MARCH 2021

ENERGY

INDUSTRY REVIEW

SAVING JIU VALLEY

European Vision

BATTERY TECHNOLOGY

A New Era Emerging

NEW PARTNERSHIP

UPG and Transgaz to Collaborate on Hydrogen Production and Storage

Gabriel Comanescu, President & CEO of Grup Servicii Petroliere

GSP Getting Where No Other Romanian Company Has Gone Before

clean energy since 1909

ROMGAZ

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

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

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

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

www.romgaz.ro

Natural Resources vs Market Trend

In an increasingly globalized world (process accelerated by the current health crisis), natural resources are extremely important in the regional geostrategic equation, and their exploitation and capitalization in an advantageous manner for the states holding them should be the law. I say this thinking about the fact that no technological process in the world can be carried out without resources, whether human or material. If for the first part of the problem there is no longer an impediment to work in any place on the planet, for companies that pay better than others, for the second half, that of mineral resources, it is more difficult to transfer them from one side to the other of the globe. This in conditions in which they are not leased or simply sold to some companies that have nothing to do with the states that hold the mentioned resources.

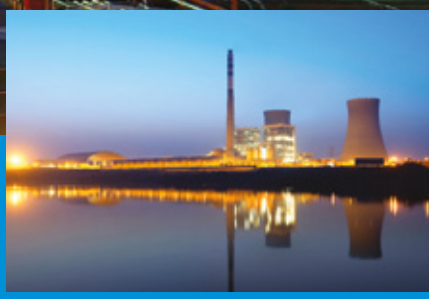
In this entire paradigm of globalization, in which digitization plays an increasingly decisive role, the strategy of making the most of natural resources that nature has given to us is more than important. Of course, it all has to be put in the light of global warming, we know that, of sustainable capitalization on soil and subsoil riches, of environmental policies etc., in one word to be in line with the new tendencies that must necessarily be 'politically correct'.

It seems that green energy, electric vehicles and all these adjacent industries benefit and will be trendy and in great demand in the years to follow. This is to the detriment of countries that hold mineral resources, oil and gas resources, which will no longer be that popular. Environmental activists (see the case of famous Greta Thunberg, who at the age of 15 was traveling to all conferences around the world to sound the alarm about global warming, and even confronted former White House chief Donald Trump, live) fight hard for cleaner air, less pollution, green energy etc. We all want to breathe a cleaner air, to be healthier.

But the other side of the coin is less on the radar. Countries whose resources are no longer fashionable will suffer to the detriment of those that massively invest in the new market trends. This could result in discontents or even protests, I don't want to think about more than that.

Mining seems to be backed into a corner by the new green technologies, and even by important decision-makers at European level and not only, in conditions in which China wants to rebuild the Silk Road and, moreover, to build in every important region on the new economic axis a power plant fired by... coal. Motor vehicles powered by conventional fuels are increasingly slandered against the electric ones, but increasingly more voices say that the batteries of the latter are very expensive and... polluting. In conclusion, no wonder what many ask themselves, as Caragiale would say, "who shall I vote for?".

Daniel Lazar
Senior Editor



OPTIMIZING THE
OPERATION & MAINTENANCE
OF THE WORLD'S ENERGY PRODUCING INDUSTRIES

www.dietsmann.com

Dietsmann is the leading independent specialist in Operation & Maintenance services and Maintenance Engineering & Inspection for continuous-production plant. With over 40 years of accumulated know-how of plant and equipment, we serve clients in the oil & gas, conventional & nuclear power generation and mining industries. A trusted partner to improve operational output by optimizing maintenance, maximizing availability and extending life-time of machinery and installations, without compromise to quality and safety.

Contact
Dietsmann SRL
CUBIC CENTER
1B Pipera Boulevard
Jud. Ilfov
077190 Oras Voluntari
Romania

e-mail: romania@dietsmann.com

SMART MAINTENANCE SOLUTIONS
FOR CONTINUOUS-PRODUCTION PLANT

Dietsmann
Maintaining Energy

CONTENTS

ENERGY INDUSTRY REVIEW | March 2021 • Year 4 • Number 33

VOICES

OIL & GAS

OIL & GAS

ENVIRONMENT

POWER

METALS & MINING

TECH

ANALYSIS

Connectivity for a European Gigabit Society

Advanced connectivity is the fundamental building block of the digital transformation and the enabler of a sustainable future. Fixed and wireless networks contribute significantly to providing affordable and accessible services and bridging the digital divide. Ubiquitous connectivity is a decisive factor in closing economic, social and territorial divides. High-capacity networks, fibre and 5G, underpin next generation innovations.

Enhanced connectivity will support more connections and they will be faster and more reliable. It will empower people and businesses with better, faster and more widespread internet coverage. Citizens will have access to more efficient digital services, consumers will enjoy more choices and available information, and businesses will explore new opportunities through innovative business models, remote collaborations and digital tools.

Faster and resilient connections are the basis of the digital landscape and innovation. The best way to make them timely available for everyone is to encourage rollout of improved networks, like fibre and 5G, and that means - cutting rollout costs and making 5G radio spectrum usefully available.

BC Ferries' Fifth Battery Hybrid-electric Vessel Launched at Damen Galati

Another of BC Ferries' Island Class ferries has launched, entering the water recently at Damen Shipyards Galati in Romania. The yet-to-be named ship is the fifth in a series of six Island Class vessels joining the BC Ferries fleet. When in operation, it will be one of two Island Class vessels assigned to the Nanaimo Harbour – Gabriola Island route.

Work will continue on the new ship until scheduled sea trials in June. Following successful sea trials, the vessel will be delivered to Point Hope Maritime in Victoria in late 2021 for final preparations. Two-ship service is scheduled to begin on the Nanaimo Harbour – Gabriola Island route by early 2022, replacing the Quinsam.

Replacing one larger ship with two smaller vessels on the route will provide customers with increased capacity per hour and more frequent service. Customers will also notice reduced vehicle line-ups and congestion on local roads, and improved safety. It also eliminates the need to consume more greenspace to increase the size of terminal holding compounds by moving more traffic through the same amount of space.

Ultra-Clean Jet Fuel, 75% Reduction in CO2 Emissions

Sustainable and green-energy company, Clean Planet Energy, announced a breakthrough product in their mission to significantly reduce carbon emissions in fossil-fuel led transport. Branded as 'Clean Planet Air', the certified Kerosene/Jet Fuel can be used as a direct replacement for the fossil-fuel equivalent, yet it reduces C02 emissions by a minimum of 75% in comparison, whilst removing thousands of tonnes of waste-plastics from the environment every year.

"On an average day across the world (post-COVID), you would expect 75,000 planes to take-off. The aviation industry is making great strides to be greener and cleaner, but still, it is calculated by the European EEA that a domestic flight, for every 1,000 KM travelled (the average distance between the UK > Spain), will release 250kg of new CO2e emissions for every economy passenger onboard. Those numbers will not meet the emission cuts the world must make to stop climate change, so alternatives are needed now. Currently there is no viable commercial alternative to fossil fuel led aviation, so until there is our strategy is to assist in the reduction of carbon emissions by producing alternative & greener fuels", said Bertie Stephens, CEO of Clean Planet Energy.

Clean Planet Energy's mission is to remove over 1 million tonnes of waste-plastics from the environment every year, and they achieve this by launching ecoPlants which convert this plastic into new products, including ultra-clean fuels and petrochemical feedstocks to make new circular-plastics. The plastics used by Clean Planet in their ecoPlants would otherwise be going to landfill, incineration, or worse, entering our oceans.

EUR 1.5mln Investment at Petrobrazi to Increase the Efficiency of the Lighting System

OMV Petrom, the largest energy company in South-Eastern Europe, has invested EUR 1.5 million at the Petrobrazi refinery to streamline the lighting system of the ten industrial ramps, where crude oil and feedstock is unloaded, and oil products are loaded.

The old lighting system at the refinery's supply ramps was decommissioned and conventional lighting fixtures were replaced with about 1,000 new LED fixtures. The new LED-based lighting system will halve the annual amount of electricity used by the refinery at the industrial ramps, resulting in an annual reduction of about 100-ton of carbon emissions. The reduction in emissions is equivalent to the volume of carbon dioxide sequestrated annually by about 18,000 trees.

"We have an essential role in providing the energy that Romania needs and we want to contribute through various solutions to reduce the carbon emissions in all our business segments. We continue our environmentally friendly initiatives on the entire value chain, which include both the implementation of new technologies and an efficient energy management during operations," said Radu Caprau, member of OMV Petrom Executive Board, responsible for Downstream Oil.

ENERGY INDUSTRY REVIEW

Publisher:
Lavinia Iancu
lavinia@energyindustryreview.com

Business Development Manager:
Marius Vladareanu
marius@energyindustryreview.com

Scientific Board:
President: Prof. Niculae Napoleon Antonescu PhD
Members:
Prof. Lazar Avram PhD; Assoc. Prof. Marius Stan; Prof. Ionut Purica PhD; Alexandru Patruti PhD

Contributing Writers:
Adrian Stoica, Daniel Lazar, Dumitru Chisalita, Ioan-Corneliu Dinu, Evgenios Zogopoulos

Digital Manager:
Justin Iancu

ISSN 2601 - 3819
ISSN-L 2601 - 3819

41 Costache Negruzzi St., 100147,
Ploiesti, Prahova, Romania
Phone: +40 (0)344-143.530;
E-mail: office@energyindustryreview.com

© Material in Energy Industry Review may not be reproduced in any form without the written consent of the Industry Media Vector. All rights reserved. All other editorial items are the copyright property of Industry Media Vector.

Like us on Facebook
@energyindustryreview

Follow us on Twitter
@EnergyInReview

Join us on Linkedin
Energy Industry Review

Subscription

Energy Industry Review subscription rates:

Annual subscription - 10 print issues per year
€ 145/year - Worldwide FREE Shipping

EUR 53mlnn Aid for Charging Stations for Low Emission Vehicles in Romania

The European Commission has found Romanian plans to support the creation of a network of recharging stations for electric vehicles to be in line with EU State aid rules. The measure will contribute to reducing CO2 and other pollutant emissions without unduly distorting competition in the single market.

"Romania will contribute to the fight against global warming, in line with the European Green Deal's objectives. This scheme will reduce harmful car emissions and improve the health of citizens, without unduly distorting competition," Executive Vice-President Margrethe Vestager, in charge of competition policy, said.

The scheme, which will have a budget of EUR 53 million covering the period from 2020 to 2025, is expected to stimulate investments into recharging stations for hybrid and battery electric motor vehicles in Romania. It will cover urban, sub-urban and rural areas and aims to develop a network of recharging stations that will cover the entire country. The scheme is open to all economic operators meeting certain criteria, for example in terms of plug equipment. The beneficiaries will be selected through an open and transparent tender procedure and the support will be awarded in the form of grants.

Restart Energy Investing USD 30mln in a 45 MW Solar Project in Salaj County

Restart Energy, one of the largest independent suppliers of electricity and natural gas on the Romanian market, intends to invest approximately 30 million dollars in developing a 45 MW solar project in Sarmasag locality in Salaj county. The purchased project is in the 'ready to build' phase, and the money will be invested in the park's construction. The company estimates that the park will start to function in the first quarter of 2022.

This 45 MW project is the company's first step in developing and integrating its upstream segment with 500 MW renewable energy projects by the end of 2025. Restart Energy aims to buy or develop 100 MW projects in each of the next five years. The projects will require investments estimated at USD 100 million annually. Restart Energy targets the solar, wind, biogas, biomass and geothermal energy fields.

The Sarmasag park will have an annual energy production of 55 million kWh - enough to supply about 30,000 households with green energy. Putting it into operation, the release into the atmosphere of 1.23 million tons of CO2 during the 25-year operation period will be avoided.

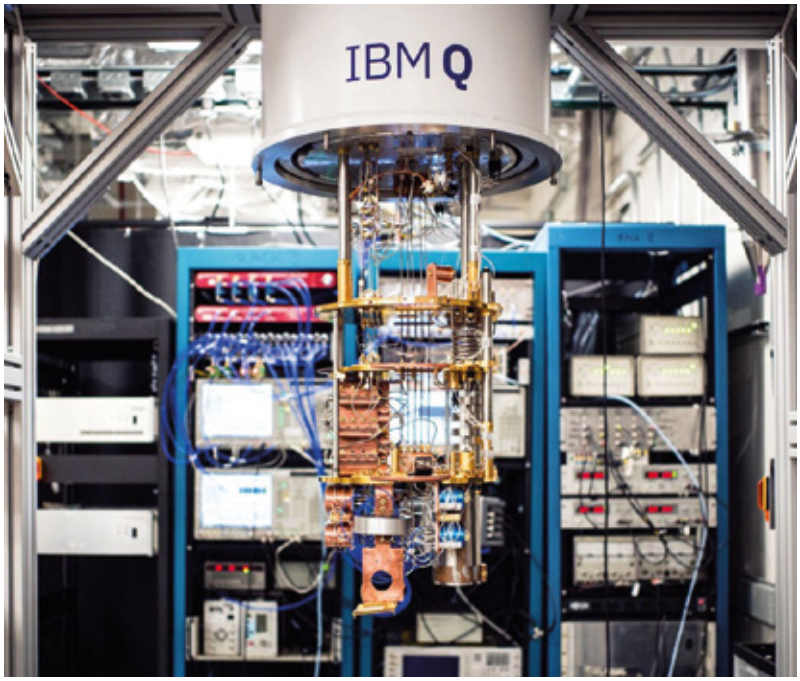
Novel Automated Well Control Technology

Safe Influx, a provider of Automated Well Control solutions, has been granted a patent by the United Kingdom Patent Office covering its Automated Well Control technology. The patent secures key elements of Automated Well Control technology, including a wide range of modules using the same technology.

This patent recognises the ability of the Automated Well Control to detect the presence of a fluid influx condition in a wellbore, make a decision against criteria to shut-in, and then automatically initiate an initial well control protocol that results in the well being safely shut-in.

The Safe Influx Automated Well Control system enables fast identification, decision-making and reaction to well control events. This revolutionary technology is capable of reducing the size of an influx compared to conventional techniques, and this means a reduction in delays, costs and operational issues in getting back to drilling.

