Issue 26 / November 2023

Energy Journal

Wind of Change: Sustainable Innovations

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Enclosed, find CESI's sustainability policy

A magazine about energy and more by **CES**

Summer Man



Energy Journal

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Editorial

The Future of the Sustainable Energy Transition



Guido Bortoni Chairman, CESI

Domenico Villani CEO, CESI

In an age when geopolitical turmoil is also reshaping energy policies, Europe's strategic responses hinge on integrating security with sustainability. This issue of our Energy Journal (EJ) puts a spotlight on the deployment of sustainable solutions within the energy sector, with an emphasis on European efforts where policy and technological innovation converge with urgency.

It is against this backdrop that our Group has unveiled its Sustainability Policy, a document attached to this issue, outlining how sustainability is deeply woven into our values and operations, extending well beyond environmental concerns to embrace social responsibility.

While individual organizations like CESI make strides in sustaina-

bility, the broader EU landscape is also evolving. The EU's revised energy strategy, mentioned in our EJ, is an earnest pivot for electricity towards renewable energy sources - including solar and wind - as well as nuclear, as evidenced by one the three pillars of the REPowerEU initiative introduced in May 2022. Yet, a World Bank report highlights a stark contrast: the financial support for fossil fuels is currently sixfold that of climate change mitigation efforts outlined in the Paris Agreement.

Addressing the energy mix necessary for a sustainable future, nuclear energy is regaining attention as an essential component of the decarbonization strategy. In this vein, French Energy Transition Minister Agnes Pannier-Runacher has emphasized the need for a

consolidated European approach to harnessing nuclear power in meeting the long-term goals of carbon neutrality.

The attention on diversified energy sources seamlessly extends into the "Industries & Countries" section of the Energy Journal. Here, we explore the energy strategies of nations that balance their current infrastructure with innovative approaches.

In the "Opinions" section, the diverse viewpoints of influential figures cast light on the complexities of energy transformation. Damilola Ogunbiyi, CEO and Special Representative of the UN Secretary-General for Sustainable Energy for All, elucidates the pivotal role of women in energy and the critical objective of achieving universal energy access. In a separate discussion, Ditte Juul Jorgensen, Director General for Energy at the European Commission, shares her reflections on the past months of the energy crisis. She extracts five key lessons that have been indispensable to the Commission's strategy for managing the crisis.

In addition, IEA's Executive Director, Fatih Birol, advocates for a novel energy partnership for Africa. He reminds us that Africa's solar potential is largely untapped, with the continent having a photovoltaic capacity comparable to Belgium.

Highlighting the significance of critical materials in the energy future, CESI's alliance with the Italian Observatory on Critical Raw Materials for Energy (OIMCE) is analyzed in our Energy Journal current issue. These materials are already pivotal in meeting the burgeoning need for key components in wind turbines, solar panels, and battery production. The McKinsey Report on "Net-Zero Power" underscores the essential potential of long-duration energy storage systems in significantly cutting CO_2 emissions, a step towards the faster decarbonization of our power systems, a subject that receives a deep dive in our magazine's analysis.

This issue of our Energy Journal thus offers a carefully selected blend of insights and foresights, weaving together a narrative that charts the course toward a resilient and sustainable energy framework.

We hope you find this exploration both enlightening and thought-provoking, as we continue to navigate the complex journey of a sustainable and affordable energy transition.

Enjoy the reading!

Guido Bortoni *Chairman, CESI* Domenico Villani CEO, CESI

Issue 26 / November 2023

Contents



8 News

Latest from CESI



10

Scenario

Moving towards a "Fair Transition"



18 Top Story

The Race for Wind Energy: Global Leaders and New Installations



28 Industries & Countries

Sustainable Transition: How Countries Are Playing Their Hand Energy Journal can be browsed and downloaded at www.cesi.it

"We believe that the energy transition is essential for our future competitiveness."

Ursula von der Leyen, President of the European Commission 2023 State of the Union Address



40 Future & Technology

A strategic partner for the energy transition Opinions

The Crisis that Extends Our Borders



50 News & Events

Upcoming Energy Events

Latest from CESI



Solar Cells

ASI-CESI Agreement to Support Space Factory Project

CESI and the Italian Space Agency (ASI) have signed an important 13-milliion-euro agreement to support the Space Factory project. This project represents an important strategic resource for Italy, helping to reinforce the national industrial supply chain skills in the space sector. Thanks to the agreement and the National Recovery and Resilience Plan funds managed by ASI, CESI will be able to increase its production capacity of solar cells for space satellites, introduce digitalized production processes, and use new cutting-edge monitoring technologies and machinery. The objective of the Space Factory is to attract future investments by private parties involved in the creation of satellite constellations and mega-constellations, projecting Italy even further forward in the exploration of the cosmos.

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A project that reinforces our national industry in the space sector.



Sustainability

CESI Receives Sustainability Award

CESI has been recognized as a sustainability champion by the Deutsches Institut für Qualität und Finanzen (German Institute for Quality and Finance) and media partner Repubblica Affari & Finanza. The award was presented at the recent introduction of the Sustainability Champions 2023/2024, a ranking of Italian companies published by Repubblica Affari & Finanza, one of the main Italian business dailies. This is a significant achievement for CESI, a company that has consistently demonstrated a strong commitment to economic, social, and environmental sustainability. Indeed, it positions CESI alongside renowned companies such as Ferrari, Coca Cola, Essilor Luxottica, Enel, and Deloitte. Moreover, it constitutes a springboard for CESI to continue its active pursuit of the ecological transition. The survey, which collected the opinions of 10,671 employees working in Italian companies with at least 300 employees, included 17 different criteria related to economic, social, and environmental sustainability aspects of organizations.

A meeting to underline the central role of technology.

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Wind Energy

Crucial KEMA Tests for Connection of TenneT North Sea Wind Farms

TenneT and its subcontractors have successfully completed the installation of a state-of-the-art transformer substation in Wijk aan Zee. This innovative facility integrates three new North Sea wind farms into the Netherlands' high-voltage grid, including the Hollandse Kust Noord earth station and the Wijk aan Zee 380 kV substation. The main components of the substation are the ground station, which converts green electricity collected from wind farms from 220 kV to 380 kV, and the substation, which directs the power to various customers, including Tata Steel, and integrates it into the national grid at 380 KV via the Beverwijk substation. The thorough testing process employed specialized cameras to detect air bursts, allowing for rapid resolution of any identified issues. The project will face its final challenge in November, when the 69-kilometre-long undersea cable to the wind farm will be evaluated using five test sets.

Specialized video cameras to identify water leaks.



Meetings

Italian Environment Minister Pichetto Fratin at CESI

At the beginning of October, Gilberto Pichetto Fratin, Italian Minister of the Environment and Energy Security visited CESI's Milan headquarters, where he was welcomed by Domenico Villani, CEO of CESI, and Guido Bortoni, CESI President. The meeting provided an opportunity to discuss the future of the energy sector and to gain insight into CE-SI's future plans and objectives, including the creation of a resilient and secure network to improve the overall resilience of the energy sector. Pichetto Fratin appreciated CESI's approach and reiterated the government's attention and commitment to the sector, underlining the central role played by technology. The minister's visit coincided with CESI's event on "The Protection of Systems in the Great Energy Transition," organized by the Italian Association of Electrical Engineers, Electronic Automation, IT and Telecommunications (AEIT).

A meeting to underline the central role played by technology.



Scenario

Moving towards a "Fair Transition"

European strategy is being reviewed to address the new geopolitical panorama: recent studies focus on increasing renewables, (that require further acceleration) energy security, and a renewed role for wind and nuclear energy.

he new geopolitical reality that has emerged following the Russian invasion of Ukraine calls for the European energy sector to pursue a double objective: accelerate decarbonization to mitigate the effects of climate change as much as possible and the need to become independent from Russian supplies. In fact, the crisis scenario has concentrated the EU's attention on the energy transition. The debate on supply security is at the top of government and company agendas, and will be one of the main drivers behind changes in the EU energy sector. Unfortunately, the IEF-GARP Global Energy Risk Forum, held in June, concluded that political and market solutions to Ukraine's invasion are exacerbating energy security risks.

The energy transition must drive the development of a more reliable and sustainable system that will guarantee energy supplies at an accessible price. At the end of 2022, the World Energy Outlook proposed ten guidelines to reinforce energy security during the "intermediate transition" period. Meanwhile, clean energy and fossil fuel systems continue to coexist, and both will have to provide reliable energy services. Recommended action includes the management of the decommissioning (and consequent reuse) of fossil fuel infrastructure, including those exploiting natural gas as a source of energy.

The use of natural gas has increased rapidly over the last decade, satisfying nearly onethird of the total added energy demand, more than any other fossil fuel. And its use is forecasted to continue rising markedly in all the scenarios analyzed by the IEA. According to McKinsey's Global Energy Perspective 2022, fossil fuels such as oil and natural gas will continue to represent a significant percentage of the energy mix until 2050. Today, natural gas powers one-fourth of global electricity production and the fossil fuel will accompany the transition.

In terms of impact, the combustion of natural gas releases less $\rm CO_2$ and atmospheric pollutants than the fossil fuels it replaces, especially coal. Moreover, the opportunity to supply it via pipelines or liquify it for shipping – and the fact that gas-fueled electric plants can be rapidly started or stopped – means that natural gas perfectly suits demand fluctuation (both seasonal and short-term) as well as supporting (both in the short and medium term) the growing use of intermittent renewable energy sources such as wind and solar.

