

SEPTEMBER 2021

ENERGY

INDUSTRY REVIEW

ENERGY POVERTY

A Time Bomb Waiting
to Be Defused

RENEWABLE HYDROGEN

Driver of Green Revolution
in Europe?

CCUS AND ENERGY TRANSITION

Oil and Gas Producing
Countries Strategies

**George-Florin Prunaru,
Process Engineering Director
Southern Europe,
Bilfinger Tebodin**

**Economic Benefits of Digitalization
and Process Technology Solutions**

clean energy since 1909



The background of the entire page is a photograph of an industrial facility, likely a gas processing plant, during sunset. The sky is a mix of orange, yellow, and red, with the sun low on the horizon, creating a strong lens flare effect. In the foreground, there is a complex structure of metal scaffolding, walkways, and pipes. The structure is multi-tiered and appears to be part of a large-scale industrial operation. The overall mood is industrial and dramatic due to the lighting.

S.N.G.N. ROMGAZ S.A.

The company is listed on Bucharest Stock Exchange and GDRs are transacted on London Stock Exchange.

Romgaz undertakes geological exploration in order to discover new gas reserves, produces methane by exploiting the reservoirs included in the company portfolio, stores natural gas in the underground deposits, interventions, workover and special operations on wells and technological transport. Starting with 2013, Romgaz extended its scope of work by taking over the Iernut thermoelectric power station, and thus it became also electric power supplier.

Romgaz is the largest natural gas producer and the main supplier in Romania.

www.romgaz.ro

Gas Price Hike in Romania

Causes and Consequences



Gas prices are skyrocketing in Romania, being even double for certain customers as of this autumn. Some companies have notified their customers already in the competitive market whose contracts concluded for one year are about to expire.

In the notification sent to a customer, the supplier mentions that the change of price occurs after an unprecedented increase in the gas acquisition market, in both Romania and Europe. That is after, in the last year, gas prices have already increased, on average, by 20%, according to the National Institute of Statistics.

In response to this situation, the authorities considered appropriate to threaten the suppliers that, if they increase gas prices, they will be subject to fines in the amount of 10% of their turnover. Agreed, the decision of gas suppliers cannot be labelled as moral, but the business relies on laws, not on morality.

The Intelligent Energy Association provides clarifications in this case. Gas market liberalization was made on July 1, 2020, based on Ordinance 1/2020 of the Romanian Government, and the way in which this process was to be carried out was established in March 2020, under an Order (no. 27/2020) of the National Regulatory Authority for Energy (ANRE). According to these legal acts, if the household customer fails to exercise its right of eligibility by June 30, 2021 and does not conclude with the current supplier or with another supplier a contract related to gas supply in competitive regime, if it fails to communicate to the supplier, by this date, the refusal to sign the contract or a request to amend/supplement the contractual conditions/clauses, the offer proposed by the current supplier shall be considered accepted and, consequently, the gas supply contract related to this offer shall be considered tacitly concluded as of July 1, 2021, under the conditions provided by Article 1.196 para. (2) of Law No. 287/2009 on the Civil Code. The same legal act provided that in the performance of the Contract legally imposed by the supplier, any intention of the supplier to amend/supplement the contractual conditions/clauses, together with the addendum to the contract, shall be notified to the household customers at least 30 calendar days before the date when the amendment/addition will be made. The amendments/additions shall be considered accepted by the household customer if it fails to communicate, within 30 days of the notification sent by the supplier, the termination of the gas supply contract.

Therefore, millions of Romanians were transferred based on a legislative construction of Romanian authorities to the competitive market, under the exclusive conditions imposed by one of the parties - by the supplier. It would have been normal that the new contracts be signed by both parties, in which situation many of the clauses of the current contracts wouldn't have existed. This legal construction, which exclusively favours the supplier, giving it the legal right to impose what it wants within the limits of the law, is the cause of price increases, while the behaviour of energy suppliers is only the consequence of these laws.

Lavinia Iancu
Publisher

A handwritten signature in black ink, appearing to read 'Lavinia Iancu'.

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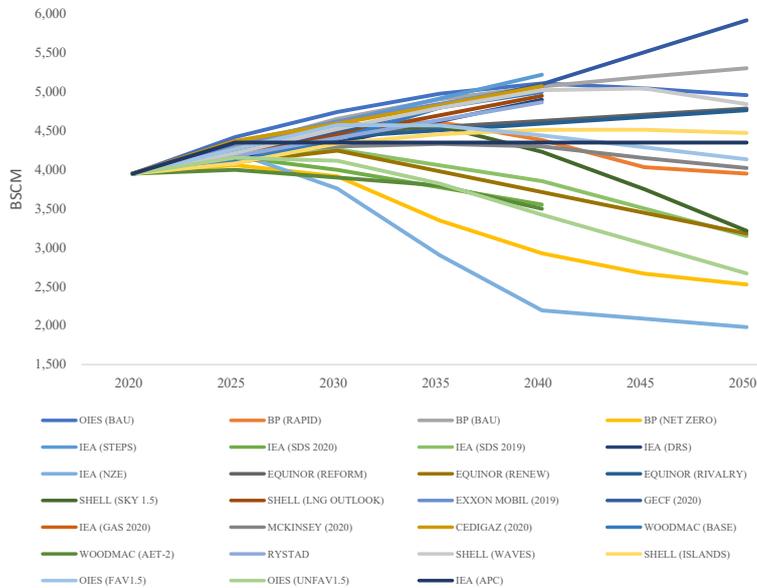
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Increasingly Expensive Fuels in Romania

Taking advantage of Romanians' appetite for holidays or weekends at sea or in the mountains, the distributors significantly increased the prices for gasoline and diesel, which again broke the psychological threshold of RON 6/litre.

A tendency of the recent years was to transform the traditional fuel distribution stations into real minimarkets or even financial services centres, the gains from non-core services being increasingly high. This trend is surprising in conditions in which the sales of hybrid or electric vehicles advance every year, stimulated by vouchers or the young people's appetite for less polluting vehicles. Even if they are increasingly scarce, private distributors also have a reasonable market share, and names such as Oscar Downstream, Smart Diesel, RBC or Carbogaz are known at national or regional level.

Domestically, OMV Petrom increased diesel production and tripled kerosene production to cover the market deficit after the closure of the Petromidia refinery, said Radu Caprau, member of the OMV Petrom Executive Board, responsible for Downstream Oil. In conditions in which Petromidia refinery, the largest in Romania, was closed following an explosion, the pressure moved to the other producers in the market.

Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping

bp and the Mærsk Mc-Kinney Møller Center for Zero Carbon Shipping signed a partnership agreement committing to a long-term collaboration on the development of new alternative fuels and low carbon solutions for the shipping industry.

As a strategic partner to the Center, bp will second experts to work on relevant research and development projects in the Center's portfolio and contribute to the development of methodologies and optimized pathways for safe and sustainable fuel solutions for shipping. Additionally, bp will join the Center Advisory Board providing guidance for transition strategies and further development of the Center's activities.

With 70,000 ships consuming m300Tons fuel p.a., global shipping accounts for around 3% of global carbon emissions, a share that is likely to increase as other industries tackle climate emissions in the coming decades. Achieving the long-term target of decarbonization requires new fuel types and a systemic and regulatory change within the industry. Shipping is a globally regulated industry, which provides an opportunity to secure broad-based industry adoption of new technology and fuels.

Agreement on Research, Innovation and Development of Novel Energy Production Technology and Fuels

The Romanian Energy Center (CRE), a professional association of public and private companies operating in the Romanian energy sector, has signed a Memorandum of Understanding (MoU) to create a Technical and Research Collaboration Framework (the Agreement) with LIBERTY Steel Group, part of Sanjeev Gupta's sustainable industry leader GFG Alliance, MTAG Switzerland, the international engineering corporation, ICSI Rm. Valcea, the

Romanian research and development facility and Adrem, the energy services company oriented towards innovation, efficiency and sustainability.

The Agreement will promote, facilitate, and consolidate international cooperation in research, innovation and business development of novel energy production technology and fuels.

The parties to the Agreement, which is initially for five years, intend to collaborate in a range of ways,

including: Joint research projects and pilot projects; Joint technical and commercial advisory services, training services, case studies and possible business development activities related to green hydrogen, green steel, renewable energy sources and energy storage amongst others; Joint participation and dissemination of research information in workshops and/or conference days; Joint teaching and/or supervision of students.

DEER Signs 3 European Grant Agreements for Investment Projects



Distribuție Energie Electrica Romania (DEER), part of Electrica group, has received approval for European funding of 3 investment projects on modernization and development of the distribution system. The investment projects have a total value of RON 198mln, of which RON 159mln are non-reimbursable funds, the difference of RON 39mln being represented by the company's contribution.

These complex projects within the LIOP 6.3 axis - Call code: LIOP/290/6/3/ 'Reduction of average consumption of electricity at household level' will be started after signing the grant agreements, with an estimated deadline for completion in 2023 and refer to: the implementation of a Smart Electricity Distribution System in a homogeneous area from the Rogerius neighborhood, Oradea locality; the implementation of a smart electricity distribution system in a homogeneous area from Targu Mures municipality; creating a smart distribution system in a homogeneous area of electricity consumers in the Tiglina 1, 2, MICRO 16 (Tiglina 3), MICRO 17

(Tiglina 4) neighborhoods, in Galati municipality. Also, a fourth project, 'Smart Metering Solutions Center Region - Codlea and Ghimbav towns', within the same axis, is in the final phase of technical-economic evaluation and has an eligible value of approximately RON 50mln.

All the four investment projects of the company follow the strategic guidelines for the development of smart grids that allow the development, connection, and operation of multiple sources, widely distributed, ensuring the framework of the transition to green energy. In the medium term, DEER has initiated several important investment projects with European co-funding, worth RON 340mln. They aim at the improvement of quality of the distribution service and increasing operational efficiency, by modernization, automation of installations, implementation of modern technologies and increasing the energy efficiency by reducing electricity network losses. At the same time, in the long run, company's projects aim at focusing on the smart grid concept, in line with trends in the industry.

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World's Largest Wave Energy Test-rig

CorPower has constructed the world's largest wave energy test-rig following an intense two-year project. The 45-tonne moving mass system, installed at CorPower's Stockholm base, is capable of simulating ocean wave conditions anywhere in the world. Measuring 40m in length and 9m in width, the system will play a fundamental role supporting CorPower's flagship HiWave-5

demonstration project, involving the deployment of the firm's first full-scale WEC (Wave Energy Converter) off the coast of Portugal, later this year. For the last decade CorPower has been steadily undergoing a rigorous five-stage product development and verification process, which initially started with small scale tests in Portugal and France. It later progressed to a half-scale WEC

prototype, which also underwent dry-rig testing prior to sea trials in the Orkney Islands, Scotland, in partnership with utility firm Iberdrola.

CorPower's commercial scale WEC - 9m in diameter with a 300KW power rating - will spend around 4-months on the test-rig, which can deliver 7.2MW peaks and generate 80.6kNm torque, with 5 m/s maximum speed.

Simtel Team Installs over 1300 Photovoltaic Panels for Kaufland Romania

Simtel Team built for Kaufland Romania two power plants that involved the installation of over 1300 photovoltaic panels. The panels installed on the roofs of two stores located in Bucharest and Focsani have a capacity of 490.5 KWp. They will support the environment by reducing with 760 tons per year the carbon dioxide emissions.

Simtel implemented the two installations projects of photovoltaic panels for the Kaufland Focsani and Kaufland Bucharest Militari stores. 720 photovoltaic panels were installed on the roof of the Kaufland store in Bucharest, on over 1300 square meters. On the top of the location in Focsani, 588 panels were installed, spread over an area of over 1000 square meters. Approximately 30 people were involved in the implementation, working in parallel on both projects.

The two stores' annual electricity production will be 639.8 MWh, out of which the Bucharest store will generate 358.5 MWh, and the one in Focsani, 281.3 MWh. Simtel Teams will ensure the maintenance of the photovoltaic panels, which includes 24/7 monitoring, corrective remedies of any kind performed in 24 hours, and annual inspections to prevent any potential unpleasant situations in the future.

World's First Fossil-free Steel Ready for Delivery

SSAB has manufactured the first fossil-free steel in the world and delivered it to a customer. The test delivery is an important step toward a fully fossil-free iron and steel production value chain and a milestone for the HYBRIT partnership between SSAB, LKAB and Vattenfall. In July, SSAB Oxelösund rolled the first steel produced using HYBRIT technology, i.e., reduced by 100% fossil-free hydrogen instead of coal and coke, with good results. The steel is now being delivered to the first customer, the Volvo Group.

SSAB, LKAB and Vattenfall created HYBRIT, Hydrogen Breakthrough Ironmaking Technology, in 2016, with the aim of developing a technology for fossil-free iron- and steelmaking. In June 2021, the three companies were able to showcase the world's first hydrogen-reduced sponge iron produced at HYBRIT's pilot plant in Luleå. This first sponge iron has since been used to produce the first steel made with this breakthrough technology.

The goal is to deliver fossil-free steel to the market and demonstrate the technology on an industrial scale as early as 2026. Using HYBRIT technology, SSAB has the potential to reduce Sweden's total carbon dioxide emissions by approximately ten per cent and Finland's by approximately seven per cent.

Hidroelectrica Completed the Filling of Gura Apelor Lake at NNR



Hidroelectrica completed the filling procedure at NRL (normal retention level) - 1072.5 m³ of Gura Apelor Lake, belonging to AHE Raul Mare Retezat, Hateg Branch, as well as at the inauguration of the objective, which – on this occasion, was put into operation at the initially designed parameters. The works, started in 1976, have been going on for more than 30 years, but the final reception has been postponed over time due to the finding of excessive leaks in the left slope and the need to complete the contour road. Following the performance of concrete injection operations and specific consolidations, the objective went through safety assessment procedures, in 2020, the company's management taking the decision to proceed to the final acceptance. The filling of the lake, which covers about 360 hectares and accumulates about 220 million cubic meters of water, was possible only this year, amid favorable hydraulics.

“Today we are writing an important page in the history of Hidroelectrica, a page of confidence in the thorough

work done and of the completely assumed decisions. This plant, from Raul Mare, is the second largest plant on inland rivers, but it was never exploited to the potential of the project. We did not want this objective to remain a Cinderella of Hidroelectrica. We have confidence in the way this project was carried out, in the calculations made by the specialists and in the effort of the Hidroelectrica team. In addition, the filling of Lake Gura Apelor at NNR is a condition for implementing the Retezat CHE refurbishment project, whose estimated value amounts to almost 77 million euros, and which has already passed the initial stages of acquisition,” said Bogdan Badea, President of the Board of Hidroelectrica.

Gura Apelor Dam is the second largest clay core rock dam in Europe, the construction encompassing 7 million cubic meters of stone from quarries in the area, as well as one million cubic meters of earth. The building, 160 meters high, is placed on a 560-meter wide base and stretches 460 meters long at the canopy.



Natural gas compression equipment with helical compressors.
Electric centrifugal compressors for natural gas or turbine gas compressors.
Centrifugal air compressors and centrifugal air blowers.
Co-generative power plants producing thermal and electric energy for oil extraction.
Gas expansion energy recovery using helical expanders and its transformation in electrical energy.
Automation equipment for turbomachinery.
Applied research in production regarding manufacturing processes for complex shaped forms and low rigidity parts (rotors, pinions, bladed stators, coolers, cases).
Maintenance and service.
Spare parts for turbomachinery.

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Eni to Expand Electric Charging Services in Italy and Europe

Eni, through Eni gas e luce, signed an agreement to acquire 100% of Be Power S.p.A., which through its subsidiary Be Charge is the second largest Italian operator with over 5 thousand electric vehicle charging points on public land. The transaction marks a further step forward in Eni's energy transition strategy and commitment to achieve total decarbonisation of products and processes by 2050.

The mobility market is set to experience a steady increase in the number of electric vehicles on the road in Italy and Europe in the coming years. Within this context, the acquisition of Be Power will allow Eni gas e luce to become a primary operator of electric vehicle charging on public land, on private land with public access and in Eni service stations, in Italy and abroad.

Founded in 2018, Be Power owns the Be Charge branded charging infrastructures installed on public and private land and holds the relevant concessions. It also manages its own charging stations and those of other operators through a proprietary technology platform and provides charging services to drivers of electric vehicles on its own or third-party charging stations through a dedicated app.

Euro Sun Mining to List on LSE

Euro Sun Mining Inc. (ESM), a European focused gold-copper developer, announced its intention to seek a listing of the Company's shares on the London Stock Exchange (LSE) Main Market. Subject to the required regulatory approvals from the Financial Conduct Authority and the LSE, including publication of a Prospectus. Admission to the LSE is expected to occur in Q3 2021.

The announcement is an advertisement for the purposes of the Prospectus Rules of the Financial Conduct Authority (FCA) and not a prospectus and not an offer to sell, or a solicitation of an offer to subscribe for or to acquire, securities in any jurisdiction, including in or into the United States, Israel, Australia, Japan, or the Republic of South Africa.

"The decision to list in London, the world's most dominant capital market for mining stocks, fully underpins our overarching strategy of producing critical metals from our asset located in the EU to meet the increasing demand from European markets, which are taking steps to become more self-sufficient and cut their reliance on countries such as China for strategic resources. There is currently a short supply of copper and gold produced within Europe, and ESM is well placed to help fill that gap. Once in production, we expect to be one of the most efficient and environmentally responsible producers of copper and gold not only in Europe but globally. The Board looks forward to the opportunity to raise the Company's profile through the London listing ahead of what management expects will be several value-accretive catalysts," Scott Moore, Chief Executive Officer of Euro Sun, commented.

Ingenious E-Sense™ Providing Digital Transformation Solutions to Mining Companies

Industrial IoT solutions provider Latium Technologies has launched the Ingenious line of IoT technologies, first introducing the ground-breaking E-Sense™ device.

Mining operations depend on interconnected networks of High-Voltage Cables to power their fleet of excavators - that's why when a faulty or damaged cable triggers an automatic shutdown, mining firms

need a way to quickly determine which segment in a line needs to be replaced to mitigate downtime.

The Ingenious E-Sense™ is a non-invasive IoT sensor that provides mining companies with a better way to monitor networks of high-voltage cables for damage or faults. To date, this challenge has been a completely manual process. E-Sense™ allows maintenance teams

to immediately identify and replace damaged cables, reducing costly downtime and eliminating manual processes. The Ingenious E-Sense™ integrates directly into Latium Technologies' industry-leading Job Site Insights® suite of applications.

Latium's JSI® technology is already used by several clients in the industrial sector, including Trans Mountain, TC Energy, and Enbridge.

Products

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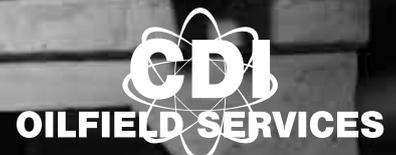
Product Services

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JM to Drive World-leading Fuel Cell Performance

Johnson Matthey (JM), as part of leading European consortium GAIA, has helped deliver a fuel cell power density of 1.8 W/cm² @0.6V. This represents a twenty per cent increase versus state-of-the-art technology. This market-leading result marks a significant step forward for fuel cell technology and JM's net zero aspirations. Working alongside BMW, Freudenberg, 3M and others, JM has been instrumental in delivering this step-change, supplying critical components within the fuel cell stack - the membrane electrode assemblies (MEAs).

This milestone is a further example of how JM is applying its heritage in fuel cell technology to help the world become cleaner and healthier, today and for future generations. The increased power density will lower overall stack cost, in turn helping to advance the commercialisation of fuel cell powered vehicles. This helps with the decarbonisation of the entire transport sector, meaning light duty vehicles such as passenger cars, as well as HGVs and trucks, contribute zero emissions.

The GAIA project, which started in January 2019 and will run for 3.5 years, aims to develop and bring together advanced critical proton exchange membrane (PEM) fuel cell components, integrated into a fuel cell that is capable of delivering the most challenging performance, cost and durability targets required for large-scale automotive fuel cell commercialisation.

World's Longest ETH Production Pipeline

Neptune Energy finished installing and testing the world's longest trace-heated (ETH) subsea production pipeline at its operated Fenja field in the Norwegian sea. The 37 kilometre electrically trace-heated (ETH) pipe-in-pipe solution will transport oil from the field to the Njord A platform, operated by Equinor. The innovative use of the ETH pipe-in-pipe significantly reduced the potential cost of the development by enabling the field to be tied back to existing infrastructure.

The ETH pipeline was developed and qualified through a collaborative approach with TechnipFMC. Due to the high wax content of the Fenja field's oil, the contents of the pipeline must be warmed to a temperature above 28-degrees Celsius before starting the flow after a scheduled shut down or interruption. During normal production, the temperature in the pipeline would be well above this temperature.

The offshore installation was carried out across two subsea campaigns in 2020 and 2021 by TechnipFMC's vessel, approximately 120 kilometres north of Kristiansund, Norway, at a water depth of about 320 metres. The fabrication and assembly of the ETH-pipe was conducted by TechnipFMC.

MET Group Acquires 60MW Suvorovo Wind Park in Bulgaria

On 30 July 2021, MET Group signed a share purchase agreement with Grupo Enhol, a Spanish family-owned company focusing on renewable energy, to acquire its 60MW Suvorovo Wind Park in Western Bulgaria, along the Black Sea coastline. The closing of the transaction is expected to take place in Q3 2021.

Swiss-based energy company has acquired a 100% stake in a 60-megawatt wind park in Bulgaria, after signing a share purchase

agreement with Spanish Grupo Enhol. The transaction is an important step in achieving MET's renewables growth targets in the CEE region of 500 MW in operation by 2023 – with this acquisition MET will expand its operating wind portfolio in Bulgaria to 102 MW.

Suvorovo Wind Park, representing 8,5 per cent of the total installed wind capacity in Bulgaria, consists of 30 units of Gamesa G90 wind turbines – 2 MW capacity each. The

wind farm, operating since 2012, produces approximately 120 GWh of electricity per year, supplying power equivalent to the consumption of around 38.000 households.

MET Group considers the growth in the renewable power generation in the CEE region as a core part of its business strategy. This transaction will provide MET with a strong local renewables footprint in Bulgaria following the acquisition of the 42MW Black Sea Wind Park earlier this year.

Kraftanlagen Romania S.R.L. was founded in 2007 as a subsidiary of the German company Kraftanlagen München GmbH and expanded its local services successfully in 2016 with IPIP S.A.

We engineer, design and build complex piping and plant systems for the chemical and petrochemical industry. Our technical competence covers also requirements for new plants and maintenance for refinery, extraction & production and industrial plants.

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Basic and precision installation of all components, such as devices, columns, pumps and compressors
- Steel construction
- Installation of cracking and reaction furnaces
- Tank farm construction
- System integration, operating checks and commissioning
- Plant revisions
- Pipeline and bracket corrosion protection
- Insulation
- Scaffolding





Combining Traditional Energy Technologies with Renewable Ones

Lately, the funding in the area of renewable energy sources' development has gradually increased worldwide. It is also a trend for the Russian Federation but rather not in the economically justified projects, but in the initiatives to promote the 'green' image of the corporations. For example, ROSATOM, RUSHYDRO. These companies are implementing fairly large-scale projects for the introduction of renewable energy sources using their fundings. It helps to demonstrate the feasibility of combining traditional energy technologies with renewable ones.

The question arises on how to ensure the proper interaction of traditional and renewable energy, thus there are no violations of power quality indicators. Moreover, to ensure the reliability and uninterrupted power supply in the system.

Russia implements local projects to install renewable energy sources in remote regions, in case if it is economically justified. Since the costs of connection to power lines are significantly higher than the capital costs of the establishment of such facilities. Due to the lack of fuel costs, the operating costs of renewable energy sources are always lower than traditional ones.

In Russia, renewable energy sources are being developed for local practical application. So far, it is not economically profitable without the compensation of the costs by the expense of the market.

To guarantee the investment return, it is necessary to partly extract the funds from the

capacity market (from the profit of traditional energy) and transfer it to renewable energy sources.

The share of renewable energy sources is not significant in the total balance of power generation, so the share of funds' redistribution is not very noticeable. However, if the share increase, it starts to affect the redistribution of profits more significantly.

Many experts emphasize that non-traditional generating facilities of low capacity put additional pressure on the market. Thus, traditional energy pays out of its profits for the development of renewable energy sources. Due to weather conditions, local renewable energy installations can't always ensure the reliability of energy generation, therefore these installations are equipped with diesel generators (as a backup power source).

However, it leads to the dependence of such installations on the supply of diesel fuel, which also negatively affects the environment. In addition, while the share of renewable energy sources increases, the storage system is demanded. The production of batteries is also an energy-intensive process, which requires the extraction of certain natural resources. Additionally, it has an impact on the environment.

Although the introduction of renewable energy sources helps to reduce CO₂ emission, at the same time, the negative impact of the extraction of minerals for the storage systems manufacturing increases. Environmental experts note the insufficient research of the negative impact of the entire life cycle of renewable energy

sources in combination with an accumulation system. This is a worldwide problem.

Currently, scientists are looking for technological solutions to reduce the impact on the environment.

In my opinion, it is necessary to create digital models before the establishment of renewable energy installations. Digitalization is the key to understanding how and where it is advisable to install renewable energy sources, how to make this process safe for the reliability of power generation, as well as for the environment. European analysts note that mainly projects related to wind and solar energy are financed.

However, a parallel assessment of the dynamics of the emission level doesn't correlate with the increase in the share of renewable energy sources. Other sources contribute to increased CO2 emissions. Replacing traditional energy with renewable energy sources doesn't lead to the expected reduction of emissions. Perhaps this problem will be solved by the

development of other renewable sources such as geothermal energy, waste processing, etc.

The prospects for using the traditional electric power system with a decrease in environmental impact should be considered. Technologies based on hydrogen and the conversion of electricity to gas are becoming more important. Consequently, energy-gas technology has great potential to provide the transfer of electricity to the users in non-electrical form. Though there are still many unsolved issues concerning hydrogen energy. The technology of hydrogen production, transportation, accumulation system, converting it into energy at the power plant.

On whole, the prospect of a particular technology has a direct connection not only to the resource potential but also to the scientific results. Thus, the development of renewable energy sources can't be predicted without considering the scientific breakthroughs. Its expectation and accuracy require the creation of mathematical models. ■

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Oil Price Stability Proposals for the Path to Follow

Oil price instability creates a vicious circle because the oil industry goes through continuous cycles of rise and falls. Talking about the last 20 years, the oil price volatility was greater than for other raw materials, the fluctuations bringing disputable revenues for both producer and consumer. This instability of the oil price triggers investments in the oil industry and negatively influences the entrepreneur with projects in the field of alternative energy sources, thus discouraging it. The oil industry crisis has proven that the decrease in the capacity reserves has led to an increase in the oil price, and, during the periods when crude oil reserves were kept at the proper level, the oil price was stable.

The stability of the oil market and its optimal price guarantees sustainable development, but the notion of 'optimum' in terms of price stands as a sum of aspects, such as: ensuring return on investment, economic growth, rational use of energy, encouraging farmers, sustaining research for new technologies meant to confer the increase

of the deposits' recovery degree etc. Making a weighted average with the intensity of the aspects defined in the previous phase, it is considered an oil quote that gives a price of USD 60-70/barrel, which is a compromise that responds to a major part of requirements.

The promotion of dialogue meant to prevent the future crisis, especially the reverberations that we feel nowadays, being considered as support, brings two immediate and future necessities:

- the first one – the setup of a Global Agency for Energy meant to improve and amplify, in a transparent manner, the information related to the oil and energy market and
- the second one - the identification and implementation of some secure mechanisms for the improvement of the oil and energy price stability, task transferred to the Global Agency for Energy.

Creating a Global Stability Fund meant to limit the reduction in producing countries' income when the oil price falls below a value considered by reputable economists as a critical threshold, fund which should be fed by the consuming countries. These countries, without budgetary efforts, but considering the costs saved due to the oil price decreases and using a duty-type mechanism, could participate in a correct and grounded manner to the recovery of losses incurred by producing countries, due to the decrease in the damage threshold of the oil price. The setup of the Global Fund of Stability can contribute to the reduction of the sinusoidal cycles of the oil price on fiscal budgets and the public consumption within the oil producing countries, the steady energy market limiting the role of speculations in oil price formation.

The market of capacity reserves productive at global level constitutes a key element to prevent the situations when, by a decline in supply, the oil price increases. To reduce this risk, it is necessary to ensure the development and maintenance of a proper level of productive reserves on the oil market, reserves differentiated according to the quality and geographical criterion. As these reserves are not deliberately maintained and supported, it is expected to have a settlement of a productive reserves market meant to enable the change of equivalent securities for certain unused capacities. The

Global Agency for Energy, as independent entity, would have the task to gather the agreements between governments and manage the hereabove securities market.