Advancing Use of Quantum Computing in Energy



By joining the IBM Quantum Network™ as an Industry Partner, bp will have access to IBM's quantum expertise and software and cloud-based access to the most advanced quantum computers available via the cloud. This includes access to a premium 65-qubit quantum computer, the largest universal quantum system available to industry today, and an important milestone on the IBM Quantum roadmap to a 1,000-plus qubit system, targeted for the end of 2023. bp will work with IBM to explore using quantum computing to solve business and engineering challenges and explore the potential applications for driving efficiencies and reducing carbon emissions.

"bp's ambition is to become a net zero company by 2050 or sooner and help the world get to net zero. Next-generation computing capabilities such as quantum computing will assist in solving the science and engineering challenges we will face, enabling us to reimagine energy and design new lower carbon products," said Morag Watson, Senior Vice President, Digital Science and Engineering for bp.

Quantum computing has the potential to be applied in areas such as: modelling the chemistry and build-up of various types of clay in hydrocarbon wells – a crucial factor in efficient hydrocarbon production; analysing and managing the fluid dynamics of wind farms; optimizing autonomous robotic facility inspection; and helping create opportunities not yet imagined delivering the clean energy the world wants and needs.

algeco®

360° SERVICE

WE ARE:
AVAILABLE
Wherever the project, big or small, we can deliver anywhere.
ADAPTABLE
Whatever the costumers need – space, furniture, equipment, connectivity – we provide turnkey solutions.
RELIABLE
Whenever we are required we have the expertise to get it right first time.

info.ro@algeco.com
www.algeco.ro

Most Cost-Efficient Technology to Produce H2

Agfa's Zirfon membranes make alkaline electrolysis the most efficient technology to produce hydrogen. A recent study by the Fraunhofer Institute using Agfa's ZIRFON separator membranes confirms that the Alkaline ElectroLysis (AEL) technology can be as efficient as the Proton Exchange Membrane (PEM) technology and is able to operate at high current densities. This presents AEL as the most cost-efficient hydrogen production system.

As an electrolysis technology, AEL is confirmed by the study to have a higher efficiency than PEM but when comparing the efficiency of low temperature electrolyser systems using respective technologies, PEM used to offer the advantage of operating at higher current densities.

The Fraunhofer report now also shows that when Zirfon membranes and quality electrodes are used, AEL is close to reaching the same current densities as PEM. This presents AEL as the most cost-efficient hydrogen production system since both the material investment and operating cost (OPEX) for reaching this level of current densities are notably higher for PEM than AEL, especially in the case of large size installations.

Recommendations to Mitigate Misconduct in EU Gas Balancing Markets

The EU Agency for the Cooperation of Energy Regulators (ACER) and the European Network of Transmission System Operators for Gas (ENTSOG) have jointly published a policy paper with recommendations to mitigate potential misconduct in EU gas balancing markets. This paper incorporates the feedback received in the public consultation held between 21 September and 3 November 2020.

This policy paper includes recommendations related to good practices for ex-ante monitoring checks on balancing and creditworthiness, and cross-border exchange of information. It also includes good practices currently implemented for proactive measures and the possibility for reactive measures in case of balancing misconduct identified in another Member State.

The policy paper refers to the following key proactive measures to improve the correct functioning of the market.

Chevron Commits USD 300mln Toward Low-Carbon Technology Investments

Chevron Technology Ventures (CTV) announced the launch of its USD 300 million Future Energy Fund II focused on technologies that have the potential to enable affordable, reliable, and ever-cleaner energy for all. With the first Future Energy Fund launched in 2018, CTV invested in more than 10 companies with more than 150 other investors to support innovations in carbon capture, emerging mobility and energy storage. Building upon the success of the first Future Energy Fund, Future Energy Fund II will focus on innovation in industrial decarbonization, emerging mobility, energy decentralization and the growing circular carbon economy.

"We continue to take meaningful actions to address the challenges and opportunities of the global energy transition," said Barbara Burger, Vice President, Innovation and President of Technology Ventures at Chevron. "I'm proud that our second Future Energy Fund has the potential to make energy and global supply chains more sustainable by helping industries and our customers build a lower-carbon future."

Future Energy Fund II is the eighth venture fund launched since CTV was established in 1999. CTV also has a Core Energy Fund which invests in technologies with the potential to have a significant impact on Chevron's core business through operational enhancements, digitalization and low-carbon operations.

Chevron is also an investor as a limited partner in funds such as the Oil & Gas Climate Initiative's (OGCI) Climate Investments and Emerald Technology Ventures' Industrial Innovation Fund.

Denmark to Construct World's First Energy Hub in the North Sea

Denmark has reached a landmark agreement on the construction of an energy hub in the North Sea. The energy hub will be an artificially constructed island 80 kilometres from the shore of the peninsula Jutland. It will be owned by a public-private partnership. The hub will strengthen the integration of Europe's power grids and increase renewable electricity production necessary for a cli-mate neutral Europe.

Denmark has introduced cut-off date of 2050 for oil and gas extraction in the North Sea and cancelled all future licensing rounds. By agreeing on the construction and ownership of the world's first energy hub in the North Sea, Denmark takes another significant step in the green transition. The energy hub will produce yet unseen amounts of green electricity and is one of the government's flagship projects for the green transition in Europe. Fully implemented it will be able to cover the consumption of 10 million European households.

The energy hub will serve as an offshore power plant gathering and distributing green electricity from hundreds of wind turbines surrounding the island directly to consumers in countries surrounding the North Sea. The island is expected to have a total area of at least 120.000 square meters and in its first phase it will be able to provide 3 million European households with green energy. The project will be a public private partnership between the Danish state and private companies. The State will own most of the island, but private companies will be crucial for the project to fulfil the potential as regards to innovation, flexibility, cost-effectiveness and business potentials.

Atlas Copco

Rental of hydraulic tools for big bolt applications

Each rental comes with exceptional service to meet all your needs. From customizing your ideal equipment needs with our sales team, to providing routine maintenance and calibration from our experienced technicians to keep your projects running smoothly, we are with you each step of the way.

With rental services you always have:

- the best solution to fit your needs
- quality equipment - properly maintained and in excellent working condition
- standard maintenance and calibration included
- equipment when you need it
- costs under control
- training of your personnel as an option

Atlas Copco Tools Romania
mob: +40 730 088 707
florin.bujor@atlascopco.com
www.atlascopco.com/ro-ro/itba

Laurentis to Support Refurbishment at Cernavoda Unit 1

Laurentis Energy Partners was awarded a contract worth EUR 3.156 million, through its subsidiary Canadian Nuclear Partners, to support refurbishment at Romania's nuclear station in Cernavoda. The contract from Romanian utility Societatea Nationala Nuclearelectrica (SNN), equivalent to about USD 4.86 million Canadian, calls on Laurentis to develop a conservation program, to protect the integrity of SNN's Unit 1 reactor while it is drained of water during refurbishment.

"SNN looks forward to working with Laurentis in refurbishing Cernavoda Unit 1, providing Romania with a source of clean, safe, reliable and affordable electricity for another 30 years," added Cosmin Ghita, CEO of SNN.

The Laurentis contract with SNN includes a EUR 1.5 million subcontract to Framatome, in Germany, to use their proprietary Film Forming Amine (FFA) technology. FAA has been deployed in the Darlington Refurbishment to conserve and protect water-steam systems while dry, reducing or preventing the need for maintenance.

Work by Laurentis at Cernavoda will occur in two stages. The contract award is for phase 1, system analysis and design engineering, over 21 months in 2021 and 2022. Phase 2 is implementation, following regulatory approval for SNN's refurbishment, scheduled to move forward in 2026-27.

ENGIE and Equinor Partnership to Develop Low-carbon H2 Projects

ENGIE and Equinor started a partnership to develop joint low-carbon hydrogen activities. The partners will investigate the production and market potential for hydrogen from natural gas whereby the CO2 will be captured and stored permanently offshore.

ENGIE and Equinor signed a memorandum of understanding to investigate the development low-carbon hydrogen value chains in Belgium, the Netherlands and France. In the coming months, ENGIE and Equinor will start discussions with potential customers to assess the project, as well as with stakeholders and relevant authorities.

ENGIE and Equinor believe that it is essential to develop low-carbon and renewable hydrogen projects at scale in order to make it possible for industrial customers to significantly reduce CO2 emissions before 2030. This development of low carbon and renewable hydrogen will accelerate the construction of new hydrogen infrastructure and the repurposing of current natural gas infrastructure, thus paving the way for net zero in 2050.

ElectReon to Provide Road Charging Technology

ElectReon, which is developing and implementing Wireless Electric Road Systems (ERS) that wirelessly charge commercial and passenger electric vehicles while driving, was selected to provide the technology for eCharge, a project funded by the Roads Innovation Program of the German Federal Highway Research Institute (BASt). The winning consortium includes Volkswagen and Eurovia. The aim of the project is to develop an economical and functional solution for inductive charging of electric vehicles while driving. The project has received EUR 1.9 million financing from the German Federal Government.

ElectReon will act as a subcontractor providing the project with its leading wireless dynamic charging technology, as well as leading and supporting different project tasks. As part of the project, ElectReon will integrate its wireless vehicle receiver to a Volkswagen electric vehicle to be tested on the Electric Road.

A few subsidiaries of the global Vinci group are part of the consortium - Eurovia Germany will lead the road construction task, the digital enterprise VIA IMC will manage the project, and Omexom will lead the grid connection task. Volkswagen will lead the vehicle task and Braunschweig University will lead the road materials and aging task.

First Haier Refrigeration Plant in Romania

Haier Europe stated that construction of the first Haier refrigeration production facility in the EU is proceeding according to schedule, with production expected to start in late Spring 2021. This large investment project exceeds EUR 70 million. The factory will have 63,000 square meters floor space on a total land of 130.000 square meters, located in the Ploiesti West Park Alinso Group at Aricestii Rahtivani, near Ploiesti, 70km away from Bucharest. The production facility will manufacture best-in-class refrigerators, both built-in and freestanding for Haier Europe's 3 brands - Candy, Hoover and Haier - with a focus on connectivity and preservation.

The new factory will employ nearly 800 people - at full capacity - for an expected production of 600,000 units after 2022. The factory design, which is based on modular approach, will allow an expansion up to 1 million units at full capacity. "We are happy to have chosen Ploiesti for our first cooling production facility in the European Union. This project will make Romania a strategic hub for Haier Europe and will play a key role in its strategy to become one of the top 3 leaders in the industry by 2023. With its large production capacity, technology transfer and logistic features, we are confident this facility will be a first-class project that effectively shows our 'zero distance to consumers' philosophy," says Alessia Ianni, Cooling Technical Operation Director at Haier Europe and Managing Director at Haier Tech Romania.

The Romanian plant will be a world-class facility featuring premium production processes brought by Haier's advanced R&D, manufacturing capabilities and know-how. Its strategic central location, technology and efficiency will enhance Haier's ability to serve customers in the region. This key project represents a strategic pillar in the leadership's consolidation path of the company in the refrigeration segment worldwide and in the execution of Haier Europe's vision to become the first choice for consumers for smart home.

GANZAIR Compressortechnics

GAS APPLICATIONS
ELECTRICITY
HYDROGEN

30 Years

GANZAIR COMPRESOR TEHNIC SRL
representative for Romania,
the Republic of Moldova and Bulgaria

MM, Tauti, 28th street, no.34
Telephone number: (+40) 744 478 925
e-mail: rotibm55@gmail.com
olimpiuratiu@barr.ro
www.ganzair.com

Compressors for natural gases, nitrogen, CO2 and hydrogen
Special compressors after the project

Repairs/Service
High and low pressure compressors

Industrial compressors

Electric current generators

C&G installation for vehicles

An Inconvenient Truth...

One plus one equals two. The earth is not flat. The oil and gas industry isn't doing any good for the planet. Right?

Many don't even think about it or question the headlines. Oil and gas are perceived as relics of our past, with no place in the future. And the world can easily do without our industry. "Keep it in the ground" is such a logical concept, isn't it?

For those fortunate enough to enjoy access to reliable and affordable energy, this might be a 'feel good' truth. But the reality is, almost 800 million people live without access to electricity. Hundreds of millions more only have very limited or unreliable access to electricity. Billions do not have access to clean cooking fuels. They deserve better, don't they? Assertions that electricity access can be expanded to over a billion people quickly and in a completely 'green' fashion are either naïve or, even worse, ignorant. Emerging economies will continue to rely heavily on oil and gas for decades to come.

But it's not as simple as addressing the needs of the developing world. Frozen wind turbines in Texas, solar panels blanketed in snow in Europe, current weather conditions demonstrate again how much the world depends on reliable energy sources and that the diversification of energy supply is a key enabler for keeping homes warm and the lights on. Renewables, without a doubt, play a key role in a diverse and lower carbon energy system, but they need reliable back-up. There is simply no way to meet the world's energy demand without oil and gas any time soon. This doesn't mean that those of us who work in Oil and Gas want to ignore the need to further decarbonize production and reduce our environmental footprint or that we are not strong supporters of the progression and advancement of renewable energy and partners in that journey. On the contrary. If we look at the pure facts, we, the industry, are the ones driving transparency and advocating measurement and reporting of methane emissions and developing technology such as Carbon Capture and Storage. We are not the ones just talking without taking action, perpetuating myths, or politicising the debate.

The lack of public acknowledgement of what our industry does to provide reliable and affordable energy to billions, or our contribution towards decarbonization is telling. Why do we barely hear from anyone talking about the benefits of oil and gas? Because it is too inconvenient.

It is so much easier and headline grabbing to draw a picture about a planet-destroying industry rather than telling the story about an industry that is the backbone of economic growth, an industry that is empowering, literally, the lives of billions of people, an industry that is embracing change and playing a key role in achieving the Paris Agreement goals, an industry that has the brightest talents, know-how, and data to develop the innovative solutions needed to reduce global emissions.

Those of us working in the industry experience this frustration. Constant criticism and denial of our achievements can make us become defensive, sometimes even apologetic, or self-effacing. The brutal and equally inconvenient truth is that we need to speak up, to stand up for our role in enabling economic growth, aiding global development, driving innovation, and the hard work we do every day to make our delivery of reliable hydrocarbons as clean as possible. ■

Iman Hill *is the Executive Director of IOGP*

A stronger Romania.