An Admonishment from the World Bank

The EU has timely begun to seek energetic independence, especially via the REPowerEU Plan that aims to rapidly reduce dependence on Russian fossil fuels and accelerate the green transition. And significant steps forward have been made. At the beginning of the war in Ukraine, 40% of the gas imported into the EU was supplied by Russia. By autumn 2022, this figure had shrunk to 9%. The EU's answer to the crisis is reinforcing the objectives set by the "Fit for 55" strategy and the "European Green Deal." However, some analysts believe that a deeper review of the European energy transition is necessary, carefully considering the starting point of each member state. A "fair transition" is key to implementing these ambitious climate policies,



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Luca Migliorini (Consulting Division) luca.migliorini@cesi.it Bruno Cova (Advisory Services & Studies Director Consulting Division) bruno.cova@cesi.it notwithstanding the fact that the most recent data published by IRENA, the International Renewable Energy Agency, in the Energy Progress Report 2023 (June) reveals that the international community is not on schedule to achieve the SDG7 objectives. In 2021, 675 million people still did not have access to electricity, and, at the current rate of progress, 660 million people will continue to not have electricity in 2030, while 1.9 billion people will have to continue relying on environmentally harmful fossil fuels for cooking.

The current increase in the use of renewable energy sources in the energy sector is insufficient, despite the ca. 27% growth over 2010-20 and a peak growth of 7% in 2019-20, the greatest annual increase in the last three decades. The renewable sources quota of total energy consumption reached 19.1% globally in 2020, compared to 16.7% in 2010. However, progress is needs to be improved, and the use of renewable energy must be significantly stepped up, especially in heating and transport. Similarly, progress in energy efficiency measures, with a mere 0.6% in 2021, is also unsatisfactory. In the meantime, international public financial flows towards developing countries to support clean energy have decreased for the third year in a row, falling to US\$10.8 billion in 2021. This represents ca. 40% of the peak sum of US\$26.4 billion invested in 2017.

These numbers are certainly not flattering, and the admonishment by the World Bank doesn't help. In their "Detox Development: Repurposing Environmentally Harmful Subsidies" Report, published in mid-June, the international organization emphasizes that countries spend six times more every year to subsidize the consumption of fossil fuels than to work towards achieving the Paris Agreement commitments on climate change. The time available to face the climate crisis is nearly up, warns the World Bank. If we wish to limit global warming to an average temperature of 1.5 degrees centigrade - the organization states in a recent report entitled "Energy Efficiency: The Decade for Action" investments to improve energy efficiency must increase threefold by the end of the decade, rising from the current US\$600 billion to US\$1800 billion by 2030. According to IEA, increasing energy efficiency from the current 2.2% to more than 4% by 2030 would allow significant cuts in greenhouse gas emissions and also generate a further 12 million jobs globally, extend access to energy, reduce utility bills, decrease atmospheric pollution and cut the dependence of some countries on fossil fuel imports.

New Support for the "Fit for 55" Package

In this troubling context, the EU climate transition process marked an important milestone on April 25 when the European Council adopted five legislative measures. These measures will allow the EU to reduce greenhouse gas emissions in its main economic sectors, guaranteeing that its most vulnerable citizens, micro-enterprises, and all the sectors that can "relocate" their carbon emissions will receive adequate support for the climate transition. These measures are part of the "Fit for 55" package that defines EU policy to reduce net gas emissions and achieve climactic neutrality by 2050. The European climate bill makes these objectives mandatory for the EU and its member states. And this is a fundamental decision amidst the energy crisis unleashed by the Russian-Ukrainian conflict, an issue that was also discussed at the G7 summit on climate and energy, held in Sapporo, Japan, where decarbonization was one of the main points on the agenda.

In the final communication, the seven countries committed to accelerating the gradual abandonment of fossil fuels that corrective measures have not mitigated to

reach net zero in their energy systems no later than 2050. The aim is to end the production of energy from fossil fuels while understanding that, during the transition phase, energy production companies must adopt measures to limit the environmental impact of these fuels through technology for carbon capture or emission reduction. This long temporal framework, based on the need to develop strategies that will allow member states to find alternatives to Russian energy imports, poses various problems related to the ecological transition. As specified in the policy document, investments in gas extraction will be viewed as an appropriate response to the current circumstances affecting the energy market.

The most critical aspect concerns the use of coal, definitely the most environmentally unfriendly fossil fuel. Notwithstanding the constant pressure exercised by some members, the final communication salvaged the formula introduced at last year's German summit, when G7 representatives proposed 2035 as the deadline for "fully or predominantly" (as per the original communication) decarbonizing their energy sectors. The United Kingdom and Canada pressed other members to remove the term "predominantly," which provides an exception for governments that intend to continue using coal and delay its complete substitution with renewable sources.

On the other hand, a positive aspect that surprised some observers was the decision to increase the collective capacity to produce energy from renewable sources. The objective for offshore wind sources is to increase the installed capacity to ca. 150 GW by 2030, while the objective was set at 1 TW for photovoltaic, also by 2030.

Accelerating Renewable Sources

IRENA has a partially positive outlook and reports that the ministers of Canada, France, Germany, Japan, Italy, the United Kingdom, and the United States "have expressed their worries for the global rate of renewable energy diffusion, according to the most recent data presented by the IRENA World Energy Transitions Outlook Preview 2023." Moreover, IRENA points out that a fundamental review of the energy transition is necessary to limit temperature increase, on average, to 1.5 degrees centigrade. The objectives described in the final communication by the G7 Climate, Energy, and Environment Ministers reflect IRENA estimates. Indeed, the G7 governments have invited the organization to prepare an innovation and sustainability analysis for offshore floating wind platforms. The plan described in the G7 communication posits an increase in the diffusion of all renewables, including solar, onshore/offshore wind, hydropower, geothermal energy, sustainable biomasses, biomethane, and tidal energy. G7 countries will also invest in developing and





implementing next-generation technology, as well as secure, sustainable, and resilient supply chains. According to Francesco La Camera, Director General of IRENA, "The G7's commitment to accelerating the diffusion of renewable energy is a positive step. It sends a strong message to the international community: accelerating the energy transition is necessary. IRENA will continue to collaborate with G7 countries to implement their objectives." In fact, the agency is collaborating with the G7 Presidency to prepare a report on the sustainable production and sale of hydrogen in remote regions and developing countries.

In 2023, renewables - especially solar photovoltaic and wind - will reach a new annual record for electricity supply capacity. The IEA estimates that added capacity will rise to 107 GW and reach 440 GW by 2023, bringing the total global renewable electricity capacity to 4500 GW, equivalent to the total joint capacity of China and the United States. In its update on the renewable energy market, the IEA connects this growth to the global energy crisis, increased political backing, the higher cost of fossil fuels, and issues related to energy security. In particular, added solar photovoltaic energy represents two-thirds of this year's increase in capacity, and it will continue to increase in 2024.

2030 according to IEA, the world will have sufficient solar photovoltaic capacity to satisfy the annual demand forecast in the Net Zero Emissions by 2050 scenario. Added wind energy will increase by nearly 70% in 2023 over the previous year. Unlike solar photovoltaic, however, the wind turbine supply chain needs to expand more rapidly, according to IEA, to satisfy the growing demand in the medium term. Renewable energy "is at the forefront of the European solution to the energy crisis. And new policy measures will also contribute to significant increases in the United States and India over the next two years. In the meantime, China is consolidating its leadership and will account for nearly 55% of added global renewable energy capacity in 2023 and 2024."

A Road Map for Nuclear Energy

The message that emerged from Sapporo was clear: industrialized nations must grow independent from Russian gas supplies. EU Energy Commissioner Kadri Simson points out that "there is no stepping back on our diversification of Russian energy exports. However, diversification is also fundamental for > critical materials necessary to preserve

our transition objectives towards clean energy." The discussion revealed different outlooks. While Great Britain and France proposed concrete new objectives, other countries such as Japan – which is markedly dependent on imported fossil fuels – and the United States favored a more conservative approach.

The desire for greater diversification of energy sources has also brought nuclear energy back into the debate. During the meeting of the alliance of EU member states in favor of nuclear energy, French Energy Transition Minister Agnes Pannier-Runacher asked alliance representatives to draft a standard road map for the development of atomic energy. The objective is to determine how "nuclear energy will contribute to our carbon neutrality objectives over the next 30 years." The 16 EU member states in the "nuclear alliance" aim to develop a road map for an integrated European nuclear industry that will produce 150 GW of nuclear energy for the EU electricity mix by 2050.

In a report published at the end of 2022, the **International Energy Agency** evoked "a new dawn for nuclear energy," pointing out how, in its absence, the ecological transition would become **difficult and expensive**, especially from 2030 to 2050, due to the high cost of renewable energy storage devices (batteries).



According to the most recent ICCP Report on "Climate Change 2022 – Mitigation of Climate Change," nuclear energy (together with solar, wind, and hydropower) is necessary to limit the increase in temperatures to 1.5 degrees centigrade by 2050, eliminating insofar as possible the impact of fossil fuels.

Today, nuclear plants produce ca. 10% of the total energy generated globally (2.790 TWh) and are the second source of low-impact energy, globally, after hydropower, coming before both solar and wind. Nuclear plants provide 26% of electricity in Europe, proving that this form of energy is fundamental for three reasons: it's carbon-free, it can be perfectly integrated with other renewables, and it can guarantee a supply of energy, thanks to the many countries with operative plants and their high energy output.

In mid-March, the ambassadors of the 27 EU member states approved hydrogen produced by nuclear energy as an official renewable energy source. According to the IEA "Net Zero Emissions by 2050" Report, 32 European countries have nuclear plants. Moreover, 29 new nuclear plants are scheduled to be developed, while the lifecycle of 60% of existing plants will be extended. Nearly 63% of the current nuclear generation capacity is provided by plants constructed over 30 years ago. Many of these plants were built in response to the petrol crises of the seventies.