The coordinated management of all global oil reserves, mechanism that, in the short term, would enable the avoidance of the negative impact during the periods of lack of supply or limited supply. The global management of all reserves (crudes, as well as the main finite products) held by governments could alleviate or even remove the fears caused by the lack of oil in emerging situations due to lack of supply, thus limiting the natural panic that unleashes on the market due to the sudden interruption of supply.

The proposal to jointly resolve crisis situations, which requires correlation and decision for a collective functioning under the control of the Global Agency for Energy, could bring the stabilization of oil price fluctuations within a rational margin. The mentioned mechanisms, the capacity reserves

market, the coordinated management of all global oil reserves, all these would guarantee a proper barrel quantity as basement and surface reserve that would be used in crisis situations, with the limitation of the uncontrollable explosions of the price.

The path to follow is the immediate setup of the Global Agency for Energy, which stands as an important milestone regarding global cooperation, demanding alignment of all oil market players. It is very important that all producing countries, as well the consuming ones join the initiative, as founding members of the Global Agency for Energy, thus the main actors on the oil market being engaged. The identification and selection of the instruments working for the stabilization of the oil price would be the next step after the setup of the Global Agency for Energy. Thus, the centralized management of the instruments and mechanisms for oil price stabilization would be ensured, based on efficiency assessment. ■



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George-Florin Prunaru, Process Engineering Director in Southern Europe at Bilfinger Tebodin, on Economic Benefits of Digitalization and Process Technology Solutions

The multidisciplinary consultants and engineers of Bilfinger Tebodin are the technical link that transforms investor's wishes into concrete plants. The company specializes in numerous market segments including industry, oil and gas, energy, pharmaceuticals and biopharma, property, sustainable solutions. George-Florin Prunaru, Process Engineering Director in Southern Europe at Bilfinger Tebodin, discusses the economic benefits of digitalization and process technology solutions to improve efficiency and quality in the energy sector and other market segments.

by LAVINIA IANCU

Photographs by JUSTIN IANCU



After graduating from Petroleum-Gas University in 2012 (Faculty of Petroleum Processing Technology and Petrochemistry), George-Florin Prunaru took his first career steps at Bilfinger Tebodin (former Tebodin Consultants & Engineers) as a Process Engineer. In September 2015, he became a Business Development Manager responsible for company activities across Romania. As of October 2017, he took over the position of a Process Engineering Director and started developing technology integration team and projects. Currently, George-Florin is responsible for projects in Southern Europe (Romania & Hungary). He holds a Master's degree in Computer aided chemical engineering for refinery and petrochemical.



Dear Mr. Prunaru, for the last nine years you have worked within the oil and gas industry, this sector experienced a period of continuous improvement and innovation. How did you perceive these transformations?

It was a period of many challenges. Oil and gas industry is the most unpredictable of all market sectors. Back in 2012 when I started my career, it was a stable market with clients ready to invest and develop continuous improvement strategies. The crisis of 2015-2016 affected mostly the oil market, when many big players were reconsidering their investment plans. No wonder those decisions had an impact on design and construction companies as well. Thanks to the flexibility and diversity of engineering disciplines and specialisations, Bilfinger Tebodin was able to make a stable transition to other markets where process technology knowledge is required. We executed projects for international food, agriculture, energy, and industrial clients and keep working on those successfully. Today we are recognised on the market as a process integrator in various industries, not only oil and gas related projects.

I must say, I am glad to see such diversity of remarkable projects we are executing together with our colleagues from the region – the Czech Republic, Poland, Hungary, Ukraine, Russia, and Serbia. Such diversity and knowledge exchange enables the team to develop rapidly and always stay on top of recent developments in various markets.

What are the ways to adapt Bilfinger Tebodin's systems to the current global landscape? Where does your company sit in the hearts and minds of customers?

Today investors do not look for pure execution. Professional management of a project, guiding them with advice and being focused on their business goals – that is what Bilfinger Tebodin aims to deliver. We are a consultant, a process integrator, a professional manager, an international company with a local knowledge – that is how our customers see us.

Over 75% of our projects and turnover come from repetitive clients. That is a key figure for me, as it is the best proof of the customers' trust. I believe that we have gained this trust by always being close to our clients and to their needs from the early project stage until commissioning. Flexibility is a strong feature that enables us to be such a partner, and it has been a differentiator for Bilfinger Tebodin throughout its 76-year history. Our open culture combined with stable processes create a unique environment with engaged people, dedicated project approach, continuous improvement and integration of new tools that bring benefit to our clients.

As we see, the world is changing towards globalization, the market competition is growing and our clients require a united and similar approach, no matter where their projects are. To deliver same quality and ensure flawless service in any location, our structure in Central & Eastern Europe was adapted to serve the clients' needs best.



Currently we are operating in four business lines across CEE: Consultancy, Process Engineering, Engineering and PMC (project management consultancy). It means we are not a country-based company since 2018, and our international customers embraced this change towards uniting the CEE region of 800 people, as they see all benefits of a clear service split regardless the location.

Bilfinger Tebodin covers a wide range of activities. Please describe a little bit some of most important services for your customers. What are your company's main service attributes and benefits? Can Bilfinger Tebodin build a plant from A to Z?

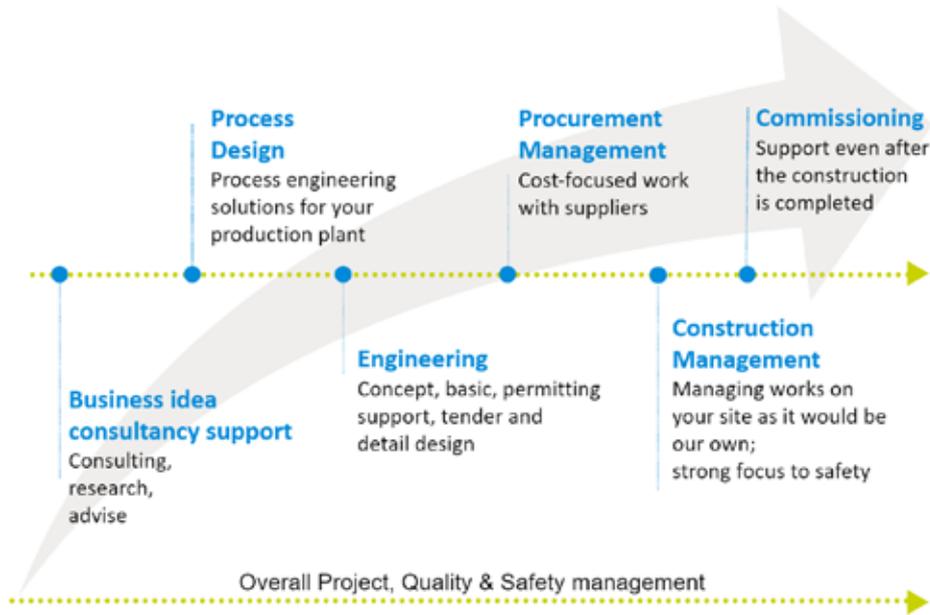
We support our partners with professional consulting, engineering, process technology and PMC services, managing their industrial assets and construction sites worldwide.

Being flexible means being able to support customers at any stage independently. Sometimes the investment decision is not in place yet. Then a site search or a technical due diligence is in demand. For other clients


BILFINGER

Consultancy	Engineering	Process Engineering	PMC
<p>We advise professionally to help your business grow</p> <ul style="list-style-type: none"> Site search & selection Environmental consultancy Due diligence Feasibility study Technical evaluation Logistics and master-planning Permitting support Economics and finance Project strategy Market study Risk analysis 	<p>We design your facility to fit your business requirements and future operational needs</p> <ul style="list-style-type: none"> Concept design Basic design Tender package preparation and bill of quantity Detail design Author's supervision Site-based teams, delivering owner's engineering Design management Engineering consultancy Utilities operational excellence expertise 	<p>We develop the technology design – a heart of your facility</p> <ul style="list-style-type: none"> Initial project definition, concept design Basic, detailed design, FEED PFD, PID, FEL HAZOP support Site and production logistics Cost analysis Permitting and certification documentation support Strat-up services for the process plants User requirements 	<p>We manage your project at every stage to fit the time, budget and quality</p> <ul style="list-style-type: none"> Project strategy Project management Risk management Scheduling & progress control Cost estimation & control Procurement Safety management Construction management and site supervision Permitting support

Four Business Lines at Bilfinger Tebodin in Central & Eastern Europe, covering the whole project life-cycle



A full range of services for the investment project from a business idea to commissioning

we may step in at the execution phase to ensure timing and quality by professional project management. Covering all important disciplines with our own staff enables us to provide specialized workforces and establish tailored project teams depending on the need – specialized consultants, architects, structural engineers, HVAC, electrical, road, process, piping and mechanical, instrumentation, procurement, project managers.

For complex projects, where customers require a single point and a trusted partner to manage the project from A to Z, we offer a turnkey EPCM package (engineering, procurement, and construction management). This means that we can be next to our



Bilfinger Tebodin largest construction site for a bioethanol plant

Bilfinger Tebodin has been commissioned by the Swiss specialty chemical company Clariant to deliver EPCM (engineering, procurement, overall project and construction management) services for the construction of their commercial-scale cellulosic ethanol production plant using Clariant's sunliquid® technology in southwest Romania. The plant will produce second-generation bioethanol from agricultural residues once accomplished by the end of 2021 as planned.

While the Covid-19 pandemic continues to present a challenging situation, the team is able to ensure that works on the construction site continue while fully complying with all pandemic precautionary regulations as established by the Romanian authorities.



First commercial-scale plant for Clariant in Podari | Photo credit: Clariant

clients from the early stages: contributing to their business idea with consultancy support, identifying best process engineering solutions, helping with all design stages, preparing tender documentation for a general contractor and selecting them, supervising construction and execution and supporting during commissioning. Such approach provides an integrated engineering solution, which minimizes interfaces between disciplines, helps avoid re-works during execution, identifies cost saving solutions and creates effective communication between the teams.

What projects are currently underway within your company?

Our biggest project at the moment is a second-generation bioethanol plant for the Swiss specialty chemical company Clariant, planned to be accomplished by the end of 2021. Bilfinger Tebodin has been commissioned to deliver EPCM (engineering, procurement, overall project, and construction management) services for the construction of their commercial-scale cellulosic ethanol production using Clariant's sunliquid® technology in southwest Romania.

Other than that, Bilfinger Tebodin runs dozens of projects across Central and Eastern Europe from various market sectors.

One of the most rapidly developing sectors for us now is an automotive market. We have been awarded 10 contracts for over 7.2-million-euro for projects related to e-mobility. Those include all types of products to serve electric vehicles – from raw materials to final battery assemblies. We expect further growth here, as the EU has long-term plans for this industry: previously 90% of European EV batteries have been produced in Asia, and now we are glad to support new investors aiming to create self-sufficient local supply chain.

One of automotive projects in Romania is an EPCM for Michelin trucks tires factory in Zalau. Michelin decided to reduce CO2 emissions in all their factories to enable sustainable tire production. Supporting energy transition, Bilfinger Tebodin followed this challenge and implemented future-proof HVAC technical solutions for their factory.

You mentioned that Bilfinger Tebodin is managing its largest construction site for Clariant in Romania. What kind of professional services is your company providing to support this project?

On behalf of Clariant, Bilfinger Tebodin provides the complete EPCM scope (engineering, procurement, construction, and project management) utilizing the force of an international team of colleagues based in the Netherlands, Romania, Poland, Czech Republic, and Ukraine. Bilfinger Tebodin is in charge of overall planning, engineering, contracting, site management and supervision of the bioethanol plant. As a site supervisor during the construction phase, Bilfinger Tebodin cooperates closely with Clariant to coordinate the work of different contractors (civil, mechanical, electrical and instrumentation) as well as to check the quality of work and takes care that all the safety rules are implemented and respected.

While a global energy transition is underway, further action is needed to reduce carbon emissions and mitigate the impact of climate change. What is Bilfinger Tebodin's approach to dealing with this situation?

Indeed, there is a need for all businesses to act fast on this subject as the

European Union and local governments are establishing mitigation actions to minimize and prevent a negative environmental impact. In addition to multiple opportunities such change of industrial climate offers, it poses significant challenges and uncertainties for companies with regard to their future investments. Our engineers help investors turn this transition challenge into an opportunity and show how they could benefit from it. We help our clients focus on the skills that are essential for their business, while taking advantage of numerous opportunities emerging with the energy transition.

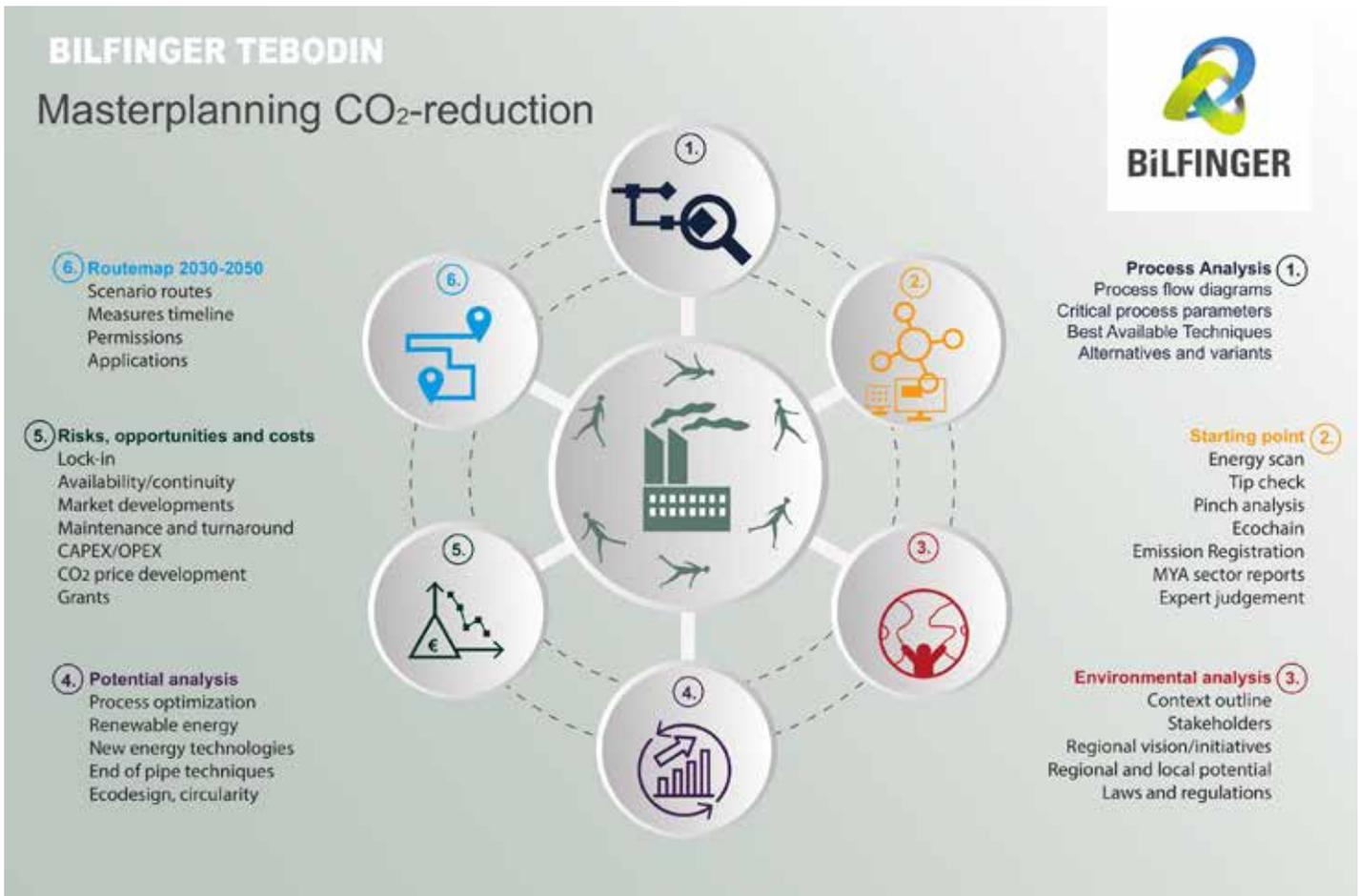
Luckily, the available technologies are continuously improving, with increased efficiency, lower operational costs, and extensive solutions to address engineering challenges. We support the industry in its energy transition, providing the best available technologies and services for industrial players.

As a group, we have built up over 10 years of experience and competences in hydrogen and carbon capture projects. Our energy market leaders see around 350 decarbonisation projects in the early stages of implementation in Europe, the USA, and the Middle East. Bilfinger Tebodin supports investors in those initiatives, mostly

focusing to hydrogen, energy efficiency, CCUS, electrification, wind, and solar energy projects.

What are the essential steps towards energy transition from your point of view?

The immediate shift towards zero carbon production cannot happen fast due to a number of reasons such as legacy infrastructure, extensive financing needs, significant lead times as well as technological uncertainty and high cost. Therefore, industrial decarbonisation is a multistage transition from CO₂ emissions reduction to full decarbonisation. We help industrial enterprises on their decarbonisation pathway providing support within energy efficiency programs, switching to renewable energy sources, process optimizations or application of innovative technologies, such as electrolysis-based hydrogen production and carbon capture, utilization, and storage.



Bilfinger Tebodin CO₂ reduction masterplanning



Having feedback from our consultancy team, who supports investors with planning of those activities, we can distinguish three stages of industrial implementation of decarbonisation projects, each with specific challenges:

1. Project planning happens under market uncertainty and lack of benchmarking. Almost any energy transition project today requires involvement of project and financial partners. The investment scenario has to take into account the requirements of various stakeholders, while the technology concept has to consider core and related technologies and infrastructure needs.

2. Project financing step goes next to monitor financing programs. It implies the use of financial engineering to ensure full coverage of project financing needs. The project documentation should meet the requirements of international standards and policies of funding organizations; the project model itself should include the implementation of environmental and social

requirements in addition to economic indicators.

3. Project implementation as a final stage implies attracting qualified partners capable of combining the implementation of local and international standards in innovative projects. At this stage, it is important to ensure the availability of infrastructure and obtain the necessary permits. Procurement strategy at this point should take into account sufficient timing of production and delivery of equipment and components, as well as turbulence in the cost of materials and other factors.

The pandemic had speed up the adoption of digital technologies and latest surveys confirm that the future will belong to companies that put technology at the centre of their outlook, capabilities, and leadership mandate. How can Bilfinger Tebodin make the most of digitalization and process technology solutions?

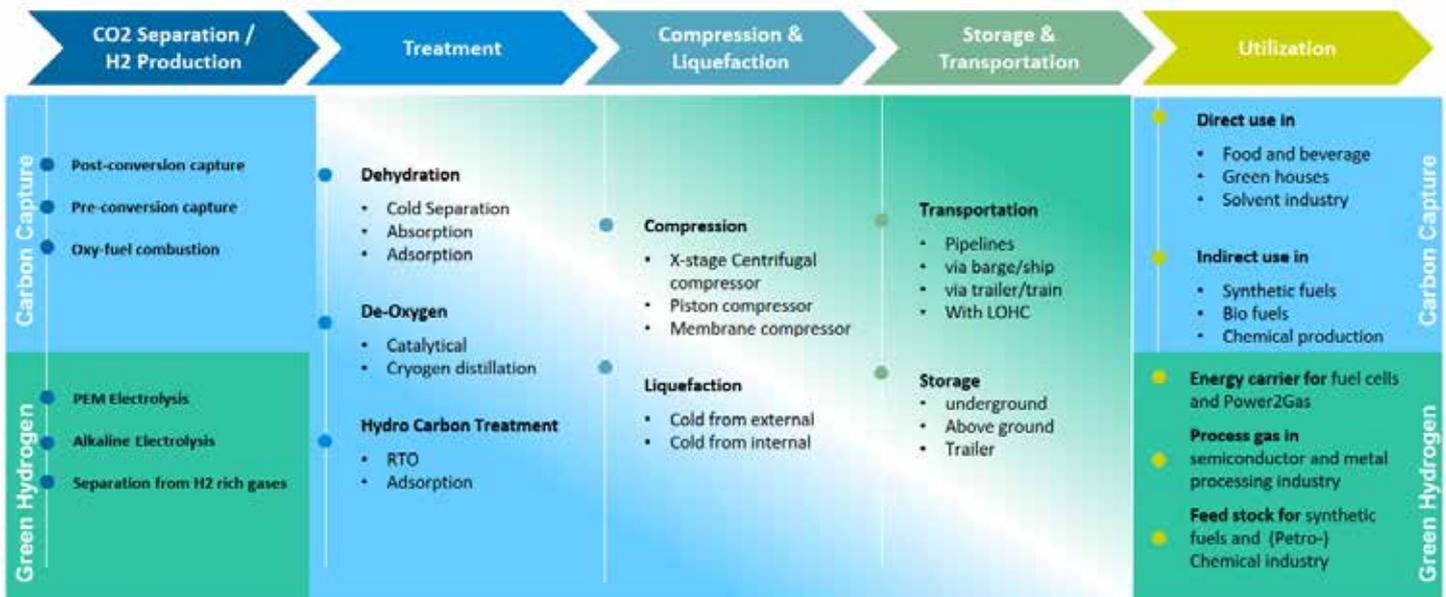
We are constantly implementing efficient digital tools that are able to upgrade the quality, timing and safety of our service. We are also presenting to our clients some of those, which fit their needs and business objectives. For investors those may be small steps into the digitalization and increasing production efficiency. I must

INTERVIEW / *George-Florin Prunaru*

say that before the Covid-19 outbreak, a very small part of them embraced this as future investments. Due to the pandemic situation, more and more of our customers get interested in adding the digital technologies and solutions to our scope.

There are several different fields in which digitalization is currently developing, and we are checking each of them. No doubt that they can bring significant improvement to design, construction, or productivity. For instance, using the virtual reality and BIM modelling, we are holding safety audits on distance. Virtual reality (VR) technologies let us experience visiting the facility during the design phase, as if it's already built. Specialists see their creation full-scale, feel its spacing; any non-conformity is immediately marked in the model, and a design solution is reconsidered to mitigate risks.

Once of the best and most demanded VR features is an opportunity to hold meetings inside the model. Participants of such meetings see and hear each other, may point on objects inside the model and discuss design solutions. You don't necessarily need to join such meeting from the same room. In the end, we are saving costs for a client on time and



Investor's way towards energy transition with Bilfinger Tebodin services



travel, as well as doing design changes cheaper and easier; implementing them in a model, instead of fixing it during or after the construction is completed.

What are Bilfinger Tebodin's future plans for Romania and/or Hungary/region?

Our organisation in Central and Eastern Europe has clear objectives to grow. We are naturally driven by developing expertise in those sectors where the market is growing. For instance, in South-East Europe we focus on automotive market and electromobility, getting involved in all types of projects related to this industry – from raw materials for EV batteries to final assembly lines. Renewable sector is our strategic objective as well, with particular focus on biofuels, wind, and solar projects. As for the oil and gas market, I see a strong move towards petrochemicals. Therefore, we are growing our expertise to help companies in this transition from conventional fuels to fine chemicals.

When it comes to services, I see more and more companies coming to us with a request for consulting support on their planned investments in Romania, Hungary, or nearby countries. Such profound approach to project execution is a totally different way of thinking. Precise planning from the early stage and involving technical experts who have the local knowledge allows the investor to mitigate dozens of risks and delays on later project stages. We have decades of project experience to predict those challenges, so for such clients we focus on good consulting services from the start, using extensive knowledge of our network.

Additionally, there is a growing demand for process technology integration in industries like food or automotive. Investors usually have their own technology or the one from a licensor, and they need it to be integrated into a production facility in a best possible way. Once done right, it enables maximum efficiency, flawless logistics and a smooth operation. ■



Virtual Reality (VR) design review session

Romp petrol Opens 10 New Fuelling Stations in Romania

The distribution division of the KMG International Group (Romp petrol) recently opened 10 new gas stations in several regions of Romania. Two of them were opened under the auspices of the Kazakh-Romanian Energy Investment Fund (FIEKR) - the station on Zetarilor Street in Bucharest, respectively the second station in Lugoj, Timis County.

They will serve heavily trafficked areas, one in Bucharest, in the southern part of the capital, on one of the inner rings that connects the east and the west of Bucharest, and the other one, Lugoj 2, a transit station, located on the city ring.

The new stations have shops and restaurants under the 'hey' brand, high-performance fuel pumps, including a fast pump and AdBlue in Lugoj station, LPG skids and a modern car wash in the station on Zetarilor Street, in the capital. Also, the new station in Timis County will have the capacity to charge electric vehicles.

"We undertake the commitments made in front of the FIEKR shareholders, and, implicitly, in front of the Romanian state, through investments that will benefit both the national energy system, but also the communities in Romania. The two stations are part of the overall strategy set out in the fund's development programs. Despite the difficult period our Group is going through, we find the necessary resources to continue our way, and to contribute to Romania's energy development in the future," said Iskander Abdibaitov, General Manager of the Kazakh-Romanian Energy Investment Fund.

By opening the two stations under the auspices of FIEKR, Romp petrol has created over 30 new jobs. Currently, the Kazakh-



Romanian Energy Investment Fund has developed a network of over 30 gas stations operating under the Romp petrol brand and undertook the goal to reach a number of 84 gas stations in Romania by the end of 2023 (acquisition and modernization of existing stations, development of new stations), which will create over 1,000 jobs, with over 5,000 people involved in various stages of development (design, execution, actual construction) and over 1,200 business partners.

Also, another 8 new stations were opened under the Romp petrol franchises. These are three Romp petrol Partner stations, in Alba, Prahova and Arges counties, but also five Romp petrol Express stations, in Caras-Severin, Hunedoara, Galati, Suceava and Olt counties. They will operate in compliance with the quality standards imposed by Romp petrol, and their opening has created approximately 50 new jobs.

Romp petrol Downstream operates a network of over 1,000 gas stations in Romania, and the Romp petrol brand is also present in countries such as Georgia, Bulgaria, and the Republic of Moldova, where it operates, in total, over 240 gas stations. ■

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CCUS to Play Key Role in Energy Transition

OIL AND GAS EXPORTING COUNTRIES LOW-EMISSIONS STRATEGIES

Carbon capture, utilisation, and storage (CCUS) is an important emissions reduction technology that can be applied across the energy system. Also, CCUS could play a key role in oil and gas exporting countries low-emissions strategies increasing the resilience of core sectors of their economies in the era of the energy transition. The Oxford Institute for Energy Studies explains the most relevant things to consider when implementing this technology.

Increasing the resilience and competitiveness of the energy sector can take different forms. The most obvious strategy is to invest in renewables, such as solar and wind and green hydrogen, which in addition to energy efficiency programmes and energy pricing reforms, can optimise the energy mix and reduce CO₂ emissions and create new sectors. Also, such technologies could be integrated with existing hydrocarbon infrastructure to reduce emissions in oil and gas production. Most oil and gas exporters have great potential for renewable energies due to high levels of irradiation, and wind potential in some. Also, many countries, particularly in the Gulf, have fewer limitations on the use of land for construction of wind and solar farms.