With energy from the Black Sea.

OMV Petrom

The energy for a better life.

Sale of Extra-murros Land

AMENDMENT OF THE NORMS TO LAW 17/2014

The amendment of Law no 17/2014 regarding (among others) the sale of land located outside of buildable areas (Romanian: *teren extravilan*) in the last year's autumn (via Law 175/2020) triggered multiple concerns for the energy sector. The concerns were caused by the newly introduced provisions that added supplementary restrictions on the sale of *extra murros* land.

As such, following the amendment of Law 17/2014, it became necessary to amend the methodological norms (the '**Norms**') for the application of Title I of the Law 17/2014. Said amendment entered into force upon publishing the Order 311/2020 (the '**Order 311/2020**') on 8 February 2021 in the Official Gazette of Romania. We expressed[1] (even before the entry into force of the Norms amendment) the hope that certain provisions of Law 175/2020 will be corrected while the amended Norms were supposed to clarify certain grey aspects introduced by the same Law 175/2020.

It is to be stressed that *intra murros* land (Romanian: *teren intravilan*) does not fall subject to Law 17/2014; neither the means of securing land (presented in the previously published material) which do not involve sale of ownership right (i.e. such other means can be used without observing the Law 17/2014 restrictions).

1 The present material is a follow up to the previous comment published in the November 2020 edition of Energy Industry Review.

The conditions for sale of extra-murros agricultural land

Logistics clarifications

In accordance with the amendments brought by Law 17/2014 under Law 175/2020, the attributions of the public authorities involved in the procedure of sale of agricultural land have been amended/detailed: as such, the course of the documentations is specified in detail; the response time of the authorities is provided for each step of the procedure (as per Art. 3-5 si 8-10 of the Methodological Norms). Moreover, the standard forms to be used under the procedure prescribed by Law 17/201 (such as the offer for the sale of land, the notification of the pre-emptors or the decision to select a pre-emptor etc) were updated/ supplemented and are available under the Annexes of the Norms.

Justifying documents

One of the elements brought by Law 175/2020 was the substantial broadening of the pre-emptors' categories; consequently, in order to differentiate between such categories, the Norms had to specify which documents are necessary to be exhibited by each category of pre-emptors in order to exercise their pre-emption right. As such, under Article 6 of the Norms, each of the first 6 categories of pre-emptors (the State, which represents the 7th category, is not listed therein) has a dedicated section clearly listing the documents they have to produce in order to be acknowledged as pre-emptors.

Along the same line, considering that (by Art. 41 of Law 17/2014), a new (intermediary) category was introduced between the pre-emptors and the seller's freely chosen buyer(s), i.e., namely

Daniel Vlasceanu *is a Partner at Vlasceanu, Ene & Partners*

the potential buyers ('**Potential buyers**'), the Norms specify (under Art. 8) the documents they must exhibit (in order to fulfil the conditions imposed under Art. 41 of Law 17/2014).

Selection between multiple pre-emptors

A useful clarification is brought regarding the selection between multiple pre-emptors of the same category (or between Potential buyers): the seller is given the right to freely choose between the purchase offers submitted by such 'equal' pre-emptors (or by the Potential buyers) [as per Art. 9 para (1) and (2)].

Approvals of the Ministry of National Defence/ Ministry of Culture

The following prior approvals must be obtained (as per Law 17/2014):

- The approval of the Ministry of National Defence, if the sale concerns a plot of land located within 30 km from the state border/from the Black Sea shore or within 2,400 m from special objectives; and
- The approval of the Ministry of Culture, if the sale concerns a plot of land encompassing an archaeological site.

From our experience, the approval of the Ministry of Defence is regularly obtained very fast.

In order to avoid delays, both the Law 17/2014 and the Norms set forth that if the approval is not issued within 20 working days, the respective approval is considered favourably issued; the Norms also specify that the sale-purchase agreement may be concluded based on the proof of the registration of the application [Art. 12 para (1) letters. a) and b)]. While this is a useful provision meant to exert pressure on the respective authorities, in practice, one can hardy take the risk of perfecting a sale based on a tacit approval (for example, one would not like to be in a position where the Ministry of Defence discovers - following the closing of the sale - that the acquired land plot is strategically necessary for a special objective; however, from our experience, the approval of the Ministry of Defence is regularly obtained very fast).

The obligation to use agricultural land exclusively for agricultural activities

One cannot end the discussion regarding the amendment of Law 17/2014 without mentioning a big concern of the energy community (especially relevant for the photovoltaic industry), namely the express obligation to use agricultural land (only) for agricultural activities [as introduced by the amendments under Law 175/2020 (Art. 4^2 para 5)]. Unfortunately, the Norms do not bring any clarification (nor the awaited exemption for specific investments) in this respect. However, it is expected that an interpretation favouring the use of agricultural land only for agriculture is not acceptable and the above referred to legal text shall be amended. ■

INCDT COMOTI
experience in oil and gas equipment industry

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

Romanian Research & Development Institute for Gas Turbines - COMOTI
Address: 061126, 220D Iuliu Maniu Blvd., Bucharest 6, ROMANIA
Phone: (+4) 021 4340198; (+4) 021 4340231; (+4) 021 4340239; (+4) 021 4340240
Fax: (+4) 021 4340241
E-mail: contact@comoti.ro
Web site: **www.comoti.ro**

COMOTI
ROMANIAN RESEARCH & DEVELOPMENT INSTITUTE FOR GAS TURBINES


ROMÂNIA PETROLIFERĂ
SOCIETATE ANONIMĂ ROMÂNĂ
CAPITAL SOCIAL 50000000 LEI
ACȚIUNE LA PURTĂTOR
O SUTĂ DE CINCI SUTE
Société des Pétro
SUBSOLUL ROMÂN
10 ACȚIUNI LA PURTĂTOR
SUBSOLUL ROMÂN

GSP Getting Where No Other Romanian Company Has Gone Before

Interview with Gabriel Comănescu, President & CEO of Grup Servicii Petroliere

Grup Servicii Petroliere (GSP) is the first holding built on 100% Romanian capital which delivers offshore construction and offshore drilling services. The group holds the most important position in the region, on this particular sector of industrial activities.
In 2021, GSP continues to perform well as one of the most profitable industrial companies in Romania and in the region. GSP's track record, projects and future plans are the basis of the interview we had the pleasure to take with the group's founder, President & CEO, Mr. Gabriel Comănescu.
GSP owns and operates, in an integrated system, especially designed to support the whole of offshore industrial activities. Starting from design and engineering, fabrication, logistics and up until installation and operation. GSP reunites the human and technical resources necessary to develop EPCI projects of major complexity.
The group has a strong fleet of support and construction vessels, together with drilling rigs designed for both shallow and deep water.
In GSP's ownership and operation we find the biggest sea crane in the Black Sea. GSP Neptun has a lifting capacity of 1800 tons.
GSP is one of the most important entrepreneurial endeavours in Romania. This year the group will reach its 18th year of existence. In 2011 the Romanian company was rated 2nd in the Deliotte Top 500 for Central Europe.

by **LAVINIA IANCU**
Photographs by **JUSTIN IANCU**

After graduating from "Mircea cel Batran" Naval Academy in 1989, Gabriel Comanescu takes is first career steps at ROMLINE, enrolling in the Romanian civil Navy. At just 25, he was already leading the first oil service company in post 89' Romania. He rapidly becomes one of the most successful businessmen in the industrial landscape of Romania and uses this experience to lay the foundation of GSP (Grup Servicii Petroliere), in 2003.

Just five years after its foundation, the Romanian company wins important offshore construction projects and offshore drilling campaigns in the whole world. This, in turn, raises the reputation of GSP and exponentially grows its client portfolio with some of the biggest names in the Oil & Gas business: ExxonMobil, TPAO, Gazprom, Japex, Siemens or Wintershall, just to name a few.

The rest is history as they say. Indeed, GSP has a certain historic relevance as the first Romanian, privately owned, company to reach a portfolio of over 70 successfully completed drilling projects, hundreds of km of underwater pipes and umbilicals laid and with major complexity EPCI projects that surpass 1 billion euros in value.

Dear Mr. Comanescu, how did GSP start its history, to date? What were the premises upon which GSP was founded and what are the worthy to mention milestones on the road so far?

GSP is turning 18 this year. Chronologically, we could say we are reaching adulthood, but, in reality, we passed the maturity test long ago, when together with a group of ambitious people we founded what was to become the most important and successful offshore construction and drilling group in the Black Sea region. GSP was built on a solid foundation of expertise and capital, both of which are 100% Romanian. I like to say that Grup Servicii Petroliere represents the sum of Romanian expertise in an industry that requires highly specialized experts, minute organizing and finally a lot of courage and endurance.

GSP is a company of "firsts". I say this with a dose of national pride: we are the first and only ones that managed to reach this level. The Black Sea was just the first step. It is here that we proved our capabilities by installing hundreds of km of underwater pipes, for world renowned clients.

With this "business card" in our wallets we managed to get where no other Romanian company has gone before. We drilled in almost all the world's oceans. We constructed large scale integrated projects going through all stages, from design and engineering through fabrication and installation, because our plan has followed a simple set of principles which I can summarize, we have to be the best at what we do

Photo 1: GSP Neptun Heading to Gloria Rig Decommissioning ▶

Photo 2: GSP Shipyard Base - Midia GAS Development Jacket for Ana Platform Fabrication

is Oil & Gas servicing. What we do is offshore drilling, onshore and offshore construction and Oil&Gas Services. Thus, we became the biggest deliverer of turnkey projects in the region, with a solid reputation, built on both quality of works and the knowhow of our engineers and representatives.

Twelve years ago, we were opening our first office abroad, in Rotterdam, Netherlands, following a set of large-scale projects such as DLS. Over 165 km of underwater gas pipes were installed on the bed of the Black Sea. Another example is the construction and expansion of the Akcakoca offshore gas field. GSP fabricated, transported and installed the biggest Jacket in the Black Sea, a detail not very many people know.

Time makes it impossible to go through all relevant milestones. Suffice to say, that by looking at our world footprint you will find GSP in almost all regions where offshore construction, offshore drilling, surveying and other Oil & Gas services were needed. Whether we are talking about the North Sea, the Gulf of Mexico or West Africa, be sure you will find GSP presence in relevant project for the region.

The last three years, along with international project, GSP has been building in Romania, for the American company Black Sea Oil and Gas, the first new offshore gas development project in the last 34 years. We are the main contractor for this work that involves complex offshore and onshore construction.

Also, the offshore operations for OMV Petrom are being handled, in an integrated contract, by GSP. We signed this contract in 2019. Our experience is intensively used in Romania, which is a matter of great honour and responsibility for us.

What are the major objectives upon which your business strategy is focusing?

Development, dynamics and adaptation. Three words that express very well GSP's business attitude. Although most of your readers know this, I would like to once again point out that the Oil & Gas market is highly volatile. A sure thing is hard to obtain in this business. Here you need intelligence and the capacity to adapt. Maybe more than other industrial sectors, in Oil & Gas you have longer investment periods, in which the project eats up resources and time. This is where you need good planning and development. The global pandemic has once again taught us that the only thing you can be certain about is change. This is where you need to quickly adapt, to dynamically evolve.

As opposed to other sector specific companies that reduced, some even drastically, personnel, development and investments, GSP did the opposite. We raised our workforce, we raised up investment budgets and took on new challenges. More than 2.6 thousand people are working in some form or other, for the extended GSP Group. We invested in a new management structure, we called in professionals and distinguished experts in their respective fields. We have also grown our technical capital because we want to be able to successfully handle all projects, as we time and time again said, of high complexity and difficulty.

◀ **Photo 1: BlgFoot 1 Pipelaying for Midia Gas Development**

Photo 2: GSP Saturn and GSP Prometeu Rigs in Berth 34

Increased interest of international oil and gas operators in the Black Sea has caused a recent boost of activities in this segment. Let's not forget that Black Sea hydrocarbon discoveries could also increase political influence. What are Romania's strengths in this context and how can Black Sea hydrocarbon exploration and production projects contribute to the development of Romanian economy?

The future of energy, regionally, is in the Black Sea. Whether we are talking about gas, a transition fuel towards renewable energy, or wind potential, it becomes elementary that the Black Sea, and especially the Romanian economic zone will act as a powerful magnet for big investments in energy.

Studies show approximately 170 billion cm, momentarily captive beneath the seabed of the Black Sea. These are however some of the most pessimistic studies out there. Speaking from my experience I could dare to say that a lot more gas is hiding down there, more than some people believe. The economic potential is huge, on both medium and long terms. We are talking about a continuous investment for a period of at least 20 years. A stable investment. Specialized studies predict an economic contribution of 10 billion dollars/year. This is from direct and indirect contributions. At least 15.000 jobs will be created. New jobs the offshore sector. A brief calculation shows us that at the end of the project all contributions to the national economy could go up as far as 100 billion dollars. Maybe more.

Economic growth, social benefits and jobs, all problems with one simple solution: invest in the offshore gas development of Neptun Deep. Extract gas from underneath the Black Sea, put it to use, and give one more powerful engine to the economy.

Let's also talk about the huge offshore wind potential of the Black Sea. The World Bank made public reference to a study that shows over 70GW of available power in the immediate vicinity of the Romanian Black Sea shores. Both fixed and floating structures. I can rhetorically ask how exactly did Romania became an importer of electricity. We are in a deficit of at least 2000 MW of power that could be easily balanced by only a fraction of our offshore wind potential.

These are just a few reasons why the European Commission recognized the economic potential of the Black Sea. I believe in the economic and political viability of energy projects in Romania. The energy independence we have so long been hearing about cannot be attained without Romania's resources. The decisive support for Romanian offshore projects could be a powerful political statement for our country. It is an action that can boost our economic power to such a degree as to significantly reduce imbalances between Est and West. Time is however our biggest enemy when it comes to developing historic new projects in the offshore of the Black Sea.

