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DEC. '20 / JAN. '21

ENERGY

INDUSTRY REVIEW

REGULATED ENERGY PRICE

Obstacle or Necessity?

GREEN H2 BLUE DANUBE

A Hydrogen Project of European Dimensions

NAMR PRIORITIES FOR 2021

Offshore Gas Exploitation and Resuming the Licensing Round for Offshore Blocks

Christopher Veit, Member of OMV Petrom Executive Board

OMV Petrom Targeting Regional Growth in the Black Sea Area

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ROMGAZ

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

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Oil, Green Energy and Spheres of Influence

The health crisis caused by the Covid 19 pandemic gave few winning economic sectors, but several fields, including the industrial, oil, gas and energy sectors took quite of hit due to restriction of activities for various periods of time.

The decrease in air and land traffic meant a lower fuel consumption, meaning lower oil quantities in the refining sector.

For the oil price not to collapse, causing cascade regressions in several economic sectors, it was necessary to limit production, which affected countries that hold significant reserves.

In this context, which was not at all predictable, OPEC has reviewed its estimates on oil demand for 2021, having as arguments the economic outlook below expectations and the increase in the number of coronavirus cases.

In its monthly report, a very important criterion for the regional markets at global level, OPEC estimated that global oil demand would shrink in 2020 by approximately 9.8 million barrels per day, in annual terms, which means a downward revision of demand by 0.3 million barrels per day.

For 2021, OPEC expects oil demand to go up by 6.2 million barrels, in annual terms, which means a downward revision by 0.3 million barrels compared to the October 2020 estimate, in conditions in which the organization has constantly reduced its outlook on the 2021 demand, from an initial level of 7 million barrels, in July.

"These downward revisions take into account the negative economic outlook adjustments for the economies of the Organization for Economic Co-operation and Development, due to measures to combat the spread of Covid-19 and the adverse impact on transport and industrial fuel demand until mid-2021," shows the OPEC report was published at the beginning of December 2020.

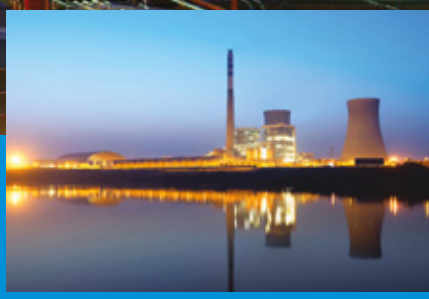
In full health crisis, the alliance of oil producing countries, to which partner states are added, known as OPEC+, which includes Russia, agreed on a record reduction of oil production, by 9.7 million barrels of oil per day, starting May 1, 2020 and in August 2020 the reduction was reviewed to 7.7 million barrels of oil per day.

Specialists estimate that the trend will continue, so a similar measure could be taken in early 2021.

Of course, no one can deny that, frightened by pollution, the effects of greenhouse gases and global warming, several countries have implemented programs to stimulate the purchase of electric cars, and some European regions have already claimed intentions to limit of access to conventional cars in their territories, which also led to a reduction in the consumption of conventional fuels.

One thing is certain: with the expansion of electric cars it is very likely that the spheres of influence at global level will also suffer adjustments, generated by resources or investments that revolve around a 'green' industry.

Daniel Lazar
Senior Editor



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OIL & GAS

ENVIRONMENT

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ANALYSIS

BRUA Phase 1 Completed

"Romania - regional energy hub! Romania has the potential of becoming an important regional player and authentic hub in the field of natural gas, and this potential must be capitalized with determination and responsibility," said Romania's President Klaus Iohannis on the occasion of completion of BRUA gas pipeline phase 1.

Romania managed to complete a strategic investment key to the energy security of the country and to diversification of gas supply in the region. Transgaz, the operator of the national gas transmission system, has completed the construction of BRUA gas pipeline Phase 1, one of the few large-scale projects of Romania completed over the past 30 years. The pipeline will facilitate gas transmission from the Caspian region to Europe, being supported by the European Commission with financing of almost EUR 180mln.

"BRUA interconnection on the Vertical Corridor, offshore Black Sea exploitation are real assets for Romania to become an important player in the region in the gas market. Investments in energy infrastructure bring a huge potential of regional development and stimulate a greater welfare of communities on the transmission corridors, by expanding the network of gas supply to the population," pointed out Klaus Iohannis.

Engie Romania Acquired PV Park in Harghita

Engie Romania has completed the acquisition of a 9.3 MW photovoltaic park in the central county of Harghita. The acquisition is in line with Engie Romania's strategy focused on the development of renewable energies that have a key role in the energy transition.

Prior to the completion of the deal, the park was part of Ever Solar, a local company owned by German photovoltaic park developer Soventix and developer Alpin Solar.

The photovoltaic farms were put into operation in 2015 and have so far produced approximately 55 GWh, the equivalent of annual electricity consumption of some 34,000 households.

"This acquisition marks a new stage in achieving our goal of becoming a major investor in the field of renewable energy in Romania by 2030, thus contributing to the group's ambition to be the leader in energy transition," Engie Romania president and CEO Eric Stab said.

"Locally, our goal is to occupy a leading position in the segment of centralised renewable energy and to provide green energy to our customers," he added.

ROPEPCA Has a New President

The Romanian Petroleum Exploration and Production Companies Association (ROPEPCA) announces that, following the annual elections held within the association according to statutory requirements, Spencer Coca (MAZARINE ENERGY ROMANIA S.R.L.) has been voted to assure the leadership of the organization for the next year.

Spencer Coca has been actively involved in the Romanian oil industry since February 2007, when he joined OMV Petrom as Director of the Reservoir Division and later Director of Petroleum Engineering, a position he held until 2013. Within OMV Petrom, Spencer Coca also acted as Liaison Officer with the National Agency for Mineral Resources (NAMR), being close to Romanian authorities along these years, thereby fostering cooperation in the oil and gas sector. A geologist and petroleum engineer by background, Spencer Coca has worked for Shell International on numerous onshore and offshore oil and gas fields in various countries across Europe, Asia, and Africa. Starting with 2016, Spencer Coca took over the position of Country Manager Romania for Mazarine Energy, a company held by The Carlyle Group, together with Black Sea Oil and Gas (BSOG). Spencer takes over the ROPEPCA presidential term from Stephen Birrell, a geoscientist with over 34 years of experience in technical and senior management roles. He has been active in Romania since 2005, being an important player involved in the process of ROPEPCA's founding in 2012.

Investments About EUR 21mn at Petrobrazi to Increase Bio-blending Capacity

OMV Petrom, the largest energy company in Southeastern Europe, has invested approximately EUR 21mn at Petrobrazi refinery to increase the bio-blending capacity and to improve the infrastructure for the transport, unloading and storage of bio-components within the refinery. OMV Petrom supplies fuels with a volumetric bio-content of 6.5% in diesel and 8% in gasoline.

Following investments of approximately EUR 21mn allocated starting 2018, Petrobrazi has increased the blending capacity of bio-content in fuels from 200 kilotons to approximately 350 kilotons of biofuels per year.

As per European regulations, the renewable energy content in transportation fuels must increase from 10% in 2020 to 14% in 2030, to support the reduction targets of greenhouse gas emissions arising from transportation. Bio-quota targets are set as energetic substitution targets, whereby each fuel has a different energy content defined.

"We are an energy company, and we want to be part of the solution for a cleaner energy. We are investing in obtaining fuels with a high level of biofuel content, as well as in alternative solutions for mobility and in various others sustainable projects. It is a combined effort at all levels across our company, as we aim to reduce our carbon emissions by 27% by 2025 versus 2010," said Radu Caprau, member of OMV Petrom Executive Board, responsible for Downstream Oil.

Petrobrazi has a total crude oil processing capacity of 4.5mn tons per year and, starting 2005, OMV Petrom has invested approximately EUR 1.8 bn in the refinery. One third of this investment contributed to the reduction of the environmental impact.

Through sustained investments, OMV Petrom has reduced the carbon emissions of its operations by 22% in 2019 vs. 2010.

OMV Petrom is one of the first companies in Romania to sign the UN Global Compact, since 2013. Through this project the company contributes to achieving the Sustainable Development Objective 13 - Climate Actions.

Furthermore, OMV Petrom is the first company in Romania to have announced its support for the recommendations issued by the Task Force on Climate-related Financial Disclosures.

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OMV Petrom to Outsource Surface Operations and Services

OMV Petrom has outsourced some operations and general surface services related to the activities of extraction and production of crude oil and natural gas, together with the assets and servicing employees, to the consortium Dietscon O&M S.R.L. (leader), Dietsmann S.R.L., Dietsmann Safety and Environment Services S.R.L. and Confind S.R.L. (Dietscon consortium) and to the association Bonatti SpA, Bucharest Branch (leader) and Bonatti RO PARMA S.R.L. The Competition Council has already authorized these transactions.

The Competition Council has analysed these operations and found that they do not raise a significant obstacle to effective competition on the Romanian market or a substantial part thereof and there are no serious doubts on their compatibility with a normal competitive environment and the decisions will be published on the webpage of the national competition authority, after eliminating the confidential information.

Dietscon consortium and Bonatti association will sign a framework agreement with OMV Petrom for the provision of surface and transport services, minor operation and maintenance services, fire and rescue services, field operation services, facility operation services, treatment facility operation services.

Following a procurement procedure, the Dietscon consortium was designated the best ranked bidder for lots D (Moldavia production area) and E (Crisana production area), and the Bonatti association will manage the services for lot C (Muntenia production area).

Working Capital Loan for Romanian Steelmaker Donalam

Romanian steelmaker Donalam is planning to bridge a potential working capital gap with a EUR 5 million loan from the European Bank for Reconstruction and Development (EBRD).

Donalam, located in Calarasi, south-eastern Romania, was set up in 2006 after the Italian group Beltrame, the European leader in merchant bars, bought the local Siderca rolling mill. Steel rounds produced at Donalam are sold to Germany, Italy, and markets in central and eastern Europe, for use in industrial and mechanical engineering, the automotive sector, and the oil industry.

The company will use the two-year EBRD loan to finance its working capital needs and bridge liquidity gaps caused by the Covid-19 pandemic. The EBRD has previously provided EUR 4 million in financing for investments at the Donalam steel mill.

The Bank is a major investor in Romania. To date, it has invested EUR 8.8 billion in the country's economy through 449 projects. The EBRD's activity is currently fully dedicated to helping the economies where it invests, and private sector companies, to overcome the impact of the ongoing coronavirus pandemic.

Study on Situation Related to Energy Supplier Switch

Ringel and Ijdelea Mihailescu law firm have been contracted by the Romanian Energy Regulatory Authority (ANRE) for the preparation of a 'Study on the existing situation related to the energy supplier switch'.

The goal of the study is to develop technical and regulatory proposals for the implementation at national level of an online platform designed to optimize the operational processes generated by supplier change requests (electricity and natural gas).

The cumulated experience of Ringhel Team and Ijdelea Mihailescu covers the entire spectrum of the energy and IT fields. Ijdelea Mihailescu's team is composed of three lawyers coordinated by Partner Anca Maria Mihailescu.

"Together with our partner, we are happy to be among the first professionals contributing to the digitalization of the Romanian energy field, a topic of great relevance and necessity both at a European and national level," noted Anca Mihailescu.

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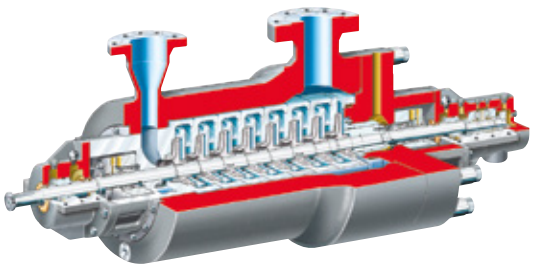

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OMV Invests Around EUR 200mn at Schwechat Refinery

OMV, the integrated, international oil, gas and petrochemicals company headquartered in Vienna, is committed to the Paris Agreement and EU climate targets and has set itself ambitious climate goals. OMV has pledged to reach net-zero emissions in operations (Scope 1 and 2) by 2050 or sooner. On its long-term path to net zero, OMV has set concrete interim targets: By 2025, at least 60% of the product portfolio should consist of natural gas and low/zero-carbon products. The investment in the Schwechat site for processing biofuels contributes to the goal of reducing the carbon intensity of the OMV product portfolio (Scope 3) by at least 6% versus 2010.

OMV is currently investing in the Schwechat Refinery so it will be able to substitute large quantities of fossil diesel with biodiesel in an innovative co-processing approach. With this process, the hydrogenated vegetable oil should lead to an annual reduction in OMV's carbon footprint of up to 360,000 metric tons of fossil CO2. This is equivalent to the annual emissions of around 200,000 cars driving an average of 12,000 km per year. The product meets the highest quality standards and can be freely used in any type of vehicle.

Declaration on Digital Society and Value-based Digital Government

The Berlin Declaration on Digital Society and Value-based Digital Government has been signed on 8 December by the responsible ministers of all EU Member States.

The Declaration follows up on the success of the Tallinn Declaration on eGovernment, which endorsed the key principles for digital public services put forward in the eGovernment Action Plan 2016-2020. The Berlin Declaration takes the user-centricity principles formulated in the Tallinn Declaration a step further by strengthening the pioneering role of public administrations in driving a value-based digital transformation of our European societies.

The Declaration acknowledges the public sector as an essential element for the European Single Market and a driving force for new and innovative technological solutions for public services and societal challenges. It emphasises that public authorities at all levels must lead by example to strengthen the tenets of the European Union.

The European Commission, therefore, welcomes the objectives put forward by Member States in the Berlin Declaration and will support these with policy initiatives at the European level.

Siemens Energy to Deliver Grid Stability Technology in UK

Uniper has appointed Siemens Energy to deliver the rotating grid stabilisation technology that will enable Uniper to provide dedicated grid stability services to the British electricity system operator National Grid ESO at its facilities in Killingholme, Lincolnshire and Grain, Kent. This follows Uniper being awarded four six-year contracts by National Grid ESO earlier this year, to provide inertia services and voltage control to the grid under phase 1 of its Stability Pathfinder.

Siemens Energy will be responsible for installing and commissioning synchronous condenser units at both facilities. Two steam turbine generators will be repurposed, and flywheels installed at the Killingholme site; and two new synchronous condenser units will be built on the site of the old oil-fired power station at Grain. These units will be connected to the existing grid connections at each site.

The services provided by Uniper through this innovative solution will make an important contribution by keeping the power system stable and our electricity supply at the required frequency as more renewable generation comes online. Traditionally, inertia has been provided as a by-product of generating electricity at thermal power stations with large synchronous spinning generators. However, as many of these facilities reach retirement, the job of managing grid stability has become more challenging for National Grid ESO, as renewable generation is not connected to the grid in the same way and cannot provide inertia.

Rompetrol Opened a New Gas Station in Georgia

KMG International Group recently opened a new Rompetrol gas station in Georgia, near the tourist resort of Borjomi - famous for its brand of carbonated natural mineral water exported to over 40 countries.

Located in the centre of Georgia, the unit is part of the new concept of Rompetrol gas stations in Romania and in the region – the Republic of Moldova and Bulgaria, characterized by the new visual identity elements of the brand, a modern architecture, and by the quality of materials and finishes.

The Borjomi station is endowed with state-of-the-art pumps, equipped with multimedia systems which ensure low energy consumption, as well as modern environmental protection systems (real-time monitoring and control sensors for fuel tanks, vapor recovery at fuel pumps).

In addition to the Fill & Go Card pump payment service, it offers the Efix and EfixS fuel ranges produced by Petromidia refinery, ensuring an increase in car performance, efficiency, and engine reliability. In addition, EURO 5 fuels also contain a mixture of active components for engine protection, ensuring its proper operation.

"In the context of the general crisis caused by Covid 19, the main priority of the company was to protect our employees and customers, while managing to continue our investments, with a major impact in supporting local and central budgets, but also in creating new jobs. This year we have opened six new gas stations in Georgia, and we intend to open four more during the upcoming period," said Zamanbek Mirzayanov, CEO of Rompetrol Georgia.

Founded in 2005, Rompetrol Georgia is well known on the local market as a distributor of high-quality fuels and one of the most important oil companies.

The subsidiary of the KMG International Group operates a distribution network of 85 filling stations and 2 fuel depots. Besides the distribution network, the company performs wholesale activities through the Batumi Port depot (28,500 cubic meters), as well as through the Tbilisi depot which has been completely modernized, increasing the storage capacity from 6,500 tons to 10,000 tons.

New Utilities Contract Set to Power the Red Sea Project with 100% Renewable Energy

The Red Sea Development Company (TRSDC), the developer of the world's most ambitious regenerative tourism project, has awarded its highest-value contract to date to a consortium led by ACWA Power to design, build, operate, and transfer The Red Sea Project's utilities infrastructure. The contract marks a significant step forward for The Red Sea Project, establishing it as the region's first tourism destination powered solely by renewable energy. A project of this size has never been achieved on this scale anywhere in the world.

"This is a pivotal moment for us as we seek to build a new kind of tourism destination. We've always been committed to doing things differently and investing heavily in renewables is helping us to set new global standards in regenerative tourism," John Pagano, CEO of TRSDC stated.

"This contract also signifies a noteworthy step change for us as the consortium brings foreign investment to the project for the first time, demonstrating international support and confidence for the vision that is becoming a reality along the Red Sea coast. At the same time, we are delighted to partner with a consortium leader that has its roots in the Kingdom and shares our ambition to accelerate the energy transition locally," John Pagano added.

Historic Milestone at Chernobyl Nuclear Power Plant

The first waste canister of spent nuclear fuel was loaded into the Interim Storage Facilty 2 (ISF-2) at the Chernobyl Nuclear Power Plant. This important milestone represents the culmination of more than 20 years of work at the site. The facility is funded by an EBRD-managed international donor fund, the Nuclear Safety Account.

The first loaded double-walled canister contains a total of 93 spent fuel assemblies that have been removed from the site's ageing storage facility, processed, and packaged in the new ISF-2 facility. In total, more than 21,000 spent fuel assemblies from Chernobyl reactors 1, 2 and 3 will make this journey over the next eight or more years. The ISF-2 is the largest dry spent fuel storage facility in the world and has a lifespan of a minimum of 100 years.

"This is a momentous achievement that stands testament to the many days, weeks and years that the EBRD, donors, contractors and Ukraine have dedicated to delivering this critical safety project. We have had to overcome many challenges to reach this point, but it is even more gratifying that we eventually got there," Balthasar Lindauer, EBRD Director, Nuclear Safety, said.

EG Group to Acquire OMV Filling Stations in Germany

OMV, the international, integrated oil, gas and petrochemicals company headquartered in Vienna, Austria, and EG Group, a leading global independent petrol forecourt convenience retail operator, reach agreement for EG Group to acquire the OMV filling station business in Germany. The transaction is subject to required regulatory approvals and closing is expected in 2021.

The purchase price amounts to EUR 485mn. As part of the agreement, EG Group will assume outstanding lease liabilities resulting in a total enterprise value for the Business of approximately EUR 614mn. The purchase price is subject to customary net working capital and net debt adjustments.

The agreement encompasses 285 filling stations in southern Germany with focus on Bavaria and Baden-Württemberg, which have only a limited degree of integration with OMV's refinery in Germany, as the refinery is specialized in petrochemicals production. OMV remains strongly committed to its remaining operations in Germany centered on its highly integrated petrochemicals operations in the Burghausen refinery. The acquisition will expand EG's presence in Germany.

Global Private LTE and 5G Market to Triple by 2025

Nokia and A1 have joined forces to provide a private wireless network for Siemens' microgrid, which is deployed at its Austrian headquarters in Vienna. The A1 campus solution demonstrates the advantages of using a private wireless solution to operate critical applications such as enterprise or utility microgrids, and how they can be efficiently implemented with secure, reliable, and fast connectivity.

Renewable energy sources, storage and microgrids are being adopted by industries worldwide to help enterprises minimize their environmental footprint and reach their sustainability objectives. Smartly managed renewables within a microgrid are making an impact on many industrial applications by offering energy cost savings and supplying security to industrial campuses.

Nokia is providing the industrial-grade private wireless network, while A1 is providing spectrum along with hosting and management of the newly deployed campus network. The private wireless network is connecting the microgrid assets on the Siemens campus, enabling secure communication between the microgrid controllers and the metering or charging points at guaranteed data rates and with low latency.

The Siemens Vienna campus microgrid project includes solar generation, electric vehicle (EV) charging, building management and battery storage. Initially, Siemens has implemented 320kW of solar generation and 500kWh battery storage, all to support around 50 EV charging stations.

"One of the challenges of the future is a reliable and at the same time clean supply, transmission and use of energy. Microgrids can significantly contribute to this. Our campus project, in combination with the infrastructure of an existing industrial plant, is the first of its kind – and offers many opportunities for innovative research and concrete new solutions," Wolfgang Hesoun, CEO Siemens Austria says.

Hydrogen Era

ALREADY ON THE DOORSTEP?

It is known that in recent years, in the world, hydrogen has sparked serious interest given its potential use in terms of importance of addressing the decarbonization process as topic, but especially as an object of energy production in the widespread battle against climate change.

A Hydrogen strategy for a climate-neutral Europe

In Europe, the development of hydrogen is highly anticipated, 2050 being considered as the certain end of carbon. The European Commission's document 'A Hydrogen strategy for a climate-neutral Europe' may be the clear trajectory in this direction.

It is designed, but both specialists and energy companies, depending on the two important components: costs and safety.

Strategically, there is already talk of the 'Hydrogen Era'.

Hydrogen around the world

As far as the other continents are concerned, let us remember the numerous statements on hydrogen in Australia, Chile, China, Middle East, North America etc.

The background theme is related to the fact that the combustion of hydrogen generates water, not carbon, and hydrogen can be achieved by electrolysis of water from renewable sources, the so-called 'green hydrogen' that can be used in housing, transportation, industry, and the auxiliary area of the entire energy sector.

It can be said that it will be a revolution in energy systems. The question that remains is time, the time in which it can be done. Since 2002, Jeremy Rifkin prophesied the birth of the hydrogen age.

The outlook has also changed with the emergence and explosive scale of renewable energy production.

Currently 99% of hydrogen production is based on fossil sources, a process that obviously leads to carbon dioxide emissions. That is, we can say that hydrogen is not a primary energy resource.

Global hydrogen production uses fossil fuels (48% methane gas, 30% oil, 18% coal, 4% water electrolysis), processes that are accompanied by significant carbon dioxide emissions. It is estimated that hydrogen production has grown by 2.5% annually since 1990. The figures were presented at the Global Energy Congress in September 2019, the session 'Hydrogen bridging sectors and regions.'

The current cost of production of hydrogen from fossil sources worldwide (excluding penalties for carbon dioxide emissions) varies between USD 1.25 and 2.5/kg, i.e., USD 37.50 - 75.00/MWh, approximately EUR 37/MWh according to the European Commission.

But, according to Hydrogen Europe, hydrogen currently produced from onshore wind energy in Germany costs EUR 60/MWh with 2,000 hours equivalent, at high load factor would cost EUR 7.8/kg, corresponding to EUR 235/MWh, so a very high value.

The price of hydrogen

In order to achieve a competitive price for green hydrogen, large investments are expected to increase efficiency by 75%, reaching the power level of 100 MW by 2030 (and 1000 MW by 2050). Economic analysts in the energy sector, for the time being, claim that the price of hydrogen will remain very high anyway. Opinions are divided:

• Even with a significant price reduction,

▶ **Ioan-Corneliu Dinu** *is a Scientific Counsellor at Romanian National Committee of the World Energy Council*

Hydrogen Europe has demonstrated that in 2030 the price of hydrogen will not be higher than EUR 3/kg, i.e., EUR 90/MWh, parallel to the price of electricity of about EUR 50/MWh equal to offshore wind power and with a load factor of 4500 hours/year.

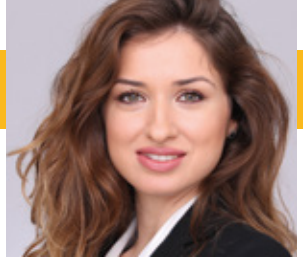
• Continuing price reduction, in 2050 hydrogen will cost USD 1.4/kg (USD 42/MWh) and electricity EUR 20/MWh. The interest remains that in 2050 the price of hydrogen will be equal to the renewable energy used in the various electrolysis processes, obviously thinking that until then new technologies will be discovered/innovated, new now, but also new in the 2050s.

The transport of hydrogen

Along with price-related aspects, let us also address the issue of hydrogen transport, both in relation to the fairly low energy density per unit volume, as well as safety standards, both aspects following to be well defined by then. The problem of assigning 'colours' to hydrogen according to the type of production technology is not yet unambiguous, but we can present their list: black hydrogen, obtained from fossil fuels, without capturing those emissions; grey hydrogen, produced from fossil fuels with low carbon dioxide emissions; blue hydrogen, produced using renewable energy, without emissions or using nuclear energy for electrolysis; green hydrogen, produced entirely using green energy.

Regarding the direct transport of hydrogen, in its gaseous form it can be based on pressure, up to 200 bar or high pressure up to 1000 bar in special transport equipment, both by road and by rail, obviously in extremely safe conditions; through pipeline, underground, but with higher costs than the costs for transporting methane gas, which has 3 times higher calorific value.

The transport of hydrogen in liquid form, the liquefaction being obtained at a temperature of -253 degrees Celsius (process which consumes a third of the energy power of hydrogen) can be performed in special cryogenic equipment for the street and in tanks for rail transport with significant energy consumption to keep the temperature constant. Indirect transports or storage, for example with ammonia, are also under discussion and experimented, hydrogen then being released at the time and point of use. ■



Hydrogen in Romania

A CHANCE FOR INDUSTRIAL LEADERSHIP ON THE ENERGY TRANSITION

There is a wide recognition that climate change should be at the top of the political agenda irrespective of all the other challenges the world faces right now. In the past few months alone, the EU, China, Japan, South Korea, and South Africa have all adopted targets to be climate or carbon neutral by around the middle of the century. And now Joe Biden wants to put the US on a similar course. There is also a strong global consensus that investments in the clean energy transition are a very good motor of post COVID economic recovery. This new emerging green pathway to 2050 brings huge opportunities for the gas infrastructure.