But the margins in renewables are small and can't fully substitute for the rents generated by the hydrocarbon sector and thus exporters could work towards ensuring that their production processes and core hydrocarbon products can also compete on the emissions front. This involves reducing emissions from both the production process and in the consumption of gas and products derived from crude. Regarding

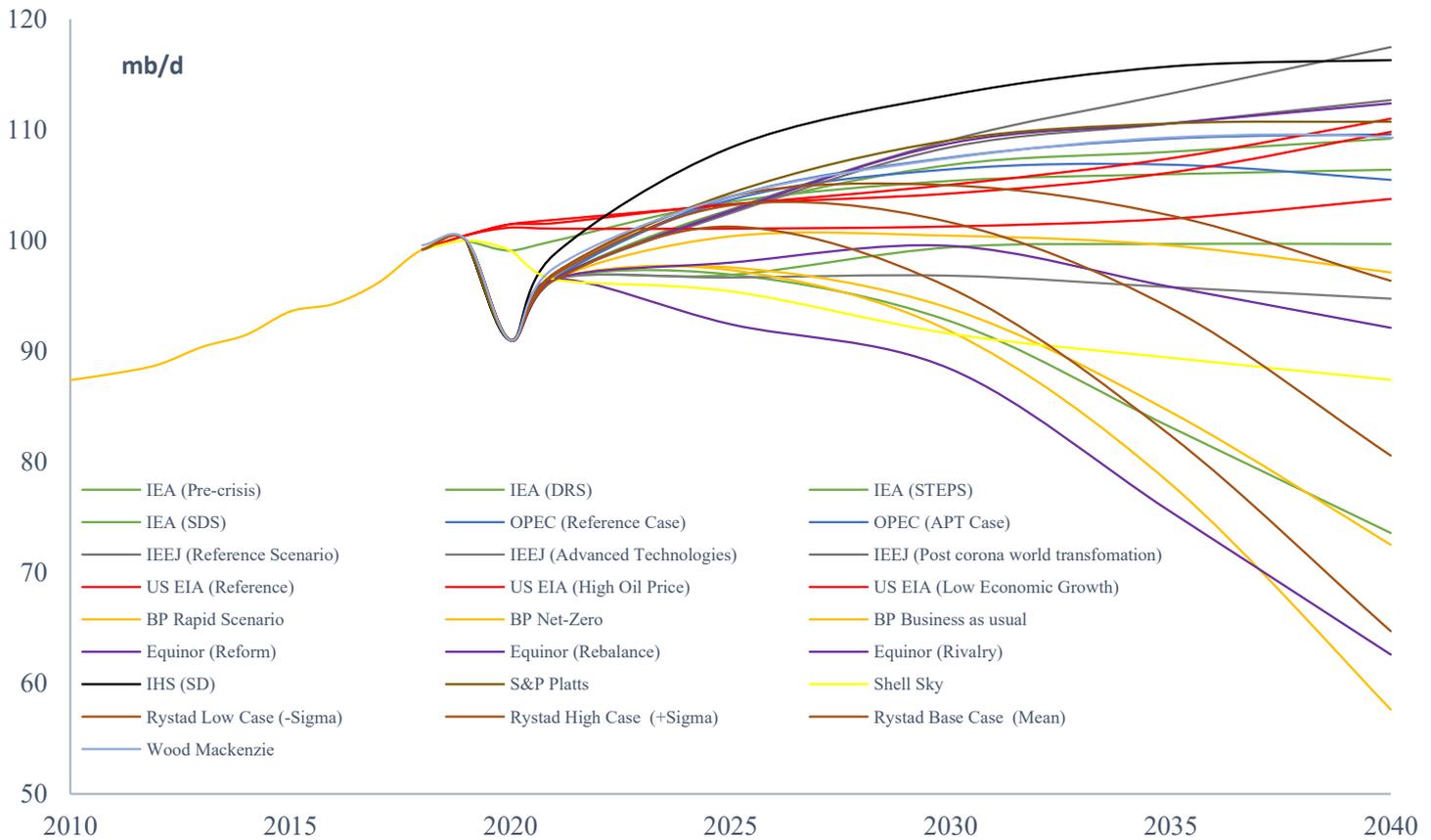
the production process, some oil and gas exporters such as Saudi Arabia are already in a relatively better position compared to other producers due to the low carbon content of their crude and their heavy investment in infrastructure to reduce gas flaring and methane emissions.

However, the real challenge lies in reducing emissions from the consumption of the gas/petroleum products. This is where CCUS can play an important role in oil and gas exporters' policies and strategies for a few reasons.

First, global deployment of CCUS is needed to help achieve the goal of net zero emissions given that oil and gas are projected to remain an important part of the energy mix at least for the foreseeable future. Models projecting long-term oil demand are highly sensitive to the underlying assumptions (GDP growth, population growth, carbon prices, transformations in the transport sector) and the purpose of the underlying exercise and therefore the uncertainty surrounding oil demand projections is very wide. But even in the most aggressive scenarios, oil demand will remain part of the energy mix, though in the most aggressive scenarios the decline is quite substantial. A similar picture emerges for projections of natural gas demand. There are several forecasts that would imply a significantly lower demand for hydrocarbons, some even forecasting no role for hydrocarbons in the energy mix with the combination of clean electrification and green hydrogen delivering the net-zero emissions by 2050. But even assuming new oil and gas developments cease in 2021, the IEA Net Zero Roadmap still suggests 7.6 Gt (gigatons) CO₂ being stored in 2050.

Second, CCUS could reduce the cost of meeting climate targets as other sectors have to pursue more expensive mitigation options and CCUS enables

Selected Global Oil Demand Scenarios, mb/d



Source: Various Reports

continuing access to lower cost fossil fuels. Also, in many models, CCUS plays an important role in achieving the 2°C scenario. For instance, researchers find that CCS plays a key role in all models' mitigation portfolios that they investigate and while the range of CO₂ captured varied widely between models (up to 3050 GtCO₂ cumulatively until 2100 in some instances), none of them captured less than 600 GtCO₂. Interestingly, the authors do not find a decreasing role for CCUS over time. However, not everyone accepts this conclusion, and some models predict the role of CCUS to fall over time and it not constituting a core decarbonization technology.

Third, the Intergovernmental Panel on Climate Change (IPCC) scenarios rely on the availability of carbon sinks (either biological or geological) to achieve negative emissions and the 1.5-degree goal.

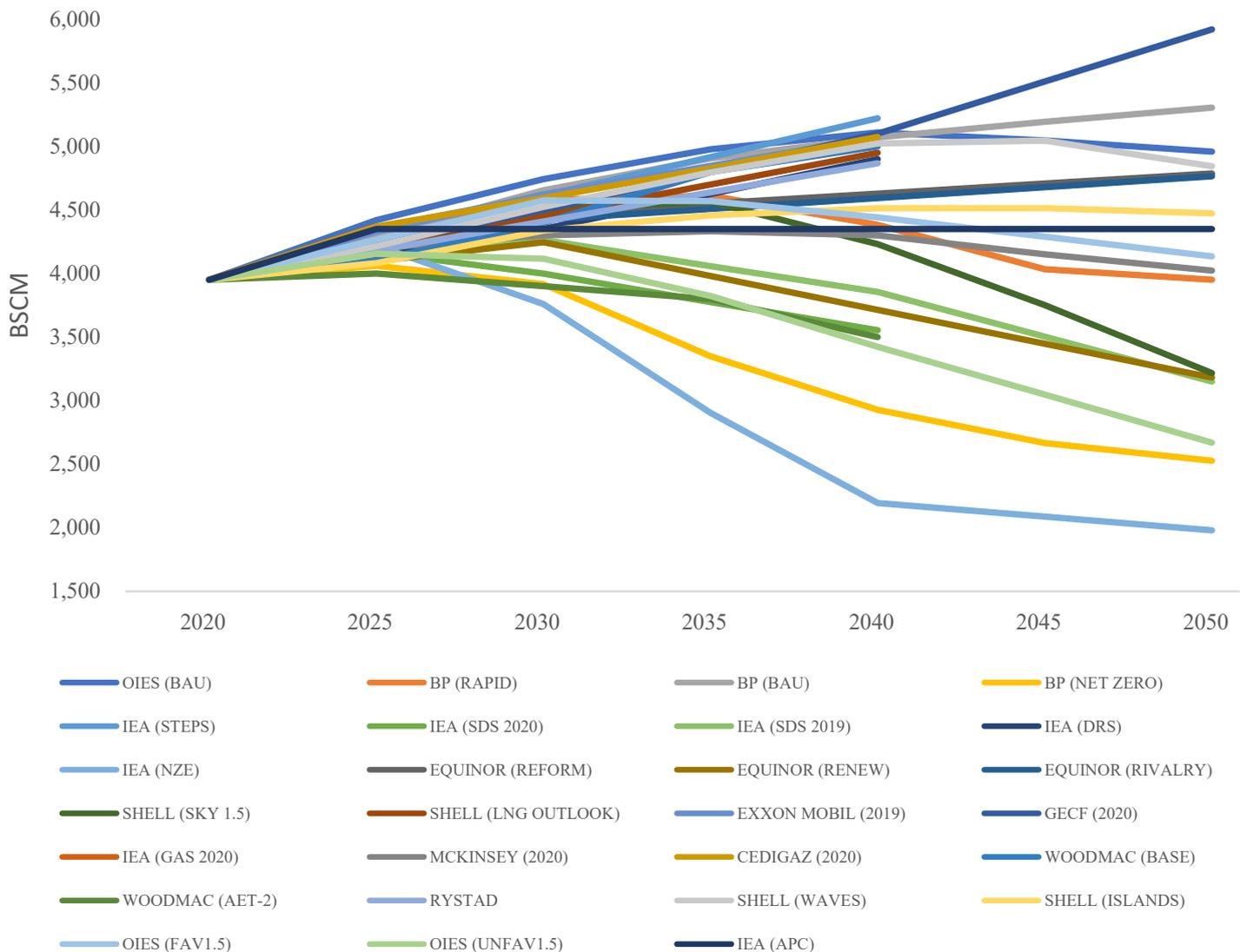
Recently, Germany has been focusing on negative emissions with the country's energy agency (Dena) urging the government to develop a strategy to rapidly upscale and deploy negative GHG emissions technologies to meet its climate targets, recognising that investors will need financial incentives such as integrating CO₂ removal credits in the EU emissions Trading System. CCS offers long

lived storage solutions that can complement nature-based solutions which offer shorter lived storage options. Oil and gas producing countries are well endowed with geological sinks. These could be used as part of CCUS to decarbonise hard-to-abate sectors and provide an option via DACCS to achieve negative emissions.

Fourth, for some energy intensive hard-to abate sectors such as steel and cement, technical options to reduce emissions without CCUS are currently limited. Given that energy intensive industries are at the heart of industrialisation and development strategy of many hydrocarbon-rich countries, CCUS is an essential technology to decarbonise and maintain the competitiveness of these sectors in a world with carbon taxes.

Fifth, this is a sector where some exporters could establish a clear comparative advantage and contribute to emissions reduction given their

Selected Global Gas Demand Scenarios, BSCM



Source: Various Reports

geological storage capacities and access to depleted fields, existing infrastructure, and the expertise built over the years. Developing a CCUS sector would also complement their efforts of diversifying into new sectors and finding new opportunities to utilise carbon.

Finally, for instance by limiting consumption or extraction of hydrocarbons reserves, are economically intrusive and do not constitute a solution on their own. The analysts also argue that 'policies focused on emission rates make tension between growth and climate protection seem inevitable' especially in oil and

gas exporting and developing countries that rely on hydrocarbons to fuel their economies. Instead, other experts propose that the climate change problem is reframed as a stock rather than a flow problem, one similar to an industrial waste disposal problem where fossil fuel producers can continue to extract their reserves but are required to dispose a certain fraction (known as the sequestered adequate fraction of extracted or SAFE) of the carbon dioxide from the products sold through deploying technologies such as CCUS and DACCS. If cumulative emissions don't exceed some allowable total, which requires adjusting SAFE over time, fossil fuels reserves can continue to be extracted and consumed.

Thus, the deployment of technologies such as CCUS provide oil and gas exporters with the opportunity to continue to monetise their reserves sustainably in a net-zero emissions world while contributing to mitigation. This contrasts with demand side policies such as carbon tax which focus on emissions reduction, but also other supply side policies which aim to reduce emissions by limiting the consumption and the extraction of hydrocarbon reserves. Other analysts note that many of the current supply side policies are underpinned by the belief that ‘continued investment in fossil fuel exploration, extraction, and delivery infrastructure makes global climate protection objectives much harder to achieve’ and thus policies that discourage the extraction of fossil fuel can complement demand side policies. The movement of divesting away from fossil fuels and/or measures to increase the cost of finance and reduce the flow of funds to hydrocarbon projects fall within such supply side policies. Many private and development banks have announced that they will no longer finance certain fossil fuel projects with the Asian Development Bank being the latest institution to announce that it plans to end financing of coal fired power projects and oil, gas, and coal mining. Others have warned against the risks of financial institutions being exposed to fossil fuels which could lose value overtime posing a systemic risk for the global financial system. As such there have been increasing calls for mandatory climate risk disclosure, with the Group of Seven (G7) rich countries recently supporting measures to force banks and companies to disclose their exposure to climate-related risks. Governments can also rely on regulatory frameworks, for instance by restricting leases for the development of hydrocarbon reserves or infrastructure. Recent examples include the U.S. Interior Department’s plans to cancel oil and gas lease sales from public lands and the decision by the Biden Administration to cancel the Keystone pipeline. Another example is Spain’s recent decision to end its limited fossil fuel production by 2042 under its new climate law. Other instruments include paying resource owners to keep their fossil fuels underground, but such schemes have failed to gain traction.

Surprisingly, technologies such as CCUS do not feature heavily in such supply side policies. Many remain sceptical about the role of CCUS as a climate mitigation technology, citing factors such as its high cost and fears around the safety and permanence of storage. Sceptics argue that CCUS can also perpetuate the use of fossil fuels and discourage change in societal behaviour and reinforce existing dependencies and power structures. It is also argued that CCUS could discourage countries from pursuing clean technologies. As such, the support for CCUS is weak, especially from some NGOs and the wider public. For instance, Climate Action Network Europe calls for natural carbon sinks to ‘continue to be prioritised in any consideration of the need for net negative emissions’; that ‘CCS must not be used in the EU power sector’; that ‘BECCS should not now be part of a pathway towards net-zero or net-negative emissions as the current EU’s long-term target can and should be reached by other means’.

However, as noted by some analysts ‘worthwhile policies should be pursued in their own right. Solving climate change is too important to be held hostage to any other issue.’ Also, supply-side policies that focus on restricting the use of oil and gas amplify the distributional impacts of climate change policies making hydrocarbon exporters worse off, even if one considers the benefits from reduced threats from climate change. They ignore the political economy of oil and gas producers and the central role the hydrocarbon sector plays in their economies. Such proposals are also short, or even absent, in identifying concrete mechanisms that could help producers in their adaptation process. Also, to expect oil and gas exporters to keep their resources underground, and/



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or fully diversify away from the oil and gas sectors which constitute their core competitive advantage, and, for this strategic sector to play a lesser role in the transition process, is not only unrealistic it is also sub-optimal, as these economies will limit their scope for risk reduction and adaptation strategies in the face of a potentially disruptive shock.

Policies focused only at restricting the supply of hydrocarbons can risk disincentivising oil and gas exporters from playing a more constructive role in climate change negotiations and reducing their incentive to be part of the solution to climate change, especially in the absence of a global framework that channels funds (for instance through the establishment of Green Funds) to help these countries adapt to the disruptions of the energy transition.

Many oil and gas exporters recognise the climate change threat and are adopting a fundamentally different approach from the past and have shown a willingness to employ technical and financial resources and lead on initiatives to fight climate change. For instance, Saudi Arabia has been advocating the Circular Carbon Economy (CCE) approach and its 4Rs (Reduce, Reuse, Recycle, and Remove) to confront the challenge of climate change. Of these 4Rs, 'Remove' is key as it enables oil exporters to exploit their resources while reducing net emissions through the deployment of technologies such as CCUS and DACCS. From oil and gas producers' perspective, carbon sink-based mitigation strategy can reinforce certain principles which are key for a smooth energy transition. These include:

- The recognition of national circumstances in climate change negotiations.
- The recognition that there will be various transition paths depending on starting points, core competencies and existing assets of each of the countries. Insisting on a single path and selecting winning technologies while excluding other technologies leading to an inefficient transition.
- The concept of a 'just transition' and the recognition that adjustments cost is not uniform across the globe and therefore the importance to offset some of the adverse impacts through the establishment of mechanisms that allow for cost sharing and reducing the adjustment cost for the most affected countries.

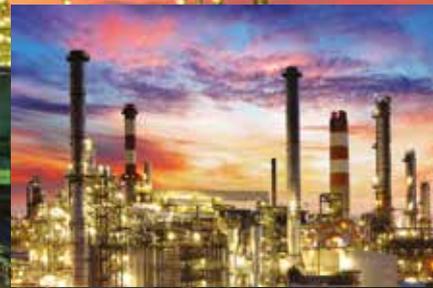
Conclusions

The energy transition and the road to net-zero emissions will create serious challenges for all oil and gas exporters, though this group is far from homogenous, and some are in a better position to adapt to these challenges. Diversifying away from the oil and gas sector is often presented as an effective transition strategy to confront these challenges. However, diversifying from this core sector is fraught with risks and most oil and gas exporters have not implemented the reforms essential for the success of such a transformation. A complementary transition strategy would be to increase the competitiveness and the resilience of the oil and gas sector. This would allow oil and gas exporting countries to draw on their sources of competitive advantage to mitigate the potential impacts associated with the energy transition.

Rather than just compete on cost alone, exporters could also

compete on reducing emissions both from their oil and gas activities and in the consumption of final petroleum products. Technologies such as CCUS that store carbon in terrestrial sinks could allow these countries to continue to monetise their hydrocarbon reserves while simultaneously harmonising the transition to a net-zero emissions world and enabling CCUS as a key mitigation sector and one in which some oil and gas exporters could establish a competitive advantage. This requires exporters to take a more active role in developing and scaling up CCUS and geological storage through investments in the sector. Higher capital and operations costs reduce the return on projects compared to exporting unabated gas and oil, and this strategy comes at a cost. But these costs could be lower than those associated with diversifying into new non-energy sectors; CCUS can support current industrialisation strategy into energy intensive industries; these costs are expected to reduce over time; and above all these costs could increase the competitiveness of a key sector in a carbon constrained world. Furthermore, the cost of doing nothing could prove to be much higher.

However, it should also be recognised that producers' economies would have to undergo some of the deepest transformations and shifting the costs to producers alone is not viable. If the costs are too high or domestic competition from other sectors for the use of hydrocarbon revenues intensifies during the transition, then scaling CCUS to levels that are needed for it to be an effective mitigation strategy will not materialise in these countries. Here lies the importance of developing burden sharing frameworks and mechanisms that allow for the costs to be shared more equally both across the supply chain and between exporting and importing countries. From the perspective of achieving net-zero emissions, this could enable a key mitigation strategy to help countries achieve their ambitious targets. From a producers' perspective, it allows producers to play a more active role in climate change negotiations and encourages them to be part of the solution through utilising their own expertise and financial and geological resources. It could also help these countries diversify into new sectors which could ease the burden of the transition. These objectives can be achieved through frameworks and mechanisms that assign value to CO₂ storage and linking it to multilateral frameworks for financing. While various challenges are posed, the benefits could be high. In addition to enabling a key mitigation technology, it reinforces certain key principles such as the emphasis on national circumstances, common but differentiated responsibility and a just and inclusive energy transition. ■



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Increasingly Expensive Fuels in Romania

OIL PRICE: WHERE TO NEXT?

Not only gas prices reached record levels in the first half of this year, but also the price of fuels sold by major players on the domestic market returned to the pre-pandemic quotations. Taking advantage of Romanians' appetite for holidays or weekends at sea or in the mountains, the distributors significantly increased the prices for gasoline and diesel, which again broke the psychological threshold of RON 6/litre.

by Daniel Lazar

A tendency of the recent years was to transform the traditional fuel distribution stations into real minimarkets or even financial services centres, the gains from non-core services being increasingly high.

This trend is surprising in conditions in which the sales of hybrid or electric vehicles advance every year, stimulated by vouchers or the young people's appetite for less polluting vehicles.

Even if they are increasingly scarce, private distributors also have a reasonable market share, and names such as Oscar Downstream, Smart Diesel, RBC or Carbogaz are known at national or regional level.

Domestically, OMV Petrom increased diesel production and tripled kerosene production to cover the market deficit after the closure of the Petromidia refinery, said Radu Caprau, member of the OMV Petrom Executive Board, responsible for Downstream Oil.

In conditions in which Petromidia refinery, the largest in Romania, was closed following an explosion, the pressure moved to the other producers in the market.

"First of all, as operators in this oil and gas industry, we cannot help but be affected by what has happened. On the wholesale diesel side, we saw a 60% increase, which we covered from domestic production and third-party purchases. In terms of aviation jet, we have increased production three times to cover this deficit. Regarding gasoline, we directed the flows that were provided for export to the domestic market. It is a challenge for the whole industry, in the context in which we see the increase in demand for all products, but now we are doing everything we can to cover this unforeseen deficit in the supply area," said Radu Caprau.

Internationally, fresh out of the European Union, the United Kingdom has announced that new cars and vans powered entirely by gasoline and diesel will no longer be able to be sold in the Kingdom starting with 2030, the announcement being made by Prime Minister Boris Johnson. The measure is part of what the prime minister calls a 'green industrial revolution' to combat climate change and create jobs in industries such as nuclear. The plan also provides for an investment of GBP 1.3 billion in charging points for electric vehicles, in conditions in which subsidies for electric vehicles buyers will amount to GBP 582 million.

Globally, things seem to lead to a growth scenario for oil prices, given that the transport tariffs have increased, and production (and quotations implicitly) is dictated by the major regional producers. Some analysts dare to say that the price could exceed USD 100/bbl, in conditions in which in the first six months of this year it increased by 45%. In reply, many refineries in China have started to consume their oil reserves, which would mean cutting demand from the largest fuel importer in the world.

All we have to do is wait for the coming months to see what the global trends are. ■



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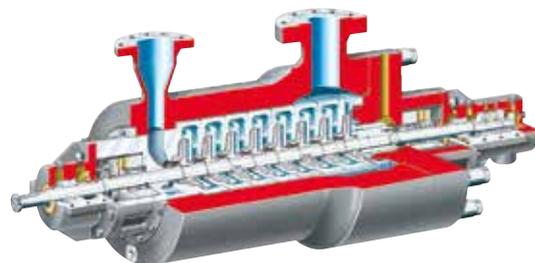
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WALKING A TIGHTROPE

Natural Gas Prices Hit New Heights

According to the recent Quarterly Gas Review from the Oxford Institute for Energy Studies (OIES) the natural gas market could effectively ‘walk a tightrope’ through the winter as the market tightness will persist, resulting in an extended period of relatively high prices.

by Daniel Lazar

More than a year from the onset of the health crisis that kept mankind in lockdown for several months, global economy seems to show visible signs of syncope, especially as regards provision of raw materials (or rather their transport), which led (is this only the beginning?) to price increases and delays in product delivery.

The cost of natural gas and electricity has surged across Europe, reaching records in some countries, as businesses re-open and workers return to the office. In Europe, plans to decarbonize the economy are also playing a part as utilities pay near-record prices to buy the pollution permits they need to keep producing power from fossil fuels.

The gas industry does not seem to be left unscathed by these disruptions in an economic chain whose missing links seem to spread more shock waves than we would have expected.

A ‘headline issue’ of recent months that has gone together with the gas price rally was the dramatic draw-down of European storage stocks in the winter of 2020/21, and the subsequent slow rate of storage injections that has accompanied the sustained high European price levels.

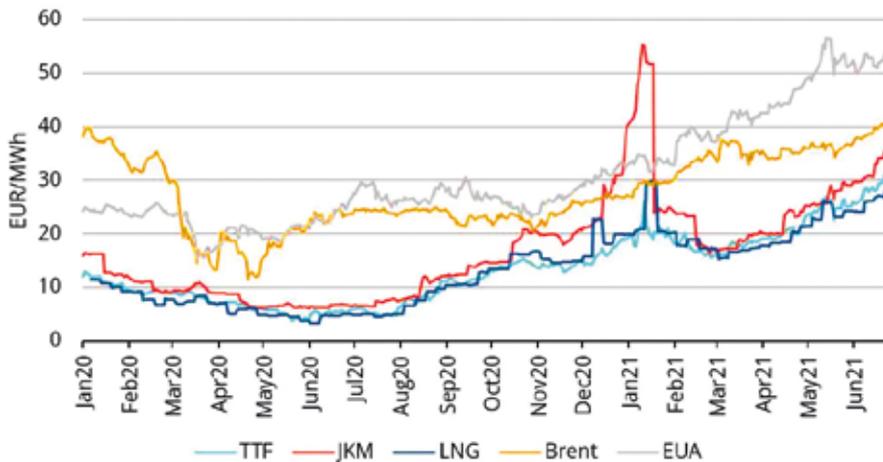
In Q2 2021, the most notable development has been the slow

pace of stock replenishment. A return to net withdrawals in the second half of April meant that stocks on 1 May were lower than on 1 April, thus delaying the start of the injection season by a month. Since then, injections have proceeded slowly. As a result, stocks held on 27 July 2021 (58 bcm) were slightly lower than on 27 July in 2017 and 2018 (62 bcm and 60 bcm, respectively), and significantly lower than stocks held on 27 July in 2019 (83 bcm) and 2020 (88 bcm). For stocks to reach even 80 bcm, by the end of the injection season in October 2021, net storage injections will need to accelerate in the coming months.

Starting the winter with significantly lower stocks than has been usual for the past several years will reduce the ‘buffer’ that Europe must cope with market fluctuations during the coming winter, thereby increasing the likelihood of price surges should any significant shift in the supply-demand balance occur, for example due to weather or supply issues.

Therefore, European Union’s gas reserves are way below the normal levels and if they are not supplemented by October the Community bloc could face problems in terms of prices, like those from last winter, analysts warn. The European Union has the capacity to store over 117 billion cubic meters of natural gas, or approximately one fifth of its annual consumption, according to Gas Infrastructure Europe. The storage facilities were full a year ago, which allowed the Community bloc to withstand without any problems an unusually long winter, which has caused global gas prices to rise since January.

“Going into the current winter with less in storage, Europe is walking a tightrope - and it wouldn’t take a huge gust of wind to knock us off,” said Jack Sharples,



Energy prices, 2020-2021 | Source: Elenger

a research fellow at the Oxford Institute for Energy Studies. “All it would take is for some (liquefied natural gas) projects currently offline to not come back on, or some unplanned maintenance on a pipeline bringing gas into Europe, or just another cold winter.”

Currently, EU storage facilities are filled to only 60 percent capacity, or just under 70 bcm of gas. That needs to get up to at least 80 bcm by October 1 to ensure a proper buffer against market fluctuations through winter, Sharples added.

The EU has the capacity to store over 117 billion cubic meters (bcm) of natural gas, or roughly a fifth of its annual consumption, according to Gas Infrastructure Europe.

Data from the IEA showed European gas consumption rose by an estimated 25% in the second quarter of 2021, its largest year-on-year quarterly increase since at least 1985.

“A rise in gas and power retail tariffs will come as a shock to users this winter. Wholesale prices are still rising along with other generating fuels globally so there is no clear end in sight yet,” said Glenn Rickson, head of European power analysis at S&P Global Platts.

In turn, James Huckstepp, gas analyst at S&P Global Platts, mentioned that “Europe managed to get through last winter relatively unscathed, as we had such high storage stocks at the start”.

Prices collapsed during the lockdown due to extremely low consumption

Part of the reason why the stocks were so high in 2020 was that the pandemic blocked the economy, creating a massive supply source that made prices fall to USD 3 per million British Thermal Units (mmbTU). Also, in March 2020, Europe cancelled US LNG shipments, which would have ensured a gas quantity higher than needed at the moment.

Nord Stream 2: only 15 kilometres left to be built

Under these circumstances, regional gas supply, for smaller distances, seems



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to be the emergency solution or even the winning one in the long run. In August 2021, Russian President Vladimir Putin mentioned that only 15 kilometres were left to be built until the completion of Nord Stream 2 gas pipeline, which will carry gas from Russia to Germany. After talks with German Chancellor Angela Merkel, who visited Moscow, the Kremlin leader said Russia intended to fully comply with obligations on gas transit through Ukraine.

Vladimir Putin said Moscow was ready to deliver gas through its neighbour even after 2024, but Russia should first understand the scale of demand for its fossil fuels. "And for that we need to get an answer from our European partners on how much they are ready to buy. We cannot sign a transit contract if we don't have supply contracts with our consumers in Europe," Russian President mentioned.

Gas prices exploded

Nord Stream 2 is awaited with great hopes by all those involved, as European gas prices have reached record levels this year due to low LNG supply. In mid-August 2021, gas prices reached in Europe a new record, exceeding the threshold of USD 585/thousand cubic meters. The increase comes after Russia's decision to cover only 4% of the additional gas transit capacity offered by Ukraine for September. "Russia is currently the only country that could have a surplus production, but to increase its exports it should book additional capacities through Ukraine," indicated Platts, the price index evaluation organization. The representatives of the organization also said that the price of natural gas in Europe is caused by the increased demand, after a cold winter and by the decrease of other sources of supply. "A decrease in Mallnow (gas station) flows reduced Russian imports by 30-45mcm/day as of July 31. Although historically Gazprom supplies were secure and problems were solved quickly and we expect the flows to return to over 80 mcm/day, Gazprom's strategic evolution to focus on value in relation to volume in 2020-2021 could bring lower flows for longer".

Despite the dramatic rise in European hub prices in Q2 2021, on the back of a tightening supply-demand balance, Gazprom's sales via its Electronic Sales Platform (ESP) were once again limited in volume, and sales for near-term delivery were almost entirely absent.

In Q2 2021, Gazprom sold 3,029 mmcm via the ESP, which was a significant rebound from the 813 mmcm that was sold via the ESP in Q1 2021. However, the sales in Q2 2021 were lower than those in Q2 2019 (3,741 mmcm) and Q2 2020 (9,881 mmcm).