In September 2020, you announced, with Black Sea Oil and Gas (BSOG), the start of works at the submarine pipeline within the Midia Gas Development (MGD) Project, mentioning that the first Black Sea gas, exploited by BSOG, would

enter the National Transmission System in mid-2021. What is the status of works at this project?

In September we publicly announced the beginning of work for the HDD stage of the project. Horizontal Directional Drilling. More precisely we managed, in short time after the inaugural proceedings, to successfully complete this important stage. It was a complex operation, very technical. Today the subsea pipe of over 120 km is installed. The jacket for the Ana well is transported on site, offshore, and installed using four large scale piles. The first well will be shortly drilled. We registered important progress, in spite of the pandemic COVID 19 context. Nothing could come between us and our objectives and I have full confidence we will continue in an accelerated tempo. I fully maintain my previous statement. 2021 is the year that we will bring the first new gas molecules from offshore Black Sea, to the National Transport System. Drilling will begin, if weather permits, in May.

What are the international markets where GSP operates and the most important domestic and foreign partners of the company? What are the programs/projects?

We can say that we are also working at extending our development abroad. Today we are looking forward to working and constructing projects in the Mediterranean and Baltic Sea. Other regions we are active in are the North of Africa and the Middle East. These examples include projects that just now are being revitalized after the COVID-19 pandemic toned down.

What is the situation of the labour force within the company? Are young people still interested in the oil and gas sector?

Our employee number grew steadily in the last years, but especially in 2020. In spite of the fact that we found ourselves in the middle of a worldwide pandemic, great numbers of highly specializes Romanian experts returned to the country. We saw this opportunity and acted to access this important resource. Workforce naturally "gravitates" around companies that have ongoing projects, and we are such a company. We did not stop work for the overwhelming majority of our projects. We "injected" GSP with new blood. Young visionary managers joined our teams led by people with decades of operational experience in the field. Our Sharjah (UAE) division for engineering is led by a manager with 37 years' experience in offshore construction all over the world. Take this as an example, but keep in mind it is not a singular case.

The GSP team is a good and natural mix of Romanians and expats, of young professionals and already distinguished experts. Even if we are born in Romania, we have to admit that we successfully implemented the best practices in the Oil & Gas business. It is a natural evolution owed mainly to the fact that we spent a lot of time in international projects developed with big league, world renowned partners.

We are constantly investing in specialized workforce. I think this is an opportune moment to introduce you to our apprenticeship program. As a pilot project we made available professional training positions for welders, electricians and locksmiths. The program is dedicated and developed in rural Constanta. This is where, mostly for social reasons, people did not receive a formal education or training of any kind. We are trying to change this by giving apprentices a job, a wage, training, a place to stay and three meals a day. All we ask in return is they are serious about learning the tools of the trade, and that they show they want to become better at what they do. If the apprentices will be employed in further GSP projects and will develop a career in GSP for us it's a strong win. We get the satisfaction of giving people without true horizons a better future, but we also gain the benefit of building up the professional workforce in Constanta. If the program picks up, we can talk about further developing it in other parts of the country.

At the same time, for student engineers, sailors or economists, we develop yearly paid internship programs. GSP is, for these young professionals, an opportunity to learn on the job, using the best practices I talked about earlier. It would be a pity for all that experience and expertise not to be passed on to new generations.

Do you consider company's expansion in other areas of activity in the medium and long term? What will GSP's priorities be in this period?

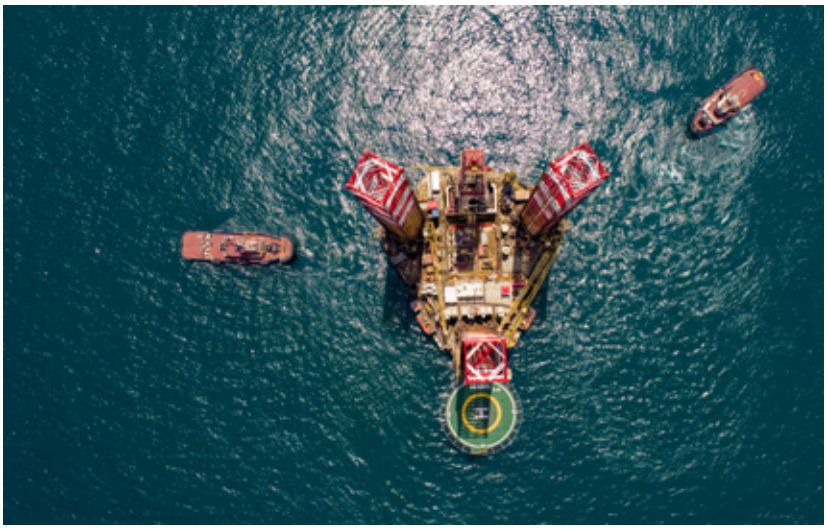
The extended GSP group covers a wide spread of services. We are constantly developing and adapting because we learned that adaptation, especially in dire times, is indispensable for survival. Now, if we focus on the trends of development in energy, it is impossible to ignore the major shift, in Europe, but also other parts of the world, towards Green Energy. Green Deal is putting forward ambitious medium- and long-term targets. The degree in which the transition into green, 100% non-pollutant energy systems is made, differs across the world. However, there is a constant. Natural gas is the new transition fuel that has to replace coal and ensure a smooth transition towards green.

The European Commission repeatedly stated that natural gases will permit a system wide adaptation to new renewable energy.

This is the basis on which GSP Power is formed. Our new energy division aims to implement gas-to-power in Romania. We have gas reserves and the technical capacity to exploit them, but we don't have enough electrical power in the system. From net exporter of electricity Romania, with a formidable mix of sources, reached a deficit of roughly 1.5 MW/h in 2019. The gap widened in 2020, when

Photo 1: Gloria Rig Transport on GSP Bigfoot 2 ▶

Photo 2: Uranus Rig



Romania imported with 2.8 MW/h more that we exported. We import from Ukraine and Hungary more that in the last years. What is missing? A reliable source of energy that offers flexibility to the system. This is, in broad strokes, gas-to-power.

Halanga is our maiden project for GSP Power, in Drobeta Turnu Severin. This is important because it's the first project in Romania that also encompasses a solar powered component that works together with the gas generation capabilities. The 50MW solar farm will replace a highly polluting ash and gravel deposit. Coal residues have been piling up on almost 100 acres in the vicinity of the power plant. At the slightest sign of wind over 50.000 households are being polluted. When our project will be ready this pollution generator will have been replaced by a clean energy solar farm.

We are interested in finding economically viable solutions that can truly contribute in the way that Romania perceives energy generation. For instance, an offshore windfarm in the Black Sea. What would it mean for the local economy? The potential is there. The World Bank sees it, also does the EU. We are the group with the biggest experience in offshore construction, at least regionally. We can also notice a working recipe successfully applied by other offshore drilling and construction companies that profile themselves doing work for renewables.

What challenges does the current social and economic crisis caused by COVID 19 bring for GSP and how do you plan to address them?

We can narrow down business views in the pandemic in two big choices. Either you understand the change around you and adapt your business model to the new reality, or you give up on change and refuse to understand the need to adapt to the unforeseeable. You and your readers can probably guess which choice we made at GSP. Just to put things into context I'm going to tell you a short story. In 2015-2016 the Oil & Gas world registered the biggest, most acute, crisis in decades. Oil dropped with over 70% in a matter of months, reaching scores of under USD 36/bbl. Way too low to support investments and development, especially in offshore. As a direct result a great deal of the offshore service sector succumbed under pressure. Seadrill, Weatherford, Paragon Offshore, Hercules Offshore put in for Article 11. Declaring their insolvency. GSP survived, with no small sacrifices, those years of crisis. It took long to recover and recuperate what was lost in 2015, but we did it because myself and my team were capable and prepared to efficiently handle a crisis. We oriented ourselves toward clear objectives, we rationalized resources and, very important, we always respected our engagements towards our clients.

The COVID-19 crisis was surprising but found GSP ready and prepared. If you remember, the start of 2020 found GSP successfully handing the Queen Hind refloat operations. The biological load was hazardous, and our teams had to take all safety precautions. Equipment, medical personnel, medications and treatments and so forward. In Oil & Gas safety in paramount. We hold an immaculate Health and Safety track record.

Rolling back the clock one year we see a lot of hysteria surrounding COVID-19. Crisis in not correctly handled with hysteria, but with steadiness, calm and forward thinking. Let me walk you through what we did in trying to foresee where the pandemic was heading. We listened to OMS advice and acted on the principle "test, test and test some more". We elaborated and applied throughout the group a set of rules to prevent and fight the pandemic. We strengthened the GSP medical team. We recurrently tested GSP employees, and especially offshore personnel. We adapted; I'd say very well to the situation. When Romania was struggling with over 10 thousand cases/ day GSP did not interrupt work, not even for one day.

We acquired tests. We acted in partnership with the Public Health Department, and other public authorities. We donated 15.000 tests destined for medical doctors and nurses in Constanta. Test ware scarce to come across in spring 2020. We contributed with donations to hospitals. We tried to act responsibly not only for our employees, but also for the environments they come from.

As the crisis got worse GSP changed the supplier of Medical Evacuation by air. I believe we were the only ones that could safely evacuate COVID 19 cases via helicopter using pressurized cabins, indispensable for serious situations.

Together with HSEQ professionals we took the decision to ensure, for all offshore personnel, a buffer period before shipping out. For five days each and every offshore worker was preventively isolated in a hotel and tested for any traces of COVID 19. Our company ensured PCR testing, rapid testing, antigen testing and antibody testing. The great majority of GSP employees and collaborators understood the gravity of the situation and appreciated the support the company gave them, and their families.

Now, looking back, I don't think I would have acted differently. Work was not suspended; people are being kept safe and we continue to do the best we can to keep things under control. Now, we are building three infirmaries destined for our operational bases, in order to have the possibility, together with public authorities, to administer vaccines in optimal and safe conditions.

Now we clearly notice a rise in optimism, after the rolling out of the vaccine. The market is once again balancing itself and we see, after one year, an equilibrium that will give power to further investments.

How do you assess the evolution of the oil and gas market for the following years? Do you believe in a strong recovery of investment in this area?

Crisis in not new in Oil & Gas. As I said before, the market works in specific cycles. In 2015 the crisis was much more profound. Investments crashed, thus oil services capsized. Coming back to 2020, the market saw a double negative impact. The drop in demand was doubled by a global oil price war. This gave way

to a historic drop of prices, under zero. It suddenly became more expensive to keep oil than to give it away for free. Happily, this was short lived. Just an anomaly. Prices are now at an ever-higher level that they were before the pandemic. Now there are talks of oil reaching USD 100/bbl.

COVID 19 came at a comeback moment for Oil & Gas. After five years of crisis the market was just recovering. The proverbial light at the end of the tunnel was visible. However, fate put on pause a growing market trend, investments, trust altogether in new projects.

Now, regionally I can stake on a powerful comeback of the market. We can count on a rising confidence in the profitability of major new projects. Globally, along with the massive reduction of the number of COVID 19 cases, along with the lifting of lockdown measures and the rise of demand for energy things will naturally come back to normal. This can, in turn, bring successive growth to oil service market, to offshore construction and offshore drilling. The investment prudency is still there, but I am sure companies with vision will take the chance to invest and develop a positive investment strategy.

We can find a concluding argument for this, once again, in the Black Sea. Ukraine announces a new partnership for offshore development. Tukey is in search of partners for big offshore development projects. Bulgaria announces investments in their perimeters, such as Han-Asparuh. The level and timing of these investments is determined by trust. If the level of trust in the viability of the market rises, we shall see this strongly reflected in investments, new projects and developments. ■

Powerful Magnets to Remove Wellbore Debris from Deep Down

Easy-to-use, highly successful and field-proven magnets for wellbore cleaning and fishing operations to increase uptime and cost reduction

A third of all failed completion runs globally are attributed to wellbore debris. As a result, you'll have multiple runs being required to set and test the completion, wireline or coil type mechanical or inflatable bridge plugs. "For oilfield operators these are costly runs, resulting in non-productive time (NPT) and therefor lost revenue" says Leonard Corcodel, Senior Sales/Operations at Dosco PetroServices, the exclusive distributor of Innovar fishing and well cleaning products in Romania.

For fishing operations, conventional fishing techniques require an expensive bottom hole assembly (BHA). But there is no guarantee you'll be able to engage the fish, which can potentially result in multiple runs being done. "This makes operations costly and incurring expensive NPT resulting in major lost revenue." The same goes for the cleaning of a blowout preventer (BOP). Normally you would require a jetting sub, which tents to damage seals and/or the seal face from water cutting. "When this happens, the BOPs need to be removed and dismantled, similarly resulting in costly repairs and again lost revenue."

Dosco always tries to source new technologies and products that could benefit its customers. "We started our partnership with Innovar Solutions because of their alternative solutions for wellbore cleaning, fishing and BOP cleaning. Innovar Solutions provides easy-to-use highly successful and field-proven magnets for wellbore cleaning

"We started our partnership with Innovar Solutions because of their alternative solutions for wellbore cleaning, fishing and BOP cleaning. Innovar Solutions provides easy-to-use highly successful and field-proven magnets for wellbore cleaning and fishing operations to increase uptime and cost reduction."

Leonard Corcodel, Senior Sales/ Operations at Dosco PetroServices

BOP Cleaning Assembly

WirlTool®

Innomag® String Magnet

and fishing operations to increase uptime and cost reduction."

The Wirtool for BOP cleaning is one of those innovative products that we are very excited about. The Wirltool generates a venturi effect when the horizontal flow passes the BOP cavities, sucking out debris from these. And combined with Innovar's powerful Magnum and Innomag magnets, our customers are ensured of the most efficient well cleaning assembly available in the current market.

As the exclusive distributor of Innovar products Dosco PetroServices offers the Magnum, Innomag magnets and the Wirtool, which hold many features and advantages.

Magnum Fishing Magnet

Magnum magnets feature laser focus magnet technology that centre the magnetic field focused on the fish with no disturbing magnetic field towards the pipe wall. They ensure up to 2,800 kg lifting capacity and a working temperature of 160 degree Celsius. Also available is a magnetic shielding for flight/helicopter, certified according to IATA regulations. This allows for quick mobilisation, thus reducing the time waiting for equipment.