Key to combating climate change

Decarbonising energy is central to combating climate change. Well over 60% of Europe's energy runs on fossil fuel. Much of it can be replaced by low carbon hydrogen hence the growing interest in hydrogen as a form of energy. Today, the predominant way of producing hydrogen is from fossil fuels. The amount of hydrogen generated from coal and natural gas in 2019 for industrial uses would be enough, in theory, to run approximately half the cars on the road worldwide. But current hydrogen production releases about the same amount of carbon emissions as the economies of the United Kingdom and Indonesia combined. This can be reduced if industries currently producing hydrogen capture and store their carbon emissions – or if the hydrogen comes from renewable electricity through a process called electrolysis. Electrolysis is expensive for now. But wind and solar costs have plunged in recent years and as they keep dropping, renewable hydrogen will become more affordable. At the same time, the process of electrolysis itself will scale up in size and get cheaper.

The role of the gas infrastructure

Europe has 2.2 million km of gas pipelines connecting supply and demand. With relatively few investments, much of this gas network can be retrofitted and repurposed for 100% hydrogen. When hydrogen volumes increase, dedicated hydrogen pipelines will emerge, initially connecting industrial clusters and later extending to regional and national hydrogen infrastructures. 75% of the new hydrogen pipeline infrastructure will be converted existing natural gas pipelines. And 25% of it will be brand new hydrogen pipelines. Blending of hydrogen with natural gas in existing pipelines will also be an option in the transitional period.

11 European gas transmission system operators have now got together and envisage a European hydrogen backbone of 6.800 km pipeline network emerging by 2030. By 2040, this backbone could reach 23.000 km. Moreover, the EU has a capacity of underground storage of around 1,200 TWh that with some retrofitting could be used for hydrogen. Imports of liquid

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hydrogen through the LNG terminals will be necessary to complement domestic hydrogen production in a similar way to natural gas imports today. They will enhance security of supply through source and route diversification and secure access to global and competitive hydrogen.

Romania can become a real European hydrogen leader

Romania has a great existing gas pipeline and storage infrastructure, and it has great further wind and solar energy potential. Romania is also the second natural gas producer in Europe. So, it can become a real European hydrogen leader. To kick-off hydrogen, few conditions to create a sustainable hydrogen value chain should be considered. Support from government will be key, such as subsidies to overcome the funding and financing gaps. This also entails a shared vision and national and international hydrogen strategies. There also has to be technology developments, be it in R&D on electrolysers, cost, efficiency or operability. The availability of a comprehensive infrastructure including transport and storage infrastructure will help hydrogen reach demand from its supply source. A positive regulatory framework needs to be in place – there has to be a positive legislation that acknowledges and supports the role of hydrogen and removes barriers that will hinder its deployment. And for further supply of renewable hydrogen there will be a need for new renewable power sources, such as offshore wind, for which Romania has great potential in the Black Sea.

The Regulation Concerning Connection to the Power Public Grid

RELEVANT AMENDMENTS APPLICABLE AS OF 1 JANUARY 2021

Every year is special, but one cannot contest that 2020 was somehow 'more special' than others. All economic sectors were influenced, and the energy industry could not have escaped, but here the impact was reflected differently: while certain sectors were so severely impacted that they may never recover (e.g. it was said that 'peak oil' was reached in 2019; Denmark, the largest European oil producer, cancelled its latest licensing round and announced intend to stop fossil fuel production by 2050), other sectors may have found unexpected traction in the current times, such as the renewables that have taken a huge boost all around the world (especially in Europe where there seems to be consent to reach carbon neutrality by 2050).

The Romanian renewable market has slowly revived since 2019 and 2020 showed unforeseen expansion. The legislator supported its development by introducing favourable measures (such as re-introduction of long term PPAs for new facilities). Following the amendment of the Energy Law no 123/2020 at the middle of the year (through Emergency Ordinance no 74/2020 and Law no 155/2020), the secondary legislation had to be put in place in order to enable application of the new primary legislation. As such, the ANRE legal framework undergone probably the most complex review process in the last years and the outcome can be seen in the numerous normative acts issued in the second half of 2020.

In this material, we have chosen to analyse the amendments to the most relevant ANRE Regulation for the development of renewable projects, namely the connection to the public grid Regulation approved under Order no 59/2013 (the '**Regulation 59/2013**'). Note is to be made that **the amendments to Regulation 59/2013** were approved under ANRE Order no 160/2020 published in the Official Gazette of Romania on 10 September 2020, but they **shall enter into force as of 1 January 2021**.

GENERAL CONSIDERATIONS

The development of a wind/solar project until reaching the Ready to Build (RTB) phase entails two main simultaneous streams: on one side, the urbanistic conditions must be observed; this stream starts with the urbanism certificate ('**UC**'), continues with the permits laid out in the UC (most important usually it is the PUZ approval) and completes with the issuance of the building permit; on the other side, the ANRE/energy specific regulations must be complied with. On this second stream, the most important permitting document laying down the conditions for the future energy

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producing facility is the technical connection endorsement ('**ATR**') which must be followed by the conclusion of a connection to the grid contract; this stream completes with the issuance of the setting up authorization which (once obtained) signals reaching the RTB phase.

RELEVANT AMENDMENTS

The amendments to the Regulation no 59/2013 address the more recent (operational) needs observed in practice, namely the connection of the **prosumers**, the battery energy storage systems (**BESS**) and the possibility of new producers to **directly conclude a design & construction agreement** (after conclusion of the connection agreement). Let us detail each of these aspects below.

Prosumer's connection certificate

The definition of prosumer was for the first time included in Law no 220/2018 under the amendment dated 18 July 2018. The same definition is now replicated under Regulation 59/2013 in order to give substance in interpretation to the newly inserted para 3 of Article 55 referring to the connection certificate (Romanian: *certificatul de racordare*). The connection certificate ascertains completion of both the connection installation and of the production installation (including testing phase) and sets forth the future grid usage conditions; in case the conncetion certificate is to be issued for a prosumer (the Regulation continues to refer to prosumers with an installed capacity of up to 27 kW, but ANRE Order no 69/2020 was subsequently amended in November 2020 and now refers to prosumers having installed capacity of up to 100 kW); it must specify it expressly (since the connection certificate ascertains a prosumer's qualification as such, in accordance with the ANRE Order no 69/2020 approving the Procedure applicable to prosumers having installed capacity of up to 100 kW/a single consumption place); in the case of a prosumer, the connection certificate is required, among others, for the replacement of the one-way meter with a two-way (i.e. bi-directional) metering equipment and it is the very document enabling him to sell his energy.

Battery energy storage systems

Should energy storage systems spread on a wide basis, the arguments behind the *volatility* of renewable energy would diminish till irrelevance (simply because such storage systems ensure technical conditions for feeding power into the grid on a constant basis).

Although the cost of technology (both for wind and even more substantially for solar panels) has drastically gone down in the last years, grid parity without a support scheme is expected to be reached in Romania for RES around 2025.

In this context, also the economics of a BESS case are still far from straightforward (at least, in Romania). There are only a couple of such systems installed in Romania, but rather on an experimental basis. Permitting-wise, the road to authorization a BESS is still not clear and very incipient. While many aspects are still to be clarified regarding an energy storage system in Romania, we consider the introduction of the storage concept in the Regulation no 59/2013

as a positive first encouraging step.

As such, Regulation no 59/2013 will impose as of 1 January 2021 that an ATR is obtained (amended) whenever a BESS is installed. Consequently, the connection certificate will have to mention the specific requirements regarding BESS (as per Art 55 letter l of Regulation no 59/2013).

Design & construction agreement for the connection installation

The connection agreement must be concluded within 12 months as of issuance of the ATR [otherwise, the ATR becomes invalid, as per Art 33 para 1 letter b) of Regulation no 59/2013]. Once the connection agreement is concluded, the agreement covering the design & construction of the connection installation must be concluded. Until 1 January 2021, only the grid operator could conclude the design & construction agreement. It could have either selected the design & construction company by itself (via a time-consuming tendering procedure) or conclude the contract with a company appointed by the investor. In such cases, the operator must obtain the building permit for the connection installation.

As of 1 January 2021, the investor will be able to directly conclude the design & construction agreement [as per the newly introduced Art 44 para 4 letter b)]; this solution offers potential to lower costs and make savings of time, especially for private beneficiaries (let alone the certainty brought by the direct control over the contractor). As it is absolutely justified, such direct contracting comes with related obligations on the investor, such as:

- Notifying (in advance) the grid operator of its intention to directly conclude the design & construction agreement.
- Obtaining the building permit for the connection installation [Art 40 para 2 letter b)]).
- Bearing the responsibility for the design & execution works.
- Making sure that the works comply with the ATR and the connection agreement.

It is now clearly stipulated that the outcome of such designing & construction works (executed under a directly concluded contract) remain under the ownership of the investor and will be used by the grid operator on the basis of a frame agreement (a template being enclosed under Annex 7 to the Regulation). Such frame agreement stipulates that the operator takes over the connection installation only if reception of works and its putting into operation were performed (we have seen a situation where lengthy discussions were carried with the transport system operator due to non-completed reception of the works; such situations should no longer appear in practice following the amendments as of 1 January 2021).

CLOSING REMARKS

The general mindset of promoting RES (also geothermal, tidal and biomass, not just wind and solar) is abundantly spreading throughout most continents. Europe made already clear its intention to be the pioneer leading the way towards a carbon neutral economy by 2050. Early December 2020, the Romanian President stated in Bruxelles that Romania aims to reach this status also by 2050, while assuming the intermediary deadline of 2030 for reaching a target of energy from renewable sources of 30,7%. As such, it is clear the renewables will increase their quota into the domestic energy mix (and this will be powered both by industrial projects and also by small, primarily residential, prosumers using solar panels). In order to enable such development, one must concentrate on the development of the necessary infrastructure where such production is to be evacuated.

It is expected that Romania will rank (again) high on the list of foreign investments into renewable projects due to:

- The excellent onshore and offshore Romanian potential for clean energy.
- The generous access to European funding (some even on a non-reimbursable basis, such as the Modernization Fund).
- The large number of 'old' (i.e. developed prior to 2013) projects that are now considered for 're-permitting'.

Within this context, putting in place the necessary legal framework is of tremendous importance as it signalizes the intend (at state's level) to facilitate such development and supports the creation of a trust-based environment. ■

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- Tank farm construction
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- Insulation
- Scaffolding

OMV Petrom Targeting Regional Growth in the Black Sea Area

Interview with Christopher Veit, Member of the Executive Board Responsible for Upstream

Christopher Veit was recently appointed as a Member of the Executive Board responsible for Upstream of OMV Petrom. His extensive experience in the oil and gas industry allows him to give valuable insights on local and regional development of this sector and competence requirements for professional excellence in this field. Christopher Veit holds a degree in Mechanical Engineering and a Masters degree of Petroleum Engineering of the Mining University at Leoben. He joined OMV Group in 1986 as a Production Engineer. He held various technical and management positions in Libya, Pakistan, and Austria such as the Senior Vice President and Managing Director of OMV Austria Exploration & Production GmbH. As of January 2016, he took over the position as Senior Vice-president of Exploration, Development & Production within OMV Exploration & Production GmbH. He also represented OMV in several supervisory boards of its subsidiaries. He is member of the advisory board of the Department Petroleum Engineering at Mining University Leoben. He was appointed member of the OMV Petrom Executive Board starting October 1, 2020.

by LAVINIA IANCU

Photographs by OMV PETROM

Dear Mr. Veit, you have given many years of your life to oil and gas industry and you have probably witnessed many achievements and failures over the past years. What is your view on the upstream sector in Romania and on regional level?

After the 2015 oil price crash, 2019 was, at the global level, the most successful year for the upstream sector in terms of new well drilled and there were many optimistic signs that 2020 could follow a positive trend. On the other hand, the industry faced increasing pressure to reduce the environmental footprint, while also keeping up with growing energy demand.

However, 2020 has been an extremely difficult year for the industry, which fully felt the disruptive effects of the pandemic. Exploration spending declined and global conventional and unconventional well activity was reduced to all-time lows amid a volatile environment, characterized by record low prices, low demand and overproduction, especially in the early stages of the pandemic, when the authorities imposed state of emergency measures and restrictions on mobility.

These effects were also felt on the internal market and the upstream sector was put to a hard task, not only in terms of dealing with a depressed demand, but also on taking strict sanitary measures to protect the front-line employees while ensuring continuity of operations.

The pandemic has accelerated some trends and shown that for both the upstream and downstream sectors, natural gas has an increasingly important role to play, especially in the near future. In our portfolio, gas accounts for more than 50% of our total hydrocarbon production.

I believe that the future of the Romanian upstream sector is closely linked to the Black Sea natural gas projects. After the Neptun Deep discovery in 2012 and after the newly announced discovery in Turkey, we might get a glimpse regarding the potential of the Black Sea, in deep offshore.

For Romania, which has a mature upstream production, the Black Sea resources are essential, due to their potential for contributing to the national economy and to the energy security of the country. In addition, we expect new licensing bidding rounds for underexplored onshore fields, in order to identify new potential resources that could be exploited and that could counterbalance the natural decline of the current production.

However, in order to unlock the potential of these resources, we need a stable and competitive regulatory and fiscal framework. Fiscal stability is one of the main pillars for projects with a long investment cycle, especially if we take into account the volatile elements that have marked the oil and natural gas market recently.

1st photo – OMV Petrom exploitation well ▶

2nd photo – New gas treatment plant in Burcioaia, Asset Moldova

The importance of the upstream segment of oil and gas industry for the national economy is overwhelming, as it is the largest contributor to the state budget and a significant employer. What is the share of investments in the upstream sector within OMV Petrom? What about its contribution to the company budget?

Romania has an outstanding legacy in the onshore and shallow offshore oil and gas production and, as you say, the upstream sector has an essential contribution to the resilience of the Romanian economy, not only through taxation, but also through the fact that it capitalizes on an essential resource for our daily life. In particular, OMV Petrom is one of the largest contributors to the Romanian budget. For example, this year, at the end of the third quarter, our net contribution to the state budget was RON 7.2 bn, including dividends worth RON 360 mn. These figures reflect the importance that OMV Petrom has for Romania's budget revenues.

But if we are referring only to the upstream sector, it must be said that it is not only a revenue generator for the state budget, through royalties and the supplementary taxation, but it is also an important catalyst for investments. In 2019, we invested 4.2 billion lei, most of this amount, respectively almost 80%, went into upstream projects. Investments have a supply chain effect, adding value to Romania's economy and the upstream sector accounted for almost two thirds in our operational performance.

However, the year 2020, as mentioned above, brought unforeseen challenges for the oil and gas production. Remember that the world almost stood still for two months during the first wave of the pandemic and, in April, oil prices reached even negative levels. State of emergency measures were the only means to slow down the spread of the virus. However, mobility restrictions have sent shockwaves through the economy and especially into this industry. Things now seem to be rebalancing, after the OPEC + group reached a new agreement to reduce production and amid announcements about the discovery of effective vaccines against the virus.

However, the oil and gas industry, as a whole, still has the potential to be an important engine of the Romanian economy. To take full advantage of this potential, we need to address the following: for the Romanian oil & gas industry, the biggest challenge is the regulatory framework, which does not encourage the production of new hydrocarbon resources to stop the decline of the current domestic production.

With regard to level of royalties, specific effective taxation rate for gas production in Romania is the highest in Europe, while for oil & gas we are significantly above European average. In the last years, new upstream taxes were introduced which is equivalent to having the royalties almost doubled.

A stable and competitive regulatory and fiscal framework would unlock

◀ **1st photo – Gas treatment hub in Hurezani, Asset Oltenia**

2nd photo – The Central Platform in the Black Sea, shallow waters, Asset Petromar

investments, thus generating added value in the Romanian economy and new revenues to the state budget.

OMV Petrom has exploration, development and production operations in the shallow waters and exploration operations in deep water areas. We know that investments in the exploration campaign of the Black Sea resources have reached impressive figures, not to mention the amounts necessary for exploitation. It is the same situation with development of mature fields. Now more than ever, with the current oil price environment, there is urgent need to operate oil and gas reserves in a very efficient way to ensure they stay economical. How do you manage to do this?

In the last 8-10 years, the Upstream organization within OMV Petrom went through several adjustments that led to a more flexible organization that together with the skilful and dedicated professionals managed to successfully cope with the industry's challenges and to improve its resilience to the volatile market conditions. Using new technologies, we focus continuously on the most profitable barrels, while maintaining the discipline of capital expenditures and looking after the opportunities that generate long-term value.

What can you tell us about the evolution of ongoing activities in the Black Sea?

OMV Petrom has been active in the shallow water of the Black Sea for over four decades as operator and has gained valuable deep water experience as non-operator in the adjacent Neptun Deep license in Romania. We need to take into account that approximately 10% of Romania's gas consumption comes from the shallow Black Sea.

Neptun Deep is a strategic project, both for us and for Romania and we continue all our efforts to see this project developed.

At the same time, our strategy includes growth in the Black Sea and a stronger position in the regional energy market. We target regional growth in the Black Sea area, where our technical competencies and experience represent a competitive advantage and where we can benefit from synergies with our existing operations.

We are very proud to be now on the Bulgarian side of the Black Sea as well, where we can bring our subsurface expertise and knowledge from what we have seen on the Romanian side. At the end of August, we completed the transaction for the acquisition of 100% of the shares in OMV Offshore Bulgaria GmbH from OMV Exploration & Production GmbH and we entered in the Han-Asparuh exploration block in Bulgaria. Following Repsol's exit, the Bulgarian regulator approved the allocation of Repsol's 30% participating interest to the remaining two partners.

Nevertheless, we also wanted to take a step on the other side of the Black Sea, into the Georgian deep-water, which is right now opening up. In June 2020, we won a tender for an exploration block offshore Georgia (Block II) which covers a total area of 5,282 square

km. The block will be formally awarded only if negotiation of a Production Sharing Contract is successfully finalized.

How do you assess the evolutions in the region regarding the development of the natural gas market, considering the measures from the European Commission for the EU members, including Romania (securing natural gas supply, interconnections stand, the reverse flow at the cross-border interconnections, transparency regarding reports on gas storage capacity, etc.)?

Since 2015, after Paris Agreement, the EU has pursued a robust energy policy with a dual purpose: to become a leader in the fight against climate change and to consolidate the security of EU natural gas supply, especially in the Eastern Europe. Through the concept of the Energy Union, two important gas transmission pipelines received EU financing in order to diversify import sources for the Eastern EU Member States. Physical and legislative barriers were removed and, when the Greece-Bulgaria Interconnector will be completed, the region will be able to fully benefit from the potential of a liquid market with various sources of supply.

If we look closely at the region, we will see that Romania is the only natural gas producer with sufficient local resources to ensure its market liquidity. Reaching a high degree of energy security with local gas resources will bring tremendous benefits for the economy and for the consumers. By capitalizing on the gas resources of the Black Sea, Romania will be able to cover the increase of the internal natural gas demand, will be able to meet the 2030 climate objectives and might become an important regional player.

During the pandemic, the demand for natural gas decreased at a slower pace and not so steeply, in comparison with the demand for crude oil or coal. This has been seen at the European Union level and, especially, in our region. Natural gas had a decisive contribution to energy security, ensuring a continuous flow of electricity by replacing coal and providing spare capacity for the renewables. This demonstrates the important role that natural gas plays in a low-carbon energy system.

That is why the South-Eastern region is focusing more and more on gas and we see here two directions. On one hand, the new built pipelines, BRUA and TAP, are operational and their role will be to diversify the gas import sources for the South-Eastern countries. On the other hand, we see the increased interest of Romania's neighbours to capitalize on new discoveries in the Black Sea.

The redevelopment projects of mature fields are one of OMV Petrom's major concerns. What is the current situation with respect to these deposits? What new redevelopment projects will be implemented in the next period?

When talking about the fields that we

operate in Romania, we have to take into account the fact that most of them are in operation for many decades, therefore they are matured and partially depleted. In order to prolong their economical production lifetime, we have to invest significant amounts on a constant basis. We continue to be committed to these matured fields as they are the basis of our production and we will further invest in them, but we need to ensure that these investments are sustainable in a low oil and gas prices environment.

One of the current initiatives of redeveloping old and mature fields is polymer (viscous water) injection that aims to improve the recovery factors. We are currently running one pilot project of viscous water injection in the Independenta field (Galati County) and we are analysing the feasibility of this technology for several other fields where we could implement it in the next years. Furthermore, we are currently also analysing the redevelopment of one of our shallow offshore field.

What is the current decline rate and what are the next steps to manage the natural decline of onshore and offshore production?

What will happen to the onshore hydrocarbons output in the future?

First, I want to mention that, despite the challenges triggered by the pandemic, we managed production, workover operations and construction works without interruptions and at high safety standards. I wanted to emphasis on this because our mission is to provide the energy that Romania needs. We have an important role for the Romanian economy and society.

Otherwise, we manage to contain the hydrocarbon production declined in the first 9 month of this year to only 3%, capitalizing on investments made in the previous years, which partially counterbalanced the natural decline. We see a steeper decline in terms of the natural gas production, and this underpins the need of unlocking new natural gas reserves. In the absence of unlocking the Black Sea gas resources, 40% of the Romanian internal gas consumption will be covered with imported gas by 2025.

Exploration and production, particularly deep drilling, imply high investment risks and specialized expertise and newest technologies. OMV Petrom has concluded partnerships with different operators on this subject. How do you assess the results of these partnerships?

In an industry as risky and CAPEX intensive as oil and gas partnerships are a common practice in order to share the risks, the investments and of course the benefits. I consider that partnerships are one of the key aspects in the optimization and improvement of your operations by gaining or developing essential knowledge.

Over the last years, OMV Petrom embarked on this trend and developed partnerships with world renowned companies in various areas of our operations from exploration all the way to production operations. Out of these partnerships I would like to highlight two of them of significant relevance for us; from the partnership with ExxonMobil that helped us gain deepwater expertise to the PEC (Production Enhancement Contracts) that helped us stabilize and even increase the production of the respective fields. ■


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Entech to Introduce Fantom™ Products to the Romanian Market

In 2019, Entech introduced the industry's first and only glass ball seat as part of their newly released product line, Fantom™ Completion Accessories. The patented Fantom™ products rely on Entech's proprietary glass that can withstand shocks during handling and well operations, while ensuring complete disintegration after being activated.

Kenneth Tunes, CEO of Entech, describes the motivation behind the Fantom™ shatter ball seat. "Glass is a great material for temporary barriers because it is chemically inert, high strength and breaks into tiny particles when activated. Most glass solutions require the completion string to be run closed-ended, but our Fantom™ shatter ball seat allows circulation and auto-fill while running in hole."

The first step to developing a reliable glass ball seat was to establish the performance properties of various glass geometries. A single layer glass disk sees bending stress caused by applied pressure, but a glass ball seat will also see radial forces due to the contact area and angle of the ball.

"We were curious if point loading and hoop stress would cause the glass to fail in tension," says Entech's CTO Jan Tore Tveranger. "Surprisingly, one of our early experiments confirmed a ball seat geometry that was equally strong to a traditional glass disk and also withstood ball impacts at high velocities".

The next phase of development focused on expanding the portfolio by prototyping complete tools and characterizing performance of different ball materials and coatings. Entech now provides solutions for tubing sizes from 2-3/8" to 7", suitable for both water- and oil-based fluids, with tailored ball-dissolution onset times.

Continued research led to a glass design capable of withstanding pressure differentials over 20,000psi and the recent qualification of Fantom™ products to 400°F. "Although these ratings may be overkill for many applications, we want our customers to appreciate how versatile the Fantom™ products are and engage us to recommend solutions for their specific needs," says Kenneth Larsen, Entech's Fantom™ Product Line Manager.

Uses for the Fantom™ technology include intervention-less packer setting, temporary well barriers, casing, and liner flotation, sliding sleeve activation and hydraulic setting port isolation. With more than 200 successful installations of the technology, Entech has proven the reliability and cost saving advantages of the Fantom™ product line.

In 2020, Dosco PetroServices signed an agreement with Entech to introduce Fantom™ products to the Romanian market. If you wish to receive more information about this completion accessory, visit dosco.ro or contact your Dosco representative.

New Method to Store Natural Gas Safely and Affordably

Natural gas is the cleanest of all fossil fuels but storing it safely and affordably remains a challenge. Now, engineers from the National University of Singapore (NUS) have devised a method to convert natural gas into a non-explosive solid that can be easily stored and transported. Using a novel, low-toxicity additive mixture they formulated, the conversion can be completed in just 15 minutes – the fastest time so far. The NUS team was led by Associate Professor Praveen Linga from NUS Chemical and Biomolecular Engineering. Their paper was published in the journal Energy & Environmental Science on 27 October 2020.

Dr Gaurav Bhattacharjee holding solidified natural gas pellets. © NUS.

Fast, safe, and portable way to store natural gas

The NUS team worked on a process of converting natural gas into a solid form known as gas hydrates, or combustible ice, which consists of molecules of natural gas trapped in 'cages' formed by water molecules. In fact, nature stores natural gas this way, but the process is extremely slow. Other researchers have previously managed to speed it up artificially, but they resorted to using highly toxic additives which are unsafe for both the environment and personnel involved.

The new additive mixture formulated by the NUS researchers contains L-tryptophan, well known as an essential amino acid in people's diet. This muscle-building amino acid can also greatly speed up the caging of natural gas into solid hydrate. The NUS formulation produces the fastest

Associate Professor Praveen Linga (left) and Dr Gaurav Bhattacharjee (right) holding solidified natural gas pellets.Behind them is a prototype of the machine they used in their patented conversion process. This work was conducted in the Linga Lab @ NUS.

reaction rate to date – more than twice as fast as existing standards – while being less toxic and safer to handle.

"Our breakthrough can really be put into perspective when you consider that it takes millions and millions of years for gas hydrates to form in nature, yet with our correct addition of secret ingredients to the system in small quantities, the same process can be effected in the laboratory in a matter of minutes," Research Fellow Dr Gaurav Bhattacharjee, who worked on the project, said.

Moreover, the end-product is very stable and can be stored at -5 degree Celsius and atmospheric pressure, like the conditions of a home freezer. This is impressive considering that the natural gas is reduced in volume by close to 90 times. Alternative ways to store natural gas include liquefying it at about -160 degree Celsius or compressing it to almost 250 times atmospheric pressure. These approaches do not work at a large scale because either they are expensive or not so safe to store for long periods.