In the IEA "Net Zero Emissions by 2050" plan, half of the reduction in emissions will be secured by technology that is not yet commercially sustainable. The debate on fourth-generation nuclear plants includes Small Modular Reactors (SMRs) and small nuclear fission reactors (with capacities below 300 MW, one-third of a traditional nuclear plant). Thanks to their modularity and reduced size (no larger than a container), SMRs can satisfy local demand for electricity and thermal energy production. In March 2023, at the European Council of Energy Ministers held in Brussels, the ministers and representatives of 13 member states underlined the importance of respecting more stringent nuclear security standards. They agreed on the need for an industrial and financial framework for nuclear projects. In particular, the council welcomed a joint letter to the Commission on SMRs, underlining how this technology and traditional nuclear plants could help the EU achieve its climate and energy security objectives, while developing new competencies and further driving technological autonomy.

The lower cost, smaller dimension, and lesser risk posed by SMRs may favor their acceptance by local communities and attract private investments. SMRs can also use decommissioned electric fossil fuel plants, exploiting existing transmission infrastructure, cooling water, and qualified personnel. However, the IEA admonishes that the long-term success of SMRs depends on local politicians' strong support to mobilize investments and rationalize regulatory frameworks.



Top Story

The Race for Wind Energy: Global Leaders and New Installations

What is the role of wind energy in the global energy transition? Why is the future of offshore technology so promising in terms of potential and industrial developments? The analysis of a sector that – aiming for 8 terawatts by 2050 – represents an excellent opportunity for Italy, a global leader in wind technology and infrastructure.

ind energy has evolved rapidly. In less than 20 years, it has developed from a secondary energy source to a mature technology. Today, with over one terawatt (1000 GW) of global installed capacity, it is one of the pillars of the energy transition. This level, reached in just over 45 years, provides power equivalent to nearly 183 times produced by the Gravelines Nuclear Plant, France's largest nuclear powerplant (5.46 GW). In comparison, as of December 31, 2022, the English wind sector produced of 21.1 GW of energy, equivalent to ca. 2% of the global installed capacity.

However, although the one-terawatt milestone is a noteworthy achievement, the world is still far from achieving its wind energy objectives. According to the Global Wind Energy Council (GWEC), we must produce at least 8 TW of wind energy to reach net global zero emissions by 2050. The challenge is particularly complex. Massive investments and continuous technological progress will be fundamental to installing the 7 TW necessary by mid-century. Moreover, it will be essential to enact adequate policy measures to encourage the further development of wind energy and allow its widespread exploitation. Nonetheless, GWEC forecasts that we are on track to achieve this. Indeed, we could reach the second terawatt milestone in just seven years.

Countries have been racing to develop their wind energy capacity. China has paved the way with the installation of gigantic plants, followed by the United States and many European member states. And this drive has allowed the global community to achieve the symbolic one-terawatt milestone.

According to the Wood Mackenzie Energy and Research Consultancy, the next ten years hold great promise, especially for China and Europe. Wood Mackenzie forecasts that new installations planned by China will produce ca. 50% of the global installed wind capacity, while Europe should account for a further 343 GW over the next decade. Nearly 39% of these new installations will be offshore wind parks, underlining the growing importance of offshore wind power in the European energy mix. Globally, offshore installations will account for 26% of the total installed capacity over the next ten years.

The European Scenario

In 2022, according to the data presented by the "More Renewables, Less Inflation" Report published by E3G and Ember, wind and solar energy provided essential support to the European electric system, accounting for 24% of the electricity generated on the continent and reducing gas imports by 70 billion cubic meters, a saving of nearly €100 billion. For the first time in history, two centuries after the industrial revolution, wind and solar energy have generated more electricity than gas in the EU: 22% for wind and solar vs. 20% for gas. Comparing the power generated by wind and coal, wind energy accounted for 16% of the EU demand (17% in the UK), while coal remained at 15.9%.

Further positive news came in April from the Wind Europe Annual Event in Copenhagen, where, with the Ostenda Declaration, nine heads of state and government committed to providing a new impulse to offshore wind energy development on the North Sea. Issues, however, persist in terms of authorization procedures, network development, raw materials (a market dominated by China), and electricity market design. Based on estimates by Energy Monitor, the average cost to produce 1 MW in wind turbine capacity has increased by 38% over the last two years, a worrying technological trend. However, the forecast is to produce 120 GW of offshore wind capacity on the North Sea by 2030 and reach 200 GW in 2050.

In its annual report, Wind Europe also specified that relative infrastructure increased in 2022 with 15 GW worth of new wind plants and 41 GW of new photovoltaic power. Notwithstanding supply chain issues, wind installations increased by one-third over the previous year, especially in Germany, Sweden, and Finland. Unfortunately, this growth is insufficient to achieve the objectives set by the RePowerEU Program (450 GW of wind energy by 2030). In fact, 80 GW of wind projects are blocked in Europe alone, mainly on account of authorization issues and overly complex procedures.

Indeed, at the Wind Europe Annual Event in Copenhagen, EU Energy Commissioner



Kadri Simson called for new legislation – especially a review of the directive on renewables – to change the situation and make authorization procedures simpler and more rapid. This issue is further compounded by supply chain bottlenecks. According to IEA Director Fatih Birol, China's dominance in renewables is unhealthy, and the Director called on European policymakers to address the issue from the viewpoint of industrial diversification. These calls were echoed by the German Undersecretary for the Economy and Climate, who urged private investors to act as "the situation of the European wind industry has never been this positive."

Germany, Holland, and the North Sea

Speaking of Germany, Wind Europe also addressed the ambitious German plan to achieve 80% of renewables by 2030 (and thereby reach climatic neutrality in terms of greenhouse gas emissions by 2045), which would call for installing of 10 GW of wind energy per year starting from 2025. A new bill came into effect on January 1, 2023, that aims to increase the number of offshore wind turbines, positioning them over 30-40 km off the coast in 40-meter-deep waters. The German government has also raised offshore wind energy targets from 20 to 30 GW by 2030 and 40 GW by 2040 (rather than 2035). The final objective is to achieve 70 GW by 2045.

The implementation of this plan requires a 0.2 GW monthly increase in offshore wind energy production through 2030. However, notwithstanding its proverbial efficiency, German bureaucracy has slowed down the expansion of renewables. Considering the 80 approvals required to transport turbines, some believe this plan is overly ambitious, as the new legislative framework will certainly meet various obstacles on its course.

The North Sea is one of the most stormy and windy areas of the Atlantic Ocean. Strong winds traverse it every daily, making it the preferred location for many global energy companies seeking to install large wind parks, including floating ones. Unlike traditional offshore wind parks, which are installed and fixed to the seabed at depths of up to 60 meters, floating wind parks are anchored (rather than fixed), making

them more congenial to the difficult conditions at sea.

In the meantime, Holland has recently installed the final blade on the last turbine in the Hollandse Kust Zuid, the world's most powerful offshore wind farm, developed without any subsidies in its North Sea, ca. 18-35 kilometers off the coast. After various years of work, the aerogenerators are ready to be tested and put into service. Once operative, the 139 wind turbines, distributed over an area of 225 square kilometers, will produce ca. 1.5 GW of energy annually, enough power to satisfy 1.5 million families in the Netherlands.

United Kingdom and France

In early 2023, Hywind Scotland, the first floating wind park, turned five. The farm, located off the northeast coast of Scotland and inaugurated in 2017 with five turbines for a total production of 30 MW, is not only the first floating wind park globally, but also the offshore park that has achieved the greatest capacity factor (production vs. capacity): 54%. And this bids well for a technology that still needs to be more widespread. Dogger Bank Wind Farm is one of the leading global offshore wind parks. It is located on the North Sea, about 130 kilometers off the English coast of Yorkshire, where the sea is 18-63 meters deep. Covering an area of 8660 square kilometers with 87 wind turbines, the new offshore park will have an overall capacity of 3.6 GW, enough to fuel 6 million English houses when it is completed in 2026. At their highest point over sea level, the Dogger Bank turbines will be two and a half times as high as Big Ben in London. Contractors will build three conversion stations to direct the energy produced at sea to the coast and the national network through HVDC connections.

In terms of size, Hornsea 2 – the largest offshorewind park in the world, also off the coastof Yorkshire - was completed and has been fully operative since September 2022. With 165 wind turbines, Hornsea 2 covers an area of 462 square kilometers and can generate 1.3 GW of clean energy, sufficient to power 1.4 million houses in the United Kingdom. The wind farm was built by Ørsted, a Danish leader in the offshore wind energy sector, with an investment of 6 billion sterling and a team of over 2000 workers worldwide. While the first two Hornsea development stages are already operative, Hornsea 3 is a new offshore wind farm project, located 160 kilometers off the coast of Yorkshire. Once

completed, it will provide clean energy to over 3 million households. In the meantime, in July 2023, plans were approved for Hornsea 4, a further wind plant in the same area that will provide energy for a million households. English Energy Secretary, Grant Shapps, approved this new construction phase, and Ørsted will develop 180 new turbines for the wind power plant.

Although projects like Hornsea 4 are fundamental for energy security in the United Kingdom, the supply of low-cost electricity, and the development of new jobs (the United Kingdom ranks second in Europe, after Germany, for the production of electric energy from wind and fifth globally, behind the United States, India, Germany, and China), observers fear that Brexit may drive the UK astray of EU environmental protection regulations. In fact, due to the uncertainty caused by Brexit, many renewable energy projects - especially in the wind energy sector - could be abandoned. Investors and banks are reluctant to promote these projects due to the growing interest rates on loans that are increasing the costs of offshore wind farms. Moreover, Brexit is also creating further issues for North Sea offshore wind farms run by other countries. The fact that there is no standard network for the insertion > of electric energy produced by these

power plants forces each country to limit its production because of the saturation of local networks.