Innomag & Innomag HD String Magnets

These include traditional WBCU string magnets and heavy-duty string magnets for milling operations. Amongst their numerous features are their extreme magnetic range, due to the large magnet mass; large fluid by-pass; and easy cleaning and maintenance.

Wirltool

The Wirtool is a BOP cleaning tool that creates a powerful circular flow pattern that establishes a vortex that draws/pulls debris from the BOP cavities and crevices. It minimises the risk of water cutting of the BOP sealing elements as opposed to traditional jetting tools. The tool also reduces the risk of failing BOP pressure tests caused by metal shavings, prevents expensive and time-consuming maintenance of the BOP on surface, and reduces spilling of mud on deck when the riser is laid down.

dosco.ro

Naftogaz to Cooperate with OMV Petrom for Gas Exploration and Production

Naftogaz Group signed a memorandum of understanding for the cooperation with the leading integrated energy company in South-Eastern Europe – OMV Petrom, headquartered in Romania. Naftogaz and OMV Petrom will seek to establish joint gas exploration and production projects in Ukraine.

During 2020 Naftogaz worked to create and open new opportunities for exploration and development of new gas fields in Ukraine. With the award of substantial license potential in the Offshore Black Sea, Yuzivska and remaining potential in West Ukraine, Naftogaz now is accelerating its investment plans. Part of our strategy is to bring on board international, experienced partners to co-invest with Naftogaz. Attracting international investors is an important contributor to achieve gas independence for Ukraine by 2030. We believe OMV Petrom is a valuable and reputable partner who brings investment capacity, expertise and relevant experience in the region. The Company discovered the promising Neptun field in the Black Sea, has experience and knowhow in offshore drilling and has a proven record of successfully and efficiently exploiting the onshore resources of the Carpathian region in Romania, which share a common geological history with the Carpathian region in Ukraine. We see great potential for collaboration in those areas and look forward to establishing our cooperation concretely in the near future," Otto Waterlander, Chief Operating Officer of Naftogaz Group, said.

Naftogaz and OMV Petrom will start analysing opportunities for cooperation in the prospective offshore blocks in the Ukrainian Black Sea. According to the government's resolution, Naftogaz has already applied for 36 special permits for the exploration of these blocks.

"Our strategy is to expand our activities in the Black Sea region. Ukraine is a natural step for assessing opportunities in the area, as the country hosts one of the largest potentials for natural gas production in Europe. We are pleased to start exploring ways of working together with Naftogaz and are focused on efficient, mutually beneficial cooperation to advance some of these opportunities", Christopher Veit, Member of the OMV Petrom Executive Board responsible for Upstream, summarized.

As reported, in 2020 Naftogaz developed and launched a new Strategy for the resource base development, which aims for doubling the Company's reserves. Exploration and development of the Black Sea areas, tight gas deposits, Yuzivska area, and promising areas in the Western region are among the strategic projects.

About Naftogaz

Naftogaz is Ukraine's national oil and gas company, one of the major players in the CEE gas market. The group provides development and exploration of oil and gas fields. The Company offers drilling, gas and oil transport and storage, and supply of natural gas and LPG to consumers.

In 2020, Naftogaz produced 13.45 bcm of commercial gas. This is 73% of all natural gas production in Ukraine.

Products

API and non-API downhole pumps
Fiberglass Sucker Rods (FSR) and accessories
Steel Sucker Rods (SSR) and accessories
Plunger lift equipment and accessories

Product Services

Downhole API pump repair service
FSR/SSR technical service and installation
Rod string design and optimization
Rod pump failure analysis
Customized services and solutions

Performance-Based Asset Management

Full-line production and run-life optimization
Asset tracking and condition monitoring utilizing our Proprietary Interface Upstream Platform

7 Piatra Craiului St. | DIBO Industrial Parc | Negoiesti | Romania
Phone: +40 244 542 029
For more information please contact us at office@endurancelift.com

CDI
OILFIELD SERVICES

Florinel Dinu is Rector at the Petroleum-Gas University of Ploiesti; Technical Judicial Expert of the Ministry of Justice; Expert of the National Agency for Mineral Resources; Expert and Project Verifier of the National Energy Regulatory Agency.

Talking to Experts
Prof. Habil. Florinel Dinu Ph.D. Eng.

UPG AND TRANSGAZ TO COLLABORATE ON HYDROGEN PRODUCTION AND STORAGE

There has been a lot of talk about a V-shape economic recovery, but the factor that will have a greater influence on oil in 2021 is the vaccination process. Increases in COVID-19 positive tests after holidays and the third wave of the pandemic (with unpredictable effects) force governments to become more determined with the measures of blocking economic and social activities.

Text by **Daniel Lazar**
Photo by **Justin Iancu**

They should have, at least in the short term, an impact on oil prices. A possible increase in the first quarter in the number of COVID-19 cases in Japan, South Korea and South-East Asia countries is not however critical, in conditions in which the Asian outbreak is approaching a fraction of the cases observed in the first four months of 2020.

"In Europe, the situation is now uncertain, and we cannot rest assured that domestically we have a good situation. So, the number of cases of illness will be essential for energy performance in the first third of 2021," says the Rector of the Petroleum-Gas University (UPG) of Ploiesti, Prof. Habil. Florinel Dinu Ph.D. Eng.

The new year started with significant oil quantities in the tank farms existing around the world. Total inventories in the US are slightly below 500 million bbl and the surplus to the average of the last five years is at a difference of 50 million bbl. Most of the global surplus is located in the US, on the Gulf of Mexico coast, and in China (being an ambitious buyer of strategic reserves during price decline in 2020).

The pandemic has transformed business and holiday travel and aircraft fuel is important for the recovery of the oil market. The decline in global demand for aircraft fuel will have an impact on refineries throughout 2021, in conditions of reasonable scenarios. As such, the lack of air traffic was the factor of blockage for refineries in nine of the 12 months of 2020.

"In the last decade, many new refineries, but also the existing ones, increased production for aircraft fuel, as it was seen as a rapid growing hydrocarbon that would ensure profits, especially in emerging countries, which currently dominate the most popular air routes. The production of aircraft fuel was

reduced to the minimum by the pandemic. It is safe to say that globally, the demand for aircraft fuel will not return anywhere in the world close to the level of consumption in 2019, in 2021, regardless of whether COVID-19 vaccinations will be remarkably successful.

As regards Romania, domestic production (3.47 Megatons) reached approximately 33% of the oil demand in 2019, imports representing 6.84 Megatons. In 2019, natural gas accounted for 30% of the gross energy consumption, while crude oil and petroleum products accounted for 29% of the gross energy consumption. Romania covers most of its gas requirements from domestic production. 2020 was an atypical year, as it has been mentioned before, but probably for a situation of relative normalcy, oil/gas consumption will be slightly lower, and the ratio will remain at 1/3 the share obtained domestically by OMV Petrom (in particular) and 2/3 the imports processed at the Rompetrol and Lukoil refineries. However, the capacities of refineries in Romania are much higher than domestic consumption and a much higher oil quantity than domestic consumption is processed and sent for export," Rector Florinel Dinu also says.

"Natural gas necessary for domestic consumption is produced almost entirely by the two major domestic producers, Romgaz and OMV Petrom, and the need for imported gas has disappeared due to a reduction of consumption through the domestic recession in several production activities. Trends of increasing coal consumption in order to extract hydrogen through various modern technologies and injecting it into the gas transmission pipelines of the National Gas Transmission Company can increase the use of natural gas with beneficial effects of return and reduction of environmental pollution. To solve this issue as soon as possible, Government's involvement is needed. An important role in carrying out the project of reduction of environmental pollution by using hydrogen enriched natural gas is the partnership between the Petroleum-Gas University of Ploiesti and the National Gas Transmission Company Transgaz, established at management level. The University has submitted for this purpose a project financed from the European funds, which is the result of collaboration of two research collectives consisting of teachers from the faculties of Petroleum and Gas Engineering and Oil and Petrochemical Technology, with the aim of building and equipping two research laboratories with modern equipment and simulators for obtaining hydrogen by applying various technologies. Another issue of equal importance is the processes of hydrogen storage and its measured injection into gas trunklines. In this context, I can proudly say that the Petroleum-Gas University of Ploiesti, through its specialists, teachers of high scientific standing, aligns with the experience they have gained in over 73 years of activity and responds promptly to the greatest ENERGY challenges. We like to say that the Petroleum-Gas University of Ploiesti is a university forming energies," Florinel Dinu also said.

The Government of Romania is concerned with capitalization on Black Sea gas, in conditions in which its price is starting to grow again. An important piece of legislation recently adopted is Law 256/2018 on certain measures necessary to implement petroleum operations by titleholders in offshore blocks (the Offshore Law), which introduces the windfall tax and a number of additional obligations for the offshore industry, such as: the obligation for subcontractors to maintain an affiliate in Romania during operations; the obligation of titleholders to purchase goods and services from Romanian and EU economic operators, based on equivalent technical and price conditions; at least 25% of the average annual number of employees of titleholders must be Romanian citizens and tax residents; rights related to oil and gas exploration and production (defined collectively as 'petroleum') can only be obtained based on a petroleum concession agreement concluded by the National Agency for Mineral Resources (NAMR) with the winner of public tenders (organized by NAMR) for the designation of petroleum zones; subject to specifics of each phase of the petroleum operations, there are also regulations issued by NAMR, the Competent Regulatory Authority for Black Sea Offshore Petroleum Operations, ANRE, the Ministry of Environment, the Environmental Protection Agency and other regulatory authorities. Therefore, we can notice a concern for supporting national interest that can be amplified in a year when the budget is restricted, and it is desired to attract additional resources.

Concern for controlling petroleum resources is also noticed in the amendments to the Petroleum Law No. 238/2004 and GEO No. 27/2020, referring to titleholders of petroleum agreements. Amendment to the Petroleum Law 238/2004 through GEO 27/2020 shows the importance of titleholders of petroleum agreements and the direct involvement of Romania's Government in changing the titleholders, as well as in relation to legal persons from EU third countries. The important amendments refer to:

- The titleholder of a petroleum agreement can transfer to another legal person the rights acquired and the obligations assumed only after approval, by Government Decision, at the proposal of the competent authority.
- In the event where an operation takes place for taking over control over the titleholder of a petroleum agreement or a change in the ownership structure with controlling right over the titleholder, the new conditions shall be notified to the competent authority for approval, by Government decision.
- The competent authority may refuse, on grounds of national security, the concession and execution of petroleum exploration, development and exploitation operations of a petroleum field by legal persons that are effectively controlled by third countries outside the European Union or third country nationals. ■

PARTNER SPOTLIGHT

FISHING & WELLBORE CLEANING

INNOVATIVE SOLUTIONS FOR CLEAN & EFFICIENT WELLS

- 20+ YEARS OF EXPERIENCE
- HIGH QUALITY PRODUCTS
- EASY-TO-USE & FIELD PROVEN

FEATURED PRODUCTS

Innovar WirlTool®

A POWERFUL BOP CLEANING TOOL

The Innovar WirlTool creates a powerful circular flow pattern that establishes a vortex that draws/pulls debris out from the Blow Out Preventer (BOP) cavities and crevices. The tool is designed to remove metallic/ non-metallic debris that could adversely affect a BOP's performance.

FEATURES & BENEFITS

- Creates a powerful circular flow pattern that establishes a vortex that draws/pulls debris from the BOP cavities and crevices
- Minimizes the risk of water cutting the BOP sealing elements as opposed to traditional jetting tools
- Reduces risk of failing BOP pressure tests caused by swarf
- Prevents expensive and time consuming maintenance of the BOP on surface
- Reduces spill of mud on deck when riser is laid down

Innomag® String Magnet

THE STRONGEST STRING MAGNET

A high capacity wellbore cleaning tool, designed for wellbore cleaning applications and removing large amounts of ferrous swarf that can't be circulated out. With no moving parts and with Innovar magnet technology, it is the optimal tool for all clean-out operations.

FEATURES & BENEFITS

- Large fluid bypass
- No moving parts
- No internal bearings or wear parts
- Full 360° stabilization
- Low maintenance
- Magnet elements integrated in the tools

BOP Cleaning Assembly

COMBINED POWER FOR EFFICIENCY

The Innovar BOP cleaning assembly assures efficient removal of swarf and debris from the BOP and Riser. It prevents expensive and time-consuming maintenance of the BOP on the surface, it reduces spill of mud on deck when the riser is laid down and it reduces the risk of BOP problems during operations caused by swarf.

FEATURES & BENEFITS

- Quick and effective BOP cleaning
- Minimized risk of water cutting the BOP sealing elements
- Reduced spill of mud on deck
- Reduced risk of BOP problems during operations, casued by swarf
- Prevent expensive and time-consuming maintenance of BOP on surface

Dosco is the exclusive distributor of Innovar fishing and well cleaning products in Romania

Visit dosco.ro for more information

dosco partners


KLM
48000 L
Shell
Jet A-1
VOLVO
VOLVO

World's First Flight Operated with Synthetic Kerosene

A KLM aircraft powered by synthetic fuel transported passengers from Amsterdam to Madrid last month, being the first flight in the world operated with synthetic kerosene, the Dutch government and the air operator announced.

by **Daniel Lazar**

Photo: **KLM**

In recent years oil prices have fallen, sometimes even dramatically for the profile industry, and with the increased penetration of electric or hybrid cars and alternative energy sources it was thought that the fall would be irreversible.

Except on February 8 oil prices surpassed the threshold of USD 60/bbl for the first time in more than 12 months, this in conditions in which inventories continue to plunge, and prospects on global demand are improving. Therefore, around noon, Brent oil was on the rise 1.2% compared to the benchmark on February 5, to USD 60.06/bbl, after it had reached an intraday maximum of USD 60.27/bbl, the highest price since January 2020.

During the Covid-19 pandemic and especially when the global economy worked at extremely low rates, fuel demand fell and, therefore oil inventories shrank, but as the market started to rebalance prices followed a slightly upward trend.

Global inventories fell by approximately 300 million barrels as of May 2020, when OPEC and cartel's allies agreed to significantly reduce the common output, according to estimates of the International Energy Agency (IEA). In China, one of the main drivers for market recovery, oil inventories had fallen to the lowest level in the first year.