Scaling up for industrial use

The NUS researchers are now aiming to convert larger volumes of gas into smaller volumes of solid at a pilot-scale of 100 kilogrammes per day. If successful, this will enable the commercial adoption of the solidified natural gas technology and create a solid that is stable to store at atmospheric pressure. They hope to eventually scale it up for industrial use.

"This is especially relevant to natural gas importing countries like Singapore, where 95 per cent of electricity is generated using natural gas. The development of such gas storage technologies would help enhance the country's energy security," Assoc Prof Linga said.

This research was funded in part under the Energy Innovation Research Programme (ERIP), which is administrated by the Energy Market Authority (EMA) and funded by the National Research Foundation (NRF).

Notably, Assoc Prof Linga's work was highlighted in the recently released Research Fronts 2020, a joint report by Clarivate and the Chinese Academy of Sciences to identify the top 100 research fronts for the period 2014 to 2019. According to the report, Assoc Prof Linga and his team have published the top three papers with the highest citations in the research front related to gas hydrates for "research progress on gas hydrate accumulation and mining technology". These papers focused on the latest progress in creating natural gas hydrates, both in the laboratory environment and in mining field experiments, the limitations of the state-of-art natural gas exploration methods, and the challenges of large-scale exploration.

GeoEcoMar, Partner in the REX-CO2 International Project

The National Institute for Marine Geology and Geoecology - GeoEcoMar, with a rich activity in the Carbon Capture, Usage and Storage (CCUS) domain in the last 20 years period, well presented in previous issues of our magazine - May 2018 and June 2019, is involved now in a new CCUS project - REX-CO2 (Re-using existing wells for CO2 storage operations).

by **Adrian Stoica**

Well reuse for CO2 storage

Existing oil and gas industry installations which cover large parts of the potential CCS chain are already in place, and an increasing number of reservoirs have come to the end of their production lifetime and are earmarked as major targets for initiating large-scale CCUS operations (DOE, 2017). The existing wells in these assets present both opportunity and challenges. Substantial savings could be realized by re-using these wells as CO2 injectors, monitoring wells, or for water production (pressure management). On the other hand, the existing well infrastructure poses a risk as a potential CO2 or brine leakage pathway (Watson and Bachu, 2009). The re-use of wells is the inverse of the problem of identifying defective wells. The process of certifying well integrity can also be used to identify wells suitable for continued use in a CO2-rich environment.

Re-use can benefit projects in all geological settings but may be particularly crucial for offshore environments, such as the North Sea or the Gulf of Mexico, where well development costs could otherwise be prohibitive. Developing a procedure and tools for evaluating the reuse potential of existing hydrocarbon fields and wells will require a dedicated investigation encompassing the interrelated technical, environmental, economic, and social aspects. Currently no such publicly available tool exists. For this project, GeoEcoMar conducts the necessary research to develop a dedicated well-screening tool for Reusing Existing Wells for CO2 storage operations (REX-CO2).

National Project REX-CO2

The international project REX-CO2 (RE-USING EXISTING WELLS FOR CO2 STORAGE OPERATIONS) aims to establish the evaluation criteria according to which a hydrocarbon well can be reused for CO2 storage, in a technically safe and economically feasible manner.

The project aims to develop the necessary methodologies and tools for evaluating the potential of reusing the existing oil and gas wells for CO2 operations. Such evaluation will consider the technical, environmental, economic, and social elements of the reuse project. The methodology and tools for its application will be tested on wells in the oil and gas fields previously selected in the project partner countries. The project will develop a qualification process that will simultaneously save CO2 storage projects money and time by identifying existing infrastructure that is seif safe to re-use, while determining which wells must be remediated to ensure long-term storage.

The consortium, which is coordinated by TNO (the Netherlands Organization for Applied Scientific Research), includes research institutes and industrial partners from the Netherlands, Romania, the United Kingdom, the United States of America, France, and Norway. The project has as associate partners regulatory authorities from the UK and Romania.

The project REX-CO2 (2019-2022)

The international team of REX-CO2 project at the kick-off meeting in Utrecht, October 2019 | © Photo: TNO

benefits from international funding through the second phase of the ACT (Accelerating CCS Technologies) program. ACT is the initiative of 16 agencies for funding scientific research in Europe and the US, which want to stimulate the development of carbon dioxide capture and storage technology. In a first phase, the ACT program was also financially supported by the European Commission. In the following phases, national agencies for funding scientific research will fully finance the program. In Romania, it is UEFISCDI.

Project objectives are: Develop a publicly available well reuse screening tool which helps stakeholders to make informed decisions on the CCS reuse potential of certain wells or fields; Demonstrate the application of the developed tool to perform dedicated reuse assessment, including technical, ecological, and economic aspects with candidate wells/fields from multiple international sites; Perform laboratory testing on relevant reuse risk scenarios, provide recommendations for (smart) material selection in reused wells; feed coupled thermo-hydraulic-mechanical-chemical (THMC) models and improve failure predictions; Provide guidance for the development of reuse permit applications; Gain an improved understanding on public acceptance and provide guidance on the socio-economic aspects of re-using oil and gas infrastructures.

Expected results

The results of REX-CO2 are expected to facilitate large-scale CCUS implementation by providing a tool to evaluate and rank the CO2 reuse potential of hydrocarbon fields. The developed technology is not limited to a particular sector of CO2 storage but will accelerate all types of CCS. Key results will include: Synthesised findings from developing a public reuse well screening tool for reusing existing hydrocarbon fields; Key findings in laboratory experiments, including well cement state of stress, material self-healing potential and implications for integrity of reused wells; Field scale numerical simulation results for different reuse field scenarios; Field case reuse studies for selected wells and depleted fields in all six partner countries; Assessment of public acceptance and recommendations for future projects involving well re-use for CO2 injection/storage; Development of technical and socioeconomic best practice recommendations for reusing existing wells for CO2 storage.

Involvement of GeoEcoMar in National Project REX-CO2

In REX-CO2, Alexandra Dudu from GeoEcoMar is the coordinator of the work package 'Legal, environmental, and social aspects' (WP6) and coordinator for Romania within the project. Work package 6 involves that each participating country conducts an analysis of provisions of their own legislation on the reuse of oil and gas wells for carbon dioxide storage. This analysis aims to identify the potential regulatory gaps, which will be reported and discussed with the national regulatory authorities.

Apart from this, the work package team is focusing on the analysis of public awareness and acceptance on the reuse of wells for CO2 storage. Starting from 2nd of December 2020, the team implemented a public survey that can be accessed at https://rex-CO2.eu/survey/. The survey will be available until the end of January 2021 when the team will start analysing the results. Survey results will be used to develop public communication strategies for future projects involving well reuse for CO2 storage.

GeoEcoMar is also coordinating a case study within work package 4 ('National case studies') for Romania, involving assessment of potential for well reuse and CO2 storage of a depleted hydrocarbon reservoir in Bihor county. The case study was selected with the support of National Agency for Mineral Resources of Romania.

The well reuse screening tool developed under coordination of Los Allamos National Laboratory will be applied in the national case study. The Romanian institute was and is also involved in the development of the tool and on its improvement by testing on real data. The tool is currently launched internally on beta version and already is being tested. The national case study will be finished at the end of 2021. ■

CONPET Inaugurated the Newest and Largest Crude Oil Storage Tank at Calareti Station

CONPET on November 17 inaugurated the commissioning of the newest and largest crude oil storage tank, in Calareti, an imported crude oil pumping station, located 50 km from Bucharest.

The tank, with a capacity of 31,500 m3, is equipped to the highest technological standards, being endowed with the following components:

• Aluminium membrane and dome ensuring a high degree of safety in operation and maximum protection of the environment.

• Automation, measurement, and control systems implemented in the SCADA - CONPET system.

• A modern agitator system (with automatically controlled movement) that will lead to the elimination of deposits and a much easier long-term maintenance, ensuring in addition the possibility to provide clients with blending services (mixture of different types of crude oil).

• Detection and intervention installations (with water and foam) in case of fire.

The commissioning of the tank took place after all the legal requirements regarding its use in the production flow were met.

At Calareti there is an intermediate pumping station, fully automated, through which imported oil or oil extracted from the continental shelf of the Black Sea is handled.

The station is located on the main transport route that connects Constanta and the refineries, respectively the oil depots located in Ploiesti and Pitesti, being a modern subunit that has, besides technological automation, intelligent anti-burglary and fire protection systems.

"CONPET proves, once again, that through the investment programs undertaken every year, it manages to bring the highest level of technical performance in support of streamlining the activity and optimizing the main technological flows, with special attention paid to environmental and human protection," said the head of the Transport Operations department within the company, present at the event.

CONPET S.A. holds national critical infrastructure, based on the Government Decision no. 1198/2012 on the designation of national critical infrastructures. At the same time, the national petroleum transmission system managed by CONPET is of strategic importance, according to Petroleum Law no. 238/2004. The company is defined, by law, as being of national and strategic importance.

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Vega Refinery, the Only Romanian Producer of Bitumens, Celebrates 115 Years of Performance

Facility IV – pumphouse and boiler room, Vega Refinery 1937 | *Courtesy of "Muzeul Național al Petrolului din Ploiești"*

Vega Refinery Ploiesti is the only Romanian producer of bitumens, and polymer-modified bitumen is distinguished by high wear resistance and increased elasticity, which helps a 50% longer life compared to other bitumens. Currently, Vega Ploiesti supplies approximately 17% of the required bitumen at national level.

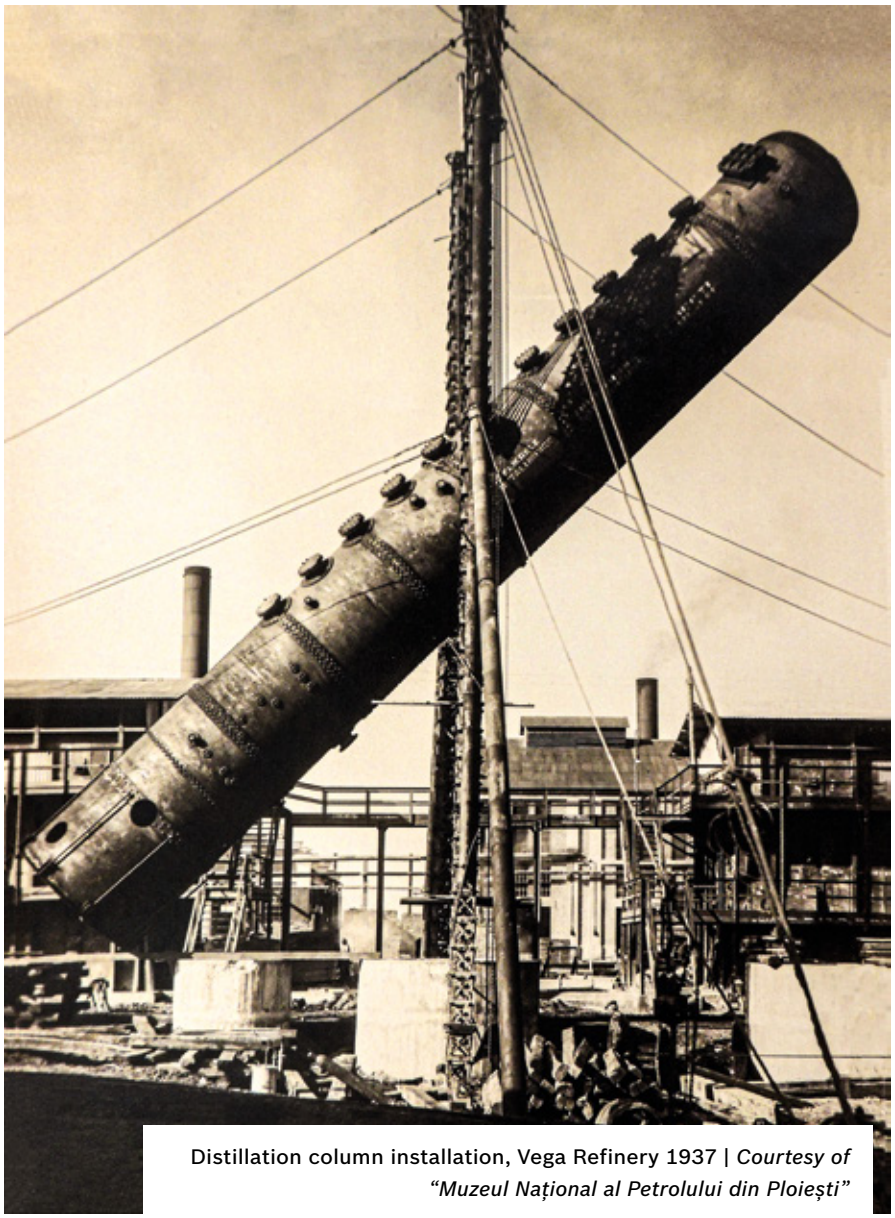
The Vega Ploiesti refinery, operated by Rompetrol Rafinare, celebrates 115 years of activity in the petroleum products processing industry. With a rich history and full of events that marked its development, the unit in Ploiesti today represents an important landmark in the Romanian energy sector.

"Vega refinery is a special unit, which has always had the ability to adapt to market requirements and to distinguish itself from other refineries in the country. Through a very well-developed flow, Vega Ploiesti grows every year, and Rompetrol Rafinare makes great efforts to develop this production unit, so important for many fields of activity in the country. For example, the bitumen produced at Vega is a strong business card and we are convinced that we will be able to increase the yields for this very valuable product," said Felix Crudu Tesloveanu, General Manager of Rompetrol Rafinare.

In 2019, the Prahova refinery managed to record operational records for the production of bitumen (120,000 tons), respectively the production of hexane (92,000). A high level of production was maintained in the first 9 months of 2020, with a total of 265,000 tons of processed raw materials and semi-finished products.

Growing production is supported by the polymer-modified bitumen plant, built in 2007, after the majority stake was taken over by KMG International, with an investment effort of over 7 million dollars. In the next period, KMG International intends to make additional investments in the bitumen production sector, given the growing demand for the absolutely necessary product in the development of road infrastructure at national level.

Currently, the refinery no longer processes crude oil, but only medium distillate products, from Petromidia Navodari. Thus, even though it is the smallest profile unit in the country, with an annual production capacity of approximately 400,000 tons, Vega Ploiesti exclusively develops products with high added value, such as hexane, special solvents, and bitumen.



Distillation column installation, Vega Refinery 1937 | *Courtesy of "Muzeul Național al Petrolului din Ploiești"*

The Vega Ploiesti refinery also makes considerable efforts in terms of environmental protection and limiting the impact of industrial activity. In 2019 alone, upgrades worth over 8 million dollars took place (new vapor recovery system, new incinerator for safe combustion of gases resulting from technological processes, replacement of the furnace in the Vacuum Distillation plant), with direct effect in decreasing the level of pollutants and the pressure on the environment.

At the same time, Rompetrol Rafinare carries out one of the largest ecological operations in the recent history of Romania: remedying the lagoons resulting from the refining activity of the last century. Upon completion of operations, the area will be renaturalized and monitored for 30 years.

Distillation column installation, Vega Refinery 1937 | *Courtesy of "Muzeul Național al Petrolului din Ploiești"*

About the Vega refinery

Vega Ploiesti was put into use in 1905, and Lazar Edeleanu was one of the first general managers of the refinery, a Romanian chemist who left his mark on the refining industry, by developing a process that bears his name and which consists in refining products with liquid sulphur dioxide as a selective solvent, which ensures the selective extraction of aromatic hydrocarbons, a process used for the first time in the world in the Vega refinery.

In 1916, during the First World War, the Vega refinery was set on fire, affecting important facilities and over 80% of the 50 tanks. After capital investments, Vega ends up being considered the second-best refinery out of a total of 46 existing in the country, in 1919.

The history of the longest-lived refinery in Romania also included an episode that slowed the development of the unit: the bombings of the Second World War, which affected approximately 90% of the refinery, considered at that time a strategic objective.

Following a major modernization carried out between 1955 and 1958, the refinery began to produce detergents, pharmaceutical Vaseline or special bitumens.

In 1999, the production unit in Ploiesti was privatized and bought by Rompetrol, a company that saved from extinction the refinery that was in liquidation procedure for about 8 months. Then, Rompetrol started an investment project, meant to refurbish the refinery. Development is constantly continuing after the takeover of the majority stake by the KMG International Group, which has increasingly focused on high value-added products.

One by one, the facilities in Vega Ploiesti were modernized to increase production capacity: the Hexan plant in 2011, the Vacuum Distillation plant in 2013 or the New Vapor Recovery plant in 2019.

Vega works in perfect synergy with the Petromidia - Navodari refinery, the largest in Romania and one of the most modern in the Black Sea region. Thus, Petromidia provides the entire refinery in Ploiesti with the raw materials/ semi-finished products necessary to obtain special products with a high added value. ■

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UPRUC-CTR Continues Investments

Horia Enciu, General Manager of UPRUC-CTR, talks about investments, modernization, and the most important projects of the company in 2020.

How was 2020 for UPRUC-CTR SA?

An atypical year, with unexpected and unprecedented events, in which we had to adapt very often to ever-changing conditions. However, we decided not to stop investments, to continue at a steady pace and prepare for the post-pandemic period.

The colleagues from UPRUC-CTR understood that it is an exceptional situation in which we must mobilize, and they managed to keep the level of production and sales at a level which, although below the budgeted one, was satisfactory for a year marked by the pandemic.

Both the market of fittings and pressure vessels had a setback in 2020, as the economic crisis overlapped the oil crisis, due to the low oil price. Crises so far have always been desynchronized, and the fact that we also faced a health crisis is also a novelty.

You said you did not reduce the level of investments despite the uncertain economic situation.

On the contrary! We decided to "press the pedal" even harder and we had a volume of investments and repairs at the level of 2018 and 2019 taken together. We purchased overhead cranes, plate rolling machines, vertical lathe, an automatic saw, laboratory equipment, tools for butt weld fitting production, we rebuilt the floors and the roof, we repaired and modernized ovens, we changed the hall windows, we arranged new production spaces and offices etc. Investments and repairs worth almost EUR 800,000 were made from own funds, without resorting to bank loans or other financing schemes and involved both the colleagues from maintenance and many collaborators.

Did UPRUC-CTR SA resort to any of the support forms provided by the Government during the pandemic?

No! In conditions in which UPRUC-CTR SA has no loan, it did not resort to any form of aid from the state during the pandemic and did not decide to finance itself by deferring the payment of taxes and duties owed. We also decided to behave this way because we understand that the state has a massive need for financing, and we chose to do our duty in this way too.

What was the most important project in 2020?

An important project was the arrangement of the second half of the pressure vessels shop, through which we will double both the production area and that of the administrative building.

For butt weld fitting production, an important project that will continue in 2021 is the extended use of induction heating, which will bring us an essential competitive advantage. We work closely with the local partners, who still have the know-how for this technology and with which we are convinced that we will manage to have a successful implementation.

How did the profile of UPRUC-CTR client change lately?

The economic crisis that started in 2020 was a black swan. Our clients were faced with uncertainty, which led to the reduction or stoppage of investments. On top of that, the low oil price determined our clients not to be able to estimate the needs and ordered one day for the next. We had to find quickly other customers and with the help of their orders we reached a reasonable turnover, even if below that budgeted for this year. Therefore, we had less work for the oil industry and more for the gas industry.

An end message?

I wish all collaborators inspiration to learn from the period we went through the most possible to help them resettle their businesses and careers for the years to come!

I thank my colleagues from UPRUC-CTR SA for their effort in 2020 and I wish them good health and strength in their work in 2021!

Europe's Largest Green Hydrogen Project: NortH2

Norwegian energy major Equinor and German utility RWE have joined the NortH2 green hydrogen project in the Netherlands. NortH2 project aims to produce green hydrogen using renewable electricity from offshore wind off the coast of Netherlands of about 4 gigawatts by 2030, and 10+ gigawatts by 2040, kickstarting the hydrogen economy in Northwest Europe.

This is a ground-breaking project that Equinor is looking forward to contribute to. The project can be an important part in our efforts to build a competitive position in hydrogen, creating future value and industrial possibilities. Our aim is to be a net-zero energy company by 2050 and developing a profitable low carbon value chain for hydrogen will be an essential part of our transition to become a broad energy company. Hydrogen will be key to decarbonisation and net zero efforts for the energy market, especially in otherwise hard to abate sectors which cannot be served by electricity," says Equinor CEO, Anders Opedal.

NortH2 was launched in February 2020, with Shell, Groningen Seaports Gasunie and the province of Groningen. Equinor joins RWE as new partners to the project. The project will complete a feasibility study by 2021, with the aim to start project development activities in the second half of 2021.

"As a new partner, RWE will contribute its broad expertise to create a powerful infrastructure for green hydrogen in Northern Netherlands. We are the world's second biggest operator of offshore wind farms and have experience in the field of electrolysers, making us the ideal partner for NortH2," adds Roger Miesen, CEO of RWE Generation.

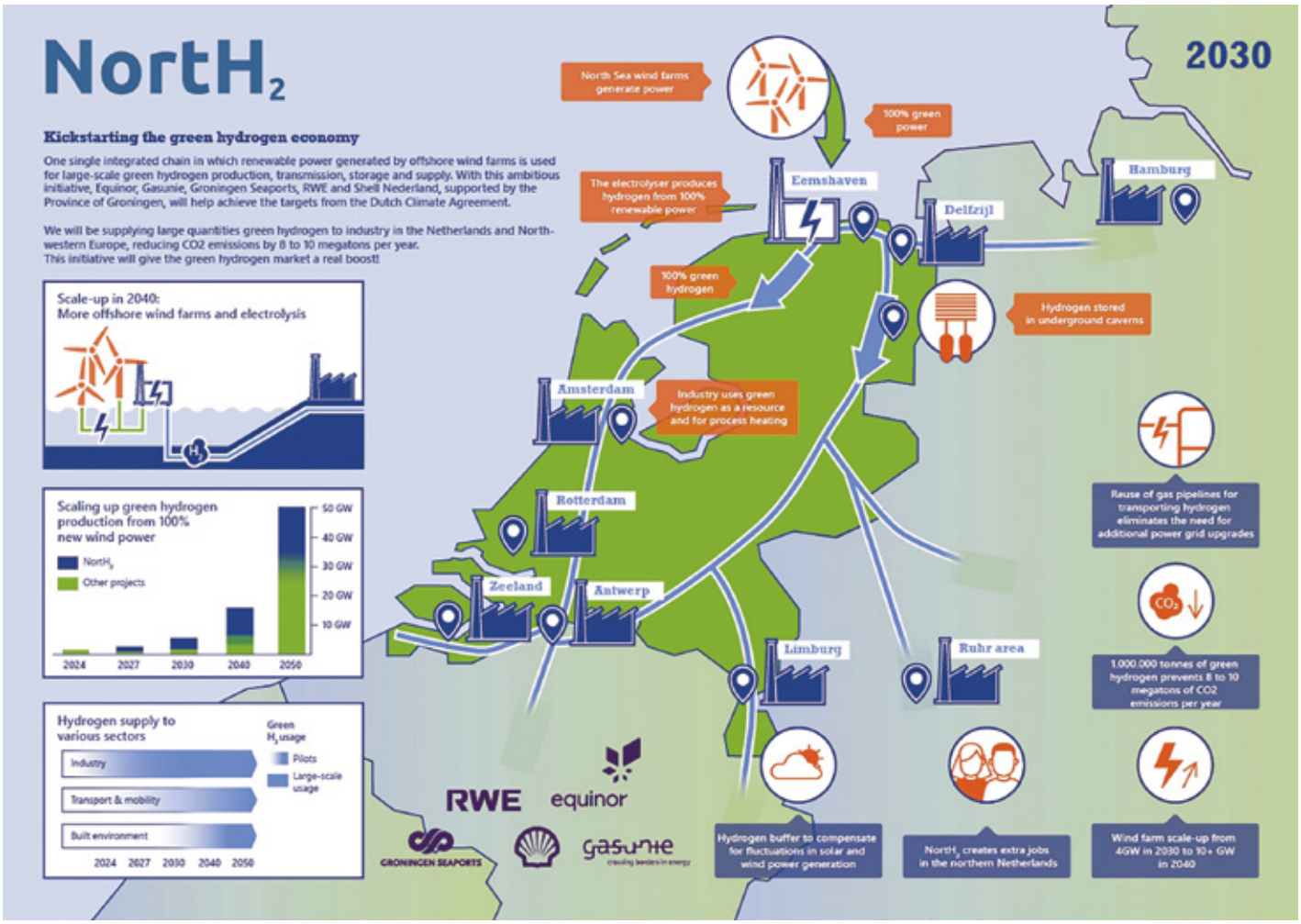
The project will have a capacity of 1 GW in 2027, 4 GW by 2030 and 10+ GW by 2040 for electrolysis. This equates to 0.4. million tonnes of green hydrogen production in 2030 and 1 million tonnes green hydrogen production by 2040. This can abate 8 to 10 million tonnes of CO2 emissions. This is equivalent to the yearly emissions from road traffic in Norway. The rapid growth in offshore wind is well suited to developing a green hydrogen value chain.

"NortH2 fits well with Equinor's experience and position as a leading offshore wind operator. Hydrogen will add to the competitiveness of renewables in the years to come, by adding value and an alternative route to market for renewables. The development of viable large-scale clean hydrogen value chains twill help meet the Paris agreement targets, mentions Pål Eitrheim, Executive Vice President New Energy Solutions in Equinor.

In recent months, the consortium has been working on the first phase of the feasibility study, focusing on the period up to 2030. The study concludes that NortH2's integrated approach could lead to a 20% reduction in societal costs compared to a smaller-scale approach. Because the consortium wants to build the entire chain on a large scale - from offshore wind farms, production, storage, distribution to the eventual use of green hydrogen - this cost reduction can be achieved. In this way, green hydrogen can become an economically interesting decarbonisation option in, for example, the industry in comparison to alternatives.

According to a recent study by the University of Groningen, the project could involve between 700 and 1,200 structural jobs in the province of Groningen and a multitude of this during the construction phase. The second phase of the feasibility study focusing on the period after 2030 has now started.

"We are very pleased with RWE and Equinor joining the NortH2 consortium. This expansion



of the consortium fits well with the international ambitions of the project. European collaboration is necessary to ultimately achieve the climate goals and accelerate the energy transition. In addition, RWE and Equinor are no strangers in the Eemshaven and the Northern Netherlands, and we can use each other's knowledge and expertise to further develop Europe's largest green hydrogen project," says Cas König, CEO of Groningen Seaports.