Gazprom should have ensured the transit of 40bcm of gas per year through Ukraine and purchase additional capacities if needed. This in conditions in which Russia purchases an important additional transit capacity when its gas pipelines that bypass Ukraine supply gas to Europe at full capacity.

The tightening global gas market

According to the Oxford Institute for Energy Studies, the rapid rise in global gas prices this year has reflected a tightening global gas market. The reasons for this have been widely discussed within the industry by participants and commentators. The cold winter prompted a significant rise in demand, especially in Northeast Asia, and strong demand has continued as the world economies recover from Covid-19. Supply has also been constrained by a few issues surrounding LNG plants around the world as well as Nord Stream 2 not being completed.

With European hub prices climbing to record levels for this time of year, a question that has been increasingly asked by analysts is whether Gazprom – as the single largest supplier to the European market – is pursuing a sales strategy that aims at leveraging its market power to maintain such prices.

Specifically, is Gazprom 'holding back' volumes to ensure the market remains tight, by not booking (and utilising) additional transit capacity via Ukraine?

OIES Quarterly Gas Review's conclusions

To conclude, the overall picture in Q2 2021 was that of a tight market at a global level for LNG (as evidenced by OIES 'LNG tightness' analysis) and in Europe (accompanied by higher coal and carbon prices). Looking forward to both Q3 2021 and the coming winter of 2021/22, it is possible that this market tightness will persist, resulting in an extended period of relatively high prices. This certainly seems to be the market sentiment, given the forward prices in Europe (TTF) and Asia (Argus NorthEast Asia) through to Spring 2022. Throughout Q3 2021, the signposts we will continue to look for are the rates of storage injection in Europe, the start-up of Nord Stream 2, and developments at LNG export terminals that could bring back supply that is temporarily offline, plus new projects coming onstream.

All these factors will influence the supply available to the global market, and by extension, the market situation at the start of winter. In the near term, Q3 2021 seems likely to experience a continuation of the trends seen in Q2 2021. Looking further ahead if the global market enters the winter period with lower-than-usual storage stocks in Europe, Nord Stream 2 not coming on during the winter, substantial LNG export capacity possibly still offline, and demand continuing to rebound, the market could effectively 'walk a tightrope' through the winter: a mild winter could pass without incident, but either a weather-related demand surge or a supply-side disruption could see prices once again surging, as they did in January 2020. ■

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Equipped with a new operating concept featuring a rotary switch and a touch display, operation of the M255 could not be simpler, even when wearing unwieldy work gloves. Furthermore, the new Sigma Control Mobil 2 (SCM 2) compressor controller allows the machine to be used in conjunction with multiple stationary systems in a compressor station.

The inclusion of lashing eyes as standard and climbing aids to enable safe access to the lifting eye make transportation safe and simple. The road-going version can be towed with a pick-up, for example, since it weighs less



Image: KAESER KOMPRESSOREN SE

The M255 is Kaeser's largest oil-injected portable compressor for the European and North American markets.

than 3.5 tons even when fully equipped, whilst the tandem chassis with overrun brake ensures maximum safety when towing and parking.

A look under the hood reveals various familiar efficiency features, such as the energy-saving fan, or the air filter with safety elements. But there is also something new: the oil separation system uses cartridges that can be screwed on and off quickly and easily to significantly reduce the time needed for maintenance.

There is also security for the system

itself. The M255 can be equipped with a modem to allow remote monitoring of the machine's location and operating data, so that the operator knows where the machine is at all times, how it is operating and what its status is.

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Fit for 55 Package: Speeding up Decarbonization

In the European Commission work programme for 2021, the revisions and initiatives linked to the European Green Deal climate actions and in particular the climate target plan's 55% net reduction target are presented under the Fit for 55 package.

by Adrian Stoica

The European Parliament adopted the new EU climate law, a project that raises the target of the European bloc to reduce greenhouse gas emissions (GHG) by 2030 from 40% to at least 55% compared to 1990. Under the new climate law, which João Pedro Matos Fernandes, Minister of Environment and Climate Action, called the “law of laws”, the EU takes the firm commitment to become climate neutral by 2050. With the adoption of Fit for 55 package, the European Commission should re-examine and, as appropriate, propose the revision of all relevant policy instruments to achieve further emission reductions in the perspective of 2030.

Achieving the target to reduce by 55% greenhouse gas emissions will contribute to the further reduction of air pollution, reaching a total reduction of 60% by 2030, compared to 2015. Therefore, the costs of harmful effects on health could drop, compared to 2015 levels, by at least EUR 110 billion. Boosting actions to combat climate change would also reduce



Under the new climate law, which João Pedro Matos Fernandes, Minister of Environment and Climate Action, called the “law of laws”, the EU takes the firm commitment to become climate neutral by 2050.

the costs of controlling air pollution by at least EUR 5 billion in 2030 and would contribute to mitigate other environmental problems, such as soil acidification, according to the European Commission.

Energy sector, the greatest reduction potential

By 2030, it is expected that the EU share of electricity production from renewable sources will be at least double compared to the current level of 32%, reaching approximately 65% or more. The increase in the level of ambition in terms of climate from the current target for 2030 to 55% and achieving climate neutrality by 2050 would save EUR 100 billion in EU's import bill during 2021-2030. The energy sector has the greatest potential of further reductions with low costs, beyond the existing policies, especially by avoiding fugitive (undirected, airborne) methane emissions from oil, gas and coal production and transport. These aspects will be addressed, among other things, in the future methane strategy.

Biological waste storage prohibited as of 2024

It is also expected that the waste sector will drastically reduce its emissions, especially due to the obligation of separate collection of biological waste as of 2024 and prohibiting its storage. Reductions will depend to a great extent on ensuring full compliance with the existing legislation. Turning waste into resources is an essential part of closing the loop in a circular economy, by reducing emissions throughout the industrial value chain. Moreover, wastewater treatment has an additional potential of cost-effective reduction, especially through a better management of sewage sludge.

Building renovation rate must be doubled

The construction sector, currently responsible for 40% of the final energy consumption and 36% of greenhouse gas emissions in the EU, has a major potential of emission reduction, in a cost-effective manner. Today, approximately 75% of EU building stock is energetically inefficient. Many houses are still heated by outdated systems that use polluting fossil fuels, such as coal and oil. To fully tap this improvement potential, the renovation rate, which is currently around 1%, should at least double by 2030.

Scientific Advisory Board at EU level

With the entry into force of Fit for 55 package, as part of the European Green Deal, a Scientific Advisory Board on Climate Change will be established at EU level. This independent board will have, inter alia, the task of providing scientific advice and report on measures, climate targets and indicative budgets to limit EU's greenhouse gas emissions, as well as on their consistency with the European Climate Law and international commitments assumed by

the EU under the Paris Agreement.

INECP to be updated

The Integrated National Energy and Climate Plan (INECP) of Romania will be updated in the context of the new targets to be assumed by the European Union. According to the current form of the plan, Romania has assumed a target of 30.7% for the share of renewable energy in 2030, compared to 24% set as target for 2020 and reached since 2017. The financial sources to support investments will come from the National Recovery and Resilience Plan and the Modernization Fund.

CO2 emissions fell by 5.2 Mt in Romania

According to EU-ETS data on carbon allowances traded in 2020 published by the European Commission, in 2020 Romania registered a decrease of 5.2 Mt of carbon dioxide emitted into the atmosphere by industrial facilities, according to an analysis by Bankwatch. A total of 32 Mt of CO₂ was emitted, compared to 37 Mt in 2019. Most industrial producers have reduced their emissions compared to previous years, especially coal-fired electricity producers, which have seen production declines amid declining electricity demand during the Covid-19 lockdown. However, coal is still ranking first in the top of industrial polluters. In 2020, coal-fired power plants in Romania had a production of 8,329 GWh and emissions of 8.28 Mt CO₂. According to the current form of INECP, Romania estimates that in 2030 it will have a coal-fired electricity production of 11,931 GWh and emissions will be around 11.86 Mt CO₂.

The price of emission allowances surged by 135%

In the European Commission's plan, emission allowances are a focal point of the decarbonization policy, and by imposing an additional cost on polluters, an attempt is being made to reorient them towards more environmentally friendly economic activities. According to an analysis by the brokerage firm XTB Romania, the price of allowances increased by 135% compared to 2020, to EUR 52.73, and could reach EUR 70 by the end of the year.

The increase in the price of allowances was supported by the recovery of economies, which took place earlier and with a greater speed than the markets expected, the quoted analysis also shows.

Non-polluting car purchases become mandatory

The Executive adopted a legal act to green the car fleet in state institutions and companies, according to EU Directive 2019/1161. The deadline for adapting the domestic legislation to the EU law is August 2, 2021, date after which the Government risks triggering infringement proceedings. The measure will lead however to an increase in expenses for vehicle purchases, which in Romania's case would be difficult to bear, especially by state-owned companies, many of them facing major financial problems.

More non-polluting vehicles in circulation

From August 2, 2021, in public or sectoral vehicle procurement tenders, contracting authorities and contracting entities will be required to comply with a number of minimum targets related to the share of non-polluting vehicles purchased.

Therefore, the draft GEO establishes that 18.7% of light vehicles purchased from August 2, 2021, until December 31, 2025, will have to be non-polluting, following to maintain the same quota in the period January 1, 2026 - December 31, 2030.

As regards the procurement of non-polluting heavy vehicles in the N2 and N3 categories (utility vehicles), the share of non-polluting vehicles must be 6% during August 2, 2021 - December 31, 2026, and 7% during January 1, 2026 - December 31, 2030. Also, 24% will have to be the share of non-polluting heavy vehicles in the M3 category (buses), of the total number of heavy vehicles included in this category, which are subject to public and sectoral procurement contracts awarded from August 2, 2021, until December 31, 2025, the share following to increase to 33% by December 31, 2030. Army vehicles and those used by the General Inspectorate for Emergency Situations (ISU) will be exempt from these environmental obligations.

How much would it cost in case of failure to comply with the imposed deadline

EU Directive 2019/1161 was adopted on June 20, 2019, and published in the Official Journal of the European Union on 12.07.2019. Failure to comply with the deadline of August 2, 2021, for the adoption of national legislation in accordance with the provisions of the directives is one of the most serious violations, and the infringement procedure can quickly move from the pre-litigation phase to the litigation phase, completed with conviction by the Court of Justice of the European Union (CJEU) in a relatively short time, is shown in the explanatory memorandum of the draft GEO. If it notifies the CJEU, the European Commission may propose in respect of Romania a lump sum of at least EUR 1,723,000 and penalties between EUR 2,082 and EUR 124,900, per day of delay, considered from the date of the reasoned opinion, sanctions that could apply cumulatively to our country, given that, since 2017, the European Commission has asked the CJEU to apply both the lump sum and delay penalties.

Romania, without a green procurement plan

On the other hand, Romania is among the last three EU countries that do not have an Action Plan for Green Public Procurement. At European level, the amount spent annually by authorities is on average 16% of GDP. In Romania, it reaches almost 19% of GDP - which means a huge volume of products, services, works purchased by authorities, with a major impact on the environment. The pace of green public procurement in Romania is extremely slow compared to the urgency with which measures on climate neutrality targets must be implemented, which thus cannot be achieved by Romania until 2050 (according to the EU objective). This is the conclusion of the first National Study on Green Public Procurement in Romania, conducted by ARDL - Romanian Association for Sustainable Local Development and ONV LAW. The European Union requires Member States to have at least 50% of total public procurement green, and in national legislation there is a 2018 Order requiring public authorities to comply with a number of minimum environmental protection requirements for 6 categories of products and services (printer paper, furniture, food and catering services, transport vehicles, cleaning products and services, office IT equipment). So far, there has been no formal instrument for measuring compliance with this obligation by authorities. Member States must adopt a National Action Plan for Green Public Procurement and most Member States are already at the 4th or even 7th edition of such plans (22 states).

CJEU has convicted Romania for pollution

This year, on April 30, the Court of Justice of the European Union published the Decision on the conviction of Romania for non-compliance with Directive 2008/50/EC on ambient air quality, the decision referring to exceeding the maximum limits allowed for PM10, in Bucharest, in the period 2007-2016, but also to the problems that the country registers in the process of combating pollution. In CJEU's presentation, one of the observations underlines the minimal impact of the 'Rabla Program' which, although applied for 12 years, in Romania three times more used cars are registered than new cars, and the vehicle fleet is one of the oldest in Europe. ■

The background of the entire page is a photograph of an industrial facility, likely an oil or gas processing plant. It features large white pipes, valves with prominent red handwheels, and a clear blue sky. A semi-transparent blue triangle is overlaid on the bottom left, containing technical drawings and the main text.

Challenging applications and tough environments

Ever since we first struck oil, it has been a vital asset to us. Every day we use hundreds of things that are made from oil or gas. In an industry with challenging applications and tough environments – Safety, reliability and innovation are key. And a global presence for local needs. It is hard to imagine the world without it. We are global – never far away. We believe in individual solutions. Atlas Copco – safe, high quality products that will increase your productivity.

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RENEWABLE HYDROGEN **Driver of Green Revolution in Europe?**



With more and more countries pledging climate neutrality, the world needs to find solutions to decarbonise every part of our economy. Because of its multifaceted and versatile nature, renewable hydrogen can play a key role in addressing the challenges ahead.

by Rona Rita David

Over the past 10 years, activities around green hydrogen have gathered pace in Europe. On this occasion, experts from Delta-EE specializing in energy transition conducted an unprecedented study to make a first inventory of this growing market. According to analyzes, green hydrogen should reach 50 times the production capacity created in recent years. However, this growth is way below the European Union's targets, established at 6 GW for 2024.

A center dedicated to studying green hydrogen in Europe

It's about Delta-EE, which has interviewed a sample of over 50 companies over the past 12 months to store information and visions on the green hydrogen market. "As hydrogen appears as a key component of decarbonization efforts around the world, it makes sense to centralize and formalize this expertise through a complete service. From now on, all players in the hydrogen market could benefit from strategic data and personalized assistance, to invest the best this energy for the future," said Arthur Jouannic, director of the French office of Delta-EE.

A year ago, interest in green hydrogen exploded following the ambitious national and European strategies. As a result, many projects were announced around Europe, claiming that hundreds of megawatts or even gigawatts of green hydrogen production capacity would be installed in the next few years. Delta-EE decided to identify the green hydrogen projects that are currently operational and those that will probably start by 2025.

Germany provides half of the European renewable hydrogen production

According to the study, Europe can currently produce 56 MW, i.e., approximately 4,700 tons of green hydrogen per year. Half of this production is consumed by the transportation industry

and approximately one third is used to decarbonize industrial applications, such as petrochemical refining. Germany is the leading state as far as hydrogen is concerned. The country provides almost half of the European production, while no other country produces individually 10 MW. However, the sector is in full swing and large projects are planned this year in Spain, the Netherlands and Denmark, where 10 MW of green hydrogen will be produced by 2020 and 100 MW by 2025.

To support this growth, large producers, such as Nel Hydrogen, ITM Power, Cummins and McPhy, they all build new plants able to produce hundreds of MW or even GW per year. Nevertheless, very little time remains to plan, build, and commission the necessary tens of projects of 10 MW and 100 MW.

Pioneering the use of green hydrogen

The continuous exponential demand for green hydrogen, as well as the states subject to pressure can make funding for environmentally friendly hydrogen projects to continue to boost growth in the energy sector. However, it would be strategic to focus on larger-scale projects (more than 10 MW) intended for mixed industrial applications, rather than smaller transmission applications, which are more frequent today, Delta-EE specialists believe.

As regards renewable hydrogen, the results are therefore mixed. Even if there is a rapid growth of this key technology for reaching the zero carbon targets, we are still quite far from the established national and European targets, extremely ambitious. Today, the green hydrogen market is like an embryo. Ongoing projects are almost entirely funded by the European Union or by national funds, and stakeholders target the sectors in which public support is the greatest. At this stage, the market depends entirely on the huge capital made available by Green Deal and on the various national strategies on hydrogen. Hydrogen is a solution for the future and there are good reasons for this. Through its multidimensional and versatile nature, hydrogen can play a key part in solving future challenges. On the one hand, it can serve as an energy carrier or as a raw material. On the other hand, it can be used to store seasonal renewable electricity. Hydrogen has the great potential of facilitating decarbonization of industrial sectors 'difficult to decarbonize' and energy-intensive, such as the steel industry. Moreover, it can be used as green fuel for heavy transport, for which the current electric battery technologies are not practicable.

As the EU is moving away from its reliance on fossil fuels, hydrogen will play a key role in the future energy systems and in achieving the EU's carbon neutrality target by 2050. Due to a combination of renewable energy, smart storage, energy efficiency and flexible grids, the latest models estimate that clean and sustainable energy can be delivered at a large scale and at the necessary speed. Many experts predict that hydrogen will be at the heart of this transition.

What form of hydrogen is the most suitable for reaching our climate ambition?

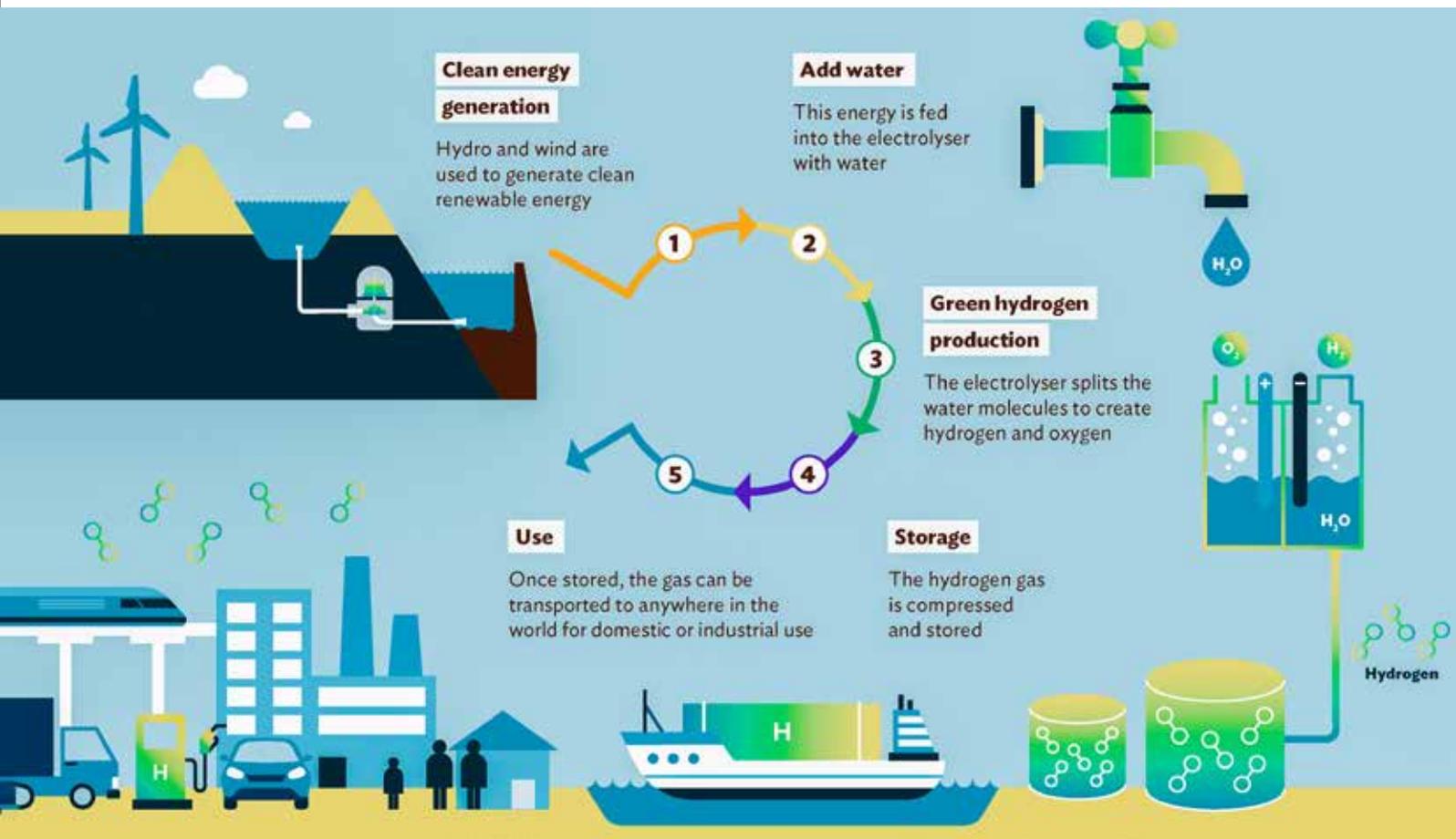
Hydrogen is the most abundant element in our universe but represents only a small fraction of the global energy mix in the EU. Today, less than 2% of energy consumption in Europe comes from hydrogen, which is mainly used to manufacture chemicals such as plastics and fertilizers. Moreover, 96% is produced from natural gas, and the production process emits significant amounts of CO₂. But how can hydrogen production be decarbonized?

The most important is the primary energy source to produce hydrogen. This source and the process used determine the degree of cleanliness or pollution of the finished product. Fossil hydrogen from natural gas is often named gray hydrogen and is the most common type of hydrogen used today. Low-carbon hydrogen, often called blue hydrogen, is also made from natural gas, but CO₂ emitted during its production is captured and stored underground, making it a cleaner, lower-emission option.

Low-carbon hydrogen can play a transitional role to replace gray hydrogen. The cleaner option, however, is renewable hydrogen, i.e., that... green hydrogen. It is obtained from renewable energy sources (wind and solar power, through an electrolyzer). Because the only by-product is water, production is almost zero-emission, which is why it is the form of production that attracts the most interest - from policy makers to scientists and investors.

Having defined the recommended type of hydrogen, the European Union is studying how to increase the production, transport, and profitable consumption of renewable hydrogen to use the flexibility and versatility offered by this energy source. Energy-intensive industrial sectors that are unable to decarbonize by direct electrification are looking for greener, carbon-neutral energy carriers. Renewable hydrogen therefore offers a realistic and promising prospect for environmentally friendly steel or fertilizer production by 2030. The transport sector, given the limitations and costs of batteries, the aviation, maritime and road transport sectors are all looking for solutions to use carbon-neutral fuels for long-distance travel.

With the EU's commitment to increasing the use of renewable energy sources globally, hydrogen contributes to their long-term and large-scale storage and offers immediate flexibility to the energy system.



The storage potential of hydrogen, especially in salt mines currently used for natural gas storage, is particularly beneficial for electricity grids, as it helps to balance the supply and demand of electricity when there is too much or insufficient renewable energy.

EU hydrogen strategy and long-term investment

The European Green Deal combines a double effort for reducing emissions of greenhouse gases and preparing the European industry for a climate-neutral economy. In this context, hydrogen is seen as a centerpiece in solving these two problems and in the evolution of our energy systems.

The European Commission launched two different initiatives in July 2021: a strategy for the integration of energy systems and a separate strategy for hydrogen.

The first strategy describes how the energy system can be made more flexible. This system would allow the exchange of energy between consumers and producers and between different end-use sectors. It would stimulate

the use of new technologies by integrating them more easily into the energy market, by promoting a climate-neutral energy system, focused on renewable electricity, circularity, and renewable and low-intensity fuels.

The second strategy looks more closely at the measures needed to make renewable, low-carbon hydrogen a central product of the energy system.

The EU is committed to increasing the share of renewable energy sources, a commitment that reflects a growing share of renewable energy in the energy mix. Moreover, the costs of these energy resources are expected to decrease in the coming years. In this context, the Hydrogen Strategy explores the potential of renewable hydrogen to help decarbonize the EU economy in a cost-effective way. Due to Europe's industrial power in the production of electrolyzers, new jobs will also be created that can generate economic growth in the EU, which will be key to recovering from the COVID-19 crisis.

Immediate and long-term investments are a first fundamental step for renewable hydrogen to fully take off and provide the European industry with a good starting point on an increasingly competitive global market. In the future budget of the EU, the European Commission highlights the need to unlock investments in essential and clean technologies and value chains,

including clean hydrogen. This was strengthened by the additional measures to support European recovery following the COVID-19 pandemic, which points out that recovery can go hand in hand with the decarbonization ambitions. To this end, the EC has developed a Power Up initiative, aimed to encourage EU countries to use their European incentive funds to invest more in renewable energy and renewable hydrogen production. In addition to measures to stimulate investments, Fit for 55 Package of the European Commission includes proposals for reducing greenhouse gas emissions by at least 55% by 2030. It also includes proposals to create a well-functioning European hydrogen market.

Projects, research, and innovation in the hydrogen field

In addition to defining the political and strategic guidelines for hydrogen, the EU also supports many projects and initiatives in this area. These include the European Clean Hydrogen Alliance, announced in March 2020 as part of the New Industrial Strategy for Europe and launched on July 8, 2020, together with the EU Hydrogen Strategy.

This initiative brings together industry, national and local governments, civil society, and other stakeholders. It aims to use hydrogen technologies in an ambitious way by 2030, bringing together actors in renewable and low-carbon hydrogen production, industry demand, mobility, and other sectors, as well as hydrogen transport and distribution. Over 1,000 stakeholders have already joined the alliance and can now present their projects and stimulate the adoption of hydrogen investment projects.

Projects of the Horizon program: Djewels, STORE & GO, Hybrit, H2

The EU is also promoting more hydrogen research and innovation projects under the Horizon 2020 program. These projects are managed through the program (FCH JU) and represent a common public-private partnership supported by the European Commission. These include the EU-funded Djewels project, which will build a 20 MW electrolyzer to guarantee customers low-cost green hydrogen, and the STORE & GO project, which supports new technologies to supply the renewable methane gas network, thus ensuring sustainable energy supply in Europe. Moreover, Hybrit project, in northern Sweden, is a good example of how hydrogen can help green the industries, as it uses renewable hydrogen rather than coal to produce fossil-free iron and steel. On a similar note, a 6 MW electrolyzer developed under the EU-funded H2 project supplies green hydrogen to a steel plant in Linz, Austria, and also provides power grid services due to its flexible electricity consumption.

According to data published by researchers from Delta-EE, the green hydrogen market in Europe will reach 2.7 GW in 2025, i.e., 50 times the production capacity created in recent years. However, this

is “far from being sufficient to reach the European Union’s targets of 6 GW in 2024,” the experts report.

67 clean hydrogen projects are operational in Europe, with electrolyzers in 13 countries. Therefore, “56 MW can be produced, i.e., approximately 4,700 tons of green hydrogen per year”. The transportation industry is leader, consuming half of this production. Approximately one third is used “to decarbonize industrial applications, such as petrochemical refining”.

Romania does not have yet a strategy for obtaining and using renewable hydrogen

Are the hydrogen projects included in the National Recovery and Resilience Plan (NRRP) feasible? Can the gas network be adapted to hydrogen transport?

Hydroelectrica wants to produce green hydrogen together with Verbund-Austria and carry it on the Danube across Europe. Green hydrogen will be obtained by large-scale water electrolysis, using a green energy mix (offgrid wind power and ongrid hydro power) and the resulting hydrogen will be incorporated into a mineral oil and transported on the Danube to countries in the Danube Transnational Program (Austria, Bulgaria, Czech Republic, Germany, Hungary, Slovakia, Montenegro, Serbia).

“In an integrated system of the future, hydrogen will play a very important role along with electrification from renewable sources and a more efficient use of resources, as well as the implementation of digitization. The financing part for the elaboration of a strategy is included in NRRP and in the first part of 2022 we will present a strategy that will offer us the main directions of action and which we will submit to public debate. The market is already moving in this direction. Funds will be allocated through various programs supporting the development of hydrogen production from renewable sources and from low-carbon sources (blue hydrogen). We will consult and inspire from the strategies of other European countries,” says Dan Dragoș Dragan, Secretary of State in the Ministry of Energy.

Low-carbon hydrogen, a chance for Romania

“The most correct, at this point, is to discuss about a low-carbon hydrogen. It is a better card to play for Romania, as it includes nuclear hydrogen. Although



dangerous, nuclear power has no CO₂ emissions. The start is given by Germany and the northern countries towards «green», but hydrogen has no color and we, Romanians, must anchor ourselves in our reality. We cannot afford to create a strategy only based on «good behavior» points given by international organizations. I don't urge to isolation, but the other countries in the European space do not produce hydrogen for the sake of others but pursue their legitimate national interests. Romania has a certain energy mix, which is based on an evolution of the energy sector in the last 60 years, so we cannot take the example of other countries that have an entirely different energy mix. The French mix is dominated by nuclear power, northern countries want to introduce more wind and solar power. The Romanian mix is well balanced: in addition to the part of solid and gaseous fossil fuels, which will be phased out, we have the two nuclear reactors, gaseous fuels (which are not as polluting as hydrocarbons or coal) and which must be capitalized on within reasonable limits until the moment we have a technical maturity of other technologies," believes Ioan Iordache, Executive Director of the Romanian Association for Hydrogen Energy.