The number of oil tankers heading to the Asian market reached a maximum of the last 6 months last week, and purchases are in 'significant growth' according to Ben Van Beurden, CEO of Royal Dutch Shell.

In this quite volatile context, a news report in the aviation field draws particular attention, as it is published a few days after the event. A KLM aircraft powered by synthetic fuel transported passengers from Amsterdam to Madrid last month, being the first flight in the world operated with synthetic kerosene.

The KLM aircraft used regular fuel mixed with 500 litres of synthetic kerosene produced by Royal Dutch Shell with carbon dioxide, water, and renewable energy sources, along with regular fuel to power the aircraft, according to a statement of the Dutch group.

Shell, producer of the sustainable kerosene and KLM, operating the flight, presented this showcase during the meeting initiated by Cora van Nieuwenhuizen, Dutch Minister for Infrastructure and Water Management. European politicians, policymakers, representatives from the business community, the (aviation) industry and NGOs participated at the conference.

The Netherlands is one of the leading countries in Europe that aim to boost the development and application of sustainable aviation fuels to make aviation more sustainable. The Netherlands wants to stimulate the development and application of sustainable aviation fuels (biofuels and synthetic kerosene) so European airlines will be able to fly entirely on sustainable fuel by 2050. The Dutch government supports various initiatives to stimulate production and use and thereby make it commercially viable. The construction of the first European factory for sustainable biokerosene in Delfzijl, The Netherlands, for which SkyNRG is collaborating with KLM, Schiphol Airport and SHV Energy, is one example.

500 litres delivered, refuelled and used

As announced during the conference, the first commercial passenger flight from Amsterdam Airport Schiphol to Madrid last month, was carried out on an admixture of 500 litres of sustainable synthetic kerosene. Shell produced the synthetic kerosene in its research centre in Amsterdam based on CO2, water and renewable energy from sun and wind from Dutch soil.

"I am proud that KLM is today operating the industry first flight using synthetic kerosene made from renewable sources. The transition from fossil fuel to sustainable alternatives is one of the largest challenges in aviation. Fleet renewal contributed significantly to the reduction of CO2 emissions, but the upscaling of production and the use of sustainable aviation fuel will make the biggest difference for the current generation of aircraft. That is why we teamed up with various partners some time ago, to stimulate the development of sustainable synthetic kerosene. This first flight on synthetic kerosene shows that it is possible in practice and that we can move forward,"Pieter Elbers, CEO KLM, said.

"Making aviation more sustainable is an international challenge that we face together. Today we are taking a great step in the new chapter of aviation. This promising innovation will be of great importance in the coming decades to reduce CO2 emissions from aviation. It is great that in the Netherlands we were the first to show that this is possible: a big compliment for all involved. I hope that, in these turbulent times for aviation, this will inspire people in the sector to continue on this course," Cora van Nieuwenhuizen, Dutch Minister of Infrastructure and Watermanagement, added.

"Shell is an active player in the energy transition and our contribution to this world first is an example of this. I am extremely proud that we have succeeded in producing 500 litres of jet fuel for the first time based on CO2, water and renewable energy. It is an important first step and together with our partners we now need to scale up, accelerate and make it commercially viable," Marjan van Loon, President and CEO Shell Netherlands, mentioned

New initiatives and start-ups

During the conference, the stage was set for various new initiatives and start-ups. For example, the start-up Synkero announced that it is collaborating with Port of Amsterdam, Schiphol, KLM and SkyNRG on the realization of a commercial synthetic sustainable kerosene factory in the Amsterdam port. The project seeks to link with sustainable initiatives in the North Sea Canal area, such as the establishment of a 100-megawatt hydrogen plant where up to 15,000 tons of green hydrogen can be produced with sustainable electricity.

Another initiative is the construction of a demonstration factory for sustainable kerosene using captured CO2 from the air as a raw material in Rotterdam. The Zenid initiative, in which Uniper, Rotterdam The Hague Airport, Climeworks, SkyNRG and Rotterdam The Hague Innovation Airport are participating, uses a combination of innovative technologies to focus on CO2-neutral aviation with sustainable synthetic kerosene.

Several European politicians, including Commissioner Timmermans, the German transport minister Scheuer, and his French colleague Djebbari, underlined the importance of developing sustainably produced aviation fuels to reduce CO2 emissions and give aviation a good future.

Various European member states have indicated during the conference that they want to work on this. In a joint statement, the Netherlands, France, Sweden, Germany, Finland, Luxembourg, and Spain indicate that recovery from the current crisis due to the pandemic must go hand in hand with accelerating the sustainability of the aviation sector to achieve climate goals and call on the European Commission to come up with a European blending obligation. The Member States view the development of sustainable synthetic kerosene in addition to sustainable biokerosene as one of the most promising and effective ways to reduce aviation emissions in the coming decades.

Therefore, even in conditions in which oil prices have risen due to higher demand, the development and implementation of synthetic alternatives and biofuel are seen as essential to long-term efforts to reduce greenhouse gas emissions in aviation, but not only.

Kraftanlagen Romania
A member of Bouygues Construction

ipip S.A.
A member of Bouygues Construction

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

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

The range of our solutions:

- Feasibility, process studies
- Basic design and front end engineering design
- Multidisciplinary detailed engineering
- Technical documentation for authorities
- Project management
- Technical assistance for commission, start-up, test run, guarantee test
- Supply and installation of all pipelines and brackets
  Basic and precision installation of all components, such as devices, columns, pumps and compressors
- Steel construction
- Installation of cracking and reaction furnaces
- Tank farm construction
- System integration, operating checks and commissioning
- Plant revisions
- Pipeline and bracket corrosion protection
- Insulation
- Scaffolding

PETROTEL-LUKOIL Strategic Priority

INVESTMENT IN INNOVATIONS TO REDUCE CONSUMPTION OF NATURAL RESOURCES, MATERIALS AND ENERGY

2021 is a special year for LUKOIL. It marks 30 years of development, research and implementation of new projects in over 30 countries and four continents. On this occasion, Alexey Kovalenko - CEO PETROTEL-LUKOIL, shared some thoughts on the achievements as well as prospects of the refinery for the following period.

Text by **Lavinia Iancu**
Photo by **Justin Iancu**

PETROTEL-LUKOIL refinery has received numerous awards, prizes and medals of honour for its contribution to the development of LUKOIL company. What are the most important and recent achievements of the refinery you run?

PETROTEL-LUKOIL has been re-created to be a model of refineries in terms of BAT, in terms of specific refinery indicators and in terms of efficiency and top-quality products. Despite its small processing capacity, the refinery has always fulfilled all challenges, during its strong reconstruction. Despite the social and economic crisis, the current coronavirus pandemic and other factors, PETROTEL-LUKOIL has moved forward with a complete implementation of BREF documents and also of Directive 2013/84/EU related to best available technologies and the Directive 2010/75/EU of the European Parliament, focusing on environmental investment (revamping performed), making 'PETROTEL-LUKOIL' become one of the top enterprises in the crude oil refining industry of Romania, significantly improving the crude refining depth – up to 99.5%, and increasing the quality of products; due to the high amount of investment in the revamping interval, we continue the plan on revamping production capacities and safe environment, complying with the General Development Programme of Refinery and UE requirements. The refinery in its modern image meant the Reconstruction of facilities for Crude and Vacuum Distillation, Diesel Hydro-treating, Catalytic Reforming, FCC, Gas Fractionation and Isomerization, Fuel and LPG Loading Facilities as well as construction of new units: Hydro-treatment of FCC Gasoline (Prime G+), New Hydrogen Plants, MTBE-TAME Unit).

Two current major investments with an excellent

result for the air quality and environment should be included in this frame of recent achievements, benefits:

- A long-termed revamp of the Delayed Coker Unit carried out in stages, one of the stages, currently, bringing about 13 million USD and briefly this is to bring to zero the emissions from processing;
- Construction of a new Sulphur recovery unit that requires about 30 million USD that will allow zero emissions in the accidental release of Sulphur oxides which may be generated in case of technical incidents.

A good modernization, in terms of energy efficiency, has been done with Vacuum atmospheric distillation heaters and Catalytic reforming heaters, same in case of air compressors. Presently, we are also carrying out the optimization of heat exchange within VAD (Vacuum atmospheric distillation) and Real Time Optimization.

Although last year has been challenging, our Company has found as always, the best solutions to maintain both its employees and facilities and to revive this year AS Phoenix, as our First Executive Vice-president of LUKOIL enjoys saying. REFINERY PETROTEL-LUKOIL has been awarded by the top management of LUKOIL Company, for the best unit (CCR UNIT) and also in February 2021 a good number of managers and processing employees have been awarded medals of honour, diplomas and signs of gratitude for their contribution to the total development of Company. So, we believe that this is a result of a professional work and one based on our team!

What concrete directions do you plan for the following period under the motto ALWAYS MOVING TO A BETTER FUTURE (economic, social, environment, community)?

People and Environment are definitely requiring most of our attention now. Environment, because the difficult challenges imposed by technologies, market and climate, are requiring a permanent investment and re-adjustment of our means of technology - currently the refinery is undergoing a short process of maintenance to bring a plus into our main units and most of all to environment, which is a mandatory action not only for this industry but for all of us.

Current modernizations are taking place with: Catalytic Cracking Complex; Delayed Coker Unit; Diesel Hydrotreating Unit.

Currently, there is a number of technological solutions that can significant-

ly reduce CO2 emissions even at highly complex refineries. The most promising solutions are carbon capture and the use of renewable energy to produce hydrogen, the production of modern biofuels and energy efficiency improvement, which we have not only in mind, but also on paper and we look forward to implementing.

On the community side, the PETROTEL-LUKOIL refinery has always been present through its charity program and grants offered under Lukoil policies (as mentioned in other editions of this energy magazine) towards social and economic perspectives for the regions where it activates. Thus, an encouragement for young people to preserve traditions of the regions and create career and projects opportunities has been motivating within the grants LUKOIL has implemented in Romania two years ago -Romania is the first EU country where LUKOIL company has brought its tradition of these grants with positive impact and generating continuous results today.

How do you assess the impact of changes imposed by the European Union on the fossil fuels market on refinery's activity?

We live in a world still based on oil, natural gas or coal. If we look at statistics, we may notice that more than 70% of the energy is one based on oil and gas. Nuclear energy has reached 14% and green energy covers our needs somewhere at 9% in Europe. We see that green energy has started growing rapidly, thus our Company has been doing research and included in its Strategy some points as targets both for short and medium term.

The company's strategy includes some main targets, such as increasing the energy efficiency and technologies supporting green energy in all refineries. Company predictions, based on scientific research and global statistics also referring to transportation, suggest that in the forecast period, European countries will not be able to completely exclude diesel, as commercial transport is the main consumer of diesel in Europe. For a short period, European demand for diesel may even grow.

As a future perspective, we may expect that the share of light grades in the mix of refined feedstock will reduce, that the spreads between light and heavy oils will increase and increasing the spread between dark and light petroleum products will be promoted. Consequently, this will improve the economics of the refinery's conversion processes. (There is a direct correlation between the production of high-quality light petroleum products and the volume of carbon emissions. The more complex the refinery, the more conversion processes it runs and the more carbon it generates).

According to other companies' views, between 2020 and 2025, the global distillation capacity will increase by 12 mb/d.

Do you consider, in the following period, to initiate projects dedicated to the production of green energy, possibly by accessing European funds, or you rely exclusively on protecting and supporting the existing production components?

The Company shall continuously improve its current facilities and with a view to current challenges we are creating our strategy and analytics and action as to the best of our reserves, environment and employees. Major commissioning of greenfield projects is expected in 2020 and 2024, according to Company's strategy.

Investment in future opportunities, including in innovations to reduce the consumption of natural resources, materials and energy, but keeping up with a perfect output, are considered by our Company as its strategic priority. ■

30 LUKOIL

PETROTEL-LUKOIL

A Refinery of People

235 St. Mihai Bravu
100410 Ploiesti
Romania
Tel: +40 (0)244 504 000
office@petrotel.lukoil.com
www.petrotel.lukoil.com/ro
www.facebook.com/rafinariaPLK

Ganzair Compressortechnics

LONG HISTORY, STILL PERMANENT REVIVAL

The many years of experience of the long-lived Ganzair Compressortechnics LLC is combined with constant renewal and development.

Small history picture

The brand name of GANZ has become one of the most significant trademarks of the Hungarian industry. Since the foundation in 1849, GANZ companies have been manufacturing compressors, pumps, turbines, locomotives, trams, trolleybuses, bridges, cranes, ships, transformers, motors and a wide range of other machinery products for decades.

Being consistent with historic traditions and facing new challenges at the same time, Ganzair Compressortechnics LLC was founded in 1990 in order to specialise in compressor technology. The company is a management owned business.

In 2005 the company introduced diesel and gas engine powered generating sets for continuous and stand-by power generation in island or grid synchronous operation.

The current ownership structure was established in 2016 and Oliver Gidai become the CEO.

Pillars of Ganzair LLC

Compressors for compressing air, industrial gas, natural gas, gas treatment, storage equipment, as well as power generator design, production, installation and servicing of these systems for business customers – these are the main profile of Ganzair.

As a brand-independent supplier, the company covers the entire value chain of survey, consulting, design, development, assembly, installation, maintenance, parts supply, service and renovation. It's energy and cost-effective system solutions for customer demand provide the best-fitting service combination.

The satisfaction of international and Hungarian partners has been proving to them for 30 years now that their innovative engineering developments with high technical added value effectively contribute to their business performance.

Oliver Gidai
Owner of Ganzair Compressortechnics LLC

The equipment shown in the picture is a gas engine driven natural gas reinjection unit. Its function is to increase the layer pressure of oil wells for higher oil yield.

Huge experience in the gas compressor division

The company has decades of experience in development and production of gas compressors in the oil and gas industry. Ganzair LLC is the leader manufacturer of special gas boosting equipment in Central and Eastern Europe and the Middle East region and CIS countries.