Northwest Europe is well-positioned to develop an integrated hydrogen value chain – from offshore wind development and renewable power generation to production, storage, transport, and the sale of green hydrogen.

The North Sea has a great potential for large-scale wind development, there is extensive existing natural gas infrastructure that is suitable for storage and large-scale transport of hydrogen, and there are large industrial clusters in the Netherlands and Germany as well as heavy-duty vehicle OEMs that could economically benefit from a 'first mover' advantage. NorthH2 expands the energy transition agenda for Equinor by adding a significant green hydrogen value chain. This complements already existing renewable and low-carbon world-class projects like Dogger Bank (offshore wind), Northern Lights (CCS) and H2H Saltend (Blue hydrogen). NorthH2 sets a vision for 4 GW integrated offshore-wind-to-green-hydrogen value chain by 2030, and for 10+ GW by 2040. Through the parallel development of the required hydrogen infrastructure by repurposing existing natural gas infrastructure, the project could supply major Northwest European clusters.

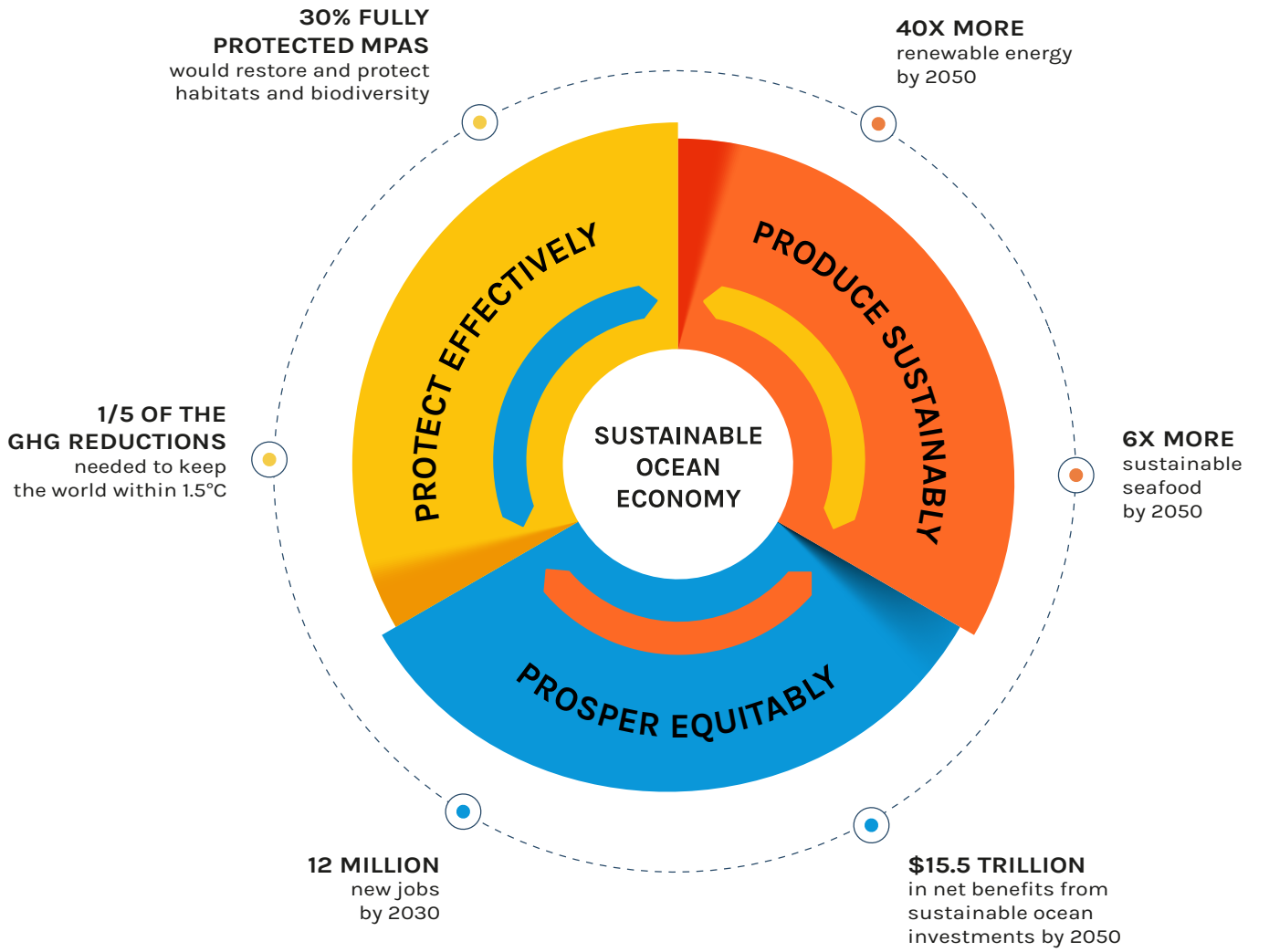
By doing so the NorthH2 project will make an important domestic contribution to meet expected quickly growing hydrogen demand and thereby to meet Dutch as well as EU climate targets for 2030. It also ensures long term decarbonisation in line with the Paris Agreement. The project fits well with the agenda of the Northern Netherlands to become a leading region for green hydrogen, supporting economic development and the creation of high-skilled jobs.

The consortium is dependent on permits from governments, the assignment of new wind farm locations in the North Sea, the available locations for the hydrogen plant(s), interest from potential customers, and the final investment decisions of the parties concerned.

NorthH2's partners anticipate that the initial project phases may potentially require European and national subsidies available for the decarbonisation of energy.

Transformations for a Sustainable Ocean Economy

A Sustainable Ocean Economy Can Create a Triple Win for People, Nature and the Economy



Note: MPAs: Marine protected areas. GHG: Greenhouse gas emissions.

The leaders of 14 countries have put forward a new ocean action agenda underpinned by sustainably managing 100% of national waters. The 14 members of the High Level Panel for a Sustainable Ocean Economy (the Ocean Panel), are heads of state and government representing people from across all ocean basins, nearly 40% of the world's coastlines and 30% of exclusive economic zones. The Ocean Panel developed a transformative set of recommendations and actions to advance a sustainable ocean economy, prioritizing a healthy ocean alongside sustainable production to benefit people everywhere.

SUSTAINABLE OCEAN ENERGY

The ocean holds tremendous potential to provide clean energy for the world. Scaling up ocean-based renewable energy will generate jobs and boost economic development while providing a pathway to decarbonisation. An ocean-based renewable energy revolution is in the making, and recovery efforts provide an opportunity to increase investment over the coming years. The pace and scope of development must match the state of the science, enable technology transfer and adoption, and minimise the impact on marine ecosystems to enable the delivery of sustainable ocean-based energy.

Ocean-based renewable energy is fast-growing and on the path to becoming a leading source of energy for the world.

Priority actions

• Invest in research, technology development and demonstration projects to help make all forms of ocean-based renewable energy—including wind, wave, tidal, current, thermal, and solar—cost-competitive, accessible to all and environmentally sustainable.

• Work collaboratively with industry and other stakeholders to develop clear frameworks addressing environmental impacts of ocean-based renewable energy, enabling capacity, co-existence, and integration with other uses of the ocean.

• Set clear goals, commit to deliver appropriate policy and regulatory measures, and remove market impediments to accelerate sustainable ocean-based renewable energy deployment.

SUSTAINABLE OCEAN TRANSPORT

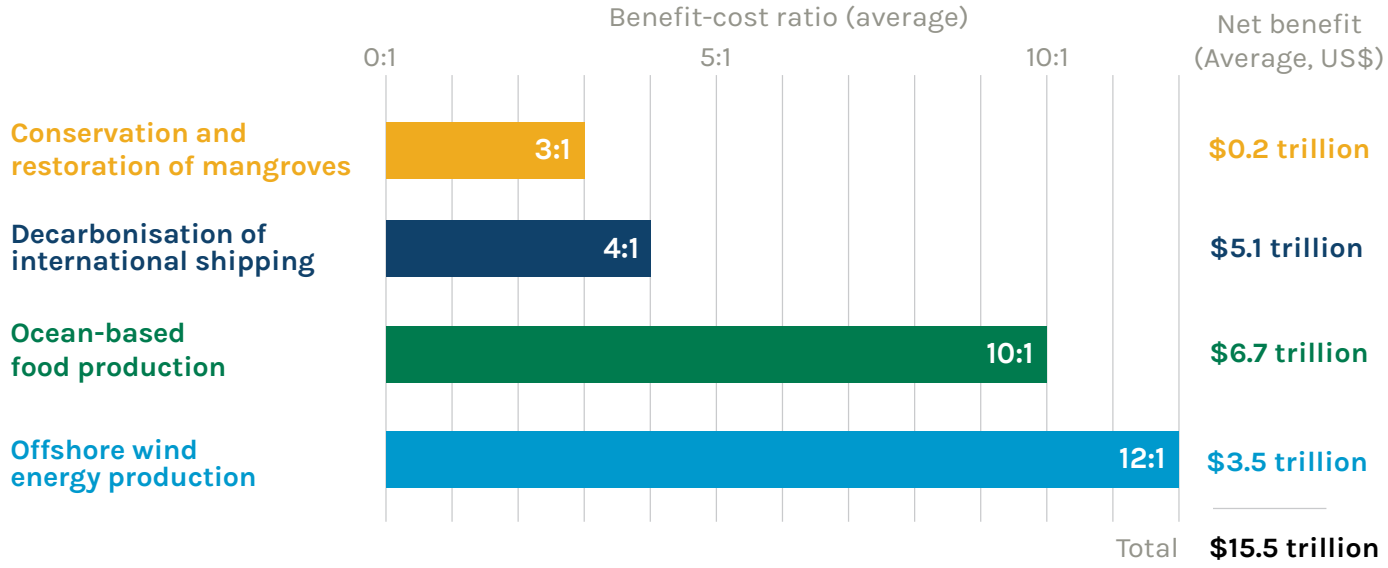
Shipping, the most energy-efficient form of transport, is vital to international trade and connectivity as it continues to move over 90% of global goods. Maintaining global supply chains will be critical to support recovery from the COVID-19 pandemic and future crises. Technology to decarbonise and minimise the negative environmental impacts of marine transport exists but must be brought to scale. To ensure the industry is resilient, we must move decisively towards reducing greenhouse gas emissions by investing in solutions now to support rapid decarbonisation. Such investments will create jobs and build connectivity and the long-term resilience of global supply chains and island and coastal communities to future crises.

Shipping investments have effectively accelerated the shift towards zero-emission and low-impact marine vessels.

Priority actions

- Establish early national targets and strategies to support decarbonisation of vessels.
- Stimulate the development and adoption of technologies for producing and storing new zero-emission fuels.
- Incentivise sustainable, low-carbon ports that support the transition to decarbonised marine transport and shipping fleets through renewable energy and zero-carbon fuel supply chains.
- Promote the transition of the global fleet to modern modes of propulsion and renewable fuels, including through strengthened regulations within the International Maritime Organization (IMO) and support technical cooperation for international capacity building.
- Minimise the transfer of aquatic invasive species by ships through an effective IMO framework, including its robust implementation.
- Apply the global regime for safe and environmentally sound recycling of ships.
- Promote quiet vessel programs by ports in sensitive areas and incentivise the use of vessel-quietening technologies considering international guidelines.
- Ban the use and carriage for use of heavy fuel oil in the Arctic through the IMO, and welcome other similar initiatives.

Sustainable Ocean–based Interventions Have Very High Benefit–cost Ratios and Could Yield Trillions of Dollars of Benefits



Note: Average benefit-cost (B-C) ratios have been rounded to the nearest integer and the net benefits value to the first decimal place. The B-C ratio for mangroves is the combined ratio for both conservation- and restoration-based interventions. The average net benefits represent the average net present value for investments and are calculated over a 30-year horizon (2020–50).

Source: Konar, M., and H. Ding. 2020. "A Sustainable Ocean Economy for 2050: Approximating Its Benefits and Costs." Washington, DC: World Resources Institute. https://www.oceanpanel.org/Economicanalysis.

SUSTAINABLE NEW OCEAN INDUSTRIES

The ocean holds untapped opportunities to deliver medicines, animal feed, fuel, new materials and carbon-storage solutions, the need for which has been further evidenced and strengthened by the COVID-19 pandemic and its repercussions. We need to innovate and invest to scale up these opportunities based on science and environmentally responsible practices.

Innovation and investments in new ocean industries have boosted environmentally responsible and inclusive economic growth.

Priority actions

- Scale up environmentally responsible commercial farming of seaweed and algae to provide food and create alternatives for products such as fuels, aquaculture and agriculture feedstocks, biotech, and viable and sustainable plastic alternatives.
- Explore and incentivise smart and sustainable cross-sectoral and co-located activities, such as ocean-based renewable energy sites to fuel zero-emission shipping and aquaculture farms.
- Promote fair and equitable sharing of benefits from research and development from marine genetic resources within national waters.
- Advance carbon capture and storage in the sub-seabed through international collaboration, appropriate incentives and mapping the storage potential of sub-seabed geological formations.

A PRECAUTIONARY APPROACH TO SEABED MINING

The deep ocean floor contains minerals that are useful for renewable energy technologies and may contribute to the transition to a low–carbon emission society. These areas are among the most isolated and poorly explored of all ocean ecosystems. The sensitivity of these ecosystems, our insufficient scientific

knowledge and our limited understanding of the potential impacts of emerging ocean activities requires applying a precautionary approach, undertaking research and investigation, and developing a circular economy to reduce demand and help mitigate these risks.

Sufficient knowledge and regulations are in place to ensure that any activity related to seabed mining is informed by science and ecologically sustainable.

Priority actions

- Build partnerships to increase research, innovation, and deployment of urban mining (reclaiming and recycling metals from spent products, buildings and waste), and of innovative technologies that will reduce the need for new sources of metals and rare earth minerals.
- Initiate an international research agenda to improve understanding of the environmental impacts and risks of seabed mineral activities (especially regarding deep ocean ecosystems).
- Ensure that regulations for seabed mineral mining—under development by the International Seabed Authority—provide effective protection of marine environments by applying a precautionary and ecosystem-based approach, using science-based and transparent management, and ensuring effective compliance with a robust inspection mechanism.
- Ensure that all seabed mineral activities within and beyond national jurisdiction comply with robust environmental standards.
- Promote the participation of scientists from developing countries in research and make the results from research and the analysis of research findings publicly available, including through the International Seabed Authority.

Ocean health

The ocean is critical for the global climate system and planetary health. It has absorbed 25% of all carbon dioxide (CO2) emissions and captured 90% of the additional heat generated from greenhouse gas emissions, but it is now warming and acidifying. The global community must act urgently to reduce greenhouse gas emissions, prevent biodiversity loss, restore and protect coastal and marine ecosystems, reduce pollution and take a precautionary approach to economic activity on the ocean floor.

REDUCE GREENHOUSE GAS EMISSIONS

The health of the ocean, and the livelihoods and economies that depend on it, requires the world to urgently reduce greenhouse gas emissions in line with the goals of the Paris Agreement. A sustainable ocean-based economy can play an essential role in this much needed emissions reduction, while providing jobs, supporting food security, sustaining biological diversity, and enhancing resilience. Ocean-based climate actions can deliver up to one-fifth of the annual greenhouse gas emission reductions needed by 2050 to limit warming to 1.5°C.

Ambitious climate action has set the world on track to achieve the goals of the Paris Agreement and restore ocean health.

Priority actions

- Establish and implement ambitious emissions reductions, covering all sectors, consistent with the Paris Agreement goal of pursuing efforts to limit global temperature increases to 1.5°C.
- Implement the Ocean Panel's Call to Ocean-Based Climate Action by scaling up investments in ocean-based renewable energy, green shipping, sustainable seafood production, nature-based solutions and carbon capture and storage in sub-seabed geological formations.
- Include ocean-based climate action in reporting under the Paris Agreement.

REDUCE OCEAN POLLUTION

The ocean has become a sink for pollutants including plastics, chemicals, nutrients, and wastewater. While global awareness and action has been increasing, it has not been sufficient to prevent an increase in ocean pollution. The response to the COVID-19 pandemic has caused a surge in production and consumption of protective equipment, much of which contains single-use plastic. This response, although necessary, has further accentuated the need to stop waste from entering the ocean. Efforts to combat harmful land-to-sea pollution should not be scaled back under the guise of economic recovery after the pandemic. Urgent action is needed to target the sources and management of pollution. Through the UN Environment Assembly, governments have endorsed a long-term vision of eliminating the discharge of marine litter and microplastics into the ocean. The G20 Osaka Blue Ocean Vision and the Ocean Plastics Charter further recognise the importance of embracing a lifecycle and circular economy approach.

Nutrient runoff contributes to deoxygenation of the ocean but suffers from less attention and action; it should be treated with the same level of urgency. The connection between the land and the ocean must be understood to address systemic sources of ocean pollution. ■

Green H2 Blue Danube

A HYDROGEN PROJECT OF EUROPEAN DIMENSIONS

VERBUND, Austria's leading energy utility and one of the largest producers of hydroelectricity in Europe, is developing the Green Hydrogen Blue Danube project in conjunction with technology partners and buyers of green hydrogen within the framework of the European Commission's Important Projects of Common European Interest (IPCEIs) initiative. The project involves various stakeholders along the value chain. Romania's state-owned electricity producer Hidroelectrica is involved in the project as co-investor in renewable energy and hydrogen production in SEE. The goal is to create a trans-European green hydrogen value chain – from production to transportation to purchase by industrial and mobility customers.

COUNTRIES:

12 companies

5.850M investment

Solar+Wind

2,0 GW

40 barges

Steel/Raff/Chem

100 HRS

500 HDV

5.000 new +
50.000 secured

80.000 t/year

- 3.200.000 t/year

The following partners are involved in the project's development: VERBUND (generates green electricity and green hydrogen and supplies it to consumers; project coordinator, Austria); Agrana (buys green hydrogen to produce second-generation bioethanol, Austria); AVL (developing a hydrogen powertrain for maritime transport, Austria); Bayernoil (buys green hydrogen for decarbonisation of refinery processes, Germany); Bosch (buys green hydrogen through customers with stationary fuel cells, Germany); Chemgas Shipping (provides the fleet for maritime transport, Netherlands); Cummins (supplies electrolysis technology, Belgium); DB Schenker (buys green hydrogen for its logistics fleet, Austria and Germany); Donau Tankschifffahrtsgesellschaft (operates the shipping fleet on the River Danube, Austria); Gunvor Raffinerie Ingolstadt (buys green hydrogen for decarbonisation of refinery processes, Germany); Hydrogenious LOHC Technologies (supplies technology to LOHC, Germany); Hidroelectrica (co-investor in renewable energy and hydrogen production in SEE, Romania); ÖBB (transports hydrogen by rail and truck, Austria); Siemens Energy (supplies electrolysis technology, provides facility planning and EPC services, Austria and Germany); TECO 2030 (supplies technology for hydrogen powertrains for maritime transport, Norway); Worthington (supplies high-pressure cylinders for transporting hydrogen, Austria).

Installation and Operation of an Electrolysis System at the Steel Production Site in Linz, Austria

An important building block for the decarbonisation of Europe

This project will greatly advance decarbonisation by means of green hydrogen – benefiting industrial users and the mobility sector.

VERBUND deems green hydrogen an important building block for the decarbonisation of Europe and intends to establish green hydrogen as a second green energy carrier next to green electricity in its portfolio. To underline these ambitions, VERBUND has already launched several flagship projects, most prominently the construction and operation of one of the world's largest electrolysis plants as part of the H2FUTURE project with voestalpine, Siemens, APG, K1-MET and TNO, funded by the Fuel Cells and Hydrogen Joint Undertaking (FCH JU). VERBUND also developed and now operates the HOTFLEX project, which deploys a highly innovative reversible solid oxide electrolyser and fuel cell. VERBUND is also engaged in several further projects related to the production, storage and use of green hydrogen.

Green hydrogen is produced through electrolysis of renewable electricity. It emits significantly less carbon dioxide when used, because natural gas is substituted in the production of hydrogen. In the mobility sector, green hydrogen is an alternative source of energy to replace fossil fuels, especially in freight transport.

From today's viewpoint, future needs for green hydrogen will only partially be met from domestic production. To a much higher degree, Austria, just like most Western-European countries, will rely on imports of green hydrogen to achieve their ambitious climate targets. A European green hydrogen economy will include all aspects from generation to transport and utilization.

"VERBUND is embracing green hydrogen, because as a producer of green electricity we believe that this sustainable product will greatly further the achievement of climate targets. At VERBUND we are taking the lead here, working with distinguished partners from Austria and other European countries to help green hydrogen achieve a breakthrough. In terms of sector integration and sector coupling, we are focusing on new infrastructure, innovative technologies, and sustainable business models," said Michael Strugl, Deputy CEO of VERBUND.

The first phase of the project focuses on production and use of green hydrogen in Austria and Bavaria.

Given that Austria will not be able to produce enough hydrogen, the second phase of the project will focus on the production of green hydrogen from renewable electricity in south-eastern Europe. There, wind, solar and hydropower will be converted into hydrogen directly on site to harness Europe's renewable resources that otherwise could not be utilised owing to a lack of electricity transmission capacity. This hydrogen will then be transported via the River Danube, a long-established European transport corridor (TEN-T), to hydrogen users in Austria and Germany.

The concept

- Produce green hydrogen on a large scale off-grid in South-East Europe using wind and solar energy
- Transport hydrogen via the River Danube to hydrogen users in countries of the Interreg Danube Transnational region
- Set up the necessary hydrogen infrastructure in the participating member states along TEN-T core corridors

The benefits

- Contribute to achieve climate objectives of Member States
- Reduce dependence on fossil energy imports: renewables made in Europe
- Increase security of energy supply: increased flexibility and resilience
- Strengthen key European industry sectors, create jobs and spill-over effects

Key facts

- 2,000 MW off-grid wind and solar energy production
- 1,800 MW electrolysis for hydrogen production
- 40 hydrogen transport barges
- 80,000 tonnes of hydrogen for industry, power + mobility hubs (500 trucks / 100 HRS) along the Danube

In a nutshell

- Use the Danube waterway for cost-efficient and sustainable transport of hydrogen in the Danube region
- Utilise the Danube sea ports and inland ports for storage and intermodal transport of green hydrogen
- Bring green hydrogen to early movers in the industry and mobility sectors and roll out the hydrogen economy along TEN-T core corridors
- Strengthen and decarbonise both traditional and new industry sectors in Europe all along the hydrogen value chain

The vision: Spill-over effects - Connect the Danube value chain to the River Rhine, to the Black Sea, to pipeline networks across Europe and to maritime ports. ■

EBRD Signs up to Sustainable Blue Economy Finance Principles

The European Bank for Reconstruction and Development (EBRD) has become a signatory to the Sustainable Blue Economy Finance Principles (SBEFP). The Principles are benchmark for investing in a sustainable ocean economy. EBRD plans to make over half its investments in environmental sustainability by 2025.

Launched in 2018, SBEFP are the world's first global guiding framework for banks, insurers, and investors to finance a sustainable blue economy. They promote the implementation of United Nations Sustainable Development Goal 14 (Life Below Water), and set out ocean-specific standards, allowing the financial industry to mainstream sustainability of ocean-based sectors.

The principles are hosted by UNEP FI, a partnership between UNEP and the global financial sector to mobilise private sector finance for sustainable development. They were developed by the European Commission, WWF, the World Resources Institute (WRI) and the European Investment Bank (EIB).

The largest ecosystem on earth, the ocean is the lung of the planet, providing the oxygen for every second breath we take. It provides the main food source for almost half of the world's population and plays host to an estimated 80 per cent of the planet's biodiversity. Major industries such as shipping, fishing, aquaculture, and coastal tourism depend upon ocean health.

With an annual economic value estimated at USD 2.5 trillion, equivalent to the world's seventh largest economy, the blue economy is increasingly attracting investors, insurers, banks, and policymakers as a new source of opportunity, resources, and prosperity. However, its rapid unsustainable growth can lead to environmental risks and losses in natural capital, eroding the ocean's resource base and creating regulatory, market and physical risks.

The EBRD, already in the vanguard of climate finance, plans to expand the proportion of its environmental sustainability lending to more than 50 per cent over the next five years.

The Bank's track record on delivering the Sustainable Blue Economy Finance Principles includes, notably, work on the Northern Dimension Environmental Partnership (NDEP), promoting environmental remediation in the Baltic and Barents Seas, with a particular focus on supporting wastewater treatment to improve the health of the marine environment and fight eutrophication. Over the past 20 years, this programme has supported 23 wastewater treatment facilities with EUR 182 million in grants for a total project value of EUR 1.3 billion, treating two million cubic metres of water per day – or 1,000 Olympic swimming pools.

The EBRD and the International Maritime Organisation (IMO) also continue their partnership through the GloBallast programme to stop global spread of invasive species and pathogens in the ballast tanks of international cargo vessels and protect marine biodiversity.

Green H2: Drivers and Barriers

Green hydrogen will have to overcome several barriers to fulfil its full potential. Chief among those barriers is cost. Overcoming the barriers and transitioning green hydrogen from a niche player to a widespread energy carrier will require dedicated policy in each of the stages of technology readiness, market penetration and market growth. According to IRENA's 'Green Hydrogen: A guide to policy making', an integrated policy approach is needed to overcome the initial resistance and reach a minimum threshold for market penetration, resting on four central pillars: building national hydrogen strategies, identifying policy priorities, establishing a governance system, and enabling policies, and creating a system for guarantee of origin for green hydrogen.

The EU hydrogen strategy

The EU strategy aims for an integrated view of the hydrogen value chain and establishes a supporting governance system and policy framework to promote hydrogen deployment.

The ambition of EU policymakers is to make the European industry a global leader, both in green hydrogen equipment and zero-carbon heavy industry. For this reason, the strategy identifies green hydrogen as the only shade of hydrogen compatible with a net-zero emission system.

The strategy aims to create at least 6 GW of electrolyser capacity by 2024, enough to produce up to 1 Mt/yr of green hydrogen. That would increase to 40 GW in EU countries by 2030, with an additional 40 GW of electrolyser capacity in southern and eastern neighbours (e.g. Ukraine or Morocco), from which the European Union could import green hydrogen.

The strategy sets several actions, including not only regulatory changes indicated by impact assessments, but also supporting investments designed to kick-start deployment.

The strategy adopts a staged approach, like the one followed in this report.