The only study on hydrogen injection into the gas transmission and distribution networks in Romania, conducted by the Intelligent Energy Association (AEI) and publicly presented on May 18, 2021, showed that a Romania with mainly green energy can be achieved using hydrogen as an Energy Vector. The use of hydrogen brings reductions in the bills to end-consumers and makes this goal possible. Experts say that there is a wrong approach, visible today in Romania, to place hydrogen as the exclusive fuel of the future, as it that can bring costs by up to five times higher at the level of the end-consumer.

The study conducted by AEI has brought to light

elements of technical, organizational structure of hydrogen transport and distribution and it was found that it cannot be an element that can solve all the future energy problems, but together with other elements it can ensure energy transition. But we cannot achieve anything without a strategy to guide us how and where we are heading. The strategy is important, but it is more important to have a legislative framework that helps us solve the fiscal problems that will accompany this new form of energy. Moreover, this new form of energy is more expensive than others, currently amortized, which involves financial incentives and optimization. "Regarding the strategy made with the help of foreign consultants, I believe that no one can come in your home and tell you what you have to do. The important problem is how we manage to enter the existing systems to produce hydrogen. Beyond what others want, a form of energy must be accepted by the consumer. Consumers were not consulted or asked how they feel about this substance that is more dangerous than others they currently use," claims Dumitru Chisalita, President of the Intelligent Energy Association.

Romania, the fourth European state in terms of hydrogen production potential

According to energy specialists, Romania has several strengths in terms of green hydrogen production. The huge potential in renewable energy, but also the domestic gas production, the second largest at European level, together with the around 50,000 kilometers of pipelines are the aces up Romania' sleeve in the field of hydrogen. Romania could attract long-term investments of EUR 775 million in hydrogen electrolysis units with a capacity of 1,500 MW, being the fourth European state in terms of potential in this field. The data are estimates of Hydrogen Europe, a Brussels-based association that represents more than 260 companies in Europe. ■

More than 50 European Cities Signed the Green City Accord

More than 50 cities have signed the Green City Accord before the end of July. This agreement sees local authorities committing to achieve ambitious environmental goals by 2030 on air, water, nature and biodiversity, circular economy and waste, and noise. From Romania 4 cities - Alba-Iulia, Bistrita, Cluj-Napoca and Tulcea, will benefit from financial assistance to become greener, cleaner, and healthier.

The Green City Accord is a movement of European mayors committed to making cities cleaner and healthier. It aims to improve the quality of life for all Europeans and accelerate the implementation of relevant EU environmental laws. By signing the Accord, cities commit to addressing five areas of environmental management: air, water, nature and biodiversity, circular economy and waste, and noise.

Today cities across the European Union face many challenges. Air pollution is a serious problem posing a real risk to health, noise pollution is on the increase, urban sprawl is affecting the availability of green spaces, while the generation of waste continues to have an impact on the local environment.

But cities can also be leaders in environmental protection and can play an important role in improving air and water quality, in enhancing biodiversity protection, in tackling noise pollution, and in moving towards a more sustainable, circular economy.

To celebrate the involvement of a growing number of cities that form part of the Green City Accord community, a high-level signatory online ceremony will take place on 22 September 2021.

Mayors, local leaders, and stakeholders will join the European

Commissioner for the Environment, Oceans and Fisheries Virginijus Sinkevičius in a unique opportunity to discuss the Green City Accord and their environmental priorities.

Major goals

In joining the Accord, mayors agree to taking further action to achieve the following goals by 2030:

- Significant improvement in air quality in cities, moving closer to respecting the World Health Organization's Air Quality Guidelines, while ending exceedances of EU air quality standards as soon as possible.
- Important progress in improving the quality of water bodies and the efficiency of water use.
- Considerable progress in conserving and enhancing urban biodiversity, including through an increase in the extent and quality of green areas in cities, and by halting the loss of and restoring urban ecosystems.
- Advance towards the circular economy by securing a significant improvement in the management of household municipal waste, an important reduction in waste generation and landfilling, and a substantial increase in re-use, repair, and recycling.
- Significant reduction in noise pollution, moving closer to the levels recommended by the World Health Organization.

The Benefits

- Acquire Europe-wide visibility in recognition of your city's environmental actions and achievements.

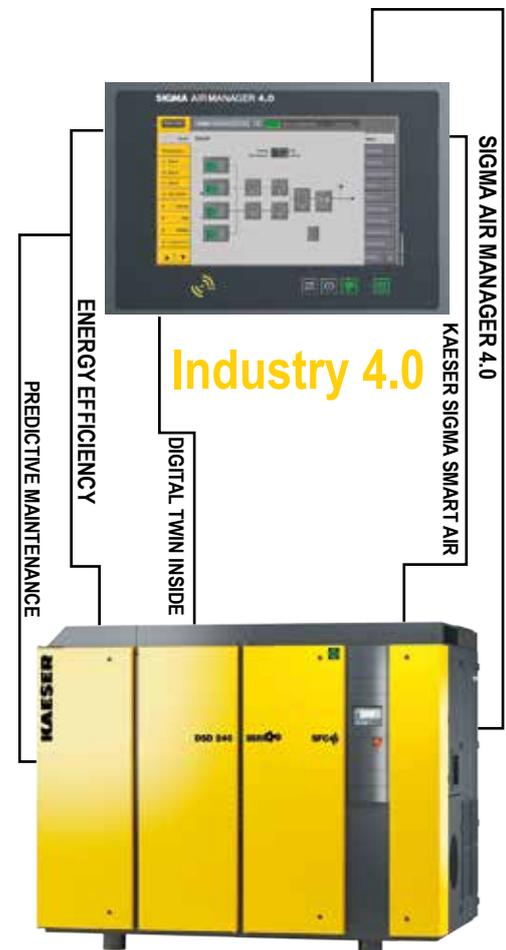


Mayors, local leaders, and stakeholders will join on 22 September 2021 the European Commissioner for the Environment, Oceans and Fisheries Virginijus Sinkevičius in a unique opportunity to discuss the Green City Accord and their environmental priorities.

- Contribute to shaping EU environment policy and become part of a community of like-minded cities driving the transition towards a clean and healthy Europe.
- Increase your transparency, accountability, and credibility vis-à-vis the local community.
- Gain access to information concerning EU funding opportunities.
- Participate in networking events, avail of capacity-building opportunities.
- Receive tailored guidance and support via a dedicated helpdesk.
- Benchmark your city achievements against progress in other cities.

The Green City Accord recognises cities as key partners in the transition to a more sustainable Europe. Mayors across the EU are invited to join this new initiative and commit to taking ambitious action to make their cities cleaner and healthier by 2030. Signatory cities will gain access to capacity-building and networking opportunities, expert advice via a dedicated helpdesk, and international visibility for their environmental efforts. ■

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Europe's Largest Hydrogen Electrolyser

Shell has started up Europe's largest hydrogen electrolyser of its kind at its energy and chemicals park Rheinland, in Germany. Shell sees great potential for the use of hydrogen in a range of sectors, from transport to industry. As governments, businesses and energy consumers continue to align on the need for net-zero emissions in the future, support for hydrogen is gathering pace.



A general view of hydrogen electrolysis plant called 'REFHYNE', one of the world's first green hydrogen plants, during a launch event at Shell's Rheinland refinery in Wesseling near Cologne, Germany, July 2, 2021. REUTERS/Thilo Schmuegelgen



As part of the Refhyne consortium and with funding from the European Commission, the 10-megawatt PEM electrolyser uses renewable energy to initially produce up to 1,300 tonnes of green hydrogen a year.

The green hydrogen will initially be used to produce fuels with lower carbon-intensity at the refinery and Shell are also working to enable the green hydrogen to help decarbonise other sectors such as road transport.

The fully operational plant is the first to use this technology at such a large scale in a refinery and plans are already under way to expand the capacity of the electrolyser from 10 megawatts to 100 megawatts.

In its Powering Progress Strategy, Shell set a target to become a net-zero-emissions energy business by 2050, in step with society. As part of their plan, they will transform five core refineries into integrated Energy and Chemicals Parks by 2030.

Transforming these refineries will mean using more recycled and renewables feedstocks, such as hydrogen and waste oils and processing less crude oil. As a result, by 2030 Shell will reduce production of traditional fuels by 55% and will produce more of the low-carbon fuels, chemicals, and energy products that the customers need.

These changes to Shell's product portfolio will help reduce the emissions generated while making its product and also those from the use of these products. The start-up of the Refhyne electrolyser is a great step as Shell accelerates its journey to meeting the evolving energy needs of our customers.

Hydrogen in the global energy system

Shell sees great potential for the use of hydrogen in a range of sectors, from production to industry.

Shell's ultimate goal is to produce green hydrogen, through electrolysis, using renewable power such as wind and solar. But moving quickly in the energy transition means both green and blue hydrogen can play a role in the decade ahead. Blue hydrogen is produced from natural gas and later decarbonised, using carbon capture and storage.

To keep up with increasing hydrogen and renewable power demand, blue hydrogen can provide an interim solution to help build the hydrogen ecosystem while still lowering emissions.

SHELL'S CURRENT PROJECTS

Germany: REFHYNE electrolyser

In July 2021, Shell has opened the REFHYNE electrolyser at our chemicals and energy plant Rheinland, Germany. With vital funding of the EU's Fuel Cells and Hydrogen Joint Undertaking, this 10MW proton exchange

membrane (PEM) electrolyser is the largest of its kind in Europe. The electrolyser was built by ITM Power and will be operated by Shell, producing 1,300 tonnes of green hydrogen per year from renewable energy. Plans are already in place to expand the capacity of the electrolyser to 100MW.

Netherlands: NorthH2

Shell, together with its consortium partners, Gasunie and Groningen Seaports, is aiming to build the largest European green hydrogen project in the Netherlands by 2040. If given the go-ahead, NorthH2 will be capable of producing more than 800,000 tonnes of green hydrogen by electricity generated from a 10 GW offshore wind farm in the North Sea. In December 2020, RWE and Equinor joined the consortium.

Netherlands: Rotterdam Green Hydrogen Hub

Shell is working together with partners to create a green hydrogen hub in the Port of Rotterdam. In July 2020 Shell and Eneco were awarded a tender for the 759 MW Hollandse Kust Noord offshore wind project in the North Sea, which will become operational in 2023. Shell is planning to build a 200 MW electrolyser in the Port of Rotterdam, which is intended to start operations by 2023 to produce about 50,000 – 60,000 kg of hydrogen per day. The green hydrogen produced will initially be used at the Shell refinery in Pernis to partially decarbonise the production of fossil fuels. A final investment decision on the electrolyser is yet to be taken.

Netherlands: Emmen

A 12 MW solar park is being built as a part of the energy hub GZI Next. Apart from producing solar energy, this energy hub will produce hydrogen as well.

China: Zhangjiakou City

In November 2020 Shell unveiled its first commercial hydrogen project in China. This infrastructure included a 20 MW hydrogen electrolyser which will see green hydrogen produced from abundant wind and solar resources in Hebei province. The joint venture with Zhangjiakou City will be used to support the development of hydrogen and clean energy in the region as well as supply hydrogen refuelling stations in Zhangjiakou, which is one of the co-hosts of the 2022 Beijing Winter Olympics.

Types of hydrogen

Producing low or zero-emission hydrogen is crucial to ensure its potential as a clean form of energy. Most of the hydrogen available today is produced using energy from hydrocarbons, particularly natural gas. Hydrogen produced in this way is known as 'grey' hydrogen.

While this process generates significant carbon emissions, it can be made almost emission-free by using carbon capture and storage to store any carbon emissions that are produced safely back underground. The product is then known as 'blue' hydrogen.

Hydrogen can also be made via electrolysis, by splitting water into oxygen and hydrogen using electricity from renewable sources. When produced like this, the process is also almost emission-free, and the hydrogen is known as 'green' hydrogen. ■

POWER



Energy Transitions in Europe

Energy transitions has hit a snag. Since the end of the World War II and even today, the economies of industrialized countries have relied almost exclusively on fossil fuels. While this dependence of countries on this non-renewable energy has increased due to high energy efficiency and improvement of living conditions, it slowed down however since 1973, when the oil shock took place. This shock has proven to be terrible for countries around the world.

A turning point was the Yom Kippur war (which put Israel in front of an Arab coalition led by Egypt and Syria). To penalize the Western countries that helped Israel, the OPEC (Organization of Petroleum Exporting Countries) member Arab countries have decided to restrict oil production, tripling, or increasing even by four-fold the oil price. For this reason, several countries have decided to develop the construction of nuclear power plants. But even if nuclear power does not emit greenhouse gases, it is still subject to very high risks in case of accident, as it was very well seen during the nuclear disasters in Chernobyl or Fukushima.

by Rona Rita David

The issue of renewable energy, intermittence

Solar panels or wind turbines are intermittent energy sources. They depend exclusively on weather conditions, which increases the uncertainty on the capacity to generate power: if there is no wind or sun, production achieved by these wind turbines and solar panels becomes zero. This is why the total power output in Europe, or the world does not come mainly from renewable energy.

Race and politics of energy transitions: leading countries

Northern European countries are often quoted as a model of energy transition. However, except for Iceland, with its geothermal

potential, most of them still rely on fossil fuels or nuclear power. Therefore, there is no Scandinavian model, but situations that vary from one country to another.

First of all, these are sparsely populated countries (except for Denmark) and have a high level of development. The energy resources mobilized for domestic consumption per capita, as well as electricity consumption per capita are quite high, which reflects the importance of their energy consumption.

In the energy transition of northern countries, it is necessary to analyze the energy mix, which varies. For example, coal continues to be used in Finland and Denmark, and the oil and gas share remains significant in Norway and also in Denmark.

Five Scandinavian models

To explain the existence of these five models, both the resources available for some countries and the history of their development should be known. The available resources are, on the one hand, hydrocarbons discovered in the North Sea, then in the Norwegian Sea and the Barents Sea and, on the other hand, coal extracted since the beginning of last century in Norway, Sweden, and Finland.

Oil exploration in the North Sea started in 1966, one year after the division of territorial waters. In 1969, in Norway, the company Phillips Petroleum discovered the giant field Ekofisk, 320 south-west to Stavanger. Oil and gas production started in 1971 and was entrusted to Norway's Statoil. In 2011, the important oilfield Johan Sverdrup was discovered, where production could account for 25% of the planned production of the country, and in 2011, the Norwegian Parliament approved the common development and exploitation plans.

In Denmark, oil production started in 1972 and gas production in 1984, after the discovery in 1979 of large fields. In early 1990s, the Danish distribution network supplied gas to the entire country, but oil and gas production has fallen since 2005. However, Norway is in a better position than Denmark: it is the seventh largest producer and the third largest exporter of natural gas and the 14th largest oil producer in the world.

Between 1960 and 1970, faced with increased energy demand, choices varied from one country to the other: Sweden and Finland chose nuclear power, while Denmark rejected it. Norway and Iceland relied on their major resources: hydrocarbons and geothermal energy. Since 1990, the energy choices have come closer due to everyone's desire to reduce GES and, therefore, to develop renewable energy; however, Finland has decided to continue the nuclear path and Norway to continue to exploit its hydrocarbons.

Denmark, after the oil shock in 1973, decided to reduce its energy dependence and, in the 1970s, chose wind power, which is primarily onshore (of the 445 islands of the country, only 72 are inhabited), and then offshore wind power. Due to its geographical position, the country has in fact a competitive advantage: a record capacity factor of over 40% and even 50% (for example, at the Anholt offshore farm). As regards offshore wind power, Denmark installed the first wind park in the world, in Vindeby, in 1999 (11 turbines at 0.45 MW). As wind is strong and regular, wind turbines can be installed everywhere. Since 2013, the largest wind farm has been the one in Anholt: it totals 111 wind turbines (3.6 MW each) and an installed power of 400 MW. The country has two major players in the European wind power sector: Vestas (the largest producer of wind turbines until 2015, before the arrival of China's Goldwind) and Ørsted (formerly Dong Energy). The wind power boom in Denmark is the outcome of a political strategy that involves national and local authorities, companies, as well as the population.

Iceland (330,000 inhabitants) is the country where almost 100% of the electricity consumed comes from renewable energy. Energy transition achieved by Iceland can be a source of inspiration for countries that want to increase their share of renewable energy. Although Iceland is a very good example of how a modern economy can develop using renewable energy, still, until the beginning of the 1970s, the country had to rely on fossil fuels to ensure most of its energy consumption. Despite the good intentions, Iceland did not resort to renewable sources, and the motivation was that

it couldn't cope with oil price fluctuations caused by the numerous crises that have hit the global market. Isolated, near the Arctic Circle, it needed a stable and economically viable energy resource.

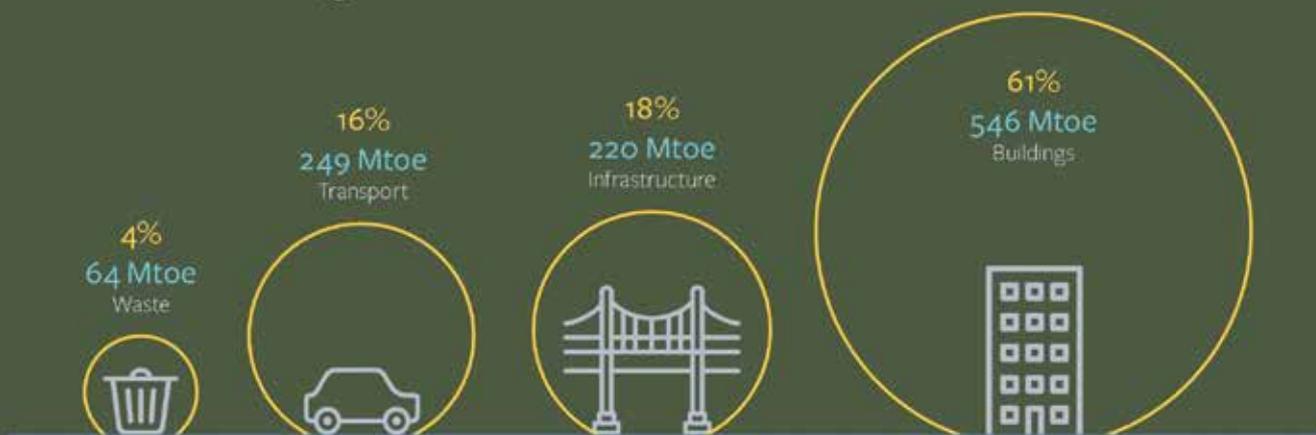
In Iceland, known as the 'land of fire and ice', access to renewable energy is highly favored by its exceptional geology and geographical position. Located in the middle of the Atlantic on the fracture of the American and Eurasian tectonic plates, Iceland is a very active volcanic area that is exploited to produce geothermal energy. Glaciers cover 11% of the country. Sleet feeds the glacial rivers that flow from the mountains to the sea, contributing to hydroelectric resources. Moreover, the huge wind potential of the country is basically untapped.

Icelandic farmers, pioneers of geothermal heating

The first initiatives towards the development of renewable energy, both geothermal and hydroelectric, were taken by local entrepreneurs. In the early 20th century, a farmer found a way to use the hot water that came out of the ground to develop a rudimentary geothermal heating system. Municipalities have gradually followed the example and explored geothermal resources more systematically. The drilling technology, used for oil, made it possible to drill deeper to warmer water, in order to heat more homes. Large projects were developed with the implementation of geothermal heating systems at commercial scale. The first hydropower projects, similar to geothermal projects, were developed by responsible farmers to supply electricity to farms. In 1950, 530 small hydropower plants were built, creating independent energy generation systems spread across the country.

In the 1960s, to encourage the use of geothermal energy, the Icelandic government set up a geothermal drilling guarantee fund to provide loans for geothermal research and drilling tests, also covering costs in the event of an emergency. The legal framework was created to encourage households to connect to the geothermal heating network rather than continue to use fossil fuels. At the same

Cities can **reduce emissions** and **make energy savings** of over 1,000 Mtoe through low-carbon measures



Source: Stockholm Environment Institute for the Coalition for Urban Transitions (estimated figures)

time, Iceland has begun to focus on large-scale hydropower development, an attractive way for international industrial users to attract new industries to diversify the economy, but also to create jobs and a national power grid. Iceland's case is unique. Although Iceland was a small and peaceful state in the 1970s, obstacles existed and success was not guaranteed, costs and energy security played an important role in the cohesion of municipalities, government, and the public. After centuries of poverty and foreign domination, the country did not have the basic infrastructure and adequate knowledge about the potential of its resources and did not have the experience to carry out large energy projects. Indeed, until the 1970s, the United Nations Development Program classified Iceland as a developing country. In addition, funding was provided by new, but inexperienced institutions.

Lessons learned from Iceland: based on its experience, Iceland gives the current and future countries that plan to start an energy transition the following advice to overcome the obstacles in the implementation of renewable energy:

- Cohesion and collaboration between municipalities, government, and the public since the first stages of transition. In Iceland, this dialogue has encouraged confidence and has developed a mentality open to solutions to overcome the previously mentioned obstacles.
- Local responsibility and public participation are of the

essence. Municipalities' commitment with innovating Icelandic entrepreneurs and lessons learned have brought to life geothermal energy and hydropower, which have proven their worth.

- A regulatory framework, incentives, and government support speed up evolution. The drilling guarantee fund in Iceland has accelerated transition by mitigating risks faced by municipalities that carry out geothermal projects.
- As in every industry development, long-term planning of the implementation of renewable energy is important.
- It is essential to present each step. The public participates in a transition that it understands and desires. In Iceland, municipalities that have had continuous access to thermal springs have become models for others. Using photos showing the capital "before and after", politicians have also drawn voters' attention to the positive effect of geothermal resources on the quality of air, compared to fossil fuels.

Conclusions: Iceland's transition is a success rather than a 'model for all'. Iceland's case shows that not only rich developed countries can overcome the costs and internal obstacles in the way of green transition.

For Iceland, it makes sense using geothermal resources and hydropower for energy transition. As regards the other states,

local conditions will determine the most efficient renewable resources and how they can be capitalized best. Each country is unique, so transition will be different in each of them. Therefore, Iceland's transition is a success rather than a 'model for all'. Iceland's case also reminds that not only rich developed countries can overcome the costs and internal obstacles in the way of green transition.

Performing recycling program, but without raw materials

Sweden has a balanced energy mix in which renewable energy accounts for more than half of final consumption, while fossil fuels account for only 27%. The country has, above all, a pro-active tax system with a carbon tax multiplied by six (from EUR 20 to EUR 120 per ton of CO₂ emitted). In Sweden, energy consumption is constant or increased slightly over the past five years (from 46 Mtoe in 2013 to 46.8 Mtoe).

Forests (almost 280,000 sq km) represent 54% of the territory and the country is the second largest paper, pulp, and wood exporter in the world (after Canada). Here, the large quantity of forestry residue can be exploited for energy, especially that the country imports wood to cope with business growth in the sector.

Moreover, Sweden has embarked on the path of biogas produced first in Skåne to deal with the proliferation of red algae, and then used agricultural, livestock and household waste. The irony makes its recycling program to be so successful that it now lacks raw materials.

One of the largest international producers of renewable energy

Over 55% of electricity consumed in Portugal comes from renewable sources. With almost 1,793 kilometers of coastline and several rivers, hydropower is the main renewable resource of the country, ahead of wind power. Portugal is proudly one of the largest international producers of renewable energy. The country is one of the most advanced in Europe and in the world at this level. The road to carbon neutrality is well on its way.

However, not all Portuguese take kindly to renewable energy. The proliferation of solar panels and wind turbines is causing discontent in the country. Thus, for example, in the Gulf of Viana Do Castelo, located in northern Portugal, the installation of three wind turbines at sea has been strongly criticized by local fishermen, as maritime conservation suffers. Thus, work is being done to promote offshore wind turbines and reduce the consequences for fishermen, especially with financial compensation. However, these shortcomings do not prevent them from continuing this green road and becoming a true European example.

Energy transition since 1980

There is a region in Europe where people get their supply exclusively from clean electricity. This 'green paradise' is Lower Austria, a province of 1.6 million people in the northeast of the country which, since 2015, has displayed a mix based entirely on renewable energy. This is the result of an investment of EUR 2.8 billion since 2002 and, in particular, of the rich hydraulic production in the region (63% of production). Across the country, the 'green' culture is also well established, as the share of renewable energy sources reaches 73%. Austria gave up nuclear power following a referendum in 1978 and popularized the concept of energy transition in the 1980s.

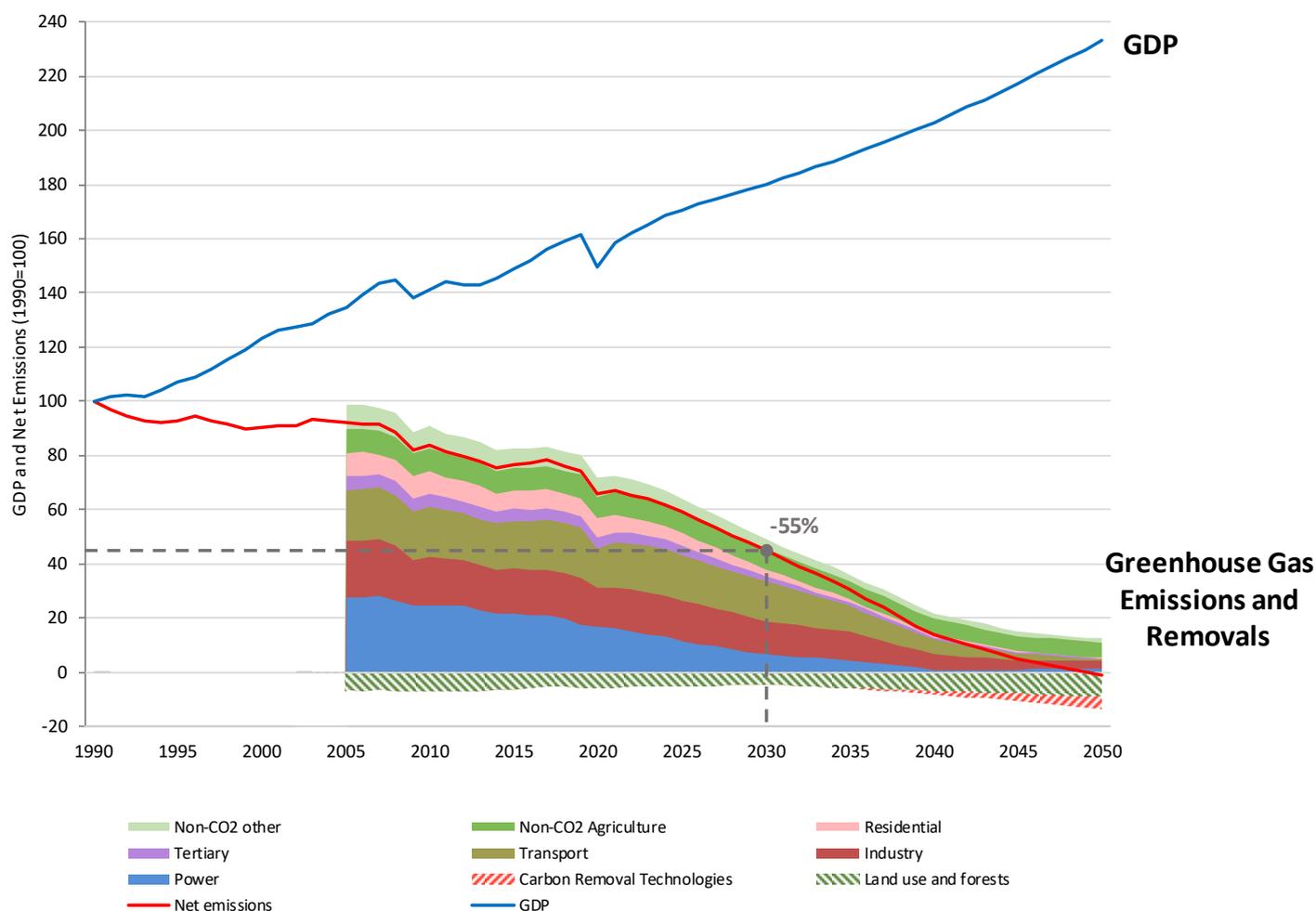
Germany accelerates energy transition

Germany aims to accelerate coal phase-out and increase the share of renewable sources to 70% by 2030. So, it has to say goodbye to nuclear power in 2022, then to coal in 2038. The whole economy, industry and society are about to make an unprecedented energy change. By simultaneously freeing itself from these two technologies, the country hopes both to achieve its greenhouse gas emission reduction targets and to regain leadership in the energies of the future. In order to reduce its CO₂ emissions by 65% before 2030, Germany will have to double the annual construction rate of its wind and solar farms and double its gas production capacity. In the absence of a clear regulatory framework set by the executive to achieve this, producers are afraid to pay too high a price for these ambitions.