The members of the company are always looking for opportunities around the world so that their unique products can be delivered into many different areas of the oil and gas industries. For the manufacturing of gas compressors, the main aspect has always been to adjust to the unique market demands, project-specific design and manufacture, that is primarily to offer solutions on a competitive price. For the demand of wide range of power (4kW – 5MW), Ganzair has appropriate production capability for manufacturing and installation of this equipment.

In the past few years, the gas compressor equipment sales have expanded, mainly in the eastern region as Serbia and Russia, where more natural gas booster units were delivered.

Entering the hydrogen economy

Relying on the experience in oil and gas industry, supporting the strengthening of green economy, the company offers a complex hydrogen producing, operating and compression systems.

Based on the company's experience, Ganzair is capable of introducing and producing hydrogen energy systems with product and service diversification. It can ensure the system from producing hydrogen to the point of use independently. As a result, the company's goal is to add hydrogen producing electrolysing equipment to its portfolio. With this step, Ganzair is capable of covering the whole hydrogen value chain from production to gas storage, from charging fuel cell vehicles to industrial usage. The company is a member of the National Hydrogen Technology Platform.

Hydrogen as an energy carrier has significant potential for the system-wide management of renewable energies, temporary energy storage and the gradual introduction of carbon-neutral energy technology. ■

Air Quality: EC Calls on Romania to Improve Its Rules on Industrial Emissions

The European Commission (EC) is asking Romania to bring its national legislation into line with the EU Directive on industrial emissions (IED) (Directive 2010/75). Industrial activities have a significant impact on the environment. The Directive on industrial emissions aims to prevent and reduce harmful industrial emissions across the EU while promoting the use of techniques that reduce pollutant emissions and that are energy and resource efficient. The European Green Deal, with its Zero Pollution ambition, puts emphasis on cutting air pollution, which is among the key factors negatively affecting human health. Full implementation of the air quality standards enshrined in EU legislation is key to effectively protect human health and safeguard the natural environment.

The Romanian legal system fails to guarantee the implementation of the key objectives of the directive, in particular that installations must only be allowed to operate if they have permits. On the one hand, the Romanian legal system, in its current state, introduces very low and inadequate penalties, which fail to ensure effectiveness, proportionality and dissuasiveness as required by the Directive. On the other hand, the Romanian authorities fail to implement the existing legislation in a coherent manner on an administrative level (e.g., suspend the operation of installations without permits), while the Romanian judiciary fails to enforce the sanctions, nullifying any effectiveness and dissuasiveness.

Therefore, the Commission is sending a letter of formal notice to Romania, which now has two months to address the shortcomings raised by the Commission. Otherwise, the Commission may decide to send a reasoned opinion.

'Moderate' quality air in Romania

At the start of 2021, Romania was experiencing a period of 'Moderate' quality air with a US AQI reading of 54. This follows the classification suggested by the World Health Organisation (WHO). The concentrate level of PM2.5 was 13.7 $\mu g/m^3$. With pollution at this level, it is advisable to close doors and windows to prevent the ingress of dirty air. Those of a sensitive disposition should avoid outdoor activity until the air quality improves. If venturing outside is unavoidable, then a good quality face mask should be worn at all times. What are the main causes of air pollution in Romania?

The main sources of air pollution in Romania can come from any of the following, but generally speaking, the main source in any large city is vehicle emissions followed by industrial emissions.

Private cars are, according to a scientific document that the Bucharest City Hall has had at its disposal since 2014, the main culprits of the polluting emissions in the city. But here we do not only refer to cars, but also to heavy commercial vehicles, buses and other vehicles. Taken together, the latter are more polluting than all cars combined (52.8 per cent of the total compared to 47.2 per cent of cars).

Burning fossil fuels in electricity production, transportation, industry and households, industrial processes and the use of solvents, for example in the chemical and extractive industries are chief contributors. Agriculture, the treatment of waste products and emissions from volcanic eruptions, airborne dust, sea salt dispersal and emissions of volatile organic compounds from plants are examples of natural emission sources.

In order to have a better understanding of the causes of air pollution, we must know that pollutants that enter the atmosphere can be divided into primary pollutants and secondary pollutants. Thus, primary pollutants are the direct result of an industrial process (such as sulphur dioxide

emitted by factories) while secondary pollutants are caused by the reactions of primary pollutants, usually as a direct result of ultraviolet light from the sun.

Due to the combustion of fossil fuels (such as coal or oil), sulphur dioxide is one of the main causes of air pollution whilst at the same time, cars with internal combustion engines, are major sources of pollutants with harmful effects on air quality because they collectively release tens of thousands of tons of harmful gases into the atmosphere every day.

Agricultural activities can be a source of air pollution through the production of ammonia. It is a product often used in activities specific to the agricultural sector whilst being one of the most dangerous gases in the atmosphere. Moreover, the widespread use of insecticides and pesticides contributes to the pollution of the environment, including the atmosphere.

Mining is a field in which large equipment is used. During the process, dust and chemicals are released into the air causing large amounts of air pollution. This is one of the reasons why this activity is responsible for the deterioration of the health of workers and residents near mining operations.

Even household activities can cause polluted air with household cleaning products or paint products which emit toxic substances into the air that cause environmental pollution.

What is the government doing about Romania's air quality?

Several measures are to be introduced by the local authorities in an attempt to reduce air pollution. Powerful washing of streets and pavements with water and/or their subsequent vacuuming (reduces suspended particles by about 70 per cent on the pavement). The planting of hedges and perennial bushes at the edge of boulevards and streets reduces suspended pollutants by 15-60 per cent on the pavement, depending on the pollutant, such as PM2.5, PM10 and carbon dioxide etc.

The prohibition of the use of gasoline-powered leaf blowers and lawnmowers and their replacement with electric blowers together with the prohibition, monitoring and punishment of burning of vegetable waste both in the city and in the surrounding villages will also contribute to cleaner air.

Careful monitoring of landfills, cement production plants, incinerators and the burning of any type of waste, as well as careful monitoring of factories in the city and all sources of gas combustion (including residential blocks), are measures to be introduced as soon as possible. If the construction of incinerators is chosen to replace the current landfills, they should use state-of-the-art technology and not have to bring garbage from other areas.

Construction sites need careful monitoring and infrastructure interventions, as the resulting dust remains in the atmosphere and is full of particularly toxic substances.

Landscaping, planting trees and greenery all year round, is conducive to cleaner city air, especially those which are resistant to shade. They have the ability to retain and filter dust much higher than ordinary trees, in addition, they help biodiversity.

The reduction of concrete spaces dedicated to surface parking is to be implemented and to increase the cost of parking to stimulate the construction of underground car parks replaced by surface parks are two measures to be introduced. The one million cars parked on the ground in Bucharest represent many sources of pollution, regardless of their technical condition.

It is hoped to begin construction of dedicated cycle lanes to cross the city on its axes, on the central and middle ring. These would reduce driving by distances of less than 5 kilometres. Cycling and walking short distances are to be actively encouraged.

Massive investment in electrified public transport and the gradual abandonment of diesel buses is strongly being considered. All new buses should be electric so that in a maximum of ten years there will be no more diesel buses in the city's car park or on the city's streets.

Trams are the greenest means of urban public transport, but only if they are modernised and are powered by clean electricity with zero emissions.

The creation of green roofs on schools and other buildings, especially in densely populated areas has been suggested. There are 7 million square meters of terraces in Bucharest, which currently reach over 70C during the summer. The use of a combination of green roof (sedum type plants) and semi-transparent solar panels would increase the green area of the city by more than 30 per cent, with immediate effect on the phenomenon of 'heat island' above the city, which raises the temperature and exacerbates pollution.

Planting trees around the city and creating green corridors that cross the city. These axes can be 50-100 metres wide and can include cycle lanes and pedestrian spaces surrounded by greenery, thus becoming a much healthier alternative than the boulevards full of polluted air.

Investment in underground public transport and light surface metro as the main means of transport in the city need to be considered. The subway is the most efficient public transport solution both in terms of pollution and energy consumption.

Another aspect to be considered is the reconfiguration of transit traffic to bypass the city (park & ride, belt, commuter trains, etc.). Here a strategy of the Ministry of Transport is needed because the local authorities do not have the financial capacity to execute such projects on their own. ■

FLOWSERVE

Choose the Flowserve SIHI equipment!

Customer Trust Remains the Focus of Our Commitment

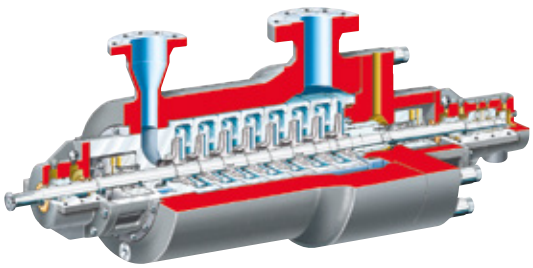
Using our resources and collective experience, we support our customers, at global level, to exceed their business targets. We fulfil this promise by the careful way in which we listen to customer requests and subsequently by delivering the products and services they need.

Our strengths

- A business model underscoring the advantages for customers, such as: predictable/low maintenance costs and increased reliability.
- The large number of customers, proof of increased productivity, optimization of equipment maintenance and repair costs, contributing to obtaining competitive positions in their markets.
- We expand technological innovations whenever possible, with the aim to improve our ability to meet the needs of our customers.
- We are open to new challenges and potential projects, which we will approach with the particularly successful team of Flowserve SIHI.
- Starting on 14th April 2017, the name of our company has changed from Sterling Fluid Systems (Romania) to Flowserve SIHI Romania - the only official entity of Flowserve SIHI Corporation for Romania and Moldova.

FLOWSERVE
SIHI® Pumps

Flowserve SIHI România SRL
105-107 Mihai Eminescu
RO-020074 Bucharest
Tel.: + 40 21 211 76 78
Fax: + 40 21 210 82 87
www.flowserve.com



WIK Pump - according to API 610 (BB5) Standard

Is Carbon Capture Too Expensive?

THE IDEA THAT CCUS IS 'HIGH COST' IGNORES THE BIGGER PICTURE

Carbon Capture, Utilisation and Storage (CCUS) technologies are critical for putting energy systems around the world on a sustainable path. Despite the importance of CCUS for achieving clean energy transitions, deployment has been slow to take off – there are only around 20 commercial CCUS operations worldwide. But momentum is building. Plans for more than 30 commercial CCUS facilities have been announced in recent years, and despite the Covid-19 crisis, in 2020 governments and industry committed more than USD 4.5 billion to CCUS.

by **Adam Baylin-Stern & Niels Berghout, Energy analysts**

A number of factors can explain the slow uptake of CCUS, but high cost is one of the most frequently heard. Commentators often cite CCUS as being too expensive and unable to compete with wind and solar electricity given their spectacular fall in costs over the last decade, while climate policies – including carbon pricing – are not yet strong enough to make CCUS economically attractive. As we explain in this commentary, to dismiss the technology on cost grounds would be to ignore its unique strengths, its competitiveness in key sectors and its potential to enter the mainstream of low-carbon solutions.

Achieving net-zero goals will be virtually impossible without CCUS

IEA analysis consistently shows that a broad portfolio of technologies is needed to achieve deep emissions reductions, both practically and cost-effectively. Energy efficiency and renewables are central pillars, but other technologies and strategies have a major role to play as well.

In its recently published report, the IEA identified four crucial ways in which CCUS can contribute to a successful clean energy transition:

1.CCUS can be retrofitted to power and industrial plants that may otherwise still be emitting 8 billion tonnes of CO2 in 2050 – around one-quarter of today's annual energy-sector emissions.

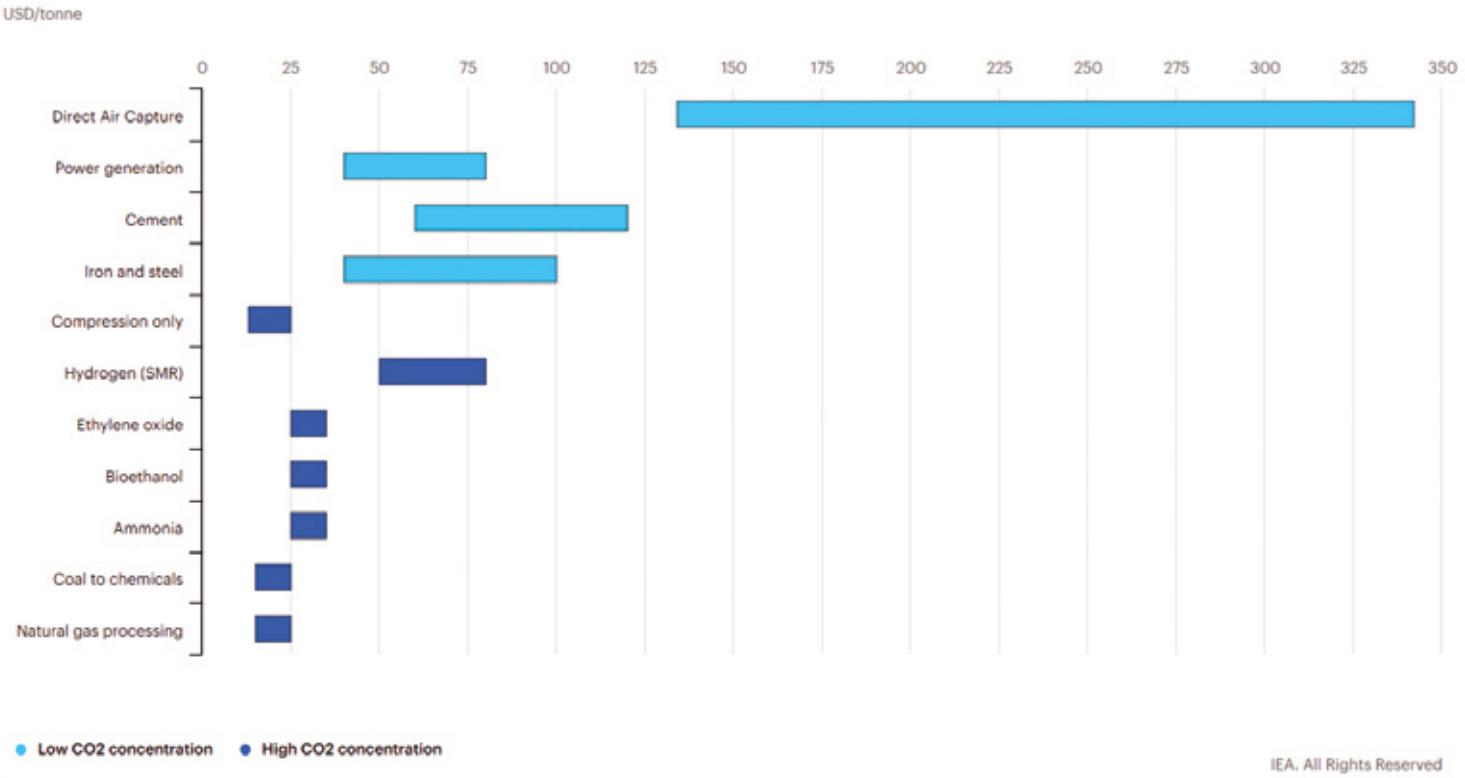
2.CCUS can tackle emissions in sectors with limited other options, such as cement, steel and chemicals manufacturing, and in the production of synthetic fuels for long-distance transport.