The production of offshore wind energy is increasing rapidly in France, too. The Saint-Briuc wind farm in Bretagne recently began producing electric energy for EDF. To date, 16 of 62 eight-MW turbines have been installed. According to Iberdrola, the company behind the project, the farm is expected to produce ca. 1820 GWh of electricity per year, equivalent to the annual consumption of 835,000 people, including heating.

The Fécamp wind farm, located 13 km off the coast of Normandy, has just installed the first of 71 planned wind turbines. Thanks to a total capacity of 500 MW, the farm is expected to produce sufficient electric energy for ca. 770,000 people.

Floating Offshore Wind: A Market on the Rise

In order to fully grasp the potential of wind technology, we need to take a step back. At the beginning of 2020, the IEA published a report stating that offshore wind – not just floating, but also fixed-bottom infrastructure – could generate 11 times more electricity than the global demand and attract US\$1 trillion in capital investments by 2040.

The wind energy sector can be subdivided into three main categories based on the position of the turbines and their structural configuration: onshore (installed on land), "near offshore" fixed (seabed-fixed infrastructure), and "offshore floating" (mounted

on platforms floating above the seabed). Offshore Floating Wind (OFW) entails using turbines fixed to floating structures. This solution provides the advantage of generating electric energy even in areas where the sea is deeper than 60 meters, too deep to install fixed-bottom infrastructure.

While the generation capacity of wind energy both at sea and on land has increased significantly over the past decades, many experts believe that OFW has the highest future development potential. OFW can be installed in deeper waters that are farther from the coast, where wind speeds are both higher and more constant, reducing fluctuations in the production of electric energy. Moreover, OFW is also driven by growing public opposition to visible or audible wind turbines.

Today, Europe produces 7 GW worth of offshore wind turbines per year, but Wind Europe has indicated that it needs to achieve a productive capacity of 20 GW annually. Moreover, it will be necessary to accelerate and increase investments in other segments of the offshore wind supply chain: cables, foundations, substations, networks, ports and infrastructure, and ships to transport materials and equipment. And Italy could be at the forefront in all of these sectors.

Italy and the Potential of Offshore Wind

"While 2022 was a record year for wind energy in Europe," points out Simone Togni, President of ANEV, the Italian National Wind Energy Association, "with countries like Germany, Sweden, and Finland developing the most new installations, Italy (which ranks ninth) requires more certainties and a new legislative framework." Prof. Domenico Coiro, President of the Seapower Research Center, emphasizes that offshore floating wind is probably the only viable option to achieve EU objectives by 2030. "In order to coordinate the development of offshore floating wind power in our country, we need to develop a central structure to coordinate public research agencies with the industrial world."

Experts consider OFW the best solution for Italy not only on account of the depth of its seas, but also as a solution to safeguard the landscape, as opposed to the higher impact of onshore solutions. In this context, ANEV estimated that Italy could achieve a 5 GW potential by 2040 with wind farms in suitable areas, such as Puglia, Calabria, Sicily, and Sardinia. And while the Adriatic – a relatively shallow sea – can host fixed-bottom turbines (off the coast of Ravenna bathymetries never exceed 45 meters), the deeper waters of the Mediterranean Sea can host OFW farms with turbines on floating platforms, even in areas with depths exceeding 80 meters.

In total, since the beginning of 2023, seven major offshore wind projects (for a total of 5.5 GW) are awaiting approval by the Italian Ministry of the Environment and Energy Security. The largest projects include the so-called "Puglia A" comprised of sixty-seven 15 MW aerogenerators (overall power ca. 1 GW) to be installed in the southern Adriatic, off the coast of Puglia. Other offshore wind projects awaiting authorization include further installations in Puglia, as well as in Lazio (Civitavecchia), Sardinia (between Olbia and Siniscola), Sicily (Mazara del Vallo), and Calabria.

Italy has the potential to lead the European wind energy sector. More specifically, OFW provides significant opportunities for industrial development. And Italy could take technological leadership of this sector thanks to its shipbuilding capacity, a crucial element for the production and installation of this type of infrastructure at sea. Similarly, the electric components tested for traditional terrestrial applications must be adapted and certified for offshore use. From this point of view, CESI is at the forefront with its KEMA Labs Division, a world leader in the testing and certification of electric components.



CESI Support for Offshore Wind Projects

CESI is involved in various offshore wind projects to optimize the capacity for energy storage, provide civil engineering services, connect produced energy to networks, and identify the best connection points. In some cases, CESI is also involved in designing optimal connection architecture, including relevant authorization procedures.

While in Asia, CESI is involved in an important pilot project in this sector – conducting feasibility studies for the implementation of offshore wind farms in the Gulf of Bengal through the definition of technical and logistic details, including the connection of the wind farms to the regional electric systems – in Italy, it is collaborating on various offshore projects, including a wind farm off the coast of Ravenna aiming to install a wind generation capacity of 1100 MW. The project is based on a system uniting two wind farms, a floating photovoltaic plant, an accumulation plant, and eventually, plants for green hydrogen production. In particular, CESI is collaborating on developing engineering services, including feasibility studies, preliminary planning, and authorization assistance.

Notwithstanding the large investments required, OFW technology presents a significant potential for Italy that can exploit the winds of the Mediterranean, a sea with deep waters that is not well suited to traditional offshore wind solutions. Moreover, open sea wind farms can exploit more hours of wind than plants on the coast. Ongoing tests indicate the need to attract considerable investments and develop both engineering and production capacity, which Italy could deploy rapidly. This would also positively affect the environment and the development of local supply systems, with the potential to drive growth beyond national borders, too.

Industries & Countries

Sustainable Transition: How Countries Are Playing Their Hand

According to an IEA forecast, in 2030, the world will have a sufficient capacity for solar photovoltaics to satisfy the annual demand forecast by the "Net Zero Emissions by 2050" scenario. India will have to radically reconfigure its energy sources to achieve carbon neutrality and abandon coal and oil; North African countries are actively joining partnerships for the production of renewables.

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f we triple the power of renewable energy sources every year to 2030, adding one thousand GW per year globally, we will limit the average increase in global warming, compared to the pre-industrial era, to 1.5 degrees centigrade. This is the mathematical formula described in the first volume of the "World Energy Transitions Outlook 2023" (a forecast for the global energy transition) published by IRENA, the International Renewable Energy Agency that brings together 167 countries and the European Union to limit the warming of the Earth's atmosphere and overcome obstacles ranging from the lack of physical infrastructure and the absence of policies and regulations to the misalignment of competences and institutional capacity. Electrification and efficiency - critical factors for the transition - can be achieved with the production of renewable energy, green hydrogen, and sustainable biomasses.

Notwithstanding the fact that 2022 was a record year for renewables, the report warns that "the gap with what is required continues to grow." In "favorably accepting IRENA's recommendations," Sultan al-Jaber, President-Designate of COP28, the United Nations Climate Change Conference, which will be held in the United Arab Emirates this year, affirmed that he has already asked "to triple renewable energy by 2030. We need a political commitment for a rapid increase in renewable energy. To achieve our objectives by 2030," the Director of ADNOC, the Abu Dhabi National Oil Company, emphasized that "we need to urgently expand our network infrastructure, expedite authorization procedures, and cut the cost of capital in emerging markets and developing economies."

China and the United States

According to IEA, renewables – especially solar photovoltaic and wind energy – will mark a record increase in new electricity capacity this year. In its **Renewable Energy Market Update, IEA** connects this milestone to the global energy crisis, increasing political interest, the higher cost of fossil fuels, and energy security issues, estimating that the added capacity will increase by 107 GW and reach over 440 GW in 2023. This will bring the global renewable electricity capacity to 4500 GW, equivalent to the total joint capacity of China and the United States. IEA explains that renewable sources "are at the forefront of the European solution to the energy crisis. And new policy measures will contribute to significant increases in the United States and Indiaover the next two years. In the meantime, China is consolidating its leadership and will account for nearly 55% of added global renewable energy capacity both in 2023 and 2024."

In particular, solar photovoltaics represent two-thirds of this year's increase in capacity, and it will continue to do so in 2024. According to IEA forecasts, in 2030, the world will have a sufficient production of solar photovoltaic energy to satisfy the annual demand described in the "**Net Zero Emissions by** **2050**" scenario. Furthermore, energy produced from wind is expected to increase by 77% compared to last year. However, unlike solar photovoltaic, the wind turbine supply chain is not expanding rapidly enough, according to IEA, to satisfy the growing demand in the medium term.

In the meantime, a two-hour meeting in the Oval Office gave rise to the "Atlantic Declaration," a new agreement launched by United States President Joe Biden and British Prime Minister Rishi Sunak. The document identifies "new challenges in international stability: authoritarian states such as Russia and China, new disruptive technology, and transnational challenges such as climate change." This is not the free exchange agreement envisaged by the UK government (which has been on hold for months) but a maxi-appendix to the plan of investments called for by the American President to relaunch the defense industry and green energy.

Also in North America, at the end of May, Enel North America, through its affiliate 3Sun USA, selected Inola, Oklahoma, as the location for a plant that will produce photovoltaic cells and modules. The plant, which will have an annual productive capacity of 3 GW, will receive an initial investment of US\$1 billion (the majority of which will be funded by a partner). The construction of the plant, scheduled to begin in Autumn 2023 and be ready to sell panels by the end of 2024, will create 1000 new permanent jobs by 2025. This giga-factory for photovoltaic cells and panels will help the United States develop a national clean energy manufacturing sector and become independent of China. The plant will be one of the largest solar device manufacturers in the United States, where to date, solar panels used in most projects are imported. Moreover, this is one





of the largest investments in solar energy production since last year's approval of the tax credit bill on climate change, the Inflation Reduction Act (IRA).