France progresses slowly, but surely

France makes slow but constant progress in terms of renewable energy. However, it remains one of the best equipped European countries to initiate this change. France has a strong potential in terms of solar and wind power. At the end of last year, the renewable energy park amounted to 55,906 MW. This park brings together wind power, solar power, hydropower and bioenergy. 2020 therefore marks an increase by 2,039 MW, mainly due to the wind and solar sectors. These green energies accounted for 26.9% of France's electricity consumption, which marks an increase by approximately 4 percentage points compared to 2019.

The increase in renewable energy in France has been significant since 2005, with the development of biofuels, solid biomass, heat pumps, wind power and



EU is scheduled to adopt the 'Fit for 55' legislation package for reducing greenhouse gas emissions to 55% (compared to 1990 levels) by 2030 and reach climate neutrality by 2050. The EU's pathway to sustained economic prosperity and climate neutrality is illustrated, with emissions declining in all sectors toward ten percent of 1990 levels by 2050 and being offset by an equal percentage of net-negative emissions (including nature-based solutions like land use changes and afforestation as well as carbon removal technologies). Significantly, the GDP is projected to continue growing at historical rates, reaching almost a 2.4-fold increase by 2050 while emissions decline toward net zero.

Source: COM 2020/562.

photovoltaics. In 2015, the French government published the law on energy transition. The established objectives were reducing the consumption of fossil fuels by 30% in the period 2012-2030; reducing the share of nuclear power to 50% by 2025 and diversifying electricity production to reach 32% of renewable energy in final energy consumption in 2030; reducing energy consumption by 50% between 2012 and 2050. Other objectives: thermal renovation of buildings, adaptation of transport, fight against waste and circular economy (recycling) etc.

Eastern Europe and green transition

Eastern European countries consider the green transition a new concept and a new way of living, which is very difficult to understand. Primarily, it could be said that they are less aware of environmental problems than the countries of Western Europe. Moreover, the fact that these countries produce coal themselves tends to explain why they don't buy it from abroad. If they were to use more renewable energy, this would require significant investment, especially in foreign companies.

Dependence on fossil fuels in Europe

Green transition and sustainable development, which advocate for the renewal of the economic and social model for the welfare of the planet, are now hindered by many sectors of the economy. One of the most damaging is the transport sector: its pollution in terms of greenhouse gases is indeed extremely important. For example, 13.41 gigatons of CO₂ were emitted in 2016 at global level, thus proving that a serious revision of the types of energy used is required.

We also find in Europe a significant reliance in terms of energy, as imports exceed half of the needs, especially primary energy such as coal, oil, and gas. Moreover, Europe has an ecological footprint by 2.2 times larger than its biological capacity, according to WWF (World Wildlife Fund, the first world organization for nature protection), which means that Europeans continue to exploit resources. But today the dependence of countries on non-renewable energy is a large part of the current energy problem. In fact, in the last ten years, over 95% of the energy for transport came from oil. Of these, aviation is the most polluting means of transport. For many environmentalists, one of the most effective ways to reduce these emissions would be to simply charge more taxes on airlines for petroleum products to reduce their frequency and limit pollution.

However, it should be noted that, in the current system, economy almost always takes precedence over environment and health. The threat of job cuts could therefore be the response proposed by these airlines, thus affecting the economic system: therefore, this partly explains why progress in this area is struggling to move forward.

Hydrogen-powered vehicles for a cleaner Europe?

Cars, trucks, and buses run mainly on oil today. The challenge faced by European countries in recent years has largely been to find propulsion systems that are less harmful to the planet, for different types of vehicles. Therefore, electric vehicles have been increasingly developed at European level. Indeed, in 2019, Norway saw the market share of electric cars increase to 55.9%, and the same happened in the Netherlands (15.1%) and Sweden (11.4%). Moreover, to promote the purchase of these vehicles, which are more favorable to a green transition, the French Government has decided to award EUR 7,000 for each person purchasing an electric vehicle.

However, even if electric vehicles do not emit CO₂, battery production poses major environmental and social problems. This is why some people talk about other energy possibilities, such as hydrogen-powered vehicles, hydrogen being the simplest chemical element that can be found in the universe. Some vehicles already run on hydrogen, such as the Toyota Mirai or Hyundai Nexo, although they are still very expensive (almost EUR 70,000).

In most cases, the hydrogen used as fuel comes from the transformation of gas or oil, which does not solve the problem of

CO₂ emissions in any way. Another promising pathway is the production of hydrogen from certain types of bacteria. Scientists have conducted research in this regard and have concluded that a bacterium called *Caldicellulosiruptor saccharolyticus* is able to produce twice as much hydrogen as all other bacteria: proof that this energy could play a key role in the future.

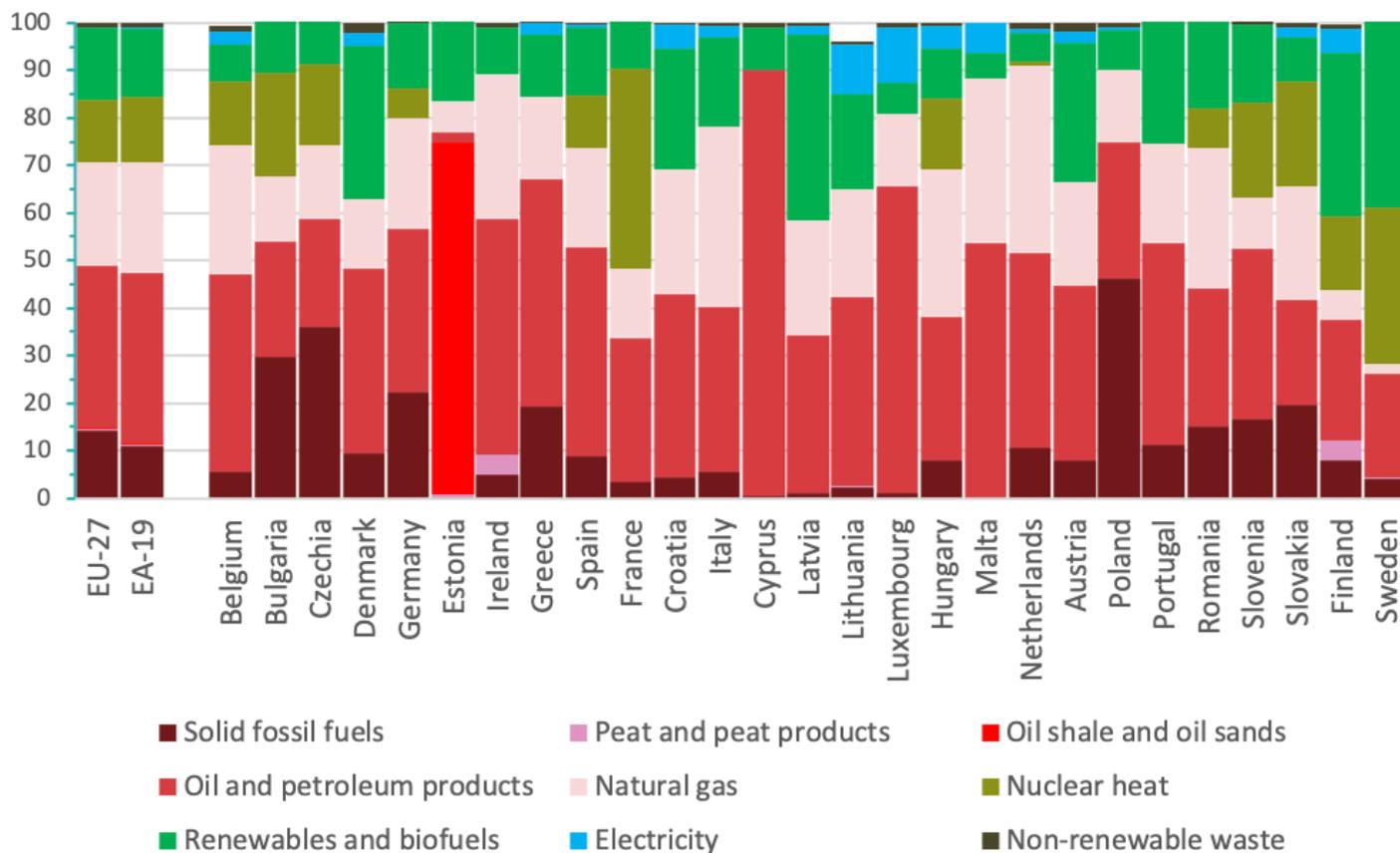
Moreover, Germany has decided, in the recovery plan implemented in the various European countries, to invest EUR 7 billion in the hydrogen research plan, an energy which could turn green in the future.

A European-wide cohesion policy is therefore needed to increase investment and European funding for the use of new energies, which emit less CO₂ and are more environmentally friendly, including for Eastern countries, which are lagging in terms of green transition in Europe. Therefore, a European commitment would make it possible to increase the development of these energies, but also, at the same time, increase the energy independence of the member states of the European Union from the world's oil and gas producing countries.

It is also agreed in the European recovery plan related to the Covid-19 crisis that 30% of the EUR 750 billion employed must be related to climate change to respect carbon neutrality in 2050, as requested by the President of the European Commission, Ursula von der Leyen.

New European partnerships and investments of almost EUR 10 billion

On February 23, 2021, the European Commission proposed the establishment of ten new European partnerships between the EU, the member states and/or industry. The goal is to speed up transition to a green, climate-neutral Europe, anchored in the digital era. The EU will grant funds of almost EUR 10 billion that will have to mobilize additional investment in favour of transition and have long-term positive effects on employment, environment, and society. European partnerships aim at improving EU's preparedness and response to infectious diseases, developing efficient low-carbon aircraft for clean aviation, supporting the use of renewable biological raw materials etc. The member states must show commitment towards use of recovery loans and grants to boost green transition, innovation, and digitalization.



Share of energy sources in the final energy use in 2018, indicating great diversities across the Union. Latvia, Sweden and Finland have the largest shares of renewables, France and Sweden largest shares of nuclear, Cyprus the highest share of oil; only in Estonia shale oil is a significant source of final energy. Poland and Czechia have the highest share of solid fuels, mostly coal. On average in EU-27 and EA-19 solid fuels are about a tenth of all final energy and would need to be replaced by clean and affordable sources of energy forms or completely decarbonised. The largest share is taken by oil followed by natural gas. Carbon-free sources are close to a third with renewables having the largest share of about a sixth.

Source: (Eurostat, 2020)

A systemic approach to the energy transitions in Europe

The scientific opinion by the Group of Chief Scientific Advisors examines how the European Commission can contribute to the preparation for, acceleration, and facilitation of the clean energy transitions in the EU. The European Green Deal aims to reach net-zero greenhouse gas emissions in Europe by 2050, a necessary step to limit global warming. Achieving this target is possible but requires urgent and decisive action. The role of energy systems is key in driving progress across virtually all sectors in the transition towards a clean planet for all. Energy policy should therefore be clearly aimed towards achieving climate neutrality and sustainability. EU energy systems should be based on decarbonised energy sources. The

Group recommends maintaining future energy systems flexible in terms of pathways, different technologies, and scales of implementation, and to support European research and innovation as a world leader in new technologies and smart systems. Policy makers should recognise the roles of all actors and stakeholders in creating an inclusive and participatory environment that supports low-carbon energy choices. Finally, the Group recommends supporting a coordinated combination of policies, measures, and instruments, including carbon pricing as a driving force, to shape an effective, consistent, and just regulatory system. ■

Romania Strengthens Collaboration with Canada on Civil Nuclear Energy

On August 5, Energy Minister Virgil and H.E. Annick Goulet, Canada's Ambassador to Romania, on behalf of Seamus O'Regan Jr., Canada's Minister of Natural Resources, signed the Memorandum of Understanding concluded between the Romanian Ministry of Energy and the Canadian Natural Resources Department on strengthening collaboration in the field of Civil Nuclear Energy. The Memorandum was signed in the presence of Romanian Prime Minister Florin Citu.

The signed Memorandum strengthens cooperation between Canada and Romania in the field of nuclear energy, as the Canadian industry has an exceptional experience in CANDU projects and has already successfully completed renovation works and new projects for the construction of CANDU units. At the same time, given the experience in CANDU projects, the Canadian partners will get involved in the nuclear energy projects in Cernavoda and those in the sector of civil nuclear energy in Romania.

At the same time, collaboration will be consolidated between the relevant companies for fulfilling the growing demand for very qualified, mobile, and adaptable labour force, in line with the current and future needs in the energy sector and reduction of climate change. These can include academic institutions, producers,

operators, and other organizations in the industry.

"I am glad that in our project of modernization and construction of new nuclear reactors, in addition to our partners in the US and France, we are joined by the Canadian partners, with whom we have a very good and long collaboration in this field. By signing this memorandum, we express our common interest in further strengthening and development of cooperation in the nuclear energy projects. And not only that: we will try to collaborate to implement new technologies, which are the future of green energy. I want to thank the Canadian partners, H.E. Annick Goulet, Canada's Ambassador to Romania, and Seamus O'Regan Jr., Canada's Minister of Mineral Resources, for their support and good collaboration. At the same time, the presence of Prime Minister Florin Citu in this event proves how important this project is for both states," said Energy Minister Virgil Popescu.

"The Memorandum signed today confirms the excellent bilateral relations that our country has with Canada. I insisted to be present in this event to show my support for the development of nuclear energy projects in Cernavoda and those in the sector of civil nuclear energy in Romania. Investments are vital and I am glad that the Canadian partners join the US partners to develop the nuclear industry in our country," said Prime Minister Florin Citu.

"Nuclear cooperation was a pillar of the 55-year-old relationship between Canada and Romania. I am proud that today we renewed our bilateral commitment by signing this Memorandum of



Understanding and I am eager to strengthen our exchanges in all areas, from security to trade,” said H.E. Annick Goulet, Canada’s Ambassador to Romania.

ROMATOM supports decarbonization in line with the European targets

In the context of the official working visit of the US Department of Energy to Romania, member companies of the Romanian Atomic Forum (ROMATOM) and the Romanian Association for Pressure Equipment (ARPE) met on August 3, 2021, with companies from the United States and Canada specialized in the nuclear field.

The purpose of the official visit is to continue and strengthen ties with the nuclear industry and decision-makers in Romania, within the Intergovernmental Agreement concluded in Washington DC in October 2020, which was recently ratified by the Romanian Government. The Cooperation Agreement includes the development of Units 3 and 4 of Cernavoda NPP, the Project of refurbishment of Unit 1 and other potential civil nuclear projects.

30 companies from Romania specializing in services, works and equipment for the nuclear industry met with companies from the United States and Canada, as well as with representatives of the US Department of Energy, within an event that lasted one day and included visits, presentations and B2B meetings aimed to strengthen cooperation between the nuclear industries of Romania and the US.

“The nuclear industry in Romania appreciates the opportunity of being involved in bilateral discussions with our partners from the United States and Canada and has confidence in the high quality and efficiency that the

partnership will bring in the implementation of future nuclear projects in Romania. ROMATOM has assessed the capacity of the nuclear industry in Romania in contributing to the project of Units 3 and 4 of Cernavoda NPP at 25%-40% of the Engineering, Procurement, Construction and Commissioning (EPCC) contract. We rely on the expertise of the qualified workforce, the experience gained in the realization of the operational units at Cernavodă and the 25 years of safe and efficient operation of Cernavoda NPP to develop and expand our skills and knowledge within our commitment to implement nuclear projects in Romania and in other countries, thus contributing to the fulfillment of objectives regarding decarbonization and obtaining economic growth in our country,” declared Lucian Rusu, President of ROMATOM.

Currently, the nuclear industry in Romania ensures 11,000 jobs, a number that could grow to 20,000 in the context of the new nuclear construction projects and has an annual contribution of EUR 5.7 billion to the national GDP, being a force of sectoral growth, development of education, nuclear research, and innovation.

“In accordance with the European objectives on decarbonization, Romania is firmly committed to developing the nuclear program, with clear benefits in terms of both decarbonization, as the existence of four operational units will lead to avoiding the release into the atmosphere of 20 million tons of CO₂ every year, and in terms of social and economic impact. Romania’s nuclear industry is a mature one, experienced and with broad knowledge. We consider that the meeting was a natural continuation of the Memorandum of Understanding concluded in October last year between ROMATOM and the Nuclear Energy Institute of the United States, trusting that a North Atlantic cooperation is the optimal solution. Strengthening cooperation with our partners in the US and Canada, while maintaining the European presence, is a positive signal for the continuation of the Romanian nuclear program by completing Units 3 and 4 of Cernavoda NPP, refurbishment of Unit 1 of Cernavoda NPP and other projects such as development of Small Modular Reactors technology,” added Teodor Chirica, Honorary President of ROMATOM. ■

Transelectrica to Reconfigure Energy System and Power Transmission Grid

Transelectrica is preparing itself for a reconfiguration of the energy system and of the power grid in line with the new directions established under the European legislative packages ‘Green Deal’ and ‘Fit for 55’. To ensure the gradual transition to a carbon-neutral economy, the pace of development of the Power Transmission Grid (PTG) needs acceleration of investment implementation. Therefore, the company aims that the targets of achieving the investment plans exceed those already scheduled.



Over the past month, Transelectrica has analysed the status of projects and prepared an open list of 20 projects of national importance in the field of electricity, for which the simplification of implementation processes is required.

The current development of the Power Transmission Grid (PTG) requires expediting the stages of power infrastructure projects to provide gradual transition to a carbon-neutral economy. Energy transition requires a quick adaptation of the power transmission grid and intensification of its expansion pace provided in the 2020-2029 PTG Development Plan.

In this context, the Romanian Government has recently approved, at the proposal of the Secretariat General of the Government - the public supervisory authority of CNTEE Transelectrica SA, a Memorandum including an Action Plan of the Company providing for the implementation of investment projects essential for strengthening the Power Transmission Grid.

Moreover, several meetings have been organized lately between representatives of the Secretariat General of the Government, of the Ministry of Energy and of CNTEE Transelectrica SA. The discussions have led to the common conclusion on the need to simplify the process of implementation of some projects of national importance in the field of electricity.

Consequently, Transelectrica has prepared an open list of strategic projects, which will allow the flexibility of the Power Transmission Grid. The company's proposal includes 20 projects, some of which are already in progress, for which it is necessary to accelerate the implementation pace.

20 Strategic Projects

1. 400 kV Overhead Line (OHL) Portile de Fier – Resita
2. 400 kV double circuit OHL Resita – Timisoara – Sacalaz – Arad
3. 400 kV double circuit OHL Cernavoda – Stalpu, with input/output circuit in Substation Gura Ialomitei
4. 400 kV double circuit OHL Smardan – Gutinas
5. 400 kV OHL Gadalin – Suceava
6. 400 kV OHL Suceava – Balti (Republic of Moldova)
7. 400 kV OHL Medgidia Sud – Constanta Nord
8. 400 kV OHL Isaccea – Tulcea Vest
9. Underground Power Line (UPL) Bucharest South – Grozavesti
10. 400 kV UPL Domnesti – Grozavesti
11. 400/110 kV Substation Grozavesti
12. Closing the 400 kV ring Bucharest – Ilfov, in the eastern area
13. Reconductoring of the 400 kV OHL Bucharest South – Gura Ialomitei
14. Reconductoring of the 400 kV axis Bucharest South – Pelicanu – Cernavoda
15. Reconductoring of the 220 kV axis Gutinas – Dumbrava – Stejaru – Gheorgheni – Fantanele – Ungheni
16. Reconductoring of the 220 kV axis Urechesi – Targu Jiu Nord – Paroseni – Baru Mare – Hasdat
17. Reconductoring of the 220 kV OHL Portile de Fier – Resita, circuits 1 & 2
18. Converting the 220 kV axis Brazi Vest – Teleajen – Stalpu to 400 kV and its reconductoring
19. 400 kV OHL Stalpu – Brasov
20. New alternating current and direct current lines discharging the onshore and offshore wind power output in Dobrogea region, namely the output generated by Unit 3 and Unit 4 of Cernavoda Nuclear Power Plant, along the Tuzla – Podisor and Podisor – Corbu – Hurezani – Hateg – Recas – Horia – Nadlac routes

For this purpose, both central public authorities and Transelectrica will take steps in the near future to speed up the implementation of the above-mentioned projects, so that Romania reaches its European targets for the time horizon 2030-2050. ■

FUTURE
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of global energy

f FELRomania

Romania's Ministry of Energy to Grant Funds of Millions of Euros to Upgrade Electricity and Heat Production Units

Romania's Energy Minister Virgil Popescu approved, at the proposal of Secretary of State Vlad Sinca, the establishment of a working group to implement the provisions of revised Directive 87/2003 regarding Mechanism 10 C - phase IV.



Virgil Popescu, Energy Minister, Romania

The priority objectives of the Ministry of Energy include the implementation of Mechanism 10c phase IV for projects with a value of less than EUR 12.5 million. The establishment of a working group that will deal with the preparation of the legislative framework in order to grant investment funds is the second stage of a process started in 2019.

Romania submitted to the European Commission and published by June 30, 2019, the 'List of investments with a value of less than EUR 12.5 million', the projects being submitted for Article 10c, which exceeded this threshold, following to access the Modernization Fund/Article 10D.

Proposed projects

1. Colterm: High-efficiency cogeneration with heat engines in CT Dragalina Timisoara (P=1 MW) - EUR 4.7 million

High-efficiency cogeneration with heat engines in CT UMT Timisoara (P=1 MW1) - EUR 4.7 million; Use of biomass as additional fuel at the existing steam boilers, at CET Sud Timisoara, to produce energy in cogeneration - EUR 1.2 million

2. ELCEN: Retrofitting/Implementation of one/several thermal energy production capacities in peak load regime of around 100 Gcal/h, CTE Grozavesti - EUR 4.5 million

Retrofitting/Implementation of one/several thermal energy production capacities in peak load regime of around 100 Gcal/h, in CTE Bucuresti Vest - EUR 4.5 million

Retrofitting/Implementation of one/several thermal energy production capacities in peak load regime of around 200 Gcal/h, in CTE Bucuresti Sud - EUR 9 million.

3. Arad Municipality: Installing a combined heat and energy production unit with 3000 mc battery at CET Hidrocarburi SA - EUR 6.97 million.

4. Ploiesti Municipality: Installing a gas turbine, with a power of 25 Mwe - EUR 12.46 million

5. Vest ENERGO: Bucharest cogeneration power plant (Baneasa Romaero area), 12MW - EUR 12 million

Bucharest cogeneration power plant (Faur area), 12MW - EUR 12 million

Bucharest cogeneration power plant (Preciziei area), 10MW - EUR 10 million

6. Vimetco: High-efficiency cogeneration power plant of 12 Mwe at ALUM S.A. - EUR 10 million

7. Electrocentrale Grup: Photovoltaic Power Plant with an installed power of up to 3 MW on the site of the former Fantanele Thermal Power Plant - EUR 2.97 million

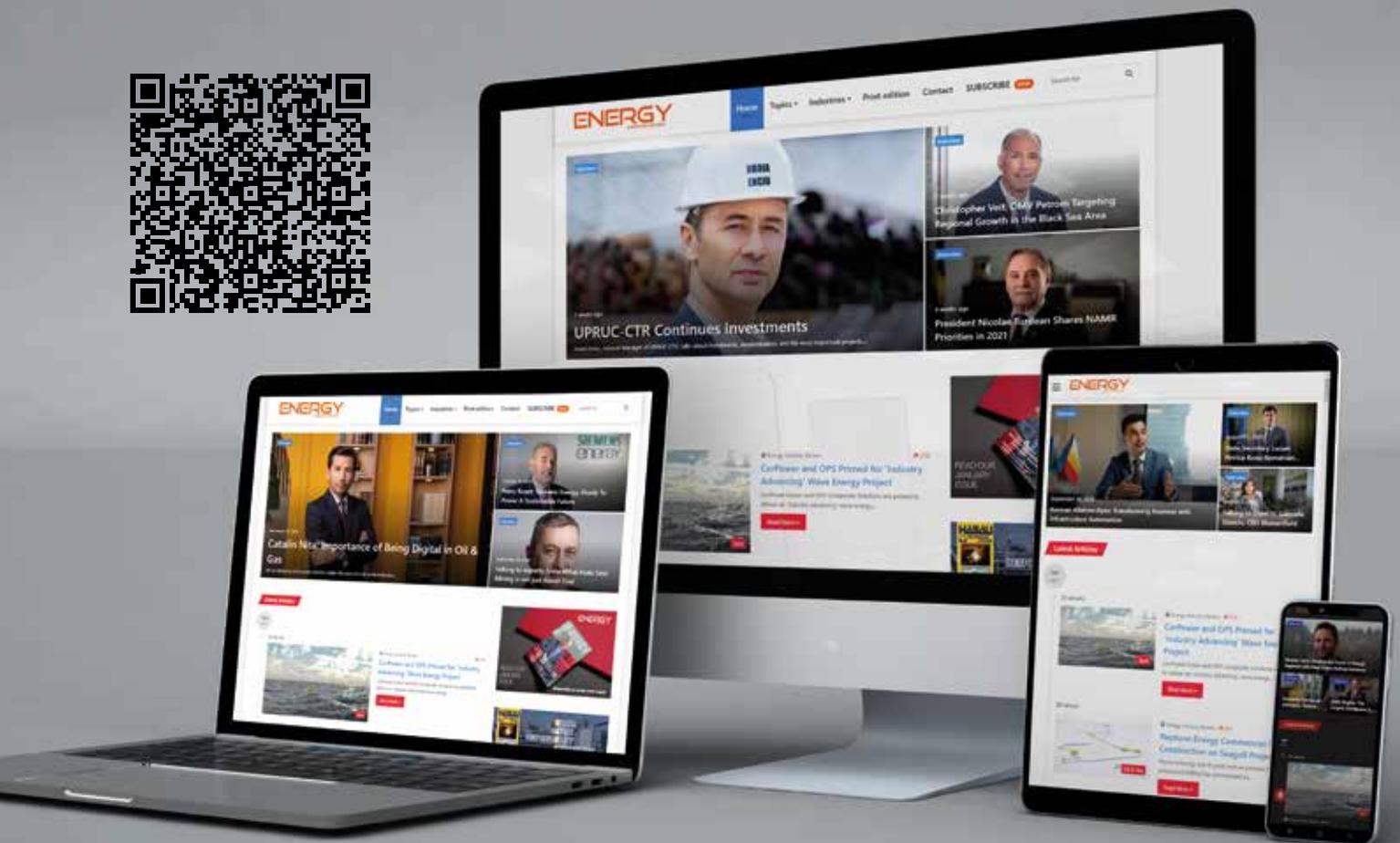
8. Arad Municipality: Execution of biomass thermal power plant, 50 MW - EUR 10 million

Therefore, the working group established at the Ministry of Energy will have as main goal to prepare the applicable legal framework necessary to implement Mechanism 10c - phase IV. ■

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ENERGY
INDUSTRY REVIEW



MARSPLAN-BS II

Offshore Winds of Change in the Black Sea

In August 2016, the Government of Romania led by Dacian Ciolos adopted Ordinance No. 18 on Romania's maritime spatial planning and based on this normative act a cadastre of the sea had to be made. It was all planned within the European project 'Cross-Border Maritime Spatial Plan for the Black Sea - Bulgaria and Romania - MARSPLAN-BS II', a large part of funding being provided by Brussels. Although five years have passed since the adoption of the ordinance, Romania is in the same place. It has not prepared such a plan, but instead is preparing to amend the legislation.

by Adrian Stoica

MARS PLAN – BS II, Bulgaria - Romania

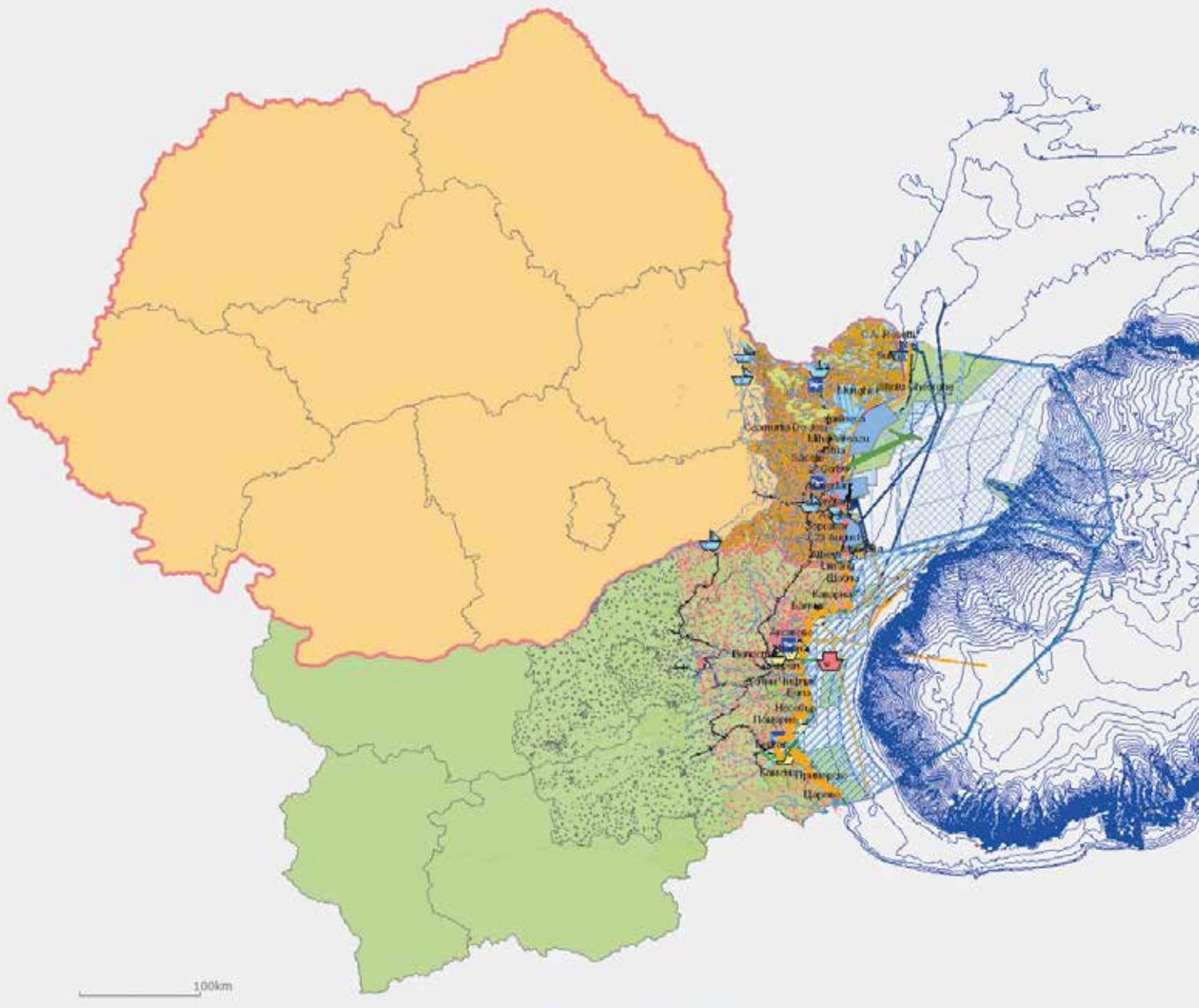
The policies related to the protection and development of maritime activities in the oceans and the seas are on the top of the European policies agenda. The Black Sea is of strategic importance for security protection of this part of Europe and for the economic and social development of all Black Sea countries.

