remain unchanged, emphasizing consistent operational efficiency. |
| Collective Radiation Exposure (CRE) | This indicator is the total external and internal whole body exposure determined by primary dosimeter, and internal exposure calculations. It includes all measured exposure reported for station personnel, contractors, and personnel visiting the site or station on official utility business. | Varied by reactor type | Updated per reactor | Reflects operational advancements and safety improvements. |
| Total Industry Safety Accident Rate (TISA) (%) | This indicator is the number of accidents for all plant personnel, including all staff, contractors, supplemental personnel, and all other non-utility personnel working onsite that result in one or more days away from work (excluding the day of the accident) or fatalities per 200,000 (TISA2) or per 1,000,000 (TISA1) hours worked. | 0.50 | 0.20 | A significant reduction target, highlighting a focus on personnel safety. |
| Safety System Performance Indicator (SSPI) | This indicator monitors the readiness of important safety systems to perform certain functions in response to off-normal events or accidents. It also indirectly monitors the effectiveness of operations and maintenance practices in managing the unavailability of safety system components (Unavailability ratio). | 0.020/0.025 | Unchanged | Continues to prioritize the reliability of critical safety systems. |
| Unplanned Total Scrams (US7) | This indicator is the sum of the number of unplanned automatic scrams (reactor protection system logic actuations) and unplanned manual scrams for approximately one year (7,000 hours) of operation. | N/A | 0.5 to 1.0 | New indicator, emphasizing the reduction of unplanned reactor trips. |

## Conclusion

The WANO 2025 targets are not merely benchmarks but catalysts for industry-wide excellence. They embody a proactive approach to safety, reliability, and operational efficiency, reflecting the nuclear industry's adaptive and forward-thinking ethos. As the sector moves towards these goals, the emphasis must remain on not just meeting, but exceeding these targets, to foster an environment of continuous improvement and innovation. Achieving these objectives requires a collective effort, underpinned by a commitment to learning, adaptation, and an unwavering focus on safety culture.

## Workshop on the Design Safety Assessment of Transport Packages Containing Radioactive Material

4 – 8 Mar 2024 , Vienna, Austria

Source

## Waste Management Conference 2024 (organized in cooperation with the IAEA)

The WM Symposia will be hosting the Waste Management Conference (WM2024 Conference), organized in cooperation with the International Atomic Energy Agency which will take place live in Phoenix, Arizona, United States of America from 10-14 March 2024. .

10 – 14 Mar 2024 , Phoenix, AZ, United States of America

Source

## Technical Meeting on Experience in Removal of High Enriched Uranium from Research Reactors

ICONS 2024 will provide a global forum for ministers, policymakers, senior officials and nuclear security experts to discuss the future of nuclear security worldwide, whilst providing opportunities for exchanging information, sharing best practices and fostering international cooperation.

11 – 14 Mar 2024, Budapest, Hungary

Source

## Organizational Meeting for the Eighth Review Meeting of the Contracting Parties to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

The Organizational Meeting for the Eighth Review Meeting of the Contracting Parties to the Joint Convention will take place at the IAEA Headquarters in Vienna, Austria, from 27 to 28 March 2024.

27 – 28 Mar 2024 ,Vienna, Austria

Source

## Workshop on Techniques and Technologies Used for the Characterization of Radioactively Contaminated Land

The IAEA will hold a Training Workshop on Techniques and Technologies Used for the Characterization of Radioactively Contaminated Land at the UKHSA Training Centre, Harwell Campus, United Kingdom from 8 to 12 April 2024.

Virtual attendance is not possible. Contaminated sites and areas requiring environmental improvement exist across the world. Critical to ensuring their remediation and reuse is the ability to characterize the site before, during and after site works.

8 – 12 April 2024, Harwell, United Kingdom of Great Britain and Northern Ireland

Source

## International Conference on Enhancing the Operational Safety of Nuclear Power Plants

The International Atomic Energy Agency (IAEA) fosters an exchange of information on factors impacting operational safety performance of nuclear power plants in areas such as: leadership and safety culture,

15–19 April 2024, Beijing, China

Source

## Intersolar Middle East

Intersolar Middle East is held in Dubai World Trade Centre Dubai on 16 to 18 April 2024 showing the companies news of United Arab Emirates and internationals related to sectors Solar energy, Renewable energies.

April 16–18, 2024, Dubai World Trade Center

Source

# 6 EVENTS

## 26th World Energy Congress 2024

The 26th World Energy Congress is a critical turning point for leadership on clean and inclusive energy transitions worldwide and an opportunity to spring forward in redesigning energy for people and planet.

22-25 April 2024, Rotterdam, Netherlands

Source

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## International Conference on Nuclear Security: Shaping the Future

ICONS 2024 will provide a global forum for ministers, policymakers, senior officials and nuclear security experts to discuss the future of nuclear security worldwide, whilst providing opportunities for exchanging information, sharing best practices and fostering international cooperation.

20-24 May 2024, Vienna, Austria

Source

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## Nuclear Innovation Conference

The Nuclear Innovation Conference 2024 (NIC2024), hosted by NRG|PALAS in collaboration with the IAEA, emphasizes the importance of nuclear energy in achieving energy security and meeting climate goals. The conference aims to facilitate collaboration to address the evolving landscape of nuclear energy. Seeks to bring together key players in the nuclear industry, fostering collaboration and showcasing high-potential initiatives. The content of the conference, supported by NRG|PALLAS's expertise and partnerships, reflects a collective vision for a sustainable future in nuclear energy. Participants can engage in presentations and discussions with global representatives from energy utilities, vendors, regulators, and other stakeholders, providing a unique opportunity to expand networks and contribute to the progression of nuclear energy.

5-6 June 2014, Amsterdam, Netherlands

Source

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## International Conference on Nuclear Knowledge Management and Human Resources Development

The International Atomic Energy Agency (IAEA) is organizing the Nuclear Knowledge Management and Human Resources Development Conference in response to challenges and opportunities in the evolving global nuclear landscape. The event aims to address the need for a knowledgeable and experienced multigenerational workforce in the nuclear industry, emphasizing the importance of preserving and transferring knowledge as experienced professionals approach retirement. The conference will review global developments, discuss challenges and opportunities, and provide practical solutions for organizational, national, and international levels. Targeting professionals from various sectors, the conference will focus on sustainability by following 'green meeting' guidelines, incorporating paper-smart documentation, waste reduction, and environmentally friendly catering.

1-5 July 2024, Vienna, Austria

Source

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## International Conference on Nuclear Knowledge Management and Human Resources Development

The International Atomic Energy Agency (IAEA) is organizing the first International Conference on Small Modular Reactors (SMRs) and their Applications in Vienna, Austria, from October 21 to 25, 2024

21–25 October 2024, Vienna, Austria

Source