- **Stage ONE (2020-2024):** Scale-up electrolyser capacity to 6 GW and produce up to 1 Mt/yr of renewable hydrogen. The focus is on decarbonising applications that already use hydrogen and facilitating the uptake of green hydrogen in new end-use applications. The hydrogen supply would be mostly local to avoid the need for extensive infrastructure while planning for infrastructure expansion.

Some existing hydrogen production is retrofitted with carbon capture.

- **Stage TWO (2025-2030):** Scale-up electrolyser capacity to 40 GW in EU countries and produce up to 10 Mt/yr of renewable hydrogen. An additional 40 GW of capacity may be commissioned in neighbouring regions, via co-operation. Transporting the green hydrogen will require a pan-European grid infrastructure that could be largely based on existing natural gas infrastructure. International trade with neighbouring regions can also be developed. It is assumed that the hydrogen market will be efficient in allocation, with unhindered cross-border trade.
- **Stage THREE (2030-2050):** Green hydrogen reaches maturity and is deployed at large scale across all hard-to-abate sectors where alternatives have a higher cost. E-fuels made from hydrogen would be used in a wide range of sectors, including aviation and shipping.

Reaching the 2030 goals is estimated to require investment of EUR 24-42 billion for electrolyser capacity, in addition to EUR 220-340 billion for 80-120 GW of additional renewable power generation capacity, EUR 65 billion for infrastructure and EUR 11 billion for retrofitting existing P1 natural gas plants. ■

European Premiere in Bucharest

FIRST BUS MODERNIZED FROM DIESEL ENGINE TO CNG (FROM EURO 3 TO EURO 6)

In a world that lays increasing emphasis on reduction of pollution and carbon emissions in the great conurbations, Bucharest takes a step forward through the technological transformation of a large part of its fleet that ensures public transport. Therefore, the Bucharest Transport Company (STB) and its partners realized the first bus in Europe modernized by transforming the Diesel engine with Euro 3 pollution norm to run on compressed natural gas (CNG) and having Euro 6 norm.

by **Daniel Lazar**

This first bus was type-approved at the Romanian Automotive Registry (R.A.R.), where it was tested by specialists to be able to enter circulation.

The engine has great advantages, natural gas being much cheaper than liquid fuels, which will lead to reduced costs in terms of consumption.

The bus will remain in circulation for testing and monitoring and depending on results its executant will continue to adjust to optimize efficiency and consumption.

Moreover, STB will modernize 600 vehicles of its fleet, turning them into CNG-powered buses with Euro 6 pollution norm. This project will reduce pollutants and renew the fleet.

Therefore, for the first time at European level, hundreds of buses with Euro 3 pollution norm of the STB fleet will be turned into CNG-powered buses, Euro 6, to align to European standards and Directive of the European Parliament on the promotion of clean and energy efficient road transport vehicles.

The project also considers transformation of other 150 old Mercedes buses into trolleybuses, as well as the expansion of the transport network in deficient areas: Gara de Nord, Bd. Ion Ionescu-Sisesti, Berceni.

Since mid-November, STB has a new General Manager, Mihai Petcu, who has extensive experience in the automotive and financial fields, having previously held several management positions in both reputable multinational companies and local companies.

The Bucharest Transport Company is the main public transportation operator in Bucharest and Ilfov County and has one of the most extensive transportation networks in Europe, with a length of the routes of 1651km, double track.

Siemens Mobility and Deutsche Bahn Launch Hydrogen-powered Train

Siemens Mobility and Deutsche Bahn (DB) are driving forward the climate-friendly transition in transport and are testing the use of hydrogen for rail for the first time. The aim is to test a completely new overall system consisting of a newly developed train and a newly designed filling station. DB will refit one of its maintenance shops for servicing the hydrogen-powered train. Both companies will test a climate-friendly complete system consisting of the train and its specially developed infrastructure.

The system consisting of trains and infrastructure is intended to replace diesel powered trainsets operating on regional routes and further reduce CO2 emissions. A one-year test of the train in the region around the city of Tübingen is planned. The state government of Baden-Württemberg is providing support for the project, and the Federal Ministry for Transport and Digital Infrastructure (BMVI) has announced its intention to fund the project.

The prototype that Siemens Mobility will build is based on the Mireo Plus regional train. The two-car train set will be equipped with a newly developed hydrogen drive.

The designated Mireo Plus H will be as powerful as its electric counterpart and have an operating range of up to 600 kilometres.

Deutsche Bahn is developing a new type of fuelling station that can refuel the train in the same time as a diesel-powered train. The hydrogen will be produced on site in Tübingen using traction electricity generated from renewable sources. DB will partially refit its maintenance shop in the city of Ulm to service the new hydrogen train.

During its planned trial operation between Tübingen, Horb and Pforzheim in 2024, the train will replace a conventional diesel-powered unit running on the route. The new hydrogen drive will save around 330 tons of CO2 in one year.

DB currently operates around 1,300 diesel-powered trains in regional service, and roughly 40 percent of DB's 33,000-kilometer rail network is not electrified. In addition to the option of further electrifying the system, the use of hydrogen-powered trains offers one possibility for DB becoming climate-neutral.

"This project proves that Deutsche Bahn is not just a mobility company, but a technology group as well. We need to bring our fossil fuel consumption down to zero. Only then can DB be climate-neutral by 2050. By that point, we won't have a single diesel-powered train operating in our fleet," Prof. Sabina Jeschke, DB Board Member for Digitalization and Technology says.

"Siemens Mobility and Deutsche Bahn will jointly develop the next generation of a hydrogen traction system – a complete system consisting of a hydrogen-powered train and infrastructure, including a new and innovative fuelling station that can quickly refuel the train in just 15 minutes. The train will have

1.7 MW of traction power providing up to 1.1 m/s^2 acceleration and a top speed of 160 km/h. This innovative technology will make hydrogen-powered train operations faster, more efficient, and more environmentally friendly. Hydrogen drives are an advanced, emission-free form of propulsion that will help decarbonize rail transport and make a significant contribution toward achieving our climate targets," Michael Peter, CEO of Siemens Mobility mentions.

"It's great that the first train employing this new and sustainable technology will be tested here in BadenWürttemberg. Especially on non-electrified routes, hydrogen fuel cell propulsion can become a climate-friendly alternative to diesel propulsion. Whether powered by overhead line electricity or hydrogen - the decisive factor is that the energy comes from renewable sources. The country likes to be a pioneer for modern, sustainable rail transport. It is an essential part of the transition in transport," Winfried Hermann, Minister of Transport, Baden-Württemberg says.

Project details

Officially, the joint funding project is called 'H2goesRail'. The Federal Ministry of Transport and Digital Infrastructure (BMVI) has announced funding through the National Innovation Programme Hydrogen and Fuel Cell Technology (NIP 2). NIP 2 is coordinated by the National Organisation Hydrogen and Fuel Cell Technology (NOW) GmbH and implemented by the Project Management Organisation Jülich.

Hydrogen propulsion

With hydrogen drive systems, the reaction of hydrogen and oxygen produces electrical energy and water as a 'waste product'. These trains can be deployed by DB to become climate-neutral and replace diesel vehicles with alternative drive systems.

Green electricity is used to produce the environmentally friendly green hydrogen. DB Energie is responsible for its supply.

Mireo Plus H

Siemens is developing a two-car commuter train with a state-of-the-art hydrogen drive system for one-year trial operation. It consists of a fuel cell and a lithium-ion battery.

The Mireo Plus H will be as powerful as electric multiple-unit trains and have a range of 600 kilometres - depending on operating conditions such as the season or the route. A three-car version will have a range of 1000 kilometres. Low life-cycle costs due to low maintenance and repair costs and a top speed of 160 kilometres per hour are the vehicle's distinguishing features.

Filling station

The hydrogen is produced by electrolysis in a DB Energie mobile filling station at the DB Regio plant in Tübingen. In the so-called electrolyser, water is split into hydrogen and oxygen by means of electricity. Compressed in a compressor, the hydrogen is stored in a mobile storage unit. Prior to the refuelling process, the green fuel is processed and cooled in the adjacent tank trailer. The mobile structure makes further test projects possible. DB Energie develops, tests, and optimises the necessary hydrogen infrastructure.

Rapid refuelling

The train is refuelled with hydrogen in a novel process: for the first time the 15 minutes, won't take longer than refuelling a diesel multiple unit. This is an important factor considering the closely timed DB train schedules in regional traffic. This means that hydrogen technology is competitive with the diesel fuel used in everyday operations until now.

Service infrastructure

The DB Regio workshop in Ulm will be converted for the maintenance of hydrogen powered trains. Extensively trained DB Regio staff who are supported by Siemens Mobility employees can then maintain the hydrogen train there.

Trial operation

Trial operation between Tübingen, Horb and Pforzheim will begin in 2024 and last for one year. Approximately 120,000 kilometres of scheduled rail service are planned. The route is particularly suitable based on the timetable intervals and topography. The Mireo Plus H from Siemens will replace a diesel railcar used on this route and save about 330 tons of CO2.

Background

On October 5 Siemens Energy and Siemens Mobility have signed a Memorandum of Understanding (MoU) to jointly develop and offer hydrogen systems for trains. The agreement was signed by Albrecht Neumann, CEO of Rolling Stock at Siemens Mobility and Armin Schnettler, Executive Vice President (EVP) of New Energy Business at Siemens Energy. The project aims at jointly developing holistic hydrogen solutions for rail transport and offering them to customers to promote the hydrogen economy in Germany and Europe and support decarbonization in the mobility sector. ■

KAESER COMPRESOARE®

Optimised Air-mains Charging Systems for Compressor Stations

Photo: KAESER KOMPRESSOREN SE

Kaeser Kompressoren's optimised air-main charging systems (initial pressure controllers) are available in various sizes. They help save energy, safeguard compressed air quality and can be easily integrated with master control and monitoring systems.

Many companies shut down their compressors at night, or over the weekend, in order to prevent energy losses caused by air leakage from occurring. While this approach is effective, it has a distinct disadvantage: There is a risk of overloading the air treatment equipment and contaminating the compressed air system when the compressors are restarted. Help is at hand however with optimised air-main charging systems (initial pressure controllers) from Kaeser Kompressoren.

In a compressed air supply system with multiple leaks, it is highly likely that the entire air distribution network will completely depressurise once the compressors have been shut down for a while. When they are restarted, the compressors are initially feeding air into an empty air distribution network. As a result, compressed air treatment components such as dryers and filters are subjected to as much as ten times their normal load during this start-up surge. Contaminants therefore enter the air distribution network even if using the very best dryer and filter systems. This unwanted effect can be easily and cost-effectively avoided with air-main charging systems from Kaeser Kompressoren.

The air-main charging system is installed in the compressor station just downstream from the last air treatment component, which means that the compressed air system remains pressurised even after the compressors have been shut down. When air demand returns, the required system pressure is quickly re-established without any associated overload. Because the air-main charging system's valve opens only when nominal system pressure is reached, dryer and filter operating pressure is maintained at all times. Consequently, the initial pressure regulator not only saves energy, but also plays a key role in safeguarding compressed air quality. The new, optimised design also features a high visibility valve position indicator and electronic alarm functions. Moreover, the simple electronics are easily programmed via an intuitive menu and connection to control and monitoring systems is a breeze; the integrated pressure sensor provides the signal.

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Regulated Energy Price: Obstacle or Necessity?

Regulated electricity prices were considered by the European Union (EU) an obstacle in the path to perfection as social, political, and economic entity. Instead, the 'market' price is the one that should dictate the operation of the system. But, especially for Eastern countries, market price actually means only higher bills, which must be paid from much lower salaries than those from the West.

by **Carol Dan**

A few years ago, on the occasion of announcing infringement proceedings against Romania, due to slowness in eliminating regulated energy prices, the European Commission (EC) stated that "setting prices for end-consumers through state intervention raises obstacles for new market entrants and therefore deprives consumers and companies of their right to choose the best service on the market."

In the meantime, after much insistence and threats with infringement, regulated electricity prices started to disappear in Romania, as the EC had requested for many years, but new energy producers emerged and the old ones are increasingly close to the moment of being closed, as they fail to comply with the increasingly severe pollution rules imposed by Brussels and because the green energy mantra is spoken louder and louder, more and more often, by more and more voices.

Furthermore, all strategic investors in Romania's energy distribution are considering selling their assets and leave, precisely when there are less than two months until the full liberalization of electricity prices, after for years they insisted that it was vital. From January 1, 2021, the 6 million Romanians who currently pay for electricity prices regulated by the state will enter the free market. This means that the regulated price will disappear.

From a net electricity exporter, Romania has managed to import constantly in the last year and a half. That is because it has not invested almost anything for at least 20 years. The prominent investment in the gas-fired power plant in Iernut, of Romgaz, which would be the first state investment in a new energy production unit in the last 13 years (after reactor 2 in Cernavoda, commissioned in 2007), has suffered repeated delays.

No matter how much the Romanian state has tried to postpone market liberalization, it still took place, even though it was made gradually. But what Brussels promised at the time that was to take place did not happen. Namely, not only the elimination of this restriction failed to bring new players on the Romanian electricity market, but it even determined others to leave or, anyway, want to leave. And prices continued to climb, dictated not by the state, but by the free market.

For example, Italy's Enel group had announced since 2015 that it wanted to sell everything, but dropped the idea until 2019, when it reiterated its intention. For now, without an outcome or at least not one known to the public. The same is the case of Germany's E.ON or Czech Republic's CEZ. Basically, these three companies are the winners of the 5 energy distribution companies sold by Romania in 2004.

CEZ was however faster and in November 2020 sold all its operations in Romania for EUR 1.1bn, to the Australian investment fund Macquarie. In 2005, CEZ purchased the distribution network in Oltenia for EUR 151mln. Of course, the company made investments in its operations (only the wind farms in Dobrogea cost as much as the Australian company paid for all CEZ assets in Romania). The Romanian state, which has publicly stated that it wanted to purchase CEZ's assets, came up with the lowest bid.

As far as investments are concerned, over time, some have been called into question. For example, the Court of Accounts has discovered at one point that in the first 10 years from the moment of privatization of the first electricity distribution subsidiary, the electricity bill increased by over 70%.

Or, another example, in mid-November 2020, Alba Police accused Delgaz Grid, from the German group E.ON, of possible criminal offenses, by the fact it has allegedly falsified some figures, so that the reported losses were higher, and this would have led to the establishment of erroneous gas distribution tariffs. Such accusations will be proven in court or withdrawn, as it has happened on different occasions. A key role in clarifying such situations could have the National Regulatory Authority for Energy (ANRE), which also has the role of approving the investments and tariffs for energy and gas distribution requested by electricity and gas distribution operators.

A common history, a separate future?

The energy landscape is similar in countries in the region, i.e., Ukraine, Moldova, Bulgaria, Hungary, and Serbia. A reliance on coal, nuclear power,

wind turbines, solar panels, and hydropower plants, in different percentages. Bulgaria and Hungary, the two neighbours of Romania that are also EU members, also align themselves with European directives and rules imposed by Brussels. Energy prices are more or less similar, especially that there is a relative integration of spot electricity markets.

More interesting is what happens with the other neighbours of Romania, which are not part of the great European family. In the last part of 2019, the discrepancies between energy prices in the countries that make up the EU are huge. For example, the electricity price for household consumers in Denmark (EUR 0.2924 per kWh) was three times higher than the one in Bulgaria (EUR 0.0958 per kWh). Probably in Brussels' view Bulgaria needs to close this gap. As Romania, Bulgaria also has a draft energy strategy providing that by 2030, with an outlook to 2050, the country south to the Danube will install over 2600 MW in new power plants, especially photovoltaic, and also keep the coal-fired power plants, despite high operating costs.

Compared to Romania, Bulgaria covers 39% of its electricity needs from lignite power plants, a percentage that has decreased significantly in the last 10 years, from almost half. At the same time, in 2030, Bulgaria would put the Belene nuclear power plant into operation. Once the new green energy capacities are put into operation, Bulgaria would reach a renewable energy consumption of 27%.

Hungary, Romania's westernmost neighbour, has an energy production capacity of 8,500 MW and provides half of its needs through the Paks nuclear power plant. In general, Hungary imports energy from Slovakia, Austria, and Ukraine. One of Hungary's problems is the lack of natural resources. In addition to lignite, used in some thermal power plants that do not exceed 10% of the needs of the neighbouring country, Hungary provides 20-25% of its gas needs, but must import the rest. Although with a population twice as small as that of Romania, the annual gas consumption of Hungary is similar to that of Romania, about 10 billion cubic meters per year. This is also because in Hungary almost the entire population is connected to the gas distribution network, unlike Romania, which has only a third of the population in this situation. The Hungarian president promised, at the end of 2019, that Hungary would completely give up coal by 2030 and that it would increase the installed capacity of photovoltaic parks tenfold, which would allow the use of only electric vehicles.

Having a high reliance on imports, producing only 12% of its electricity needs, the Republic of Moldova also has an energy intensity over three times higher than the European average. The Republic of Moldova has few import possibilities, but in the first part of this year the regulator in Chisinau announced tariff reductions by up to 13%, depending on the type of consumer, as a result of a decrease in electricity prices. However, the country is captive to Russia in ensuring its natural gas needs. Although Romania has built a gas pipeline to the border through which, if we were to believe the statements of politicians, it would bring Romanian gas to Moldova, the country continues to import 100% of its gas needs from Russia.

Romania imagined that it would export Black Sea gas, but

the exploitation has not started yet, because the Romanian politicians managed to block the intentions for extraction from the Black Sea blocks. In the meantime, ExxonMobil and Lukoil have already announced their intention to exit the blocks operated by them.

Returning to the Republic of Moldova, the main energy production unit, the Cuciurgan Thermal Power Plant, with a capacity of 2,500 MW, is located in the territory disputed with Trans-Dniester and is owned by the Russian concern RAO EAS. The own capacities of the Republic of Moldova are small: Termoelectrica Chisinau (304 MW) covers 15% of consumption, together with CET Nord in Bălți (37.7 MW). The total installed capacity of local producers is 427 MW, for a maximum consumption of 1000 MW. A country almost totally dependent on imports could hardly be considered for possible energy aid.

Like the other Balkan states, Serbia is heavily dependent on coal-fired energy. No less than 70% of the annual electricity demand comes from thermal power plants and the rest is mostly covered by hydropower plants and small groups of renewable energy. Aspiring to become a member of the EU, Serbia has a major handicap in that it insists on building new coal-fired power plants and some, fewer, gas-fired power plants, but also because it keeps electricity prices low (from Brussels' perspective). Serbia has announced plans for at least 6 new coal-fired power plant projects, with a total installed capacity of more than 2,500 MW, although by 2025 it is likely to be able to commission a single plant, of 350 MW. As in Romania, the enthusiasm of investments at any cost in green energy - in this case, in small hydro-power stations less than 10 MW - has been replaced by the concern that the energy input of these units is insignificant in relation to the risks and damage to the environment. In fact, in 2018, only 0.8% of Serbia's energy consumption came from small hydro-power stations.

In comparison, until 2012, Hidroelectrica sold several dozen small hydro-power stations, in an effort to raise funds needed for economic recovery, after the disaster caused by the scandal with the wise guys, which twice put the state company into insolvency. In those years, Romania granted small hydro-power stations 6 green certificates for 1 MWh of energy produced and delivered. The invitation to destroy natural areas and mountain rivers could not be more explicit. Things are the same in Serbia.

Of all the neighbouring countries, Ukraine has by far the most complicated situation, from all points of view, and electricity is no exception. The quality of distribution and supply services is extremely poor, even if we consider only the annual duration of interruption of energy supply to consumers, which amounts to 683 minutes, i.e., 11.4 hours. This was also the case in Romania, in 2009, two years after joining the EU, when unplanned power outages lasted more than 10 and a half hours in the country. In Oltenia, a region still supplied with energy by CEZ, even in 2013 (i.e., 8 years after privatization), the duration of unplanned outages was over 10 hours (607 minutes).

In Ukraine, prices paid by household energy consumers have not changed since the spring of 2017. Populist or not, Ukrainian politicians admit that investment is needed in the national energy system but bring to the fore the need to protect the population from price increases. Ukraine is a mirror image of Romania not many years ago. The prices paid by industrial consumers in Ukraine are enormous, in April reaching EUR 51.01 per MWh, compared to EUR 25.69 in Romania, EUR 30.23 in Poland or EUR 25.78 in Hungary.

At the height of the Covid-19 pandemic, Scandinavian countries used the money provided by their governments to reduce prices, having tariffs of EUR 4.58 per MWh. In early November, the National Commission for State Regulation of Energy and Public Utilities (NCSREPU) increased the tariffs of the energy transmission operator Ukrenergo by almost a third, but this increase is insufficient to cover the losses accumulated by Ukrenergo. Where do these losses come from, which in mid-October amounted to USD 1bn? From the fact that Ukrenergo pays energy producers feed-in tariffs. Another tariff increase would be considered in 2021, which will lead to further increases in the price of electricity to end-consumers.

Romania has had, for several years, the most generous green energy support scheme in the entire EU. It would not hurt for Ukrainians not to repeat the same mistake. ■

ANRE Gives Green Light to Transelectrica's Investments for the Period 2020-2029

The National Regulatory Authority for Energy (ANRE) in December 2020 approved the Power Transmission Grid Development (PTGD) plan for the period 2020-2029, prepared by Transelectrica, as power transmission and system operator. The total value of the investment plan for the period 2020-2029 is RON 5.67 billion.

by **Adrian Stoica**

The plan includes investment works aimed at retrofitting the existing Power Transmission Grid (PTG), integrating production from renewable sources and other production capacities, increasing the interconnection capacity, consumption supply safety, as well as the development of information, smart metering, and telecommunication systems and of the critical infrastructure. To finance the proposed investment plan, approximately RON 300 million come from European grants.

The approved development plan integrates projects of common interest, which contribute to the implementation of European Union's strategic priorities on the trans-European energy infrastructure: 'Black Sea Corridor' and 'Mid Continental East Corridor', with estimated commissioning during 2025-2027, and interconnection projects, aiming at reaching the goal on the degree of interconnection of 15% by 2030, established at European Commission level.

Strategic priorities

In the period 2023-2024, the Cernavoda - Stalpu (with connection in Gura Ialomitei substation) and Smardan - Gutinas lines are planned, which ensure the evacuation of electricity produced from renewable sources in Dobrogea area to the consumption centres in the centre, west and north of the country. Also, in order to increase the security of electricity supply of the Bucharest metropolitan area, in the period 2024-2029 it is planned to complete investment works for the

necessary lines and power stations, so as to increase safety and reliability in this area. For the following review of the development plan, ANRE has provided for Transelectrica obligations on PTGDP correlation with the Integrated National Energy and Climate Plan, with the National Energy Strategy and with the Ten-Year National Development Plan (TYNDP) at European Union level and assessing the adequacy of the National Power System through probabilistic methods according to the provisions of Gutinas the Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity.

New investment projects

The following new investment projects were included in the current edition of the Development Plan.

PTG retrofitting/upgrading:

- Autotransformer (AT) 1 replacement in Arefu 220/110 kV substation, AT in Stuparei 220/110 kV substation, transformer - T1 and T2 - in 400/110 kV Constanta Nord substation, T2 400/110 kV in Smardan substation, T1 110/10kV and T7 400/110 kV in Cluj Est substation.
- Upgrading the command-control-protection system of the 400 kV Gadalin substation.
- Upgrading the command-control-protection system of the 400/110/20kV Sibiu South substation.
- Acquisition and installation of a bucking coil (100MVAr) in the 400 kV Iron Gates substation.

Consumption supply safety:

- Installation of a new 220/110 kV 400MVA autotransformer in the 220/110 kV Fundeni substation (increasing the degree of safety in the supply of consumers in the north-eastern area of Bucharest connected to the 220/110/10 kV Fundeni substation).
- Installation of a new 400/110 kV 250MVA autotransformer in the 400/220/110 kV Bucharest South substation (increasing the degree of safety in the supply of consumers in the southern area of Bucharest connected to the 400/220/110/10 kV Bucharest South substation).
- 400/110 kV substation in Grozavesti connected by 400 kV UPL with 400 kV Bucharest South and Domnesti substations and two 100MVAr bucking coils mounted at 400 kV in the 400 kV Grozavesti substation.
- 400/110 kV substation in Fundeni also connected by the new 400 kV OHL Fundeni-Brazi West and input-output in the 400 kV OHL Bucharest Sud-Gura Ialomitei through OHL d.c. 400 kV and installation of a 100MVAr bucking coil in the new 400 kV substation.
- Reconductoring 220 kV Urechesti-Tg. Jiu Nord-Paroseni-Baru Mare-Hasdat axis.

Increasing the interconnection capacity:

- Equipping the 2 400 kV OHL Nadab-Bekescsaba circuit.
- 400 kV OHL Iron Gates-Djerdap circuit 2 - resulting from long-term analyses within ENTSO-E; the opportunity will be reconsidered depending on the evolution of renewable integration.
- RO-HU interconnection (new 400 kV OHL Oradea-Jozsa, new 400/220 kV AT Rosiori, new 400/220 kV AT Resita, reconductoring of the 220 kV Urechesti-Tg. Jiu Nord-Paroseni-Baru Mare-Hasdat axis) - resulting from the long-term analyses within ENTSO-E; the opportunity will be reanalysed according to the evolution of renewables integration.

Postponed projects

Compared to the approved edition of the Development Plan, Transelectrica decided to exclude the following investment projects.

- Retrofitting of the 400/110 kV Darste substation - will be introduced in future editions of the Plan.
- Upgrading of the command, control, and protection system in the 400/220/110 kV/MT Urechesti substation - it will be introduced in the future editions of the Plan.
- Upgrading of the command, control, and protection system in the 400 kV Nadab substation - it will be correlated with the 400 kV 2 OHL Nadab-Bekescsaba circuit equipment project.
- Upgrading the command, control, and protection system in the 220/110 kV Fundeni substation - to be correlated with the project Increasing the degree of safety in the supply of consumers in the north-eastern area of Bucharest connected to the 220/110/10 kV Fundeni substation.
- Upgrading the command, control, and protection system in the 400/220/110 kV Bucharest South substation - to be correlated with the project Increasing the degree of safety in the supply of consumers in the southern area of Bucharest connected to the 400/220/110/10 kV Bucharest South substation.
- Upgrading of the command, control, and protection system in the 220/110 kV Turnu Magurele substation - it will be introduced in the future editions of the Plan.
- Upgrading of the command, control, and protection system in the 220/110/20 kV Gheorgheni substation - it will be introduced in the future editions of the Plan. ■

Transatlantic Cooperation on Small Modular Reactor Technology

International conference 'Small Modular and Advanced Reactor Planning' had the theme of transatlantic cooperation on small modular reactor technology and its potential in the long run in ensuring the energy needs.