The Integrated Maritime Policy (IMP) is the most adequate approach for obtaining good environmental status of the marine area, as well as for most relevant investment environment for sustainable use of the potential of the sea including the creation of new jobs and sustainable 'blue' economic growth. Maritime Spatial Planning (MSP) is a public process for analysis and planning of human activities in marine areas to achieve ecological, economic, and social objectives. The final goal is to develop spatial plans which define the effective use of marine areas for different marine activities and sustainable use of marine and coastal resources. Thus, to create a framework for coordinated, transparent and sustainable decision making based on reliable data. Applying an ecosystem-based

approach and the transboundary cooperation are of great importance for boosting the sustainable growth of marine and coastal economies.

Activities

The main activities are related to elaboration of the maritime spatial plans in Bulgaria and Romania with updated GIS model and database, based on the results of the first MARSPLAN-BS Project; develop the MSP common strategy for the cross-border area of Bulgaria and Romania, addressing also Land-Sea Interactions (LSI) and Multi-Use (MU) concept; provide effective stakeholder participation in the design of national and cross-border MSP process and sharing of good practices for the Black Sea from Bulgaria and Romania.



Key facts

Co-funded by the European Maritime and Fisheries Fund of the European Union AGREEMENT NUMBER EASME/EMFF/2018/1.2.1.5/01/S12.806725

- Start of the project: 1 July 2019
- End of the project: 30 June 2021
- Duration: 24 months
- Budget: 1 562 099 Euro
- 80% funded by EC, European Maritime and Fisheries Fund (EMFF) 20% own contribution of partners

Main project objectives

- To support the coherent, cross-sectoral Maritime Spatial Planning (MSP) in Bulgaria and Romania under the framework of MSP Directive 2014/89/EU and to establish a long-lasting mechanism for the Black Sea Basin cross-border cooperation on MSP.
- To help capacity building and supporting Competent Authorities in Bulgaria and Romania for MSP implementation, as well developing of national marine spatial plans on the bases of results of the first MARSPLAN-BS Project (2015-2018).

Romania sits idly by

Although no deadlines were imposed at the level of the European Commission for making this plan, Romania managed not to move anything for its accomplishment. In December 2020, the Ministry of Public Works, Development and Administration put up for tender the contract for “purchasing expert services for substantiating and preparing the Maritime Spatial Plan”. According to the notice posted at the time on SEAP, the subject matter of the contract is conclusion of a contract, in order to purchase expert services for substantiating and preparing the Maritime Spatial Plan, in accordance with the provisions of the Directive 2014/89/EU of the European Parliament and of the Council of 23 July 2014 establishing a framework for maritime spatial planning and Government Ordinance No. 18/2016 on maritime spatial planning, within the project ‘Cross-Border Maritime Spatial Plan for the Black Sea - Bulgaria and Romania - MARSPLAN-BS II’.

The contract, with an estimated value of RON 1.2mln, VAT excluded, was not concluded, because in April this year (2021) the tender was cancelled.

Although almost four months have passed, no tender took place since then.

Why amending the legislation

The amendment and supplementation of Ordinance 18/2018 under the draft currently put up for public debate by the Ministry of Development aim only at issues meant to ensure the operation of the Maritime Spatial Planning Committee, an inter-ministerial body that ensures the development and monitoring of implementation of the Maritime Spatial Plan, i.e., precisely that body that so far has not done anything. It operates under Prime Minister’s coordination, who also ensures its chairmanship.

One of the most important amendments that envisages the operation of the Committee refers to eliminating the wording ‘nominal membership’, so that the persons nominated by the component institutions are not established by Government Decision, thus avoiding the blockages generated by the need to amend it for each change of nominations.

Basically, the wide representation of ministries in this Committee, to which several regulatory authorities are added, turns it into a mini government.

What should the marine cadastre provide

The primary purpose of maritime spatial planning consists of promoting sustainable development and

identifying ways to use the maritime space for various purposes, including for managing conflicts in marine areas.

Specifically, MARSPLAN would have a guiding and regulatory character for activities in aquaculture areas, fishing areas, facilities, and infrastructure for the exploration of oil, gas, and other energy sources, of mineral resources, and to produce energy from renewable sources.

It would also cover maritime transport routes and traffic flows, military exercise, and training areas, protected natural areas in the national network, scientific research, including related facilities and infrastructure, submarine cable and pipeline routes, and their safety and protection zones.

Last but not least, the plan would include references to areas with tourist activities, with underwater cultural heritage, coastal protection measures against erosion, intervention plans in case of accidental pollution or in case of a marine natural hazard at risk for the coastal area and areas where there is port and hydrotechnical infrastructure.

Wind potential of the Black Sea

Once Romania has a plan for maritime spatial planning, the country will be able to attract very large investments by exploiting the wind potential of the Black Sea. On the other hand, the apparition of offshore wind farms will have a positive impact on Romania’s energy independence, the authorities claim.

According to a study conducted by the World Bank specifically for the Black Sea area, in the coastal waters area alone Romania has the possibility to set up wind farms with a potential capacity of up to 72,000 MW. Romania has the best continental shelf for wind energy in Europe.

It is very stable from a tectonic point of view and allows the installation of wind turbines even at only five meters in the ground. Wind would also allow them to produce energy seven to eight months a year, while in other similar regions wind turbines produce only five to six months a year.

Who leases the land under water?

Developing the maritime spatial plan wouldn’t be the only problem that authorities should solve to green-light investors to build wind farms in the Black Sea. In Romania it is unknown what is the institution that should lease areas or land in the Black Sea for this type of activity to companies, specifically who will be able to manage the territory below the sea surface.

For now, the issue is being analysed by the Secretariat General of the Government, an analysis being ordered to this end. ■

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METALS & MINING

Aluminium

**Strategic Materials
and Energy Transition**



Aluminium has seen tripling production in the last twenty years and green transition promises to use it increasingly more in low carbon technologies. In addition to pressure on resources, China's domination over refining activities and the situation of dependence it involves, especially for Europe, the green economy needs this metal.

by Rona Rita David

The 'king of modern world', essential in the global economy

Aluminium is the second-most abundant metallic element in Earth's crust after silicon and the second most used metal after iron. It is particularly appreciated for its malleability, its natural resistance to corrosion, as well as its strength-to-weight ratio. Aluminium has become absolutely essential in our modern societies and can be found in many sectors of the economy, such as transportation, construction, the electrical sector or packaging.

Aluminium is increasingly used in low-carbon transition technologies. It is thus found in the battery case, as a cathode in lithium–nickel–cobalt–aluminium oxide (NCA) batteries and in hydrogen fuel cells. Due to its light weight, it is a privileged element of the nacelles and blades of the wind turbine, being found even in permanent magnets. As regards photovoltaic panels, it is widely used in frames and inverters. The electrical connection infrastructure is also passionate about this metal. Finally, the metal is widely used in the field of mobility because of its lightness as well as its resistance (Huisman et al., 2020).

Resources and reserves are in tropical and subtropical regions

The estimated resource of bauxite (Alu) is between 55 and 75 billion tons (Gt) globally (according to USGS, 2021). There are two main categories of bauxite deposits: karst bauxites, located mainly in the Caribbean (Jamaica), the Mediterranean Sea (Greece, France), China, Russia (Central Urals) and Kazakhstan; and lateritic bauxites, the main sources of world production being found in Africa (Guinea), South Asia (India), Australia, North and South America.

World Bauxite Reserves – 2019

Country	2019 Reserve (Mt)	% total	Cumulative
Guinea	7,400	24%	24%
Australia	6,000	20%	44%
Vietnam	3,700	12%	56%
Brazil	2,600	9%	65%
Jamaica	2,000	7%	71%
Indonesia	1,200	4%	75%
China	1,000	3%	79%
India	660	2%	81%
Russia	500	2%	82%
Saudi Arabia	200	1%	83%
Malaysia	110	0%	83%
United States	20	0%	84%
Other countries	5,000	16%	100%
World total	30,390		

The top 5 countries, Guinea, Australia, Brazil, Vietnam and Jamaica, hold over 70% of the world's documented bauxite reserves. Bauxite resources are estimated to be 55 billion to 75 billion tons, in Africa (32%), Oceania (23%), South America and the Caribbean (21%), Asia (18%), and elsewhere (6%).

Source: USGS

According to estimates provided by the US Geological Survey (2021), world bauxite reserves are not very concentrated and amount to 30 Gt. They are mainly located in tropical or subtropical areas: Guinea (24.9%), Australia (17.2%), Vietnam (12.5%), Brazil (9.1%) and Jamaica (6.7%).

The two countries with the highest bauxite reserves dominate mining; therefore, together, Australia (29.6%) and Guinea (22.1%) account for more than half of world mining production. China, whose reserves are limited (3.4%), still accounts for 16.2% of world production. This top three is completed by Brazil (9.4%), Indonesia (6.2%) and India (5.9%).

4 European countries produce bauxite

Greece, France, Hungary, and Croatia account for less than 1% of the global volume. Although Australia has been the largest producer of bauxite for more than two decades, its relative share in world production has declined (39% in 1996) due to increased production in West African and Southeast Asian countries (USGS, 2021). Having been virtually absent from the bauxite mining landscape,

Indonesia made a sensational entry into the global rankings in 2011 and accounted for almost 20% of production in 2013, when the government decided to ban ore exports in January 2014, followed by the collapse of domestic production. Malaysia then experienced the same type of growth (12% of world production in 2015), before the Malaysian government in turn banned bauxite exports in 2016. The consequences were the proliferation of clandestine operations and environmental damage (OECD, 2019).

International groups owning mines

The sector's mining landscape is dominated by large international groups that either fully own the mines or develop mining projects in joint venture with state-owned companies. There are established companies such as Alcoa (USA) or Rio Tinto (UK/Australia) with the newcomers of the 2000s, mainly Chinese companies (Bosai group in Chongqing, Chalco and Hongqiao group), and Emirates Global Aluminium (United Arab Emirates). Australian companies are also active in the field (Alumina Limited, South 32), as well as companies from India (Hindalco Industries), Norway (Norsk Hydro) and Russia (UC Rusal) (OECD, 2019).

Alumina, dominated by China

Alumina production has shifted from industrialized countries to

World Alumina Refinery and Bauxite Mine Production and Bauxite Reserves

Country	Alumina (kt)		Bauxite (kt)		Reserves (kt)
	2018	2019	2018	2019	
United States	1,570	1,600	W	W	20,000
Australia	20,400	20,000	86,400	100,000	6,000,000
Brazil	8,100	8,900	29,000	29,000	2,600,000
Canada	1,570	1,500	—	—	—
China	72,500	73,000	79,000	75,000	1,000,000
Guinea	180	300	57,000	82,000	7,400,000
India	6,430	6,700	23,000	26,000	660,000
Indonesia	1,000	1,000	11,000	16,000	1,200,000
Jamaica	2,480	2,100	10,100	8,900	2,000,000
Malaysia	—	—	500	900	110,000
Russia	2,760	2,700	5,650	5,400	500,000
Saudi Arabia	1,770	1,800	3,890	4,100	200,000
Vietnam	1,310	1,300	4,100	4,500	3,700,000
Other countries	11,400	12,000	17,000	15,000	5,000,000
World total (rounded)	131,000	130,000	327,000	370,000	30,000,000

In 2019, around 370 million tonnes of bauxite were produced world-wide. The majority of this material was consumed in-country for the production of smelter grade alumina.

Source: USGS

countries with easy access to abundant resources and cheap electricity. It amounted to 136 million tons (Mt) in 2020, largely dominated by China (54%) whose production has grown very strongly since the 2000s. This increase in Chinese production has made it possible to reduce the country's dependence on alumina imports, but now exposes it to fluctuations in the price of bauxite, from which it has to import almost half of its domestic consumption. Other producing countries are Australia (15%), Brazil (7%), India (5%) and Russia (2%). The top 10 alumina producers include four Chinese groups (Chalco and China Hongqiao, East Hope and Hangzhou Jinjiang groups), the US company Alcoa, the Anglo-Australian group Rio Tinto, the global company South32, UC Rusal, Norsk Hydro and finally India's Hindalco.

Primary aluminium

In 2020, global production of primary aluminium reached 65 Mt, a level 2.5 times higher than in 2000, with a Chinese domination (56.7% compared to 8.6% in 1996). Far behind are India and Russia, each with a market share of 5.5%, followed by Canada (4.8%) and

the United Arab Emirates (4%). There has been a decline in smelting capacity in OECD countries in recent years. For example, the United States, Canada, and Australia together accounted for more than a third of world aluminium production in 1996, compared to less than 10% today.

Compatible with the Paris Agreement

Due to its remarkable properties, aluminium will remain a flagship metal in our societies until 2050, especially in the case of a climate scenario compatible with the objectives of the Paris Agreement.

In order to determine the impact of increased aluminium demand on bauxite resources, research teams have calculated the cumulative consumption to resource ratios for the 2D and 4D scenarios. The USGS provides two estimates of bauxite resources:

the smallest places them at 55 billion tons, while the largest puts them at 75 billion tons. In the most optimistic assumption, the criticality level associated with bauxite varies between 25.2% in the 4°C scenario and 63.9% in the 2°C scenario. These ratios are 34.4% and 87.1% respectively in the case of the most pessimistic estimate. The choice of the assumption therefore affects the geological criticality analysis. However, irrespective of the assumption selected, the ratios obtained in the 2°C scenario indicate high pressure on bauxite resources.

Environmental challenge

Aluminium is an essential material for the energy transition and its demand will grow massively by 2050. This metal will be a privileged ally in the lightening of vehicles and an essential element of electrical infrastructure, solar panels, and wind turbines. The International Aluminium Institute (2021) has calculated that in order to comply with the GHG reduction targets as defined in the International Energy Agency's (IEA) Beyond 2°C scenario (B2DS), the carbon footprint of primary aluminium production would need to be reduced from more than 6t eqCO₂/t of aluminium (world average in 2018) to 2.5t eqCO₂/t. Such an increase would require an investment estimated at USD 0.5-1.5 trillion over the next 30 years. A carbon-free future therefore requires an increase in global production capacities. However, this key metal for the energy transition is also a source of greenhouse gas emissions. The aluminium industry is very electricity intensive.

In 2018, the sector alone accounted for 2% of global greenhouse gas emissions. The carbon intensity of the aluminium obtained is closely linked to the electricity mix of the producing country: in Europe, particularly in countries with decarbonized domestic production from hydroelectric dams, geothermal and nuclear power (Norway, France, Iceland), the production of one ton of primary aluminium generates around 7 tons of CO₂ equivalent (CO₂eq), while it produces more than 20 tons of CO₂eq in China, where the electricity used in smelters generally comes from coal-fired power plants (European Aluminium, 2019).

While the carbon intensity of European primary aluminium production has already decreased by 55% since the 1990s, the effort required from China is much greater and could be a source of disruption of domestic supply.

A critical metal for the European Union

In the latest update of its list of critical raw materials (European Commission, 2020), the European Union has included bauxite for the first time. Used in many industrial ecosystems, bauxite is difficult to exploit in Europe, hence the EU's strong reliance on imports (87%). A country supplies bauxite to the European Union in particular: Guinea. However, in a recent report (El Latunussa, 2020), the European Commission (EC) mentions the problematic nature of this dependence on a country whose governance is described as weak.

The EC also concludes that European demand for both primary aluminium and bauxite will increase by 2050 and indicates the risk of destabilization generated by Chinese appetite in these markets. Despite a 12-fold increase in its mining production since 1995, China now absorbs two-thirds of global bauxite imports (OECD, 2019). Europe therefore seems to be aware of the uncertainties affecting the supply of aluminium, weaknesses that could be exacerbated in a context of rapid and widespread global demand.

Recycled aluminium, much smaller carbon footprint

Aluminium is easy to recycle and can theoretically be reused again without losing its remarkable properties. Therefore, the limiting factors lie mainly in the efficiency of collection systems and in long downtime in the transportation or construction sectors, for example. This secondary production has a double advantage: firstly, secondary aluminium has a much smaller carbon footprint, which makes it an essential element in the decarbonization strategy of this industry; secondly, secondary production improves security of supply in consuming countries and, in addition, one third of European supply is already satisfied through recycling (EC, 2020).

Conclusions

A metal with remarkable properties, aluminium will remain a flagship metal in our societies until 2050 due to its increasing use in low carbon technologies.

The risks this metal is exposed to are:

- Geologic: the TIAM-IFPEN model anticipates a high degree of geological criticality for bauxite resources in a 2°C scenario.
- Economic: global production of alumina and primary aluminium is largely dominated by China.
- Strategic: Europe is heavily dependent on imports of bauxite, which has recently been declared a critical raw material by the European Commission.
- Environmental: as a source of greenhouse gas emissions, the aluminium industry is expected to undergo a profound change in the coming years. ■

Euro Sun Mining to List on London Stock Exchange

Euro Sun Mining Inc. (ESM), a European focused gold-copper developer, announced its intention to seek a listing of the Company's shares on the London Stock Exchange (LSE) Main Market. Subject to the required regulatory approvals from the Financial Conduct Authority and the LSE, including publication of a Prospectus. Admission to the LSE is expected to occur in Q3 2021.

The announcement is an advertisement for the purposes of the Prospectus Rules of the Financial Conduct Authority (FCA) and not a prospectus and not an offer to sell, or a solicitation of an offer to subscribe for or to acquire, securities in any jurisdiction, including in or into the United States, Israel, Australia, Japan, or the Republic of South Africa.

Key Company Highlights

- The Company's main asset, the Rovina Valley Project, which contains the Rovina, Colnic and Ciresata deposits, is one of the largest undeveloped copper-gold projects in Europe, holding approximately 400Mt of confirmed resources containing 7.0 million ounces of gold and 1.4 billion lbs of copper.
- The Rovina Valley gold and copper project is 100% held by the Company.
- Euro Sun recently completed a Definitive Feasibility Study (DFS) on the Rovina Valley Project, outlining its robust economics and a full project outline towards construction.
- The results of the DFS were announced in March 2021, showing average annual gold equivalent production of 146,000 ounces in the first 10 years, consisting of 106,000 ounces of gold and 19 million pounds of copper per annum at an average AISC of \$790/gold equivalent ounce with a mine life of 16.8 years.
- The DFS has been based solely on the development of the Colnic and Rovina deposits. Further development of the Ciresata resource could extend the life of the operation while utilising the same infrastructure and processing capabilities that would already be in operation.
- The management team and Board, which comprises six independent non-executive directors and one executive director, has a proven track record in financing large scale mining projects and a significant focus on corporate

governance and experience overseeing companies listed on leading international stock exchanges.

"The decision to list in London, the world's most dominant capital market for mining stocks, fully underpins our overarching strategy of producing critical metals from our asset located in the EU to meet the increasing demand from European markets, which are taking steps to become more self-sufficient and cut their reliance on countries such as China for strategic resources. There is currently a short supply of copper and gold produced within Europe, and ESM is well placed to help fill that gap. Once in production, we expect to be one of the most efficient and environmentally responsible producers of copper and gold not only in Europe but globally. The Board looks forward to the opportunity to raise the Company's profile through the London listing ahead of what management expects will be several value-accretive catalysts," Scott Moore, Chief Executive Officer of Euro Sun, commented.

"The Project, which has already been awarded its mining exploitation permit, is one of the largest undeveloped projects of its kind in Europe, with 10.1 million ounces of gold equivalent of measured and indicated resource¹. The Project is targeted to be in production in 2024 and will use simple and low-impact mining to produce a clean copper and gold concentrate product, ideally suited for European smelters. Equally as important as RVP's size and location is our commitment to responsible practices. We have clear Environmental, Social and Governance commitments that are aligned with internationally recognised standards and goals. We take pride in our low-impact approach, which will use dry-stacking, existing infrastructure, renewable/grid electricity, and zero cyanide. We have and continue to work with all levels of government and the local communities to maintain our social license to operate and ensure we leave a lasting socio-economic benefit for years to come," he added. ■

ANALYSIS

ENERGY POVERTY

A Time Bomb Waiting to Be Defused

by Rona Rita David



Energy poverty refers to the insecurity of persons, families or groups that do not have normal and regulated access, in their homes or in the places they live in, to energy sources necessary to meet their primary needs. The causes may be buildings poorly insulated against cold or heat or the price of energy resources. Energy poverty is responsible for climate problems and the ecological factor of the planet, as heating and operating the home is a direct and indirect source of significant greenhouse gas emissions, which can be reduced through energy efficiency. Energy poverty (also known as fuel poverty) was set out as concept, for the first time, in the UK, in 2001.



Energy poverty in Europe

According to Eurostat data, energy poverty (in the sense that the own home couldn't be heated due to the lack of money) affected almost 7% of EU's households in 2019. The seriousness of the situation varies widely from one country to another. The share of households with heating difficulties was the greatest in Bulgaria and Lithuania, i.e., 30.1% and 26.7% respectively. The share was above average in countries in southwestern Europe, such as Spain (7.5%) and Italy (11.1%). In France, it was 6.2% (slightly lower than the European average), while Germany (2.5%) and Finland (1.8%) were among the countries that managed to significantly diminish it. In general, single people, young people and single parent families are the most exposed to energy poverty. Across Europe, around one tenth of single parent families have hardly afforded adequate heating.

In Europe, during 2007-2019, electricity prices for household consumers increased constantly. The average cost per kilowatt-hour increased from EUR 0.18 in the first half of 2007 to EUR 0.21 in 2019, but with significant differences between the Member States. Denmark (EUR 0.31), Germany (EUR 0.30), Belgium (EUR 0.29), Ireland (EUR 0.25) and Spain (EUR 0.24) are the top five countries in which the kilowatt-hour is the most expensive, including all taxes and duties. At the other end, Member States where the kilowatt-hour is the cheapest are Bulgaria (EUR 0.10), Lithuania (EUR 0.10), Hungary (EUR 0.11), Romania (EUR 0.13), Malta (EUR 0.13) and Poland (EUR 0.13) (Eurostat).

Indicators used to measure energy poverty

Measurement of energy poverty requires a combined approach. This is what the EU Energy Poverty Observatory does, whose goal is to measure, monitor and inform about energy poverty. 28 indicators are used to assess the number of Europeans in energy poverty.

There are four main indicators, allowing to determine whether a household is in the situation of energy poverty. While two of these are based on statements regarding households' access to energy services, the other two indicators assess energy expenses. In 2019, over 30 million Europeans felt they couldn't maintain their homes properly heated, of which 6.2% represent the segment of those who cannot pay their duties on time: heating, electricity, gas, water etc. At the opposite side, 15.5% of European households allocate a large part of their income to energy expenses. It's about the families living in buildings with low thermal and energy efficiency, which require more heating to obtain a comfortable temperature inside. Therefore, high income families have proportional energy expenses.

The need to address all dimensions of energy poverty

The EU Energy Poverty Observatory presents 24 secondary indicators that contribute to a better understanding of energy poverty, such as energy prices, number of power outages and the quality of housing.

Air conditioning and transport, underestimated elements of energy poverty

Although now the concept of energy poverty tends to focus on people who suffer from cold in their homes, energy poverty also exists during summer, as some families cannot maintain their houses cool enough. This 'summer energy poverty' is already a 'life and death' problem, as the 2003 heat wave in Europe reminds us, wave which caused 30,000 deaths. Climate change increases the frequency, intensity, and duration of heat waves, which leads to an increased demand for air conditioning, even in temperate climate zones. Research shows that social and economic factors play a major part in this phenomenon of excessive heat: the risk of exposure (poorly insulated housing), people's capacity to react to excessive heat, as well as their sensitivity. Vulnerable members of a household, such as small children, the elderly and people with chronic medical conditions are particularly at risk. Therefore, summer energy poverty is an ever-increasing threat to the lives of people at a time when the European population is aging.

Also, many European dwellings have difficulties in accessing means of transport. The general concept of 'transport poverty' can mean the financial inability to travel, limited access or even lack of motorized transport or infrastructure. Therefore, transport poverty is not just the result of a significant financial burden related to fuel costs. Despite the diversity of causes and their consequences, there is a correlation between these various aspects of energy poverty. In some countries, poor quality of housing leads to thermal discomfort during winter and summer, and

higher bills throughout the year. Another study underlines that many people could focus on transport expenses (to go to work reducing other expenses, for example high energy costs and consumption with the house).

Who suffers from energy poverty in Europe?

The main causes of energy performance of buildings (aggravated by the Covid-19 crisis) are given by the poor energy performance of buildings, high energy prices and low income of families.

The European building stock is characterized by a poor thermal quality of housing. Half of the buildings were built before 1970 and their energy performance is poor. In countries with mild winters (Portugal and Malta), where buildings were not designed for cold winters and whose energy efficiency is low (due to poor insulation), the situation is often uncomfortable for residents, especially in case of extreme temperature episodes, including during summer. There is a greater mortality during winter than in countries with cold winters, where buildings are more energy efficient.

In the EU, buildings are responsible for 40% of the EU's energy consumption and 36% of the greenhouse gas emissions. According to the Buildings Performance Institute Europe, 97% of them need renovation to comply with energy efficiency standards and requirements for becoming buildings with close to zero emissions. However, energy renovation rates remain around 1% per year and only 0.2% of the buildings are subject to complete renovation every year (to reduce the energy consumption for buildings by at least 60%).