Europe and the Mediterranean

On the other side of the Atlantic, as an answer to the Inflation Reduction Act - a US\$369 billion national tax credit program with which the United States will subsidize companies operating in the "clean energy" industry, incentivizing them to operate in the United States - Europe reviewed its Green Deal to also promote industrial activity. This package of legislative proposals has given life to the Net-Zero Industry Act and the Raw Materials Act, two complementary plans that aim to produce clean energy and avoid the same errors made with Russian gas for Chinese strategic raw materials. The macro-objective of the Net-Zero Act is to produce at least 40% of the clean technology necessary for the green transition by 2030.

Thus, the EU is ready to facilitate all projects that include eight forms of technology defined as strategic, ranging from wind to photovoltaic and biogas to electrification. The EU measures will provide more

accessible licenses, tax credits, and regulatory sandboxes to allow companies to test new technology in ad hoc environments. The Raw Material Act addresses a series of critical raw materials, such as nickel, tungsten, magnesium, rare earth elements, and lithium, whose demand is in constant growth. Some of these elements could become scarce in the future; some will in the short term. The plan calls for the EU to be independent of a sole third country (the unspecified reference is clearly to China) for more than 65% of any raw material by 2030. Moreover, another objective is to extract at least 10% of necessary raw materials from within the EU, by 2030.

The European Union has further distanced itself from Russia thanks to the North Sea winds. The new cradle of European green energy lies off the Belgian coast of Ostend with its wind turbines. And the leaders of countries in this area, who met in April for the second time since the beginning of the Ukrainian war, have signed a pact to further develop this resource and turn it rapidly into the "world's largest green plant." The Declaration calls on signatory countries to protect their offshore infrastructure to ensure security and resilience from physical and cyberthreats. A nine-party pact that, notwithstanding long-standing differences on nuclear energy, has brought Paris and Berlin closer together, accompanies the new green alliance between the EU and Oslo, and will act as a counterweight to the Mediterranean hub promoted by Rome.

The leaders of France, Germany, Holland, Belgium, Denmark, Ireland, and Luxembourg (EU member states), plus Norway and the United Kingdom, met to undersign a commitment to increase renewable energy produced with wind fourfold by the end of the decade. This would mean 120 GW by 2030 and a minimum of 300 GW by 2050. The aim is to share common ambitions and a plethora of (planned) infrastructural projects with the EU and over one hundred industrial groups (including some Mediterranean, but no Italian ones) through funding, bureaucratic simplification, and regulatory modifications. Goals and ambitions that mark a record year for renewables.

In 2022, green sources produced more electric energy than gas for the first time in Europe. Wind and solar generated 22.3% of the electricity produced in the EU, compared to 20% for methane, according to the data presented in the "State of the Climate in Europe 2022" Report, jointly researched by World Meteorological Organization (WMO) and Copernicus, the European Union's Earth



observation program. In the focus on energy, the report also emphasizes that while high temperatures and drought have favored the use of solar energy, they have also reduced hydropower production (less water in basins) and nuclear (less water to cool down reactors). A tweet by EU Energy Commissioner Kadri Simon also invited members to remain alert:"Ca. 50% of EU energy consumption is dedicated to heating and cooling. And over 70% of this is still based on fossil fuels, mainly natural gas." And gas is the fossil fuel that will accompany that energy transition, which is in great demand in Europe following the sharp reduction of Russian supplies caused by the war in Ukraine.

In this context, **ENI** and Var Energi (63% ENI ownership), a Norwegian company, acquired the Neptune Energy Group, a leading British company in the exploration and low-emission production of hydrocarbons, operating in Western Europe, North Africa, Indonesia, and Australia. The operation has allowed the Italian group to extend its gas business and provide a further 4 billion cu. meters of gas to the EU, which, in the meantime, has also welcomed **Switzerland's approval of climate neutrality by 2050**. Voting on a series of referenda, 59.1% of Swiss voters approved a federal law calling for net zero greenhouse gas emissions in the coming decades. Moreover, 78.5% of voters approved introducing a minimum 15% tax on multinationals. The country is now set to increase its energy production from gas to renewables like wind and solar.

The Mediterranean area has developed a precise strategy for the energy transition: diversifying supply sources and building the necessary infrastructure. It's a strategy that mirrors the concept behind the SoutH2-Corridor, a European project for a 3300-kilometer pipeline that will transport 4 million tons of green hydrogen annually from North Africa to Italy, Austria, and Germany. The project involves 4 European TSOs (transmission system operators) and a joint venture: Italian SNAM, Austrian TAG and GCA (in which SNAM holds shares), German Bayernets, and Sea Corridor, a joint venture > between SNAM and ENI that own the



pipelines that extend from Algeria to Mazzara del Vallo, via Tunisia and the Sicilian Channel. The SoutH2-Corridor, presented in Munich on March 23, will contribute to Europe's decarbonization objectives by transporting renewable hydrogen through a vast portion of the existing infrastructure. In fact, it will re-employ 70% of the existing network. Moreover, this backbone represents one of three green gas supply corridors of the **RePowerEu** Plan, which calls for the importation of 10 million tons of green hydrogen starting in 2030.

Latin America

Europe's quest for green hydrogen is not limited to the Mediterranean area. In search of new partnerships on strategic raw materials necessary for both the energy and digital transition, the European Union is also looking at Latin America to develop new spaces and contrast China's influence. Ursula von der Leyen, President of the European Commission, has visited four capitals in as many days to promote the Global Gateway Program - the EU's alternative to China's Silk Road – that will invest €10 billion in Latin America. To date, the main points of the announced European financing and agreements concern €2 billion to drive the production of green hydrogen in Brazil - Europe

plans to import 10 million tons per year by 2030 and €225 million for projects in the same sector in Chile.

In Argentina, a memorandum of understanding was signed for a partnership on strategic raw materials – especially lithium – fundamental for electric batteries, whose demand is expected to multiply twelvefold in Europe by 2030. And Europe will also collaborate with Chile on the "white gold." Moreover, the EU also plans to work with the government in Buenos Aires to contribute to the transformation of the country as a regional hub for clean energy.

Brazil is collaborating with **Holland**, which recently approved a €300 million bill to fund the **importation of green hydrogen**. According to Hugo Figueiredo, President of the Pecem Industry and Port Complex (CIPP), located in the Brazilian state of Cearà, the Dutch funds will drive significant investments in CIPP, 30% of which is owned by the Port of Rotterdam. Indeed, the Rotterdam Port Authority has announced that, in the future, **25% of Dutch green hydrogen imports will come from the Pecem Port**, which would consolidate its role as the central hub for Brazilian exports to Europe.

Holland isn't the only country at the forefront of activity. In October 2021, **the German**



HYDROGEN

Cooperation Agency GIZ announced a €34 million investment in Brazilian green hydrogen, adding a further €2.5 million last year to create training centers for the production of green gold in various Brazilian states, from Bahia to Sao Paolo, and from Santa Catarina to Rio Grande do Norte. Shell, a Dutch-English oil company, is also at work to grasp opportunities. Last year, it invested over €10 million to employ 400 scientists to conduct research on green hydrogen. And in March 2022, Vestas, the Danish global leader in wind energy, signed a memorandum of understanding with the state of Rio Grande do Norte to study the development of an industry port for producing green hydrogen with wind energy.

The Indian Continent

Can India become a green superpower? This is the question tackled on Foreign Affairs by Arunabha Ghosh, CEO of the Delhi Council on Energy, Environment, and Water, as well as Vice President of the UN Committee for Development Policy. The starting point is the Asian state's commitment at the Glasgow COP26 in 2021, where India agreed to achieve carbon neutrality by 2070. A result that, alone, according to some forecasts, could limit global warming by 0.2 degrees centigrade. In his analysis, Ghosh underlines that the result could be achieved if "partnerships are developed with other states and international companies," transforming the area into "an indispensable and reliable hub for the global market of green energy products and services." This will, however, be a difficult achievement for a country in which primary energy consumption is satisfied by coal (57%), oil (27%), and natural gas (no more than 6%). Non-fossil fuel sources - such as solar energy, hydropower, and nuclear - represent a mere 10% of the > total. To achieve carbon neutrality,

India will have to "radically reconfigure its energy sources" and remove non-monetary obstacles such as its dependence on China, from which it currently imports 92% of its renewable energy devices, lithium ions, and rare earth elements.

Action is already in progress, but India will clearly need to accelerate these movements to achieve desired results by the deadline. According to some scenarios, by 2070, the industry and heavy transports sectors, which currently accounts for one-fifth of India's total greenhouse gas emissions and three-quarters of its industrial emissions, will have to draw at least 80% of their energy from green electricity, while the remaining 20% will have to be provided by other clean energy sources, such as green hydrogen or sustainable biofuels. India aims to implement a clean electric infrastructure of 500,000 MW by 2030. At present, its renewable capacity is 125,692 MW. "The investments that India requires to overcome these infrastructural challenges are unsettling," explains Ghosh in his analysis. He underlines that India will have to spend ca. US\$10,000 billion (per 2020 prices) in green energy infrastructure from here to 2070, the equivalent of US\$214 billion per year, in order to reach this objective. Moreover, by 2070, India will require over 5.6 million megawatts of solar capacity and ca. 1.8 million megawatts of wind capacity, 84 times its current solar capacity, and 42 times its current wind capacity.

The country's **Green Hydrogen Mission**, approved by the government in January 2023, aims to produce five million tons of green hydrogen annually by 2030. **The 13 task forces that New Delhi has appointed to devise the roadmap to green steel** – the Indian steel industry is the second largest globally – are also promoting the adoption of green hydrogen. "If steel and petrochemical producers begin using green hydrogen," Arunabha Ghosh explains, "India could become one of the cheapest global producers of green hydrogen."