CEO of National Company Nuclearelectrica Cosmin Ghita

It is a feature of the nuclear industry of anticipating and answering the technological and system needs before their implementation becomes imperative. Small Modular Reactors (SMR) have a double applicability: they facilitate in a safe way transition to new technologies and resolve the challenge on flexibility and scalability.

"Due to these advantages, there are European producers interested in the small modular reactor technology in the long run, the National Company Nuclearelectrica (SNN) being one of them. We pay particular attention to technological development and exchange of experience and know-how as key factors in developing the nuclear industry in Romania for a very long term, in addition to the currently operational reactors and the plan to implement units 3 and 4 at Cernavoda NPP, where we maintain our commitment to the CANDU-6 technology," said Cosmin Ghita, CEO of SNN, invited by US Trade and Development Agency as speaker at the 'Small Modular and Advanced Reactor Planning Workshop'.

Nuclear power is a competitive candidate for decarbonization. Without nuclear power, the cost of electricity would increase significantly in the current context of decarbonization. To maintain this advantage and extend these opportunities to the future,

U.S. Ambassador to Romania Adrian Zuckerman

based on international studies, it has been concluded that the new nuclear technologies would bring improvements in construction, flexibility, financing and incorporate passive characteristics of nuclear security.

The advantage of international cooperation consists of identifying those measures that ensure an integrated supply chain and common licensing measures.

"The new nuclear technologies are not only a clean, reliable and accessible source of energy, but especially a very effective method of increasing the energy security of states. In a very long term, most likely SMRs will be the most important technology of diversification, either stand-alone or in hybrid systems with renewables. Flexibility provided by this type of technology has a wide range of industrial applications and therefore a great diversity of potential users: thermal energy for homes and businesses, production of clean hydrogen and synthetic fuel for the transport system. In the context of taxonomy at European level, modularity, flexibility, passive nuclear safety features and efficiency are a sum of concrete benefits for European countries that have decided that the energy mix of the future will contain nuclear production. Also, in the context of taxonomy, nuclear power must be treated similarly to any other source, under equitable technical and financial conditions. Without nuclear power, decarbonization will become a challenge almost impossible to overcome," pointed out Cosmin Ghita.

"Cernavoda has long been the source of reliable, safe and clean energy for Romania. With EXIM's financial support of USD 7 billion for the construction of Reactors 3 and 4 and the refurbishment of Reactor 1, Romania's path to energy security is clear. The friendship and close cooperation between our two countries will be central to Romania's national security and economic prosperity. EXIM's financing will help guarantee Romania's national security for decades to come. No other infrastructure project in Romania has a higher profile or is more significant for Romania's future. EXIM's financing will facilitate a safe and secure U.S. solution to Romania's energy needs and ensure Romania's partners in this crucial sector are committed to Romania's defense and can be trusted. Under our Strategic Partnership, the United States and Romania aim to increase our mutual prosperity by growing our bilateral trade and investment," U.S. Ambassador to Romania Adrian Zuckerman pointed out.

Damen Cuts First Steel on Royal Netherlands Navy's Combat Support Ship at Shipyards Galati

On December 2nd at Damen Shipyards Galati, Romania, first steel was cut on the Royal Netherlands Navy's (RNLN) Combat Support Ship (CSS) Den Helder. The cutting is the first of sixteen batches, totalling 7500 tonnes of steel in 180 sections. This marks an important milestone in this project, the first tangible part of the construction.

Damen Shipyards Galati Managing Director Flemming Sorensen, DSNS Site Manager Arjen Poortvliet

The steel cutting was supposed to take place in February next year. DSNS has brought the date forward to safeguard the project's progress during the continuing coronavirus pandemic and to effectively manage the enhanced security rules that alter the way of working for the shipyard.

With construction of the CSS, the maritime supply capacity of the RNLN will be restored. The vessel will operate alongside the Joint Support Ship (JSS) HNLMS Karel Doorman and is based on the same design. The vessel can operate worldwide and under high threat, protected by frigates. Additionally, she can be used in the fight against drug trafficking, controlling refugee flows and providing emergency aid. Engineering of the vessel is taking place mostly in the Netherlands and the project will provide work for over 100, mainly Dutch, companies. To date, 47 contracts have been signed for the CSS, out of which 34 with Dutch maritime suppliers.

The next milestone will be in May next year when the keel-laying ceremony will take place.

With an area of 55 hectares and having approximately 2,500 employees, Damen Shipyards Galati is one of the largest production units of the Dutch Damen Group which operates 35 shipbuilding and repair yards worldwide. Since joining Damen Shipyards Group in 1999, the yard has developed into a highly efficient production shipyard with a significant output.

The yard's shipbuilding expertise and closely managed supply chain have been behind some of Damen's most important deliveries to date, fully representing the group's diverse product portfolio.

As from 1999, Damen Shipyards Galati has delivered more than 400 vessels to clients from all over the world (among which 29 naval vessels for 13 different countries, including NATO and EU countries). The company's portfolio includes patrol ships, offshore vessels, ferries, dredgers and barges, super-yachts, naval vessels, and tugs.

8 Marine Robotic Vessels to Be Build by VARD

VARD, one of the major global designers and shipbuilders of specialized vessels announced that it has secured a new contract for the design and construction of eight Marine Robotic Vessels for Ocean Infinity.

In partnership with Ocean Infinity, VARD has designed a unique multi-purpose platform with custom design and technology features allowing onshore remote control, light crewed or uncrewed operations, and the introduction of alternative fuels such as green ammonia. With a length of 78 meters, the vessels will be the first of their kind and represent a giant leap forward for the maritime industry.

The series of eight vessels will expand Ocean Infinity's newly launched Armada fleet, comprising the latest in technology and marine robotics including autonomous underwater vehicles and remotely operated surface vessels. The new vessels are especially developed to serve as multi-role-vessels and will support Ocean Infinity's operations worldwide from its control centres.

VARD's specialized subsidiaries are involved in the development of this series of vessels. Design and engineering are currently ongoing at Vard Design, and development of onboard control systems at Vard Electro in Ålesund, Norway.

"We are honoured to be chosen as Ocean Infinity's partner in this project. Together we take a huge leap forward into a new segment of the maritime industry by developing and providing vessels prepared for the future. All according to our strategy for innovation and sustainability," says Alberto Maestrini, CEO in VARD.

"The impact and the scale of this robotic fleet will spark the biggest transformation the maritime industry has seen since sail gave way to steam. With our new fleet we will be able to provide sustainable services to all corners of the industry from offshore energy, to logistics and transport," Oliver Plunkett, CEO in Ocean Infinity, adds.

Unique ship design and technology

The VARD 9 60 design is developed together with a customer committed to, and with high ambitions, for delivering low environmental impact marine services. In close cooperation with regulatory bodies, VARD has designed the vessels for an ultra-low carbon footprint and they are among the first vessels to be prepared for green ammonia as a fuel with fuel cell and battery technology. Furthermore, the vessels will provide safe launch and recovery platforms for ROVs and other robotic systems through two large moonpools arranged with VARD's optimized and well-proven damping system.

"With a high focus in the design process of making the vessels energy efficient, the vessels are equipped with highly optimized hull forms, propellers, and engine arrangements. The vessels are inherently developed for safe and secure prolonged missions with a redundant mindset like split engine and propulsion rooms, redundant cooling systems, sensor systems, automation and power management systems, navigation and communication systems," mentions Ove Bjørneset, VP Research and Innovation in VARD.

Vard Electro has further developed its well-proven SeaQ Integrated Automation System and SeaQ Power Management System together with the class society to allow for safe remote operations and cyber-secure communication. By utilizing its long experience as a system integrator, Vard Electro will deliver a complete electrical systems package from engineering through installation, integration, and commissioning.

A broad range of suppliers and contractors in the Norwegian Maritime Cluster are involved in the project and it creates a considerable positive spin-off effect in the region.

The series of eight vessels will be built at VARD's shipyard Vard Vung Tau in Vietnam, scheduled for deliveries in the period from mid-2022 to end-2023. ■

Boosting Offshore Renewable Energy for a Climate Neutral Europe

To help meet the EU's goal of climate neutrality by 2050, the European Commission presented on November 19, 2020 the EU Strategy on Offshore Renewable Energy. The Strategy proposes to increase Europe's offshore wind capacity from its current level of 12 GW to at least 60 GW by 2030 and to 300 GW by 2050. The Commission aims to complement this with 40 GW of ocean energy and other emerging technologies such as floating wind and solar by 2050.

This ambitious growth will be based on the vast potential across all of Europe's sea basins and on the global leadership position of EU companies in the sector. It will create new opportunities for industry, generate green jobs across the continent, and strengthen the EU's global leadership in offshore energy technologies. It will also ensure the protection of our environment, biodiversity, and fisheries.

"Today's strategy shows the urgency and opportunity of ramping up our investment in offshore renewables. With our vast sea basins and industrial leadership, the European Union has all that it needs to rise up to the challenge. Already, offshore renewable energy is a true European success story. We aim to turn it into an even greater opportunity for clean energy, high quality jobs, sustainable growth, and international competitiveness," Executive Vice-President for the European Green Deal, Frans Timmermans said.

"Europe is a world leader in offshore renewable energy and can become a powerhouse for its global development. We must step up our game by harnessing all the potential of offshore wind and by advancing other technologies such as wave, tidal and floating solar. This Strategy sets a clear direction and establishes a stable framework, which are crucial for public authorities, investors, and developers in this sector. We need to boost the EU's domestic production to achieve our climate targets, feed the growing electricity demand and support the economy in its post-Covid recovery," Commissioner for Energy, Kadri Simson, added.

"Today's strategy outlines how we can develop

offshore renewable energy in combination with other human activities, such as fisheries, aquaculture or shipping, and in harmony with nature. The proposals will also allow us to protect biodiversity and to address possible socio-economic consequences for sectors relying on good health of marine ecosystems, thus promoting a sound coexistence within the maritime space," Commissioner for Environment, Oceans and Fisheries, Virginijus Sinkevičius, mentioned.

To promote the scale-up of offshore energy capacity, the Commission will encourage cross-border cooperation between Member States on long term planning and deployment. This will require integrating offshore renewable energy development objectives in the National Maritime Spatial Plans which coastal states are due to submit to the Commission by March 2021. The Commission will also propose a framework under the revised TEN-E Regulation for long-term offshore grid planning, involving regulators and the Member States in each sea basin.

The Commission estimates that investment of nearly EUR 800 billion will be needed between now and 2050 to meet its proposed objectives. To help generate and unleash this investment, the Commission will:

• Provide a clear and supportive legal framework. To this end, the Commission also clarified the electricity market rules in an accompanying Staff Working Document and will assess whether more specific and targeted rules are needed. The Commission will ensure that the revisions of the State aid guidelines on energy and environmental protection and of the Renewable Energy Directive will facilitate cost-effective deployment of renewable offshore energy.

• Help mobilize all relevant funds to support the sector's development. The Commission encourages Member States to use the Recovery and Resilience Facility and work together with the European Investment Bank and other financial institutions to support investments in offshore energy through InvestEU. Horizon Europe funds will be mobilized to support research and development, particularly in less mature technologies.

• Ensure a strengthened supply chain. The Strategy underlines the need to improve manufacturing capacity and port infrastructure and to increase the appropriately skilled workforce to sustain higher installation rates. The Commission plans to establish a dedicated platform on offshore renewables within the Clean Energy Industrial Forum to bring together all actors and address supply chain development.

Offshore renewable energy is a rapidly growing global market, notably in Asia and the United States, and provides opportunities for EU industry around the world. Through its Green Deal diplomacy, trade policy and the EU's energy dialogues with partner countries, the Commission will support global uptake of these technologies.

To analyze and monitor the environmental, social and economic impacts of offshore renewable energy on the marine environment and the economic activities that depend on it, the Commission will regularly consult a community of experts from public authorities, stakeholders and scientists. The Commission has also adopted a new guidance document on wind energy development and EU nature legislation.

Background

Offshore wind produces clean electricity that competes with, and sometimes is cheaper than, existing fossil fuel-based technology. European industries are fast developing a range of other technologies to harness the power of our seas for producing green electricity. From floating offshore wind, to ocean energy technologies such as wave and tidal, floating photovoltaic installations and the use of algae to produce biofuels, European companies and laboratories are currently at the forefront.

The Offshore Renewable Energy Strategy sets the highest deployment ambition for offshore wind turbines (both fixed-bottom and floating), where commercial activity is well advanced. In these sectors, Europe has already gained unrivalled technological, scientific, and industrial experience and strong capacity already exists across the supply chain, from manufacturing to installation.

While the Strategy underlines the opportunities across all of the EU's sea basins – the North Sea, the Baltic Sea, the Black Sea, the Mediterranean and the Atlantic – and for certain coastal and island communities, the benefits of these technologies are not limited to coastal regions. The Strategy highlights a broad range of inland areas where manufacturing and research is already supporting offshore energy development. ■

OMV and VERBUND Embarking on Austria's Largest Photovoltaic Plant

OMV, the international, integrated oil and gas company headquartered in Vienna, and VERBUND, Austria's leading electricity company and one of the largest hydropower producers in Europe, have started up the largest ground-mounted photovoltaic plant in Austria and are embarking on a test period of several weeks. Construction on the plant began on July 8, 2020, and was attended by Elisabeth Köstinger, Federal Minister for Agriculture, Regions & Tourism; Stephan Pernkopf, Deputy to and representing the Governor of Lower Austria Johanna Mikl-Leitner; Rainer Seele, CEO and Chairman of the Executive Board of OMV; Johann Pleininger, Executive Board member for Upstream and Deputy Chairman of the Executive Board of OMV; Wolfgang Anzengruber, Chairman of the Management Board of VERBUND; and Michael Strugl, Deputy Chairman of VERBUND, at the OMV site in Schönkirchen-Reyersdorf, Lower Austria. Just five months later and the plant is operational.

On a 13.3-hectare (133,200 m^2) compound owned by OMV, Austria's largest ground-mounted photovoltaic plant with a PV capacity of 11.4 MWp has been built in Schönkirchen, Lower Austria. The first phase of construction of the east-west facing solar park sees 34,600 PV modules produce around 10.96 GWh of solar power, corresponding to the annual electricity consumption of some 3,400 households and saving around 8,000 metric tons of CO2. Despite supply restrictions caused by the pandemic, construction work has progressed on schedule. By the end of 2021, in the final phase of construction, another 10,400 PV modules will be added to the plant. This will increase the total capacity to 14.85 MWp, generating around 14.25 GWh. This is enough to meet the annual power demand of 4,400 households in total and will save an additional 2,400 metric tons of CO2 per year.

"It's been an honour to observe this project right from the ground-breaking ceremony and I'm delighted that the plant is up and running after just a few months of construction. The fact that projects like this are being built in the Austria mining sector – projects that combine competitiveness and climate neutrality – is both encouraging and motivating. The energy-intensive sectors in particular require innovative, climate-friendly solutions and this plant is an important step here," said the Federal Minister responsible for mining, Elisabeth Köstinger.

"Together with VERBUND, today we have started up the largest ground-mounted photovoltaic plant in Austria. The dedication shown by the entire project team has meant we could keep to the planned schedule

despite challenging circumstances. Therefore, effective immediately, we can meet part of our energy demand with sustainable solar power. With this, we are contributing to climate targets and consistently delivering on our commitment to reduce our carbon intensity," Rainer Seele, Chairman of the Executive Board and CEO of OMV, stated.

"We've delivered our joint vision for the future of energy!" said Wolfgang Anzengruber, VERBUND CEO. "In a construction period of just five months, Austria's largest photovoltaic plant has been successfully realized by OMV and VERBUND and starts operating today. Cross-sector partnerships like this allow us to provide both economic stimulus and sustainable investments – and the current crisis should teach us that we also need to tackle the climate crisis by standing together".

"With the largest ground-mounted photovoltaic plant in Austria, two domestic giants – OMV and VERBUND – are sending a clear signal for a sustainable energy future and themselves making a key contribution to reducing emissions. Our goal is for 100 percent of electricity in Austria to come from renewable technologies by 2030. Meeting this goal will only be possible in cooperation with Austrian companies," Magnus Brunner, State Secretary of the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology, mentioned.

Realization of this project also strengthens the strategic cooperation between OMV and VERBUND. This began in 2017 when OMV took a 40% stake in the e-mobility provider SMATRICS, in which VERBUND holds 40% and Siemens 20%. A joint assessment was undertaken of the refining sites in Austria and Germany to increase the quality, safety, and security of supply. In the green hydrogen sector, OMV and VERBUND are currently working together on a project called UpHy, which looks at producing hydrogen for use in road vehicles and refinery processes. ■

NorthWind, the New Wind Power Research Centre in Norway

On December 11, the Norwegian Minister of Petroleum and Energy, Tina Bru, announced an investment of 120 million NOK (11.3 million EUR) in a new wind power research centre in Norway. The NorthWind research centre will be at the cutting edge, working on innovations to make wind power cheaper, more efficient, and more sustainable. One of the centre's main priorities will be offshore wind research.

Rapid growth in offshore wind power internationally offers great opportunities for Norwegian businesses. Research and development are crucial to secure lower costs, less environmental impact, and improved operating models for such projects. I believe a long-term research centre with industry partners, the research community and the government will contribute to further development of offshore wind power in Norway," said Tina Bru, Norway's Petroleum and Energy Minister.

Northwind will bring together over 50 partners from research institutions and industry all around the world. It will be led by the research institute SINTEF, with partners NTNU (Norwegian University of Science and Technology), NINA (The Norwegian Institute for Nature Research), NGI (Norwegian Geotechnical Institute) and UiO (University of Oslo).

"The Centre's innovations will benefit Norwegian industry and the world at large," said Alexandra Bech Gjørv, CEO of SINTEF. "Offshore wind has the potential to meet the world's electricity needs many times over and innovations cutting its costs will help bring this renewable energy to the market even faster."

The centre will draw on Norwegian research and industry's long-standing expertise in offshore projects. "It will provide an important launching pad for students in the field aiming to become the experts of tomorrow," said the rector of NTNU, Anne Borg.

About NorthWind

NorthWind is financed by the Norwegian government through The Research Council of Norway. NorthWind is a Centre for Environment-friendly Energy Research (FME) and will be in operation from 2020 to 2028. The Centres for Environment-friendly Energy Research carry out long-term research targeted towards renewable energy, energy efficiency, carbon capture and storage (CCS) and social science aspects of energy research.

Research partners: SINTEF, NTNU (Norwegian University of Science and Technology), NINA (The Norwegian Institute for Nature Research), NGI (Norwegian Geotechnical Institute) and UiO (University of Oslo).

International associated partners: DTU, TNO, Fraunhofer, University of Strathclyde, NREL (National Renewable Energy Laboratory) and North China Electric Power University.

Industry partners: 4Subsea, ABB, Aker Offshore Wind, Amon, Aibel, Baker Hughes, Cognite, DNV-GL, Dr. Techn. Olav Olsen, Dof Subsea Norway, EDR Medeso, Energi Norge, Energy Innovation, Equinor, ESVAGT, Finnmark Kraft, Force Technology Norway, Fred Olsen Renewables, Fugro, GFMS, Hafslund Eco, Havyard Design &Solutions, Hitachi ABB Power Grids, Impello, Kongsberg Maritime, Lundin Energy Norway, Lloid's Register, Nexans Norway, NKT HV Cables, National Oilwell Varco Norway, NORWEP Norwegian Energy Partners, Norconsult, NorSea Group, NORWEA, Norwegian Offshore wind cluster, RENERGY cluster, SAP Norway, Sogn og Fjordane Energi, Statkraft, Store Norske Spitsbergen Kullkompani, Sval Energi, Trønder Energi Kraft, Vard Design, Windcluster Norway. ■

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ENERGY
INDUSTRY REVIEW

NAMR Priorities for 2021

President Klaus Iohannis enacted in late November 2020 the legal act amending and supplementing the Mining Law No. 85/2003. Part of the mining royalties due to the state budget will be transferred to local authorities on whose administrative territory the exploitation for which royalty has been collected is found. Also, the new law provides that by July 1, 2021, the Government will modify the organization and functioning structure of the National Agency for Mineral Resources (NAMR) to change its status from agency to national regulatory authority for mineral resources and petroleum. About the novelties to the Mining Law and NAMR priorities, we have talked with the President of the institution, Nicolae Turdean.

by **Adrian Stoica**

Mr. Nicolae Turdean, what was the context in which the amendment to the Mining Law occurred?

First, we are talking about the amendment to a law adopted in 2003, which no longer meets the requirements. It was necessary to cut red tape of the regime of approval of exploitation licenses for building materials and mineral waters. According to the provisions of the old law, all licenses for the exploitation of building materials and mineral waters were approved by Government Decision. Therefore, an important amendment grants NAMR the right to approve by order the exploitation licenses for building materials, concluded during 1999-2019 and not yet approved by Government Decision. When I took over as NAMR President, in November 2019, there were 456 licenses for the exploitation of mineral resources that had not been promoted by Government Decision. Of these, 330 licenses are aimed at the exploitation of mineral resources that can be used in construction (metamorphic rocks, eruptive rocks and sedimentary rocks of local importance). Licenses concluded during 1999-2019 having as subject matter other categories of mineral resources or licenses concluded after 2019, irrespective of the mineral resource aimed, are not covered by these legal provisions.

What will happen with licenses held by companies that go insolvent or bankrupt?

The new Mining Law is put in correlation with the Bankruptcy and Insolvency Law. I recall that the Mining Law appeared in 2003 and for this reason it made no reference to bankruptcy and insolvency. Therefore, the transfer of licenses from insolvent companies with license pending approval to viable companies was not possible. Now the problem has been solved.

Many mining perimeters have been closed. Will there be an attempt to reopen them?

Another novelty brought by the law refers to the exploitation of mining perimeters with suspended activity. There are over 550 such perimeters. The law now provides the possibility for resuming the mining activity in perimeters where such activity had been stopped under Government Decisions. The initiative of reopening the perimeters may belong to the Ministry of Economy and potential investors.

The royalty regime also changes. What is it about?

The new law provides that 35% of the mining royalty obtained from activities of exploitation of surface resources and carbonated or non-carbonated mineral waters represents revenue to the budget of local authorities on the territory of which the exploitation activity is carried out, 45% to the local budget of the commune, town, or city, on the territory of which the exploitation activity is carried out, and the rest of 20% will go to the state budget. This provision of the new law is extremely important for local authorities on the territory of which such exploitation takes place. They will have certain funds available to finance the priority investment projects for local communities. Also, they will have greater interest in collaboration with investors for the exploitation of local resources.

National Agency for Mineral Resources President Nicolae Turdean

What was the value of royalties collected last year by the Romanian state from such exploitation?

Last year, the mining royalty obtained from the activities of exploitation of surface resources and carbonated or non-carbonated mineral waters was around RON 160mln. It should be mentioned however that this amount was collected by the state budget at a coefficient of capitalization on local resources of only 45%.

What can you tell us about the 11th Licensing Round for oil and gas blocks?

Tenders for granting licenses for new blocks, Round XI, are split into two, as following analyses carried out, we have found that the legal provisions of NAMR overlap with those on the safety of petroleum operations, coordinated by the Competent Regulatory Authority for Black Sea Offshore Petroleum Operations. Therefore, it has been decided to momentarily stop publication of the public invitation to tender in the Official Journal of the European Union. In the first stage tenders will be organized only for the concession of onshore blocks, and this will most likely happen early next year.

What will be NAMR's priorities for 2021?

We are witnessing a real blockage of the exploitation activity, mainly due to the provisions of the current Mining Law. Updating it gives the possibility of restarting mining activities, with the following consequences:

• Unlocking the investments committed through licenses pending approval.

• Increasing revenues to the state budget.

• Creating new jobs etc.

In terms of organization, the priorities are the following:

• NAMR reorganization by separating the regulatory activities from the management of mineral resources; increasing the personnel and improving the remuneration system for employees.

• Reorganization of NAMR's Regional Inspectorates and reconsideration of their territorial location.

• Continuing to strengthen the institutional collaboration with institutions with responsibilities in the fields adjacent to the activity of mineral resources.

A unitary approach of these directions of action generates the following consequences:

From an organizational and economic point of view:

• Updating the legislation on the identification and capitalization on mineral resources.

• Simplifying the procedures of approval/endorsement of documents for capitalization on mineral resources.

• Reducing bureaucracy in NAMR's regulatory activity.

• Putting in place an efficient control mechanism to combat tax evasion in the field and monitoring how license and permit holders fulfil their obligations.

• Efficient management of geological data on knowledge and reorganization of the archiving and handling activities.

From a geo-strategic point of view:

• Developing the sector of critical materials identified in the RAW MATERIALS INITIATIVE (RMI) list by: identifying areas with useful mineral substance; establishing the strategy regarding their capitalization; putting into operation and superior capitalization of the materials included in the RMI list.

Restarting the exploitation activity and extending it in the former exploitation perimeters declared with closed activity by various license holders and in this case, titleholders proposing solutions of capitalization in the country of non-ferrous concentrates will be favoured. It is considered to restart mining activity in perimeters with suspended activity. The measure is addressed to the 556 perimeters with activity.

Also, another priority is to speed up the start of exploitation of natural gas from offshore blocks by amending the Offshore Law and resuming tenders for offshore blocks. ■

Exploration Target at Baita Plai Polymetallic Mine in Romania Almost Doubled

On November 13, 2020 Vast Resources announced an increase to the exploration target for its Baita Plai Polymetallic Mine in Romania. Baita Plai is located in the Apuseni Mountains, Transylvania, an area which hosts Romania's largest polymetallic and uranium mines. The project is 50km north-west of Romania's largest Au-Cu mine, Rosia Montana (>10Moz Au) and 52km north-west of Rosia Poieni, which contains over one billion tonnes of porphyry copper ore.

Vast Resources started the drilling programme at Baita Plai Mine in December 2019.

In October 2019, Vast Resources signed a binding conditional bond issue deed for a facility of up to USD 15 million (13.5 million euro) through an issuance of secured convertible bonds to UK-based fund Atlas Capital Markets for the purpose of bringing projects in Romania and Zimbabwe into production.