Link between energy poverty and low income

Households suffering from energy poverty are very often those with low income. Budget constraints limit their capacity to pay energy bills for the daily consumption and even more so to invest in rehabilitation for a long-term energy efficiency. Moreover, it is about



Share of population at risk of poverty with an inability to keep their home adequately warm (%)

0-10% 11-20% 21-30% 31-40% 40+%

housing where rents are more affordable, but energy costs are higher. However, energy poverty and income poverty do not overlap perfectly, as a low-income family can live in a well-insulated building and have reduced energy expenses. Therefore, the low income does not necessarily lead to energy poverty. If energy prices are high for the end-

consumer, they can contribute to energy poverty. Therefore, for European families, electricity prices were corrected with inflation and increased due to politicians' decisions of increasing electricity taxes. Energy poverty can be aggravated by such increase in energy prices, but it plays a much smaller role than the energy performance of housing and income.

Aggravating effect of the Covid-19 crisis

The measures taken by governments to stop the Covid-19 pandemic had a major impact on the European economy. Despite the mechanisms of partial unemployment established in EU countries, bankruptcy led to losses of permanent jobs and, therefore, an increase in unemployment in the EU. At the same time, lockdown measures forced to population to stay at home, which led to an increase in heating and electricity consumption and, therefore, higher energy bills, especially during winter. This could be a major impediment for many Europeans, especially for families that already have difficulties to pay their bills.

According to the European Foundation for the Improvement of Living and Working Conditions, in July 2020, 34% of respondents in Europe believed that their financial situations worsened with the pandemic and 44% said they were on the verge of not being able to keep their homes. Due to a decrease in income associated with an increase in energy expenses, more and more Europeans dedicate a higher share of their budget to fixed costs. Gradual increase in the number of persons benefiting from food aid is alarming. In France for example, food distribution increased by 30% between September 2019 and September 2020. This poverty affects students, temporary workers, but also the independent workers and handcrafters, which potentially increases the number and diversity of persons likely to suffer from energy poverty.

Women are more likely to be affected by energy poverty

Due to the longer life expectancy than in the case of men and due to lower pensions, older women face a particularly high risk of exposure to energy poverty. Single parent families are also very exposed, and they are represented by most single mothers (in 2019, 11% of adults with dependent children were single women, compared to 3% for men). Specialists' study sheds light on the different ways of feeling and reacting to such poverty, depending on gender. Women must deal disproportionately with situations, especially in the way they experience or react to energy shortages (e.g., more effort to save energy, emotional stress to protect children etc.). Social housing and those whose rents are regulated by law are more affected by energy poverty, and families who rent are also affected: more than a fifth of EU tenants say they have difficulty heating their homes during winter and pay their bills. It is difficult for tenants to improve the energy efficiency of their homes, as homeowners may not be in favour of this. Families who own their own homes are, on average, less affected by energy poverty in the EU, but this hides major differences between Member States, especially related to differences in ownership in each state. In Romania and Hungary, over 90% of the homes are occupied by their owners.

Geographical and social energy fracture

Although winters are colder in northern Europe, the one that feeds energy poverty is southern Europe. This is what prompted some researchers to talk about a geographical and social 'energy fracture' that splits the EU in half and translates in the fact that a larger share of housing in the less developed Member States leads to the incapacity to meet basic

energy needs. Bulgaria, Lithuania, Greece, Portugal, and Cyprus are the countries with the highest proportion of people who say they have difficulty maintaining an adequate temperature in their homes. This is explained not only by the high electricity and gas tariffs, but also by a higher risk of poverty. However, some countries where electricity prices are below average, such as Cyprus, Slovenia, Romania, Hungary, energy poverty is given in particular by the poor quality of housing. Moreover, absence of district heating and adequate heating systems leads to high energy expenses. This underlines the key role played by housing in energy poverty, which cannot be reduced to a form of monetary poverty.

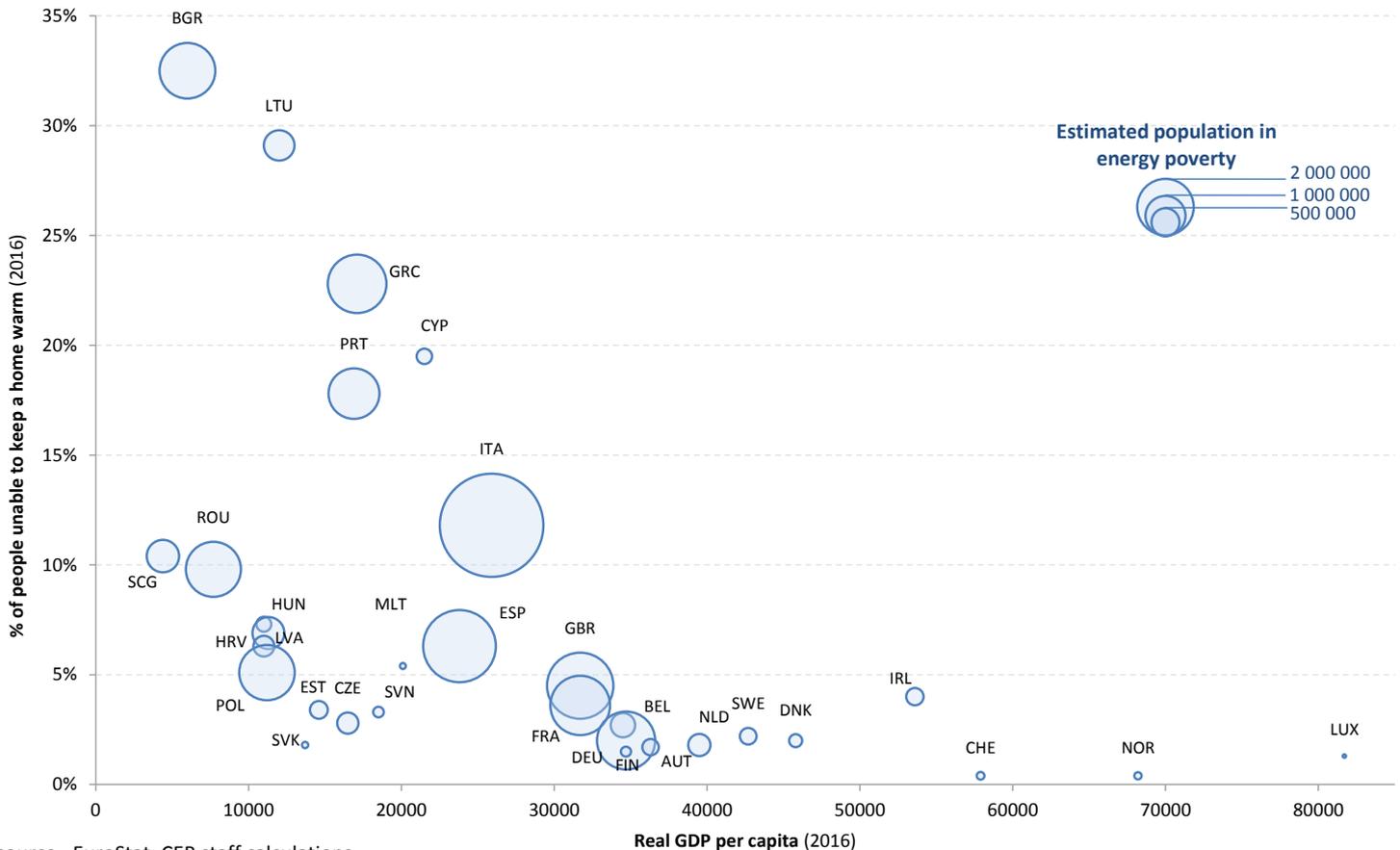
Even in north-western Europe, energy poverty is a reality: according to Eurostat data, 3-4 million French and about 2 million Germans are not able to heat their homes properly. French people facing energy poverty show that these figures can be underestimated, as 14% of homes housing over 9 million people expressed a cold sensation during the winter of 2019-2020.

And yet, the number of EU households unable to heat their homes sufficiently fell from 9.5% in 2010 to 6.9% in 2019 (with a sharp decline in Bulgaria (-54.74%)).

Although data on air conditioning in Europe are limited, researchers have developed a European index of internal energy poverty which shows that most Member States have difficulties in winter rather than summer. These statistics are concentrated in the southern, south-eastern and Baltic Sea regions, where GDP per capita is often below the European average. In 2012, half of Bulgaria's population said that housing was not cold enough in the summer, the same statement being true for 35% of Portuguese, Maltese, and Greeks. In contrast, less than 10% of the population was affected in the United Kingdom, Ireland, and Sweden.

This European Energy Poverty Index also collects data on the share of energy expenses related to transport of low-income families. However, the data highlight significant differences that depend on the policies pursued in each country. Thus, Finnish and Irish policies have encouraged the construction of houses outside urban areas and access to public transport. For most low-

GDP per capita correlated with energy poverty



source - EuroStat; CEB staff calculations

income families in Hungary and Bulgaria, public transport is too expensive for regular use. In contrast, in Spain, Luxembourg and Cyprus, due to the price and affordability of public transport, it is a viable option for anyone.

According to a study conducted in France, 21% of families suffer from energy poverty in terms of transport. Meanwhile, the government estimates that 10.2% of families allocate an excessive share of their income to moving expenses.

Consequences of energy poverty

Financial consequences

Difficulties to pay the bills lead to the use of other budgets dedicated to equally important needs, such as housing, food, education; establishing mechanisms of restriction or even deprivation leading to other consequences; resorting to aid, with its humiliating nature and others through assistance mechanisms; debts with loan application.

Technical consequences

Heating restrictions have consequences on housing: the poorly heated house will be humid (the cold mainly affects the environment by reducing the air capacity to contain humidity); a poorly ventilated house will be humid and unhealthy and will deteriorate; it will allow the formation of mould and become conducive to unhealthy conditions.

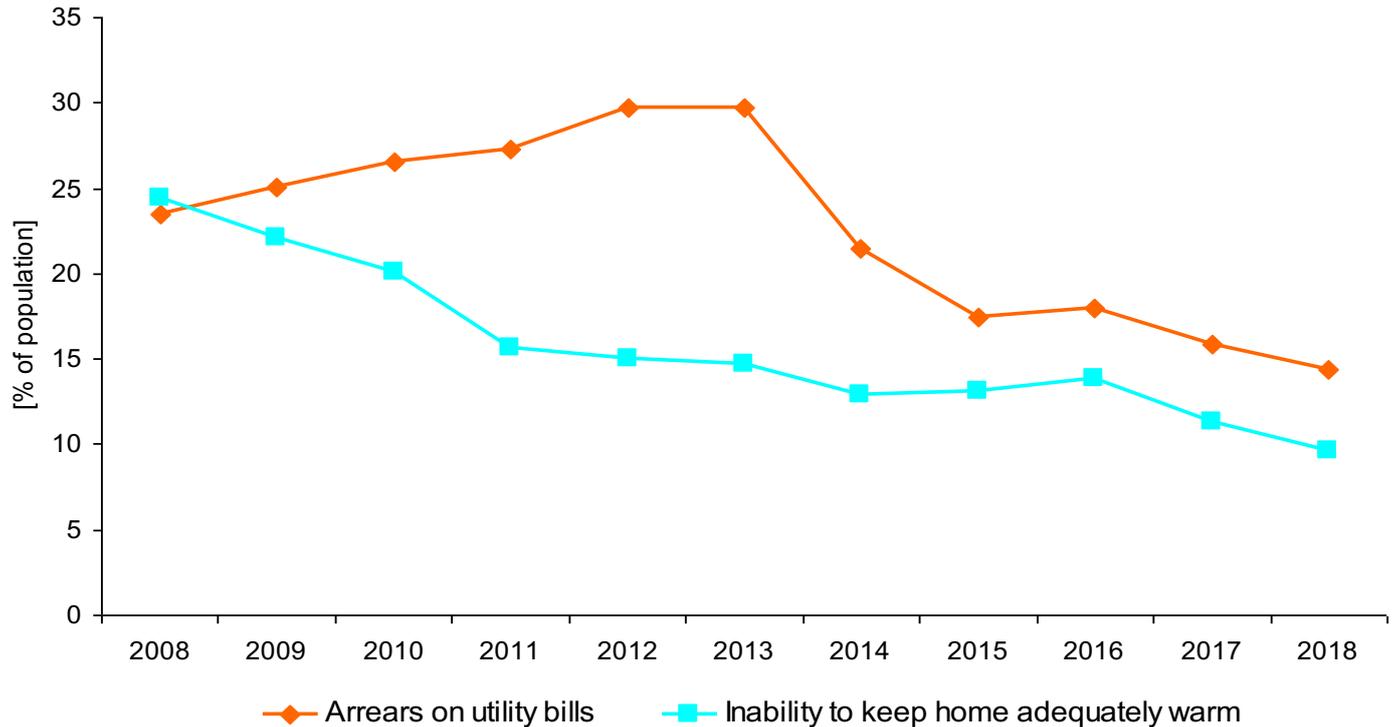
Social consequences

Damaged or uncomfortable housing has social consequences, such as: feeling of injustice, difficult social life, difficult static activities (e.g., homework), difficulties in ensuring an adequate level of hygiene, deterioration of relations with the lessor/energy suppliers.

Health consequences

Lack of heat generates a few phenomena such as: fatigue; cold favours vasomotor reactions that can trigger the transmission of pathogens. Causal links have been demonstrated for several chronic pathologies (chronic bronchitis, osteoarthritis, anxiety and depression, headaches) and acute (colds and tonsillitis, flu, or gastroenteritis), but also

Energy poverty over the last 10 years in Romania



symptoms such as wheezing, asthma attacks, hay fever, rhinorrhoea, or eye irritation.

Housing insecurity consequences

The use of oil or gas stoves can be the cause of fires, carbon monoxide poisoning.

Environmental consequences

Energy poverty and, in general, all homes with poor energy performance generate a great waste of energy and an increase in CO₂ emissions.

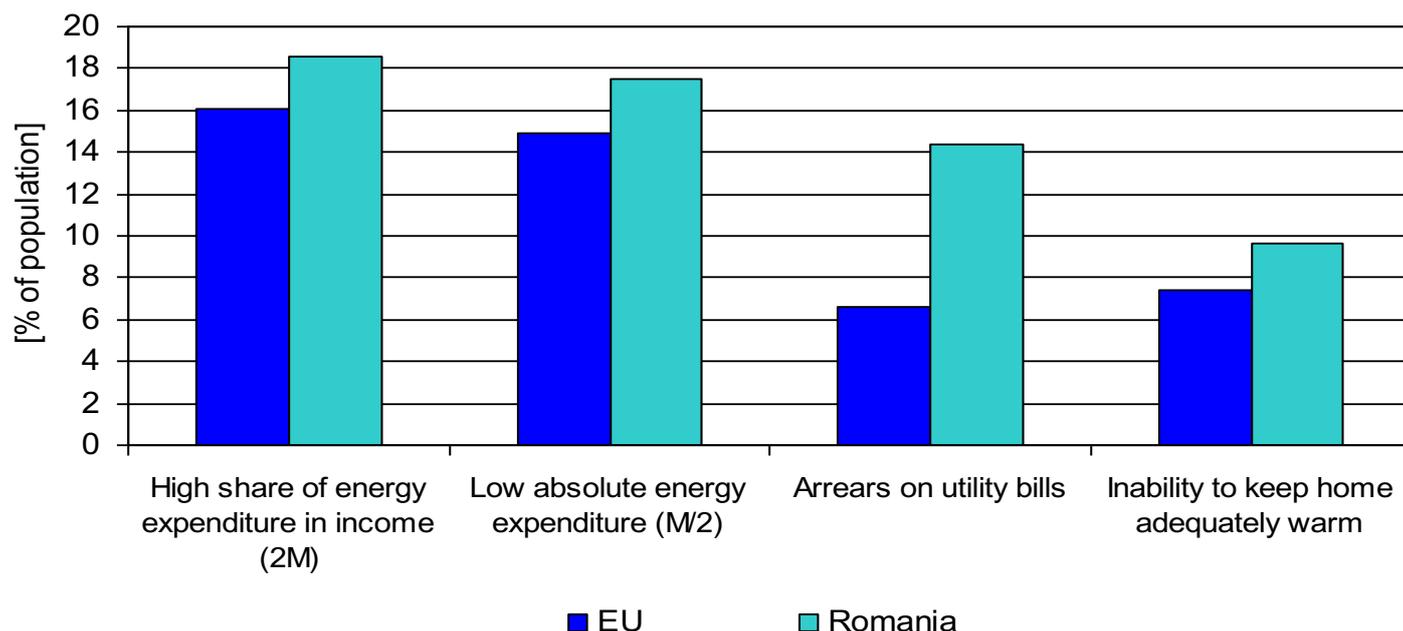
Actions to fight energy poverty

Regarding energy transition, political decision-makers have a set of comprehensive political tools to move from a system based on the inefficient use of fossil fuels to a system based on the efficient use of renewable energy. The cost of this transition depends on the approach favoured by government policy: decision-makers can decide to increase fuel taxes or invest primarily in the renovation of buildings and public transport. The 2013 protests in Bulgaria highlighted political decision-makers who should bear in mind that a small increase in energy prices can have a major impact on the daily lives of millions of households already in financial difficulties. Therefore, a socially just transition based on measures aimed at improving the living conditions of the most vulnerable families is imperative.

In accordance with the principle of subsidiarity, the main public policies to combat energy poverty are pursued by Member States, regions, and local authorities. However, the European Commission (EC) has activated various instruments to support national and local action to lift Europeans out of energy insecurity: exchange of experiences, legislation, funds, and instruments, such as the recent 'Renovation Wave' strategy. By sharing the experience of energy poverty and informing policy makers launched in January 2018, the EU Energy Poverty Observatory (an EC initiative) was designed to assist Member States in their efforts to provide a platform for knowledge and good practice exchange. The combination of indicators provides a useful basis for collecting data and measuring the phenomenon at EU level. The data, results and research, experience gained on this platform are used by the EU Observatory to provide good practice, training, and advice to decision-makers.

At the same time, the Interreg Europe platform supports local and regional

Results of EPOV primary indicators in Romania, 2018



governments, sharing experiences in public policy and providing financial support for interregional projects. Thus, the Social Green project brought together municipalities and energy agencies from six Member States. It has made it possible to identify local policy instruments for greening the social housing sector. The results show that regions can learn from each other to face similar challenges. The EC is also considering launching an initiative to provide technical support for social housing projects. This project would involve the renovation of 100 flagship districts, which will be examples.

Legislative measures to encourage Member States to act

The Regulation on the Governance of the Energy Union provides that Member States are required to submit to the EC the national energy and climate plans and action plans for fulfilling energy and climate targets. These national plans should include an assessment of energy poverty and, if the number of households affected by energy poverty is estimated to be significant, the Member State should put in place appropriate measures to address the problem. In any case, assessment by the EC of national plans shows that several Member States do not pay enough attention to the problem, requiring a systematic approach to fight against energy poverty, instead of resorting to a unique action plan.

Examples of complex approaches to energy poverty

An analysis conducted by the EU Energy Poverty Observatory assesses to what extent national plans addressed energy poverty based on 13 criteria, such as recognition and definition of fuel poverty by the Member State or the type and number of measures presented to address this issue. The Belgian, Spanish, then French and Lithuanian national plans stand out as the ones with the most comprehensive approach to energy poverty, even if there are still gaps to be filled in their strategies. In contrast, several countries do not recognize or do not define energy poverty in their national plans and present a limited number of measures implemented. These countries are mainly those with a purely social approach. In 2019, less than 3% of the population of Denmark, Estonia, Germany, Netherlands, and Sweden said they are unable to heat their homes sufficiently. Moreover, these countries do not recognize, in their plans, in terms of energy and climate, energy poverty as a phenomenon. In addition, as part of the requirements of the Energy Performance Directive, Member States were required to submit to the Commission national long-term renovation strategies before March 2020; at the end of 2020, half of the states did not submit their strategies.

The EU also provides funding contributing to the fight against energy poverty, such as structural funds and European investment funds (ESI Fund). Under Horizon 2020 program, the EU has funded several research projects to test innovative solutions to fight energy poverty. Larger

projects were supported by the European Investment Bank (EIB), through various activities. The European Local Energy Assistance Facility (ELENA, developed by the EIB and the EC) has been in operation since 2000 and has allocated EUR 180 million to energy efficiency projects in buildings and transport, mobilizing a total of EUR 6 billion in investment. This mechanism provides specialist assistance in setting up local projects, encourages large projects to reduce trading costs and to develop experiences that serve future projects. The EIB has also created a financial instrument, 'Smart Finance for Smart Buildings', which uses EU subsidies as collateral to encourage private investment in the renovation of residential buildings and helps 3.2 million households to come out of energy poverty. The EC also intends to strengthen access to private funding for building renovation as part of the future strategy. With the Covid-19 crisis, the EU has adopted a historic incentive package, the Next Generation EU (NGEU). This broad incentive package should allow the EU to act for the first time as a macroeconomic stabilizer.

EUR 312.5 billion out of the EUR 750 billion in the NGEU budget will be granted to Member States in the form of subsidies through a Recovery and Resilience Facility (RFF). Each Member State must submit a National Recovery and Resilience Plan, which must be approved by the EC before the State grants RFF funding to each Member State. In the 2021 Annual Strategy, the Commission launched a flagship initiative, 'Renovate', which presents the renovation of buildings as a priority in the RFF.

Political tools to address energy poverty

The European Pillar of Social Rights, proclaimed by the European institutions in 2017, enshrines a set of rights aimed at ensuring equal opportunities, fair working conditions and social protection for citizens. One of the 20 key principles is that everyone has the right to access essential quality services, including energy and transport.

The 'Renovation Wave' presented by the von der Leyen Commission should be a major discovery in the fight against energy poverty. It sets a framework for accelerating the overall renovation of buildings with poor energy efficiency in Europe and aims to renovate 35 million construction units by 2030. Published in October 2020, this strategy provides at least for doubling the renovation rate and improving the quality of renovation to reach higher energy efficiency standards. It seeks to remove obstacles to renovation, such as the difficulty of mobilizing funding and work organization, as well as the reluctance to engage in a lengthy process. The Commission identifies three priorities for renovation:

- Buildings whose energy performance is very poor
- Public buildings (schools can be relevant investment priorities during the recovery period)
- Decarbonization of heating and air conditioning systems

Based on the existing tools, the renovation wave proposes a comprehensive strategy based on legislation, directed funding and technical assistance tools. It also includes measures to make the building ecosystem more sustainable, to create environmentally friendly jobs, for worker training opportunities etc. At the same time, the EC has published a list of recommendations for Member States to fight against energy poverty. The Commission urges Member States to assess the redistributive effects of the energy transition, to use more means of public participation in the

development of control policies against energy poverty, to improve coordination at different levels of government and to better identify low-income families.

Several energy poverty organizations (the Action Network, the ENGAGER COST action network, as well as national organizations) reviewed the measures implemented in six Central and Eastern European Member States and were not convinced of the effectiveness of the EU approach to energy poverty. The EU mainly provides directives to Member States, instead of providing real financial incentives for renovation or initiating coercive measures to push countries into action. The organizations conclude that if the responsibility for the fight against energy poverty lies mainly with the 'goodwill' of the states, the result will be limited, which requires more severe measures, but also incentives.

Conclusions

During winter, during the Covid-19 crisis and under the conditions of continuing lockdown measures, millions of Europeans must remain in poorly heated buildings. These circumstances worsen the situation of pre-existing energy poverty, creating more discomfort and worsening the health of at least 30 million Europeans. In the last decade, the EU has developed an action framework against energy efficiency, based on legislation, on exchange of good practices and funding tools to support vulnerable households and improve energy efficiency. The renovation wave is currently trying to accelerate the general renovation of buildings, an essential step in reducing energy poverty. Already using the tools in force and recent innovations in renovation, the European Union can from now on help all Europeans to step out of energy poverty. Such an objective would be politically desirable insofar as it would make it possible to expand the political coalition that supports the European Green Deal. Therefore, it could concretely improve the life and health of the millions of Europeans suffering from energy poverty. Therefore, this document claims that the EU and the Member States now need a political strategy based on a broad coalition and concrete intermediate goals, so that the goal of taking all Europeans out of energy poverty is the key to the European Green Deal. ■

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EPG SUMMER SCHOOL

Smart Transformation in the Energy Sector

The fourth edition of Energy Policy Group's Summer School, Smart Transformation in the Energy Sector, took place between 26 – 30 July. Due to the special conditions regarding travelling and in-person meetings that persist this year too because of the COVID-19 pandemic, EPG Summer School was organized exclusively online.

Reuniting 14 participants from Romania and five different countries with experienced and reputed speakers, the 5-day program was devoted to decarbonization initiatives with renewables at the centre of the transition to a less carbon-intensive and sustainable energy system.

The summer school is one of EPG's flagship learning programs designed for students and professionals at the start of their career to offer them an in-depth knowledge about the energy sector's fundamentals, a better understanding of the global energy trends, as well as the opportunities and challenges that come along. At the same time, the EPG Summer School is a great opportunity for students and young professionals all over the world to interact, debate and get together in order to build a sense of community.

This year's edition touched upon how investments and financial flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development can be fostered through the economic recovery packages. Such decisions will shape economic and energy infrastructure for decades to come and will almost certainly determine whether the world has a chance of meeting its long-term energy and climate goals. Against this background, special attention had been given to digitalization and smart technologies as well as to understanding the potential of

energy efficiency to enable a secure and sustainable energy system while delivering environmental and social benefits.

Scientifically attested and quantified, climate change is our reality. Even though the correlation between climate emissions and climate effects is not linear, adaptation should be at the cornerstone of future politics. In the pursuit of a sustainable environment, among the most disputed topics during Summer School were the impact of Fit for 55 legislative package and how it will transform the geopolitics, the role of hydrogen for key industries, and also the decarbonization journey from Kyoto Protocol (1998) to Paris Agreement (2015) and European Green Deal (2019).

Due to its content and structure, the program allowed its attendees to understand the energy sector in its full complexity and provided them a platform of interaction and networking. Once again, EPG added a significant piece to our community thanks to an outstanding group of participants engaged and dedicated to this common goal of attaining a smart energy transformation.

The Energy Policy Group (EPG) is a non-profit, Bucharest-based independent think-tank specializing in energy and climate policy, market analytics and energy strategy, grounded in February 2014. EPG's regional focus is Southeast Europe. Its work, though, is informed by wider trends and processes at global and EU levels. EPG is committed to promoting long-term decarbonization policies and actions across all economic domains, with focus on the energy sector. They seek to facilitate objective and informed dialogue between decision-makers and a broad array of stakeholders.

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ENERGY
INDUSTRY REVIEW



2021 EY US Oil and Gas Reserves, Production and ESG Benchmarking Study

Last year was unique among down cycles experienced by the oil and gas industry, as reflected by considerable drops in oil demand, revenues, capital expenditures (capex) and reserves, according to the 2021 EY US oil and gas reserves, production and ESG benchmarking study. The study documents the historic fallout during 2020 with analysis of reserve and production information from the industry's 50 largest publicly traded exploration and production companies — based on year-end 2020 US oil and gas reserves — as well as their environmental, social and governance (ESG) disclosures.

Companies in the study posted the lowest revenues since 2016 at US\$110.8 billion, as the effect of cratered global demand, prices, and increasing investor pressure all weighed on financial performance. Impairment charges amounted to US\$66.6 billion, the highest for the five-year study period by more than 300% due to the significant decline in oil prices. After-tax losses were US\$84.1 billion — the first loss since 2016.

"2020 has the potential to be a profoundly transformative year for energy," said Mitch Fane, EY Americas Energy & Resources Leader and EY US Oil & Gas Leader. "As the market recovers from the pandemic and the financial positions of companies improve, the future of the industry will be determined. One thing is certain: there's no stopping the energy transition. The oil and gas companies that remain today are confronting the immense challenge of how to access capital, reinvest and reshape their businesses."

Capital expenditures, production, and reserves

According to the study, capex totaled US\$60.3 billion, 60% lower than 2019, the lowest for the study period, with decreased investment in all categories: proved properties acquired, unproved properties acquired, exploration, development and other. The companies studied drilled 41% and 32% fewer development and exploration wells, respectively, compared with 2019.

"The lower commodity price environment of last year caused a significant drop in capex and significant impairments," said Herb Listen, EY Americas Energy & Resources Assurance Leader. "Though prices have recovered, we haven't seen a rebound in capex in 2021 and, as a result, likely won't see a return in US production to the same pre-pandemic levels. This will cause a ripple effect as the market struggles to meet recovering demand and may result in higher prices." Oil production was 2.8 billion barrels and gas production was 13.2 trillion cubic feet (tcf), only a 2% decrease from 2019, which saw the highest oil and gas production during the study period. The companies reported combined oil reserves of 26 billion barrels and combined gas reserves of 148 tcf, decreases of 19% and 13%, respectively, compared with 2019 primarily driven by downward revisions of 5.1 billion barrels and 19.4 tcf due to lower commodity pricing and decreased forecasted capital investment commitments.

Find the study at www.ey.com/en_us/oil-gas/oil-and-gas-navigating-a-post-pandemic-world



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