Together with Sweden, India presides over the Leadership Group for Industry Transition, a consortium of 18 major economies and various companies that are concentrating on the decarbonization of heavy industry by 2050. The Green Grids Initiative - One Sun One World One Grid, created in November 2021 with the United Kingdom, aims to connect electric grids worldwide with high-voltage transmission lines that will allow countries to obtain clean energy from anywhere the sun is shining or the wind is blowing. Thanks to this project, India hopes to interconnect its electric grid with those of Cambodia, Laos, Thailand, and Vietnam. To the west, **India will connect with the Middle East and Africa**. This enormous commitment would interconnect most of the developing world and help drive both economic development and decarbonization.

Given the importance of green hydrogen, India will have to work with the United States to develop common regulations and projects for the green hydrogen global



economy. A starting point could be represented by the **Quadrilateral Security Dialogue** (QUAD), a clean hydrogen partnership involving Australia, India, Japan, and the United States that "could serve as a basis for wider cooperation."

North Africa and Senegal

The Carthage Declaration, a partnership signed at the Tunisian Presidential Palace by EU representatives and the Tunisian government states, "We believe there is an enormous potential for generating tangible benefits for the EU and Tunisia." While the declaration addresses four main pillars, the energy deal constitutes the core of the agreement. The EU aims to focus a large part of public and private investments in green energy, starting with electricity. Indeed, the EU has already planned a ${\in}\,300$ million co-investment in the Elmed Interconnector, which will be developed by Terna and Tunisian company Stega. Elmed will connect Italy and Tunisia, thanks to an investment provided

via Tunisia's new Country Partnership Framework (CPF) with the World Bank. According to Tunisian Minister for Economy and Planning, Samir Saied, the CPF will allow Tunisia to make up for lost time in terms of renewable energy. Indeed, it is surprising that Tunisia only has a 3% quota of renewables in its electricity mix. In this context, the minister added that his department is working proactively with all interested parties to drive investments in solar energy and create a favorable ecosystem for the sector's development. The World Bank has officially launched the new Country Partnership Framework with Tunisia to promote the government's development plan for economic expansion. The new five-year CPF is based on Tunisia's Development Plan 2023-25 and its vision for 2035 based on three main objectives: create high-quality jobs in the private sector, improve resilience to climate change, and reduce carbon emissions.

Morocco is also focusing on renewable energy. Currently, over 41% of its installed capacity is provided by green sources. The aim is to reach over 52% by 2030 and become a potential international green hydrogen supplier,

especially for the European market. The Moroccan Business Center (CMC) has analyzed green hydrogen's medium and long-term outlook. Experts believe Morocco presents the ideal climactic conditions for developing green hydrogen, thanks to the availability of sunlight all year and its many windy regions. Indeed, Morocco has rapidly attracted international investors, including the Danish Copenhagen Infrastructure Partners (CIP), the American Blackstone, and, naturally, the Moroccan OCP industrial group, the leading exporter of phosphates, which is now also interested in producing green ammonia from green hydrogen. Moreover, the state-subsidized group will invest US\$7 million in a plant for the production of green ammonia in Tarfaya as part of an investment program worth over 130 million Dirham (ca. US\$13 million) that was presented to King Mohammed VI. According to the CMC study, Morocco can aspire to develop an industry founded on green molecules, especially for the production of hydrogen, ammonia, and methanol. Power-to-X conversion technology, such as Power-to-Hydrogen, plays a crucial role in an energy transition that not only allows diversification of the energy mix but also promotes reindustrialization and decarbonization.

Algerian President Abdelmadjid Tebboune has also announced that the country has "started producing green hydrogen," and it will be able to supply Europe as part of a future economic partnership. Tebboune's announcement was made at an Algerian and Portuguese entrepreneurs' forum in Lisbon. The President explained that the operation is part of a "national program for the development of the renewable energy sector."

Finally, in **Senegal**, a group of wealthy countries and development banks have pledged to raise €2.5 billion to help the country reduce its dependence on fossil fuels. Senegalese President Macky Sall made the announcement at the Summit for a New Global Financing Pact organized in Paris by French President Emmanuel Macron. "Senegal has committed to achieving 40% renewable energy by 2030 thanks to funding for €2.5 billion," President Sall declared, announcing the "Just Energy Transition Partnership" (JETP) with France, Germany, United Kingdom, Canada, and the European Union.

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Future & Technology

A strategic partner for the energy transition

From space energy to critical raw materials, from national electrically powered projects to the role of testing labs for the development and evaluation of advanced technology: This is an overview of CESI activities for increasingly sustainable forms of energy.

ources of Energy has always evolved in conjunction with society. Indeed, it has served as an enabling factor leading us towards the future. It expresses the full achievement of social, cultural, and economic progress, bringing together the ecological transition, sustainability, equality, and inclusivity - the key word of The European House Ambrosetti study, presented in collaboration with Edison at the Cernobbio Forum at the beginning of September. The study, which identifies three megatrends that will impact the development of society through 2050 (global geopolitical and economic dynamics, demography, and technological evolution), points to the growing connection between technological acceleration and the process of digitalization.

While generative artificial intelligence has recently been the main issue on the international business panorama (in just two months, ChatGPT has assembled 100 million monthly users), the Ambrosetti study points to an evolutionary framework in which the economic-productive system advances in parallel with **transformations in the energy system**. Indeed, the energy sector has the greatest and most widespread impact on the achievement of the **Sustainable Development Goals** (6 SDGs and 28 targets). Moreover, it is the first economic sector in terms of investments (39% of the generated added value) and will be able to enable new production systems, widespread and responsible engagement models, and a secure and sustainable ecological transition.

And this should shift our attention to the **future of smart cities**, as an evolutionary answer to megalopolises. It is interesting that cities – which only cover 3% of the Earth's surface, contribute to 80% of the global GDP – are **responsible for 4/5 of our consumption of energy**, 70% of our solid waste production, and 75% of our carbon emissions. So, what can technology do to mitigate the effects produced by the use of fossil fuels and benefit mobility and the air conditioning of infrastructure? In the cities of the future – smart cities – sustainable mobility and buildings with higher energy classes will have a lower environmental impact. For example, there could be a 24% reduction in energy consumption and a 5% reduction in water waste, as well as a 24% drop in CO₂ emissions, with global savings reaching €14 billion per year. In terms of decarbonization, technology for the energy transition in transports will exploit electricity, hydrogen, biomethane and LNG, with a marked trend towards electrification of energy consumption. Even new buildings will integrate technology based on electricity that would replace gas with induction for cooking and using heat pumps for heating.

Will the grid be able to manage this surge in the demand for electricity? TERNA has scheduled **investments for over €21 billion in ten years** to promote the integration of renewables, digitalize the grid, and increase its level of security and resilience. However, individual homes will have to be increasingly predisposed to satisfy the

growing demand for electricity; they would take part in **energy production and shared energy solutions** through "renewable energy communities" (with condominium residents becoming prosumers, producers, and consumers of energy).

Space Cells and Critical Raw Materials

Increasing energetic sustainability is a CESI priority, a principle that is applied to all of our activities: CESI provides consulting and produces studies on the integration of renewables into the grid; we design ways of interconnections to supply renewable energy to consumption centers, and we carry out extensive environmental studies. And the same holds true for testing to increase grid resilience and develop components for electric mobility.

At the forefront in the development of technology for the future of energy, in August, CESI signed a €13 million agreement with the **Italian Space Agency** (ASI) to promote Project "**Fabbrica dello Spazio**" (*Space Factory*). This agreement, financed with PNRR funds managed by ASI, represents a new milestone for the Italian space sector and aims to reinforce the national aerospace industry.

Thanks to this partnership, CESI will be able to expand its **production of solar cells for space satellites**, which introduces digitalized production processes and adopting cutting-edge technology for monitoring and production. **Domenico Villani**, Group CEO, emphasized the importance of this initiative, explaining that "participating in the Italian Space Factory is a matter of great pride. The project will allow Italy to reach the space avantgarde, contributing significantly to technological progress. Our Group will provide experience in the design and production of solar cells for space use, which are already present in over 100 civilian orbiting satellites belonging to over 25 countries."

The solar cells produced by CESI are **extremely efficient and perfectly suited to the needs of space missions**, thanks to the use of materials such as gallium arsenide, indium phosphide, and gallium phosphide. These cells are certified both for low-earth orbit (LEO) and geostationary orbit (GEO) satellites. CESI is one of the main global producers of these cells thanks to a patented proprietary process developed in its Milan labs. The objective of the "Italian Space Factory" will be to drive **future investments** by private parties collaborating on the creation of satellite constellations and mega-constellations, advancing Italy even further in space exploration.

With regard to the energy transition, the European Union is actively committed to guaranteeing the local supply of critical raw materials and reducing its dependence on underdeveloped and often high-risk countries. In cooperation with the **World Energy Council Italia** and **Assorisorse**, CESI collaborates with the **Italian Observatory on Critical Raw Materials for Energy** (OIMCE). Founded this summer, the observatory aims to study the issue of critical raw materials and contribute to the definition of proposals for the Italian energy sector.

Implementing the energy transition will require a significant increase in the use of critical raw materials, which will be essential to achieve decarbonization objectives. And this is why raw materials – whose demand will rise significantly in the coming years – represent **increasingly fundamental components**



of technology such as wind turbines, photovoltaic panels, and batteries. In this context, the observatory (open to the participation of Italian stakeholders operating in the sector), aims to gather information on certified third parties, organize meetings, and collaborate with the relevant Italian authorities to address the issues raised by companies, associations, academics, and professionals operating in the sector.