In April 2019, Vast announced it has received a draft proposal for a loan of up to USD 10 million from a Swiss bank to finance its Romanian mining projects.

Antonio North skarn updated

Further to the recent Baita Plai JORC Resource and Reserve report, which confirmed a JORC compliant mineral total gross resource of 608,000 tonnes at 2.58% copper equivalent and an exploration target in the range of 1.8M-3M tonnes, the company has now had the opportunity to review further historical data which has only recently been made available.

Thus, it said that the Antonio North skarn, which is one of several high priority exploration targets, may be more extensive than previously interpreted.

Following an analysis of historical data records, the exploration target tonnes assigned to the Antonio North skarn has been updated to between 1.4M–2.8M tonnes giving an

increased total gross exploration target of between 3.2M–5.8M tonnes.

Based on these findings, the Directors believe that the Antonio North skarn represents a major near to medium term mining opportunity. An underground exploration drilling programme is currently being compiled to better determine its potential.

"Antonio North represents a major opportunity for the Company not only to expand our production profile but also to significantly extend the life of mine plan at Baita Plai. In our initial exploration target of between 1.8M–3M tonnes, Antonio North represented 0.2M-0.5M tonnes; however, based on this new information Baita Plai and subject to further confirmation we will have an increased exploration target of between 3.2M–5.8M tonnes. The significant value potential of Baita Plai continues to reveal itself and we are committed to maximising this," Andrew Prelea, CEO of Vast Resources commented.

Data comprising available historical assay results, logged lithologies and general plan data was recently collated from data archives accessed by the mine geologists.

The Antonio North skarn is located approximately 200m to the north of the Antonio skarn. Historic drilling from 15 level and 16 level identified a skarn below the Antonio skarn, which was subsequently mined between 15 and 16 level. Underground development on 17 and 18 levels is limited and intersected the Antonio North skarn on the western margin of the skarn. Limited mining of the Antonio North skarn has taken place on 17 and 18 levels due to the underground development not continuing below 16 level.

There is a major near to medium term opportunity for the mine to extend both the 17 and 18 level development along strike of the Antonio North skarn and to commence mining as the infrastructure is developed.

Analysis of the historical drill hole records which are presumed to have been drilled in the early 1990's, revealed numerous skarn intersections. Unfortunately, not all the records had corresponding assay data or other data such as date drilled, type of drill used or where laboratory assays were undertaken. The Antonio North skarn has been interpreted from underground intersections in 17 and 18 level development on the western margin, from underground intersections in the 15 and 16 level development above, and from four historic underground drill holes drilled from 15 level.

The drill holes intersecting the Antonio North skarn are L-16, L-28, 1388BSK and 1389BSK. The assay values from these drill holes are provided in mm. A weighted average copper% is calculated as 1.66%, lead % at 0.02% and zinc % at 0.08%.

Based on the recent drilling in the adjacent Antonio skarn, the company expects that a similar grade range for copper, lead, zinc, gold, and silver would be present in the Antonio North skarn. The historic drillhole intersections show that the grades are present and within the same broad range.

An underground drilling programme is being developed to test the geological interpretation by drilling a series of underground diamond drill holes from 15 level to intersect the Antonio North skarn. ■

Interinstitutional Agreement on Just Transition Fund: Romania to Receive EUR 1.65 billion

The European Parliament and the EU Council reached agreement on the regulation establishing the Just Transition Fund. The latest discussions have focused on the Ecological Response Mechanism. The possibility of financing gas investments has been excluded but preserved within the Regulation establishing the ERDF and the Cohesion Fund.

EU envoys reached an agreement on the bloc's EUR 17.5 billion fund to support coal regions in transition, in a compromise that excludes all financing for fossil fuel investments.

Regions that will need aid the most for transition to carbon neutral economy, as provided in the European Green Deal, can be supported through this fund.

Money will come from the Multiannual Budget of the European Union (EUR 7.5 billion) and the Recovery Plan (EUR 10 billion).

"Romania is one of the biggest beneficiaries of this fund. EUR 1.65 billion will be earmarked for Romania under the Just Transition Fund. We will use this money to help the inhabitants of Jiu Valley, Oltenia, Galati and all the Romanian regions and towns that are currently dependent on a carbon intensive economy," said Siegfried Muresan, Member of the European Parliament, rapporteur on Commission's opinion for budgets on the Just Transition Fund.

"The European Commission proposed an allocation from EU budget of EUR 7.5 billion for this fund. It will be completed with over EUR 10 billion transferred from the Cohesion Fund. We did not agree with this transfer, as it disadvantaged Romania. Our country needs more money for transition to a green economy, not fund transition by reducing cohesion funds. The Cohesion Policy is still important for Romania, as it helps us develop infrastructure, build schools, hospitals, and highways. Therefore, we requested, instead of this mandatory transfer, to increase the fund's budget," Siegfried Muresan also mentioned.

"Because we objected, this transfer obligation was eliminated from the final form of the fund. Instead, the total budget of the Just Transition Fund was increased to EUR 17.5 billion, following an additional allocation of EUR 10 billion coming from the Recovery Plan. The Cohesion Policy remains untouched, but the Member States may voluntarily transfer funds to this transition if they consider they need it," the MEP mentioned.

The agreement of the European Parliament and of the Council of the European Parliament on the Just Transition Fund will be formally ratified within the Council and voted in the European Parliament. ■

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Getac B360 Laptop

Mobility in All Circumstances

Since 1989, Getac has been providing rugged computing solutions for demanding professionals in extreme environments, Getac was established as a joint venture with GE Aerospace to supply defence electronic products, but also for special areas like energy sector or utilities.

During the time, Getac offers rugged computing which revolutionize the market of rugged equipment, such as the first 7" rugged tablet in the world, the first tablet with ATEX ZONE II/22 certification. So, we were curious to test a Getac's laptop and we have Getac B360, one of the last launched at the middle of 2020, which is available in Romania through the local distributor – ELKO Romania.

For rugged technology, Getac B360 has only 2,32kg, which it is not hard at all for a 13.3" rugged laptop – so it is a very portable model. And the product meets the standards MIL-STD-810H and MIL-STD-461G, it is certified IP66 and ANSI/ISA 12.12.01, which allows it to operate in almost any environmental conditions.

From the design point of view, Getac B360 stands out and does not compromise on resistance at all. It was possible thanks to the case made of an alloy based on aluminium and magnesium, which feels remarkably great on touching.

From the computing point of view, Getac B360 it is quite common. This model benefits from an Intel Core i5 10210U processor but could be also a Core i7 processor from the 10th generation. Clocked at 1.6GHz (up to 4.2GHz Turbo), it comes with 8GB of DDR4 RAM and a 256GB SSD, which gives it enough computing power for the fields of utilities or army. Also, here we can extend its memory to 16/32/64 GB DDR4, and 512GB/1TB/2TB PCIe NVMe plus SATA 256GB/512GB/1TB/2TB.

The B360's screen is a 13.3" IPS Full HD panel that offers outstanding image clarity and wide viewing angles that were predictable. Its special character is the maximum brightness of 1400cd/m2, which guarantees perfect readability in any ambient lighting conditions, perfect for outdoor use. In addition, it comes with a touch control stand, plus a stylus, useful to avoid dirty touch.

Another special feature for this rugged laptop is the battery, which has been replaced in this case with 2 batteries that are easy to replace. It was preferred 2 instead of one which allows the user to replace one of them when it is empty, allowing work without any interruptions, along with the high autonomy provided. The measurements show that the B360 allows up to 12 hours of web browsing via WiFi or Full HD video playback, which makes it available for a full day's work, plus overtime.

The model can operate at ambient temperatures between -290C and +630C, being at the same time resistant to strong water jets and falls from heights of up to 2m. This explains, among other things, the coverage of connectors with watertight protective caps and rubberized edges.

There is much more to say about Getac B360 - a laptop that must not only meet the requirements and needs of users, but also take into account the particularities of the environment in which it is to be used, considering the trends in terms of design of the moment. Although it seems like an impossible mission, B360 did a great job, scoring in all the key points. Basically, it is the most successful combination of elegance, performance, and endurance of the moment, which recommends it to all specialists who work in adverse environments, needing rugged computing technology. ■

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Nokia to Lead the EU's 6G Project Hexa-X

Nokia leads the way in the next generation of wireless networks as the overall project leader for Hexa-X, the European Commission's 6G flagship initiative for research that will drive the overall 6G vision. The project goals include creating unique 6G use cases and scenarios, developing fundamental 6G technologies and defining a new architecture for an intelligent fabric that integrates key 6G technology enablers.

The Hexa-X project has been awarded funding from the European Commission under the European Union's Horizon 2020 research and innovation program, a significant step toward bringing together key industry stakeholders in Europe to take the lead in advancing 6G. The stakeholders represent the full value-chain of future connectivity solutions ranging from network vendors, communication service providers, verticals, and technology providers, as well as the most prominent European communications research institutes.

With Nokia taking the lead, the Hexa-X project aims to connect the physical, digital, and human worlds, firmly anchored in future wireless technology and architectural research. Wireless technologies are critical for society and the economy today and their importance will continue to steadily increase with 5G and its evolution, enabling new ecosystems and services.

Nokia has been at the forefront in commercializing every generation of wireless technology, from the first GSM call to the best performing 4G networks and the world's fastest 5G speeds. Nokia Bell Labs, the world-renowned industrial research arm of Nokia, pioneered many of the fundamental technology innovations that are being used to develop 5G standards. These include Massive MIMO, mmWave access, coding, and 5G radio stack design, which enabled 3GPP Release 15 initial deployments. Nokia Bell Labs is also developing enablers for the upcoming 3GPP Release 16 and 17 that are key for the digital transformation of industrial verticals, such as 5G New Radio (NR) in unlicensed spectrum bands, NR-Light to support massive IoT with medium-rate sensors and localization.

Building on this strong heritage, Nokia is leading the 6G joint research and pre-standardization process and Nokia Bell Labs is already researching the fundamental technologies that will comprise 6G. Nokia expects 6G systems to launch commercially by 2030, following the typical 10-year cycle between generations.

"Even though there is still a lot of innovation in 5G with the release of new standards, we are already exploring 6G in our research lab. In the 6G era we will see applications that will not only connect humans with machines but also connect humans with the digital world. Such a secure and private connection can be used for preventive healthcare or even to create a 6G network with a sixth sense that intuitively understands our intentions, making our interactions with the physical world more effective and anticipating our needs, thereby improving our productivity," Peter Vetter, Head of Access and Devices Research, Nokia Bell Labs, said.

Nokia Bell Labs, together with the Hexa-X consortium, has identified six research challenges that need to be addressed to lay the technical foundation for 6G wireless systems: Connecting intelligence; Network of networks; Sustainability; Global service coverage; Extreme experience; Trustworthiness.

In addition to Hexa-X, Nokia is actively involved in other European 6G research initiatives such as 6Genesis, a national 6G program funded by the Academy of Finland and led by the University of Oulu, and Horizon Europe Smart Networks and Services, which aims to secure European leadership for the development and deployment of next generation network technologies and services, while accelerating European industry digitization.

The Hexa-X project starts on 1 January 2021, with

a planned duration of 2.5 years. Nokia is the project lead for Hexa-X, working closely with a strong consortium of European partners.

Hexa-X vision on 6G and research challenges

In the past four decades, driven by continuous wireless innovations and by market needs, mobile networks and the telecommunications industry have significantly transformed human society and the lives of billions. The primary focus is always to meet peoples' needs to communicate anywhere, anytime. Since the time of 4G, the focus has been extended to delivering a digital infrastructure that also supports professional services, vertical sectors, and machine-to-machine communication. With the advent of 5G, this move has been amplified considerably. 5G is expected to pave the way for the digitalisation and transformation of key industry sectors like transportation, logistics, commerce, manufacturing, health, mining, smart cities, and public safety. This trend of digitalisation, making industries more connected, automated, and smart, in conjunction with forecasted consumer interest for increasingly demanding services (e.g., AR/VR at scale) will continue. Therefore, the need for connectivity services is expected to keep growing exponentially and will call for bitrates at the order of hundreds of Gbps to Tbps.

While 5G has enabled us to consume digital media anywhere, anytime, the technology of the future should enable us to embed ourselves in entirely virtual or digital worlds. In the world of 2030, human intelligence will be augmented by being tightly coupled and seamlessly intertwined with the network and digital technologies. With advances in artificial intelligence, machines can transform data into reasoning and decisions that will help humans understand and act better in our world. As the domestic and industrial machines of today transform into swarms of multi-purpose robots and drones, new man-machine haptic and thought interfaces to control them from anywhere should become an integral part of the future network. Such a transformation will undoubtedly generate unprecedented economic opportunities and societal challenges as we move towards the 2030 timeframe; moreover, it will call for a fundamental shift in the way mobile networks are designed. Multiple key requirements must be reconciled, such as how to serve the massively growing traffic and the exploding numbers of devices and markets, while accomplishing the highest possible standards regarding energy efficiency, security, and efficiency in deployment (coverage) and operation, and enabling sustainable growth in a trustworthy way – this is the context for the 6G wireless networks vision. The main motivation factors are the following.

Technology push

The advent of key technologies such as Artificial Intelligence (AI), radio access beyond 100 GHz, network virtualisation and disaggregation concepts promise to add important abilities and design dimensions for wireless networks. A timely start of a technology and concept evaluation is required, even if some of these technologies are still on a low Technology Readiness Level (TRL), to understand the potential performance and impact on the overall system architecture. It is crucial to apply these new technologies to excel in new usage domains, and for making them indispensable parts of the future society.

Society and industry pull

Climate change, pandemics, digital divide, social inequalities, as well as distrust and threats to democracy, are some of the unprecedented societal challenges of our times. It is of utmost importance to mitigate these devastating challenges, while also creating opportunity for innovation-lead growth and employment. Wireless networks, being the central component of a digitalised society, must reflect such complex needs and opportunities and proactively provide sustainable digital solutions, to help address United Nations (UN) and European Sustainable Development Goals (SDGs). Digitalisation of industry sectors will continue to improve efficiency and resilience of the economy, promoting sustainable growth and creating meaningful jobs, supporting the transformation of Europe to a strong circular economy.

In light of the above, the 6G flagship initiative Hexa-X has been established, by bringing together the key industry stakeholders, along with the

full value-chain of future connectivity solutions ranging from network vendors, operators, verticals, and technology providers (e.g., software and Internet of Things (IoT) solutions), as well as the most prominent European research institutes and universities in this domain, streamlining expert forces and creating a critical mass to lead an integrated effort of research and development towards 6G.

As a starting point, a 6G vision was jointly defined by the 25 participants of Hexa-X. Taking the above-mentioned motivation factors into account, this vision ties key technical enablers together as a whole through an x-enabler fabric (foundation/ modular architecture for developing the vision) serving three worlds intertwined: a) a human world of intelligence and values; b) a digital world of information; c) and a physical world of processes. Real-time interactions will be vital to allow the worlds to integrate and meet future challenges. In this vision, six main research challenges were identified, which must be addressed to lay the technical foundation for the wireless systems of the B5G/6G era:

• Connecting intelligence: 6G shall assume a crucial role and responsibility for large-scale deployments of intelligence in the wider society. 6G shall provide a framework to support (e.g., through advanced resource management), enhance (e.g., through supplementary data, functionality, insights, etc.), and ultimately enable real-time trustworthy control – transforming AI/Machine Learning (ML) technologies into a vital and trusted tool for significantly improved efficiency and service experience, with the human factor ("human in the loop") integrated.

• Network of networks: 6G shall aggregate multiple types of resources, including communication, data and AI processing that optimally connect at different scales, ranging from, e.g., in-body, intra-machine, indoor, data centres, to wide areas networks. Their integration results in an enormous digital ecosystem that grows more and more capable, intelligent, complex, and heterogeneous, and eventually creates a single network of networks. It will serve various needs, support different nodes, and means of connectivity, and handle mass-scale deployment and operation fulfilling a large diversity of requirements with utmost (cost) efficiency and flexibility, promoting business and economy growth, and addressing major societal challenges, like sustainable development, health, safety, and digital divide.

• Sustainability: 6G shall transform networks into an energy-optimised digital infrastructure and will deeply revise the full resource chains of wireless networks for reduced global ICT environmental footprint. Its digital fabric shall also create the ability to sense and understand the state of the physical world in real-time and as such boost sustainability from the environmental, economic, and social perspectives – delivering effective and sustainable digitisation tools for global industry, society, and policy makers, bring UN SDGs to life and assist the implementation/ operation of EU Green Deal, after the Covid-19 pandemic, towards a circular economy and a sustainable world.

• Global service coverage: 6G shall put digital inclusion as one of the top priorities and encompass efficient and affordable solutions for global service coverage, connecting remote places, e.g., in rural areas, transport over oceans or vast land masses, enabling new services and businesses that will promote economic growth and reduce digital divide as well as improving safety and operation efficiency in those currently under-/uncovered areas.

• Extreme experience: 6G shall provide extreme bitrates (access in the order of hundreds of Gbps to few Tbps), extremely low (imperceptible) latencies, seemingly infinite capacity, and -precision localisation and sensing, pushing the performance of networks a leap beyond what is possible with 5G – unlocking commercial values of new technologies at GHz-THz range, supporting extreme experience of services, e.g. fully immersive communication or remote control at scale, and accelerating the pace of digitisation.

• Trustworthiness: 6G shall ensure the confidentiality and integrity of end-to-end communications, and guarantee data privacy, operation resilience and security, building trust of wireless networks as well as its enabled applications among consumers and enterprises – supporting and promoting European values of security, trust, and privacy protection as well as the technological EU sovereignty goal for fostering an open, trustworthy, and deeper democratic Europe in the digital age.

To fully embrace such a vision, Hexa-X recognises the necessity to expand the fundamental network design paradigm from mainly performance-oriented to both performance- and value-oriented. Here value entails intangible yet important human and societal needs such as sustainability, trust, and inclusion. This will lead to a new class of evaluation criterion, i.e., Key Value Indicators (KVIs) that must be understood, developed, and adopted in the network design towards 6G. Hexa-X understands that the development towards 6G requires wide support and global efforts. It will strive for openness and collaboration among the European and global research community, standardisation bodies, and policy makers through, e.g., organisation of public workshops, preparation of joint whitepapers, and active participation in major events. An open, modular, and flexible framework – the x-enabler fabric – will be developed as a foundation, to integrate and weave together the technical enablers that address the above six research challenges, from both Hexa-X project itself and other 6G projects. The realization of a new network generation takes about 10 years, and to guide the Research and Innovation (R&I) globally towards 6G during this time, Hexa-X will lay the foundation for the network of 2030 and develop long-term strategical roadmaps based on research outputs obtained within Hexa-X project as well as from other 6G projects. ■

Enterprise Deployment of AI & Digital Solutions Enabled by the DELFI Cognitive E&P Environment

Schlumberger and OMV Upstream announced an enterprise-wide deployment of AI and digital solutions enabled by the cloud-based DELFI cognitive E&P environment, across OMV's global operations. The five-year agreement will see the two companies collaborate to enhance efficiencies across OMV's operations and position the company as a digital front-runner in the energy industry.

"We are working hand in hand with OMV; jointly innovating on projects to support specific business goals like the reduction of well planning times and acceleration of field development planning, supported by leading digital technologies deployed within the DELFI environment," said Rajeev Sonthalia, president, Digital & Integration, Schlumberger. "This global digital deployment is a testament to the operational teams of both companies. The successes we have already achieved together underpin our innovation mindset to set us on a steady path toward achieving the enterprise-scale successes OMV is targeting."

"OMV and Schlumberger share the belief that digitalization is more than technology," said Johann Pleininger, Executive Board member responsible for Upstream and Deputy Chairman of OMV. "It's a new way of working and how we organize our global businesses. We are leveraging the DELFI environment to make the integration of our teams a reality. The powerful combination of physical science enhanced with new digital technologies leads to significantly faster and more informed decisions across both technical disciplines and operational settings. This can make our business even more efficient and therefore more cost-effective."

An extensive pilot deployment of the DELFI environment helped OMV realize operational efficiencies in exploration, field development planning, drilling and well planning. The OMV Upstream subsurface team used AI-enhanced workflows in the DELFI Petrotechnical Suite to automatically create and simulate 200 model realizations in one-sixth of the time. In well planning operations, the DrillPlan solution helped plan eight wells in the time it would normally take to plan one.

The agreement formalizes the commitment from both companies to progress the industry standard OSDU™ data platform and lays the foundation for further collaboration and innovation for workflows and solutions across the energy spectrum. ■

Energy Demand in 2021

The International Energy Agency (IEA) has lowered its oil demand forecasts by the end of 2020 and 2021 because of lower air fuel consumption due to the lower number of air passengers as a result of the second wave of coronavirus pandemic. The Paris-based international energy organization also noted that it will be months before coronavirus vaccinations begin to stimulate global oil demand, and the recovery in some of the world's rich economies "will reverse" soon due to the new anti-epidemic restrictive measures.

by **Adrian Stoica**

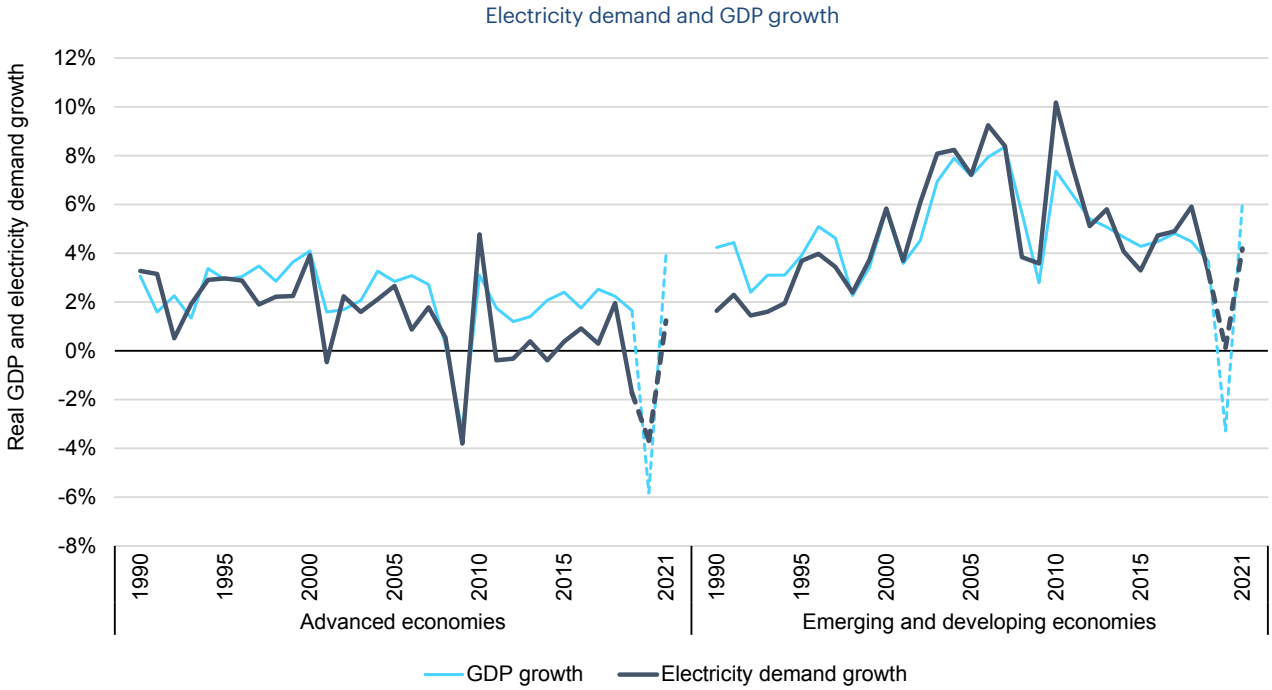
The understandable euphoria around the start of vaccination programs partly explains higher oil prices, but it will be several months before we reach a critical mass of vaccinated, economically active people and thus see a positive impact on oil demand," the IEA said in its regular monthly report.

"In the meantime, the end-of-year holiday season will soon come with the risk of a new increase in Covid-19 cases and the possibility of even more restrictive measures," the IEA warned at that moment.

The Paris-based international energy organization further lowered the expected decline in oil demand for 2020 by a further 50,000 barrels per day to a total of 8.8 million daily consumption of around 91.3 million barrels. At the same time, global oil supplies have increased by 1.5 million barrels per day in November 2020 to reach 92.7 million barrels per day, mainly due to the recovery in U.S. production following its hurricane-related shutdown and increased production in Libya.

The IEA also lowered its oil demand forecasts for 2021 by 170,000 barrels per day, to a total of 96,9 million barrels per day, citing the scarce use of aircraft fuel and kerosene, as fewer people use air transport. According to the international organization, short demand for aircraft fuel and kerosene in 2021 will account for 80% of the shortfall in oil consumption of a total of 3.1 million barrels per day relative to total demand in 2019 (before the coronavirus pandemic), which means that the world in 2021 will recover only two-thirds of the demand lost in 2020. However, the IEA still expects that the oil surplus due to the pandemic will clear out by the end of 2021, when the global economy should recover and OPEC+ countries should maintain the policy of limiting oil supplies.

Electricity demand expected to rebound in 2021



Sources: IEA (2020), Data and Statistics; IMF (2020), Real GDP Growth.

The IEA forecast comes after and the Organization of the Petroleum Exporting Countries (OPEC) lowered its estimates for oil consumption in the first quarter of 2021 from 94.95 million to 93.97 million barrels per day, as for the whole of 2021 lowered the prognosis by 360,000 barrels per day. However, oil consumption in 2021 is expected to increase by nearly 7% or by 6.25 million barrels per day as compared to 2020.

Global electricity demand expected to recover

In 2020, due to the nature of measures taken against Covid-19, the commercial sector has been particularly affected, with the drop in global electricity demand expected to be around 2% and GDP 4.4% down.

Relative electricity consumption fell less than GDP (in 2009 this was the reverse) due to the lower electricity intensity of the commercial sector compared to industry.

In 2021 electricity demand is anticipated to grow by 3% (around 700 TWh), slower than the projected 5.2% real GDP growth. In total, this means global demand would be higher than in 2019, according to Electricity Market Report - December 2020, published by the IEA.