Africa and Asia: **Strategic Development** Consulting

In order to strengthen its commitment to drive the global energy transition, CESI has recently announced two important new contracts. It has been selected as a consultant for electric interconnections between Ethiopia and Somalia, and also assigned a strategic role for the energy transition in Azerbaijan.

In the complex scenario of the Horn of Africa - characterized by persistent conflict and limited access to reliable electricity - CESI has been delegated to develop a feasibility study to evaluate the creation of electric interconnections between Ethiopia and Somalia, also with the objective of relaunching local economic and social development. This ambitious study aims to assess the economic and technical feasibility of the interconnections, as well as **develop** adequate operational and institutional frameworks. The technical assessment will include aspects such as network compatibility and system reliability, while the economic evaluation will address costs, revenue streams, and long-term sustainability. Based on the assessment of these criteria, the project will recommend the most suitable options and develop a preliminary project for the tender. The study, which will concentrate on the financial, infrastructural, proprietary, and operative frameworks necessary to guarantee an efficient long-term management of the transmission lines, aims to promote collaboration between Ethiopia and Somalia, contributing significantly to the **supply** of essential services such as healthcare and education.

Moving to Asia, as part of Azerbaijan's drive to embrace renewable energy sources and promote a sustainable energy transition, the local government has appointed CESI to oversee a project funded by the World Bank. The project, which is based on a multi-criteria analysis seeking to evaluate the green energy potential of various areas,

was conceived to address Azerbaijani



renewable objectives, identifying optimal areas to generate hydroelectric, solar, and wind energy, both on- and off-shore. Moreover, CESI was also present at the Baku Energy Forum, a strategic event to drive dialog and delineate a process for the integration of renewables into the Azerbaijani transmission system, evaluating both the market and financial competitiveness.

KEMA Labs Drive Innovation

At the center of innovation in the energy sector, CESI's KEMA Labs play a crucial role in the development and testing of advanced technology; KEMA Labs provide cutting-edge solutions for the energy transition. From **upgrading its high-voltage labs** to support the modernization of the American grid to participation in Project "**Charging Energy Hubs**" to accelerate the electrification of the logistics sector, and to the **creation of new** **specialized tests for electric vehicle components,** KEMA Labs are driving innovation in key sectors related to energy sustainability.

Before the summer, the **KEMA Powertest** high-voltage lab (Chalfont, Pennsylvania) was thoroughly upgraded to improve its testing capacity. The new system can generate extremely high voltages – 600,000 volts at up to 4A – which doubles its previous capacity. This lab plays a crucial role in **ensuring the solidity and reliability of energy supply systems**, which is an investment that reflects CESI's commitment to provide its clients with high-level services. This contributes to the modernization (and decarbonization) of the electric grid in the United States.

KEMA Labs were also recently involved in two projects in northern Europe. "**Charging Energy Hubs**," which is coordinated by Heliox and backed by the Dutch government, aims to accelerate the **electrification of the logistics sector** through collaborative research and innovation. The project involves various leading operators (including Shell, Prodrive, DAF, and others) that will aim to **delineate a series of zero-emission urban areas by 2025**, which generates a significant increase in the demand for electric modes of transportation. The project will employ intelligent electric systems to optimize electric network efficiency and promote innovative energy solutions.

In Berlin, KEMA Labs are currently developing a new testing platform for the technical requisites of CC components in electric vehicles. This advanced system will allow testing under extreme temperature conditions, as well as destructive tests on commutation devices at various temperatures. The platform is based on 14 electric breaker panels that allow the charge and discharge of an array of 1500 VDC capacitators and can generate constant high voltage, up to 1500 VCC, over a period of various milliseconds. The project reflects the commitment of KEMA Labs to contribute to the economic accessibility of electric vehicles, improving the quality of their components.



Sustainable Today, Secure Tomorrow: The New CESI Group Sustainability Policy

he United Nations' World Commission on Environment and Development has defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." And this issue does not only concern the environment, but it also addresses a greater objective: guaranteeing that the results of progress and economic growth are shared by everyone, with an emphasis on social justice, equal opportunities, and inclusion.

The CESI Group has embraced this philosophy and developed a new sustainability policy to pursue it. The aim of the document is to create a sustainable future through respect for the environment, the wellbeing of individuals, the ethical and responsible operation of commercial activities, and the promotion of sustainable services and solutions.

Knowing that the decisions made today will have lasting consequences – affecting the lives of people and our planet for generations – the **"Sustainable Today, Secure Tomorrow"** idea is subdivided into four main sections:

Environmental Respect

In order to manage environmental resources responsibly and reduce a negative environmental impact, we need to develop sustainable energy systems, production, and consumption models, along with concrete actions to counter climate change. CESI is committed to reducing the consumption of energy and greenhouse gas emissions, as well as promoting reuse, recycling, and the circular economy.

Individuals: The Heart of Sustainability

Promoting, health as well as social and individual development means guaranteeing salubrious lives and security for everyone, promoting gender equality, supporting sustainable economic growth, and reducing inequalities. CESI is committed to promoting an inclusive work environment, gender equality, which leads to an investment in lifelong learning and growth of its personnel, as well as promoting health and security on the workplace.

Ethical and Responsible Business Activities

Adopting an increasingly responsible and sustainable form of management is an objective that implies actions promoting peace, justice, and strong institutions.. CESI is therefore committed to actively involving its suppliers in sustainability objectives, preventing improper behavior, and raising supplier awareness about issues related to environmental respect.

Sustainable Services and Solutions

CESI helps its clients address the energy transition by developing sustainable services and solutions. The aim is to guarantee access to sustainable energy systems, create resilient infrastructure, promote innovation, fight climate change, and make cities more sustainable. CESI provides custom-tailored solutions for its clients, guaranteeing quality, security, and social responsibility with all its projects.

Based on a corporate governance and organizational model, this policy ensures that sustainability issues are at the center of all CESI decision-making processes. The document, which was approved by the CESI S.p.A. Board of Directors, will be periodically updated to integrate all regulatory requisites, company strategy, and both internal and external dynamics.

Moreover, the policy defines the targets of CESI sustainability policy, its objectives, key principles, and action guidelines. CESI's CEO is responsible for approving the Group Sustainability Plan and its execution; the Sustainable Affairs Unit ensures that all the initiatives and objectives defined in the Sustainability Plan are aligned with the principles described in the Sustainability Policy.

Opinions

The Crisis that Extends Our Borders

The Special Representative of the UN Secretary-General for Sustainable Energy for All emphasizes the fundamental role played by women in the transformation of the energy sector and implementation of the SDGs. The Director General for Energy at the European Commission helps us understand the lessons we can draw from the last 18 months of crisis. Fatih Birol, on the other hand, focuses on the African continent, which will be key to understanding the future of the sustainable transition. Here are the key ideas of these institutional representatives on the current geopolitical and energy scenarios.

S peaking at the Eurelectric Power Summit 2023 in Brussels, **Ditte Juul Jorgensen**, Director General for Energy at the European Commission, underlined that we should reflect on the developments of the energy crisis to contextualize all necessary action. In view of the past 18 months, Jorgensen has identified **five lessons learned by the European Commission in managing the crisis**. The DG for Energy participated in a conference with LNG producers and consumers to reaffirm the European commitment to address the **methane emissions** deriving from the liquified natural gas value chain.

Damilola Ogunbiyi, the Chief Executive Officer and Special Representative of the United Nations Secretary-General (UN SRSG) for Sustainable Energy for All (SEforAll) – who since July has been a board member of the Private Sector Investments Lab at the World Bank – speaks about the importance of **diversifying the energy sector and universal access to energy** as an essential priority, emphasizing how G20 members should feel responsible for addressing environmental pollution, especially through the implementation of a carbon tax.

We then cover the first **Africa Climate Summit** (September 4-6) in Nairobi, Kenya, where the leaders of most African nations requested trust and resources to drive the energy transition and exploit the resources available in their countries. According to the IEA, in fact, Africa boasts 60% of the best global solar resources, but only enjoys 3% of global energy investments. IEA Director **Fatih Birol** pointed out that Africa has more or less the same installed photovoltaic capacity as Belgium, a small country that is certainly not renowned for solar energy.



Ditte Juul Jorgensen

Director General for Energy at the European Commission



Speaking at the opening of the Eurelectric Power Summit 2023 in Brussels, Juul Jorgensen remarked on the importance of reflecting on the results of the

energy crisis to contextualize required action. In particular, Jorgensen indicated five lessons learned by the European Commission in managing the crisis.

1. Joint Action

"There are challenges that require joint action that no member state can manage on its own. We have seen solidarity mechanisms; market integration allowed us to jointly purchase natural gas and strengthen our position. All of these were common measures that no one would have thought possible before, but that received broad support and consensus."

2. Importance of International Partnerships

According to Juul Jorgensen, the mantra "stronger together" extends beyond the borders of Europe and also applies to international partnerships. Besides mentioning the EU-USA Energy Task Force and cooperation between two Presidents as the first example, Jorgensen also pointed to new partnerships with countries such as Norway and the United Kingdom, as well as new energy alliances with Mediterranean countries. "And then, of course, our immediate neighbors, the Western Balkans, Ukraine, and Moldova. We're talking about a two-way reinforcement of cooperation, to support both those that need help and those that need to be closer to us."

3. Developing Strengths

Juul Jorgensen acknowledged that dependence on Russian gas constituted a weak point for the European Union. However, the EU also presents many strengths: "our internal market, our interconnection, existing infrastructure, our ability to work together, and investment conditions."