Two-thirds of the additional demand is expected in the Asia Pacific region. Most of the growth is concentrated in China and India, expected to grow by 5.2% (350 TWh) and 3.6% (40 TWh) respectively compared to 2020. Both countries have already recorded significant growth rates towards the end of 2020 compared to 2019 demand.

Also, in Southeast Asia electricity demand in 2021 is expected to significantly exceed demand in 2019. Southeast Asia, one of the fastest-growing regions in electricity demand terms in recent decades, is expected to return to previous growth rates and add 5.4% of demand in 2021 compared to 2020.

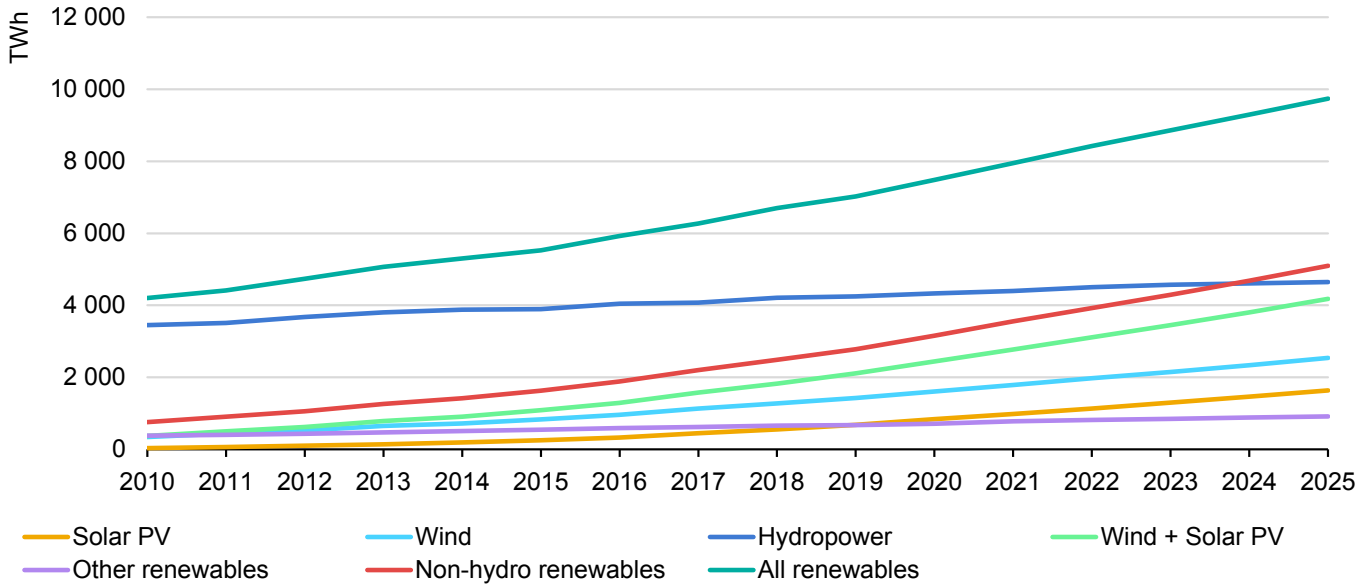
In the United States only a slight recovery of around 1% is expected, after a fall of 3.6% in 2020.

Although demand is expected to grow by 2.3% in Europe, this still means it would be 2% lower than in 2019.

The greatest uncertainty for electricity demand in 2021 is the further development of the Covid-19 pandemic, the measures taken by governments to prevent it spreading and the availability, speed of distribution and effectiveness of vaccines. This will significantly affect the commercial and services sector, which was hit hard by repeated lockdown measures towards the end of 2020.

Additionally, economic prospects depend on government stimulus packages and their success in triggering new investment and supporting businesses that have experienced economic pressure in 2020.

Renewable electricity generation by technology, 2010-25



Renewables lead capacity additions

After net additions of renewable capacity reached a new record of almost 200 GW in 2020, total capacity is expected to grow by around 218 GW in 2021, almost 10% more than 2020, writes in his IEA report.

The strong growth is driven by projects delayed in 2020 going ahead in 2021 (several governments have granted extensions to implementation deadlines) and newly financed capacity.

Additionally, distributed solar PV is expected to slowly pick up again due to economic recovery and policy support. Renewable capacity additions are led by solar PV and wind, responsible for around 54% and 31% of net additions, respectively.

The majority of solar PV net capacity additions are expected in China, making up around one-third (38 GW) of the global total – more than double the expected additions in the United States, which accounts for another 15% of the total. Further major absolute additions are expected in Europe (21 GW), India (11 GW) and Japan (7 GW).

Although being surpassed by solar PV in installed capacity terms, wind turbines remain the fastest-growing form of renewable energy in terms of generation, with around 68 GW of net additional capacity in 2021 (of which 89% is onshore).

The majority of additions take place in China (39%), Europe (21%) and the United States (16%). In 2021 offshore wind capacity additions are expected to reach a record level of 7 GW, led by China with more than half of the total. The first large-scale offshore wind project is expected to become operational in Chinese Taipei.

Around 13 GW of nuclear power units are scheduled to start operating in 2021. Out of the 13 units, three are located in China and two in India.

After the United Arab Emirates commissioned its first nuclear unit in 2020, the second unit of the Barakah power plant is scheduled for 2021 – with two more units planned for the two subsequent years.

After a construction start in 2005, the Olkiluoto 3 unit in Finland is expected to be connected to the grid at the end of 2021, with commercial operation starting early in 2022.

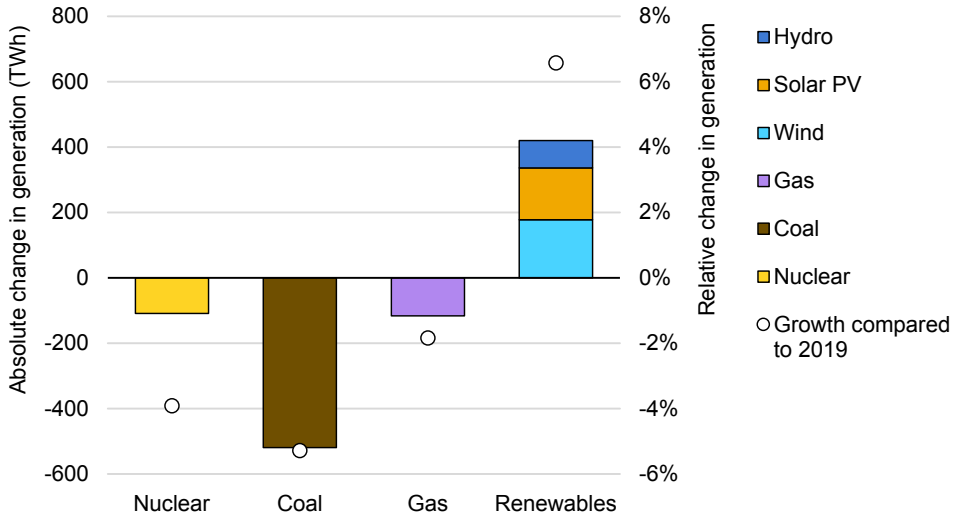
In the United States 5.5 GW of nuclear capacity is expected to retire in 2021, while in Germany three out of the remaining six units are due to be decommissioned at the end of 2021– the remaining three will follow at the end of 2022.

In 2021 global coal generation capacity is expected to reach as much as 2 140 GW, predominantly driven by 30 GW of new capacity expected in China.

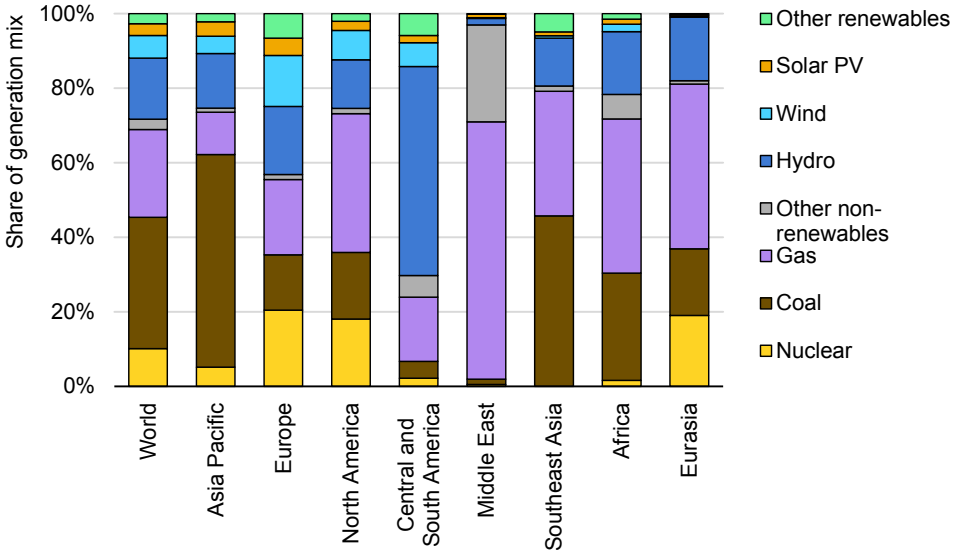
Coal capacity outside China is not anticipated to change much, with new capacity in Asia offset by retirements in Europe and North America.

In 2021 India, Japan, Indonesia, Vietnam, and Bangladesh are set to commission a number of coal-fired plants that are currently in the final stages of construction, although it is difficult to

Global electricity supply change in 2020



Electricity supply mix in 2020



make an accurate estimate as projects have been delayed by the Covid-19-induced crisis.

Unit 1 of the Hassyan plant in the United Arab Emirates will become the first coal power plant in the Middle East outside Israel.

Coal power plant retirements continue in Europe and North America in 2021.

In the United States, after 10 GW being decommissioned in 2020, another 3 GW are planned for retirement in 2021, although the final figure could be higher if some units scheduled for 2022 close earlier.

In Europe decommissioning will continue in Spain, the United Kingdom, Germany and in particular Italy, where the units Brindisi 2 (600 MW), Fusina (1 600 MW) and La Spezia (600 MW) are expected to close by early 2021, while others could follow soon.

After the closure of the Pego and Sines coal-fired power plants, Portugal will follow Belgium, Austria, and Sweden to end coal power generation in the country. Overall, over 12 GW are expected to be retired in Europe in 2021.

Natural gas power plant capacity is expected to continue to rise by just over 30 GW in 2021.

In the United States just over 7 GW of new capacity is scheduled, with Texas and Ohio accounting for over half of the incremental capacity. In terms of technology, combined cycles account for over 50% and combustion turbines for over 40%. Almost 0.4 GW of gas-fired capacity is set to retire.

In the Middle East 7 GW of capacity is expected to be added, mainly driven by plant developments in Iran, Saudi Arabia, and the United Arab Emirates.

In Asia gas-fired capacity continues to expand by over 10 GW, with China and Malaysia accounting for almost two-thirds of the incremental capacity.

In Europe 0.9 GW of gas-fired generation capacity is expected to be commissioned in 2021, including the Żerań co-generation plant (490 MW) in Poland and the Landivisiau CCGT plant (446 MW) in Brittany, France.

Top of Companies, Business Performance During the Pandemic

by **Daniel Lazar**

As at each yearend, the Romanian chamber institutions award the best performing companies in their geographical area, in an approach that rewards the economic success of those who make from their day-to-day business a role model. In 2020, a year decisively marked by the Covid-19 pandemic, the most important actors of the national and county economy were the protagonists of events that did not have the grandeur of previous years but were just as generous in awards and value recognition.

The winners were determined according to a severe and complex methodology, approved, and applied uniformly, at the level of the entire chamber system. Indicators considered in the determination of final classifications included: net turnover, operating profit, operating profit rate, efficiency of human resources use and efficiency of invested capital, calculated based on 16 elements extracted from the financial statements submitted by companies at Ministry of Public Finance and at the National Trade Register Office. To obtain an objective ranking, within each group are awarded groups on five size classes: very large, large, middle-sized, small companies and micro-enterprises.

"The National Top of Companies is an event that provides the well-deserved recognition for companies with special performance. (...) The performance of the business environment is essential for our economic development. We need powerful companies in Romania, supporting smart investments and creating well-paid jobs. The data show a steady increase in Romanian private capital, as well as in the number of companies with turnovers of tens of millions of euros per year," said Romania's President Klaus Iohannis.

The National Top of Companies also benefited from the presence of important representatives of the Romanian business environment, awarded during this event, including two companies from the oil, gas, and energy industry.

"We are very honoured to receive this award and we are proud that we obtained the same performance as in the last years. 2019 was a performance year for OMV Petrom, we had a turnover of EUR 5.4bn and we were the top private investor in Romania, with a value of taxes paid to the state of EUR 900mln, and the largest employer in Romania, directly and indirectly supporting 40,000 jobs. 2020 was much more challenging that the last one, we had to adapt to this pandemic, and we considered the continuation of supply with gas, oil and electricity production; we focused our attention on the safety and health of our employees, so that we remain a reliable partner and important energy supplier," said Alexandru Maximescu - Vice-President, Public and Regulatory Affairs Division, OMV PETROM SA.

"Thank you very much for this award. We represent Romania's chemical industry through Chimcomplex Borzesti and Oltchim and we have a long history in this industry, way before 1989. Next, those passionate about chemistry can come and have a career with us; we can thus offer Romania a wide range of products. The pandemic has shown that the chemical industry is very important. It is equally important for Romania, in order to reduce its export deficit, to pay greater attention to chemical products in our country, in order to sell them on foreign markets, being very competitive and high-quality products," said Stefan Vuza, President of Chimcomplex SA.

The Chamber of Commerce and Industry of Bucharest (CCIB) organized the XXVII edition of the Bucharest Top of Companies, a reference event for the economic life of the Capital.

"In this difficult year, of health crisis, the economic life moves forward, and I congratulate the Chamber of Commerce and Industry of Bucharest for finding its strength to congratulate the winners. We need you, you and the thousands of entrepreneurs who are behind you, to move the economy forward," said in the message sent on this occasion the Minister of Economy, Energy and Business Environment Virgil Popescu.

Out of the 134,059 companies based in the Capital, which submitted the balance sheet related to 2019, 50,133 companies fulfilled the eligibility criteria, i.e., 37.4% of the total. Among them, CCIB awarded 7,267 companies, i.e., 14.5% of the total companies considered eligible and which account for 5.4% of total companies that submitted the balance sheet related to last year.

Regarding the structure by fields of activity, most of the companies awarded by CCIB operate in the field of services (2,529 companies, 35% of the total), being followed by companies in the trade field (2,003 companies, 28% of the total) and those with industrial profile (1,505 companies, 21% of the total). In the ranking, a share of 6% is held by the following sectors: construction (437 awarded companies), research, development and high-tech (404 awarded entities), tourism - 3% (249 awarded companies) and agriculture, forestry, and fishing - 2 % (140 companies).

The 7,267 companies included in the top, by 2% more than in the previous year, posted an aggregate turnover of EUR 89.6mln, up 15.5% compared to the 2019 edition, and an operating profit of EUR 8.1bn, by 10.7% higher year-on-year. 563,496 employees are working with these companies, a number increasing by 4.1% compared to the previous edition. The winners are part of the most dynamic and important business community of the country. With an unemployment rate of only 1.24% compared to 3.26% at national level, the Capital concentrates 22.4% of total active companies in Romania, approximately 21% of total employees of the country, almost 30% of the sales and retail field at national level, 18% of the value of Romanian exports and 31% of the value of imports made by Romania and around 60% of the scientific research activity of the country. In Bucharest there are 104 thousand companies with foreign companies operational (44% of the total recorded nationwide), with an aggregate subscribed share capital of EUR 25.1bn, i.e., 54% of total subscribed share capital at national level of companies with foreign participation in capital.

The oil industry, in the 2020 Top of Prahova-based Companies

Prahova County is one of Romania's most developed from an economic point of view and among the economic fields, dominant in terms of Gross Domestic Product is the industry and from the industry field the oil sector is representative. Foreign investments, along with the domestic ones, as well as the export activity are two of the drivers of the county's economy.

In the ranking prepared by the institution led by President Aurelian Gogulescu, hierarchy structured by fields, sub-fields of activity and size classes, there are, at the 27th edition, 3162 companies - the top 10 in each category in which they fall. Of these, 1,670 companies are in the Top 3, and 786 companies are on the first place in the ranking. The 3,162 companies that make up the Top 10 represent 12% of the total companies that submitted the balance sheet at the end of last year. Their total turnover accounts for 71% of the turnover of all Prahova-based companies with submitted balance sheet, and the number of employees of the companies included in Top 10 - 58% of total companies.

A classification of companies from Top 10, on size classes, indicates the following situation: 7 companies (0.23%) are very large companies, 55 (1.74%) are large companies, 228 (7.21%) are middle-sized companies, 854 (27%) are small companies and 2013 (63.67%) are micro-enterprises. If we group the Top 10 companies on seven main fields of activity, the following situation will result: 1036 companies (32.77%) in services, 840 companies (26.57%) in trade, 641 companies (20.28%) in industry, 260 companies (8.23%) in construction, 129 companies (4.08%) in tourism and HoReCa, 128 companies (4.05%) in agriculture and 118 companies (3.37%) in research-development-High Tech.

The companies ranked in the county top on the leading places enter the competition for the national ranking. This year, 417 Prahova-based companies are included in the National Top of Companies, of which 70 companies rank 1st, 59 companies rank 2nd, and 52 companies rank 3rd. Classified by fields of activity, Prahova-based companies in the National Top are 283 in Industry, 91 in services, 66 in trade, 23 in construction, 18 in tourism and HoReCa, 16 in agriculture and 8 in research-development-High Tech.

This year, which was marked by the COVID-19 pandemic, the Gala of Top Prahova-based Companies was a special event, from several points of view: 2020 is an atypical year, in which we all tried and continue to try, as much as possible, to transform the problems and difficulties into opportunities, focusing on endurance, sustainability and reinvention. Moreover, 2020 is the year of the Jubilee of 30 years of existence and modern activity of CCI Prahova. The event took place online, by making a film that intertwines, in an original way, the messages of the President of CCI Prahova, Aurelian Gogulescu, and those of important personalities from the highest positions of the Romanian state, of collaborators and partners of CCI Prahova, with the award moments and an artistic program.

The winning companies received diplomas for ranking in the Top 10, but also trophies and distinctions: Corporate Social Responsibility Trophy, Business Woman Trophy and Top Prahova Exporters Distinction. The jubilee moment - 30 years - CCIPH was marked by the editing of the second part of the CCI Prahova Monograph, dedicated to the period 2010 - 2020, by a jubilee medal, but also by the messages that the partners and friends of CCI Prahova addressed on the anniversary and which can be found in the festive edition of the Dynamic Business publication, which appeared on the occasion of this event. ■

Romanian International Gas Conference 2020

THE FUTURE OF NATURAL GAS IN THE TRANSITION TO A GREEN ECONOMY

What role can natural gas play in the decarbonization strategy for Romania, in reaching the more ambitious climate targets imposed by the European Green Deal? How can it fuel Romania in its post-pandemic economic recovery? Answers to these questions have been given during the Romanian International Gas Conference 2020 (RIGC 2020), an annual English-language conference of the Energy Policy Group (EPG) which took place in November 23-26.

Given the major changes brought by the new EU legislative framework in the climate and energy field, RIGC2020 had as a central theme the European Green Deal and the future of gas. The event brought together a high-level line-up of EU, Romanian and regional officials, CEOs, industry and technology experts, and researchers from think-tanks and academia.

The European Green Deal sets the continent's economy on a uniquely ambitious track to net-zero carbon emissions by 2050.

"The European Green Deal is a very ambitious vision. This brings opportunities, but also challenges to the natural gas industry, the pressure to speed up a clear and realistic strategy for decarbonization, to invest in future-proof projects and think twice about any investment that risks getting stranded," said Radu Dudau, EPG Director.

In this context, what is the future of gas and the opportunities for Central and Eastern Europe, including Romania? Natural gas is an essential fuel for Romania. Therefore, putting into production the Black Sea deep-water gas fields is very important for the country's economy and energy security. However, under the pressure of existing climate targets and policies, the window of opportunity for such investment has been narrowing down dramatically. Indeed, Romania risks missing a big opportunity to benefit from its significant natural resources. Added local gas resources can support not only the security of supply and the shift from lignite to gas, but also the process of economic recovery.

"Romania is the largest producer of gas in this region, but the onshore resources are declining and in the absence of the unlocking the Black Sea we estimate that by 2025, 30 to 40 percentage of Romania's gas consumption will be covered by imported natural gas. (…) The development of the Black Sea is a huge potential for Romania. (…) The multiplier effect is huge for the economy and can be a big part in the economic recovery," said Christina Verchere, CEO OMV Petrom.

How can natural gas be part of the energy transition? It is the fossil fuel with the lowest carbon footprint. It can replace coal in the power sector, on the shorter term, and the national energy plans foresee an increase of gas use in Romania. Besides, gas-fired power plants are important in balancing the renewables in the power market. It is a versatile fuel that can be stored for the long term, compressed, and liquified. It can also have a major role to play in the production of 'blue' hydrogen (that is, hydrogen production based on methane reforming plus CCS) and has a key role in the heating and cooling sector.

"Romania is the largest producer of gas in this region, but the onshore resources are declining and in the absence of the unlocking the Black Sea we estimate that by 2025, 30 to 40 percentage of Romania's gas consumption will be covered by imported natural gas. (. . .) The development of the Black Sea is a huge potential for Romania. (. . .) The multiplier effect is huge for the economy and can be a big part in the economic recovery."

Christina Verchere, CEO OMV Petrom

"Romania has been much too slow in the Black Sea. Policy making and overall activity are not synchronized through the Romanian system," said Julian Bowden, Senior Visiting Research Fellow at the Oxford Institute for Energy Studies, a leading energy research institute specialising in the economics and politics of international energy across oil, gas and electricity markets.

"For Romania, natural gas is very important. It is an essential bridge fuel, and we are considering that the role of natural gas in this transition policy in the energy sector is very important. (…) Romania has the opportunity to have this domestic resource," said Niculae Havrilet, State Secretary at the Ministry of Economy, Energy and the Business Environment.

Dan Dragan, State Secretary at the Ministry of Economy, Energy and Business Environment, said: „The decrease of emissions should be made in the most efficient and inclusive way possible. Energy transition must be closely connected with the economic resilience and recovery plans, thus turning current challenges into opportunities to lead the economic growth. Romania supports the European approach to a fair and equitable transition for all member states, one that provides an optimal distribution of efforts and takes into account the great differences between our regions". According to him, it is necessary to invest in low carbon generation capacities and a transition from coal to natural gas and renewables, as well as investments in the modernization of the energy network alongside digitalization and smart grid. All these are essential to support the process of sector integration and energy transition.

In the context of increasing the emission GHG reduction target by 55% by 2030, a significant volume of investment will be needed. "Natural gas will definitely play an important role in the short to medium term, ensuring a transition towards decarbonation. For Romania and for other states in the region it is essential to use natural gas in the green transition phase," the official added.

"For Bulgaria and our neighbouring countries, regional cooperation is very important. Now, with the European Green Deal, reaching carbon neutrality could be possible only with increasing in the short and medium term the presence of natural gas in our energy systems," Zhecho Stankov, Deputy Minister of Energy at the Energy Ministry from Bulgaria, stated.

According to him, 40% of energy production in Bulgaria depends on lignite, which is why the state is developing new interconnectors with the neighbour countries. In this context, the development of BRUA project with the compression station at Podisor created the capacity for reverse flow with Romania. "We saw the results: better conditions, better prices and more gas flows between both countries," the Bulgarian official added.

RIGC 2020 has also tackled other major regional topics, such as the upcoming Southern Gas Corridor, the role of LNG, and the potential of – and competition from – the emerging clean technologies.

Energy Industry Review was a media partner at this event.

SolarPower Europe's EU Market Outlook for Solar Power 2020–2024

The coronavirus pandemic didn't spare the solar power sector. Whereas COVID-19 slowed the very steep growth curve observed over the past 2 years, the European solar industry has demonstrated a very strong resilience. While growth levels are still 12% lower compared to the expectations before the crisis, we now see an 11% increase in deployment of solar projects across the EU in 2020 with only 5 out of 27 EU Member States installing less capacity than in the previous year.

SolarPower Europe anticipates a return to normality in 2022, with the speed depending heavily on the economic recovery and stimulus packages.

The EU's recovery plan, Next Generation EU is an unprecedented and ambitious investment plan which aims to mitigate the impact of the COVID-19 pandemic by accelerating Europe's green and digital transition, creating new opportunities for industrial growth and job creation at the service of Europe's climate-neutrality ambition. The solar industry, as the most sustainable and job creating energy source, appears as a perfect candidate to contribute to this challenging transition.

The core of the so-called Next Generation EU plan is the EUR 672.5 billion Recovery and Resilience Facility (RRF). The RRF will provide financial support for Member States which can be directly injected in their economies, under the form of grants, loans, or state guarantees. Investments covered by the RRF must be aligned with the objectives of the European Green Deal, with up to 37% of the total funding exclusively earmarked for climate related expenditures.

To access RRF funds, Member States will have to submit their "national recovery and resilience plans" to the European Commission, detailing the measures and sectors targeted and demonstrating the contribution to the achievement of Europe's energy and climate objectives. The Commission has strongly encouraged Member States to concentrate their investments in 6 flagship initiatives, 4 of which are directly relevant to the solar sector:

- Power up: by 2025, build and integrate 200 GW of RES by 2030, support the installation of 6 GW of electrolyser capacity and the production and transportation of 1 million tonnes of hydrogen (H2).
- Renovate: by 2025, contribute to doubling the renovation rate and fostering deep renovations.
- Recharge and refuel: by 2025, deploy at least 1 million charging points and 500 H2 refuelling stations deployed.
- Reskill and upskill: by 2025, ensure 70% of Europeans of working age have basic digital skills, that 4 in 5 Vocational Education and Training (VET) graduates are employed and that 3 in 5 VET graduates benefit from in job training.

The Recovery & Resilience Plans are therefore a unique opportunity for Member States to invest into solar and boost the clean energy transition, enable sustainable growth, and create green jobs. Investments into solar create the most jobs per million dollars of capital investment. Utility-scale solar investments combine job creation with very low costs for greenhouse gas emission abatement, whereas investments into rooftop solar can be implemented within a short timeframe. Furthermore, investing into solar will contribute to increase the competitiveness of EU industry: Solar power's Levelized Cost of Electricity is already competitive against industrial and wholesale electricity prices across Europe today.

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