4. Alignment of the Energy and Climate Crises

Juul Jorgensen also believes that the energy crisis and the climate crisis are parallel. "We needed to make sure that everything we did in the crisis aligned with the objective and strategic objective of climate neutrality by 2050. We saw that the European Green Deal – more renewables, more energy efficiency – is the best way to make us more secure, not just in terms of green or affordable energy, but also in terms of energy and economic security. The REPowerEU pillars are completely aligned with this drive for climate neutrality."

5. Economics, Energy, and Climate Go Hand in Hand

Finally, Juul Jørgensen emphasized that EU economic security is largely based on energy and climate security. Therefore, "we need to ensure that our policy objectives work jointly for economic security, strategic autonomy, and the resilience of our energy systems."

According to the EU Director General for Energy, the lessons learned from the crisis inspired a rethinking of the electric market. "During the crisis, we also learned that there were market elements that could be eliminated and that could be **designed in an intelligent manner to facilitate the energy transition, accelerate the deployment of renewables, and safeguard consumers**, as well as to create the best possible integration of investments for project developers and market operators."

On behalf of EU Energy Commissioner Kadri Simson, Ditte Juul Jorgensen also participated in the LNG Producer-Consumer Conference, organized jointly by Japan and the IEA task force, to reaffirm Europe's commitment to address the methane emissions caused by the LNG value chain. The EU Commission once again underlined the importance of ongoing collaboration with global partners, as well as the IEA and the International Methane Emissions Observatory. Upcoming action will concern the creation of a methane emissions assessment framework (aligned globally for LNG projects) and support to an international public-private coordination for the reduction of greenhouse gasses caused by LNG.

Damilola Ogunbiyi

CEO and Special Representative of the United Nations Secretary-General (UN SRSG) for Sustainable Energy for All (SEforAll)



In an article written for *The New African Woman*, **Damilola Ogunbiyi** emphasized the importance of diversity in order for the energy sector to achieve the

Sustainable Development Goals (SDGs) within seven years. "Women", writes the Nigerian special representative, "play a crucial role, but the energy sector often does not take their needs into sufficient consideration. In fact, there are tens of thousands of women around the world who continue to **have no access to energy**, a situation which, along with a lack of technology and clean cooking fuel, determines a high mortality rate for women and children".

In the article, Ogunbiyi points to the fundamental role that women play in the transformation of the energy sector and the implementation of the SDGs. The contribution of women, which is underestimated at the decision-making level, needs not only to be recognized, but also valued by listening to their voices and opinions. "Concrete actions are necessary in order to actively involve women. Female students should be encouraged to pursue careers in STEM (Science, Technology, Engineering, and Mathematics) and training and mentorship programs should be made available. Moreover, in addition to custom-tailored funding, energy companies headed by women should be involved in energy

planning and the collection of gender-disaggregated data."

In a recent interview with the CNN, Ogunbiyi emphasized the responsibility of G20 members to address environmental pollution, especially through the **implementation of a carbon** tax, a declaration that calls on world leaders to reflect on their responsibilities and to urgently adopt concrete measures to mitigate climate change. Carbon finance could promote access to clean cooking fuels and incentivize female participation. "It's important to challenge cultural and social norms to promote a greater participation of women in the energy transition, guaranteeing transparency and access to information. I would like to remind you that access to energy improves lives and provides economic opportunities, especially when provided by clean sources. Therefore, the production of renewable energy in the southern hemisphere will create many jobs."

Moreover, in terms of female participation, in July, the World Bank announced the appointment of Damilola Ogunbiyi as one of the 15 board members of the Private Sector Investments Lab. The lab, which began its activities in June, drawing on the experience of CEOs, directors, financers, and asset managers of major financial corporations, aims to attract private capital for energy infrastructure and drive the transition towards renewables on emerging markets, thereby contributing to fighting climate change and promoting sustainable development.



Fatih Birol

Executive Director of the International Energy Agency



At the first **Africa Climate Summit** in Nairobi, in September, the leaders of most African countries – besides asking for greater trust and funding to drive the

energy transition and exploit local resources – underlined how Africa is the least responsible continent (producing about 4% of all emissions) but the most affected by anthropic-driven global warming. Involving Africa in the global energy transition is therefore fundamental, both in terms of climate change and the promotion of sustainable development.

However, western states believe that investments in African renewables are not sound. In an article published on Project Syndicate, written together with Kenyan President William Ruto, Fatih Birol calls for a new energy pact for the African continent, a land mass that currently has ca. the same installed photovoltaic capacity as Belgium, a country that is certainly not renowned for its solar energy. "Africa is home to 60% of the best solar resources, but only receives 3% of global energy investments. And for some of the most vulnerable populations, solar and wind energy represent much more than just a clean energy solution. They can create jobs, improve health, increase social mobility, and promote gender equality, opening the road to a more prosperous future."

Therefore, renewables are fundamental to guarantee access to energy, education, employment, and the participation in a productive economy. "Solar energy," writes Birol, "is destined to become the most economic source of electricity in Africa by 2030. Unfortunately, **four out of five households in sub-Saharan Africa still use wood and biomasses to cook**, emitting noxious fumes. Nearly half a million premature deaths per year in sub-Saharan Africa are related to domestic air pollution, caused by the lack of access to clean cooking facilities."

The African continent does not have the resources to expand the renewables sector, and to be fair the necessary **resources should be provided by the rich and industrialized countries that have a greater environmental impact** on our planet. Indeed, the IEA Director claims that "international financial institutions should step up to mobilize private capital, acting as **pioneers to absorb risk and protect investments**. Doing so would help promote projects that support vulnerable populations, lay the groundwork for sustainable economic growth, and ensure that Africa become an **attractive destination for investment**."

Investments in resilient and efficient power grids will be fundamental to satisfy the growing energy needs of densely populated urban centers and expanding industries. At the same time, off-grid systems powered by solar energy and batteries have already revolutionized the way remote towns access electricity. Birol concludes by pointing out: "both centralized and decentralized power systems will be important to expand access to electricity to all Africans. Building reliable, modern energy systems will also help Africa develop its industrial base and manufacturing capacity. And this includes clean-energy technology, a market that is set to grow rapidly over the remainder of this decade. The continent is already a major player in producing the raw materials needed for clean-energy technology and is home to more than 40% of global reserves of cobalt, manganese, and platinum - key minerals for batteries and hydrogen fuel-cells. These resources must be extracted and used to benefit local populations and respect environmental and social standards. Besides mining, African economies need to focus on strengthening their refining and manufacturing capacity, as well as building their export infrastructure. This will require a high-level labor force of trained engineers, technicians, and scientists."

News & Events

Upcoming Energy Event

Cop 28

November 30, 2023 - December 12, 2023

Dubai (United Arab Emirates)

www.cop28.com

The most important global event on climate brings together global leaders, scientists, and representatives of youth and indigenous people for a two-week summit. It is a crucial moment for the fight against climate change. Seven years have elapsed since the Paris Agreement; seven more years separate us from 2030, the year in which the objectives set in France must be achieved.

Sustainable Solar Europe

December 7, 2023

Srussels

www.sustainable-solar-europe.com

Sustainable Solar Europe 2023 provides a 360-degree outlook on sustainability in the solar photovoltaic sector. It brings together sector specialists, academics, politicians, and other interested parties to discuss best practices in the sector, as well as legislative and political updates.

The sustainable future of the Gulf Cooperation Council

December 9, 2023

Cop28 Dubai

www.cesi.it/news/2023/cesi-event-at-cop-28-on-the-gccs-energy-future/

Within the GCC, the main electrical conduit is the GCC Power Grid, which connects the six high-voltage Gulf Arab states. Furthermore, countries such as Saudi Arabia are considering interconnections with neighboring states such as Egypt and Jordan. The event organized by CESI aims to analyze the potential of regional interconnections and projects in the pipeline to connect North Africa with Europe and the Middle East with Africa, Europe and Asia.





The 4th SDEWES LA Conference

January 14-17, 2024

Vina Del Mar, Chile

www.vinadelmar2024.sdewes.org

Following the success of the global conferences on the sustainable development of energy, water, and environmental systems (SDEWES), semi-annual conferences have been organized to provide a meeting venue for Latin American and global researchers.

European Energy & Aviation Forum 2024

January 17-19, 2024

Q Zurich, Switzerland

www.gpps.global/gpps-energy-forum24/

Decarbonization of energy supplies and aviation is receiving increasing attention from governmental policy and financial support. Nonetheless, our current energy supplies are still prevalently based on fossil fuels. The GPPS Energy Forum 2024 will address the transition towards decarbonized energy supplies and air travel.

Hyvolution Paris 2024

January 30, 2024 – February 1, 2024

Paris, France

https://paris.hyvolution.com/en

The event will provide international political and economic leaders with the opportunity to open a debate on the hydrogen sector.

Shaping a Better Energy Future

CESI is a world-leading technical consulting and engineering company in the field of technology and innovation for the electric power sector. In particular, through its Division KEMA Labs, CESI is the world leader for the independent Testing, Inspections and Certification activities in the electricity industry. With a legacy of more than 60 years of experience, CESI operates in 40 countries around the world and supports its global clients in meeting the energy transition challenges. CESI also provides civil and environmental engineering services.

The company's key global clients include major utilities, Transmission System Operators (TSOs), Distribution System Operators (DSOs), power generation companies (GenCos), system integrators, financial investors and global electromechanical and electronic manufacturers, as well as governments and regulatory authorities. In addition, CESI works in close cooperation with international financial institutions such as, among others, the World Bank Group, the European Bank for Reconstruction and Development, the European Investment Bank, the Inter-American Development Bank, the Asian Development Bank.

CESI is a fully independent joint-stock company headquartered in Milan and with facilities in Arnhem, Berlin, Prague, Mannheim, Dubai, Rio de Janeiro, Santiago de Chile, Knoxville (USA) and Chalfont (USA).

www.cesi.it