3.CCUS enables the production of low-carbon hydrogen from fossil fuels, a least-cost option in several regions around the world.

4.CCUS can remove CO2 from the atmosphere by combining it with bioenergy or direct air capture to balance emissions that are unavoidable or technically difficult to avoid.

Limiting the availability of CCUS would

Levelised cost of CO2 capture by sector and initial CO2 concentration, 2019



IEA. All Rights Reserved

considerably increase the cost and complexity of the energy transition by increasing reliance on technologies that are currently more expensive and at earlier stages of development. One such example is the electrification of very high-temperature heat furnaces used for cement production and virgin steelmaking.

There is no single cost for CCUS

CCUS applications do not all have the same cost. Looking specifically at carbon capture, the cost can vary greatly by CO2 source, from a range of USD 15-25/t CO2 for industrial processes producing 'pure' or highly concentrated CO2 streams (such as ethanol production or natural gas processing) to USD 40-120/t CO2 for processes with 'dilute' gas streams, such as cement production and power generation. Capturing CO2 directly from the air is currently the most expensive approach but could nonetheless play a unique role in carbon removal. Some CO2 capture technologies are commercially available now, while others are still in development, and this further contributes to the large range in costs.

Moving on to the cost of transport and storage, this can also vary greatly on a case-by-case basis, depending mainly on CO2 volumes, transport distances and storage conditions. In the United States, for example, the cost of onshore pipeline transport is in the range of USD 2-14/t CO2, while the cost of onshore storage shows an even wider spread. However, more than half of onshore storage capacity is estimated to be available below USD 10/t CO2. In some cases, storage costs can even be negative if the CO2 is injected into (and permanently stored in) oilfields to enhance production and thus generate more revenue from oil sales.

For industry, CCUS technologies are among the cheapest abatement options – or the only option

Achieving deep emissions reductions in heavy industry (cement, steel and chemicals production) can be challenging for several reasons. But CCUS is a relatively advanced and cost-competitive option for dramatically cutting the CO2 emitted during the production of these essential materials. It can also be more cost-effective to retrofit CCUS to existing facilities than building new capacity with alternative technologies.

In the case of cement production, where two-thirds of emissions are from chemical reactions related to heating

limestone (rather than burning fossil fuels), CCUS is currently the only scalable solution for reducing emissions. And in the iron and steel sector, production routes based on CCUS are currently the most advanced and least-cost low-carbon options. Incorporating CO2 capture raises estimated costs by less than 10%, while approaches based on electrolytic hydrogen can raise costs by 35-70% compared with today's conventional production methods.

CCUS is currently the cheapest option for reducing emissions in the production of some important chemicals such as ammonia, which is widely used in fertilisers. The estimated costs of CCUS-equipped ammonia and methanol production based on natural gas are around 20-40% higher than their unabated counterparts, while the cost of electrolytic hydrogen routes is estimated to be 50-115% higher.

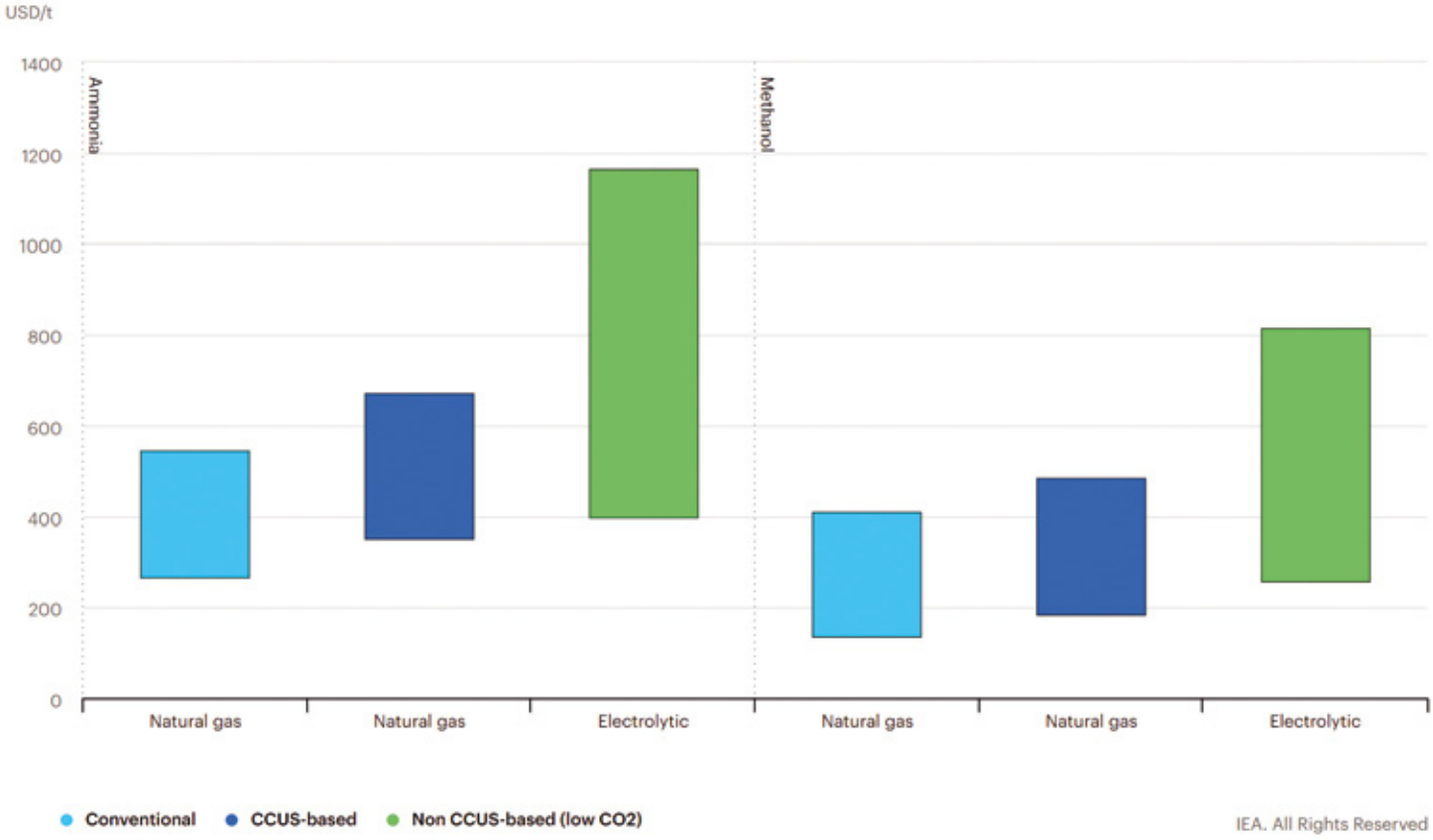
CCUS can support the integration of renewables in power systems

Solar and wind are set to become the largest and cheapest sources of electricity globally, but other technologies will still be needed for low-cost power systems. The growing proportion of power from variable renewables drives a greater need for capacity that is available 'on-demand' to ensure the stable operation of power systems. CCUS-equipped coal- or gas-fired power plants can provide this capacity and supply electricity at any time, whether at night or on a still day.

Power plants with CCUS are particularly valuable in regions with strong seasonal variations in renewable generation. The few alternatives able to manage these variations, such as large-scale hydrogen storage, are currently more expensive than CCUS.

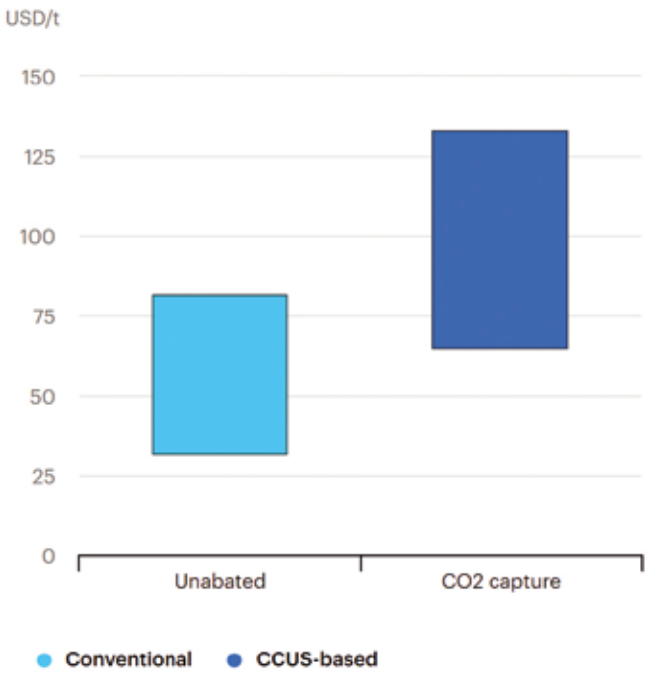
CCUS can also be a cost-efficient strategy to tackle emissions from existing coal- and gas-fired power plants. Around one-third of today's coal and gas plants were built only in the last decade; retrofitting with CCUS can allow them to continue operation and avoid the costs of early retirement.

Simplified levelised cost of competing low-carbon technologies in chemicals production

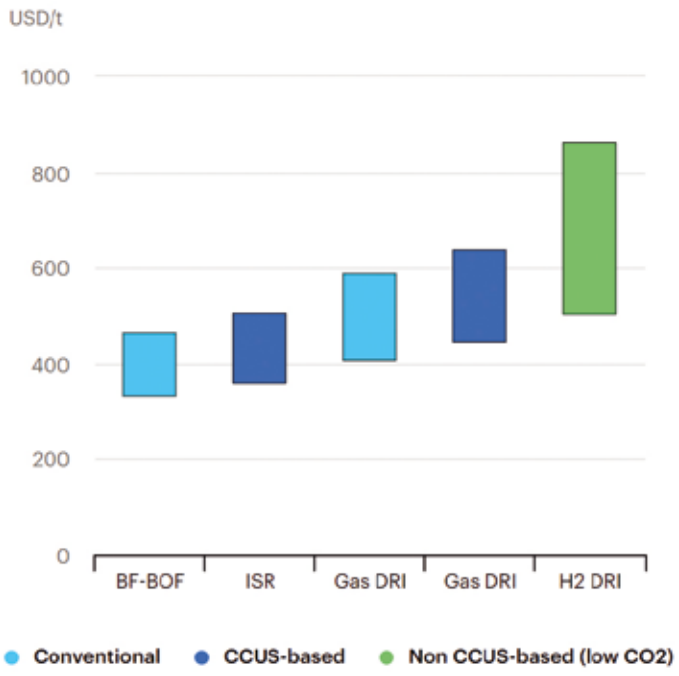


IEA. All Rights Reserved

Simplified levelised cost of competing low-carbon technologies in cement production



Simplified levelised cost of competing low-carbon technologies in steel production



IEA. All Rights Reserved

CCUS costs are already falling, with ample potential for further reductions

There is considerable potential to reduce costs along the CCUS value chain, particularly as many applications are still in the early stages of commercialisation. Experience indicates that CCUS should become cheaper as the market grows, the technology develops, finance costs fall, economies of scale are reached, and experience of building and operating CCUS facilities accumulates. This pattern has already been seen for renewable energy technologies over recent decades.

Cost reductions have already been achieved at large-scale CCUS projects. For example, the cost of CO2 capture in the power sector has come down by 35% through its evolution from the first to the second large-scale CCUS facility, and this trend is set to continue as the market expands.

Policy support is needed to drive CCUS innovation and deployment

In the pursuit of net zero, we cannot afford to dismiss CCUS as 'too expensive'. It is the only group of technologies that can contribute both to reducing emissions in critical economic sectors and to removing CO2 to balance emissions that cannot be avoided – a balance that is at the heart of net-zero ambitions. In some sectors, including in heavy industry, CCUS is currently the least-cost or only practical option for deep emissions reductions.

The relative lack of progress in deploying CCUS to date means that many technologies and applications are still at an early stage of commercialisation – and therefore at a high point in the cost curve. There is ample potential for cost reductions – the experience of wind and solar highlights what is possible – but, as with renewable energy, realising this potential will require strengthened policy support to drive CCUS innovation and deployment.

The development of economic stimulus packages in response to the Covid-19-related economic downturn presents a unique opportunity to boost investment in CCUS and support a least-cost pathway to net zero. In our recent ETP Special Report on CCUS, we outline four high-level priorities for governments and industry to accelerate progress of CCUS over the next decade. ■

Austria's Largest Electrolysis Plant

OMV AND KOMMUNALKREDIT INVESTING IN GREEN HYDROGEN

OMV, the integrated, international oil, gas and chemicals company headquartered in Vienna, and Kommunalkredit Austria AG (Kommunalkredit) announced a joint investment in the construction of Austria's largest electrolysis plant in the OMV Schwechat Refinery. Total investment will be around EUR 25 mn, with OMV and Kommunalkredit each bearing half the cost. The plant is expected to go live in the second half of 2023.

From this point, the 10 MW PEM (polymer electrolyte membrane) electrolysis will produce up to 1,500 metric tons of green hydrogen a year. The green hydrogen will be used to hydrogenate bio-based and fossil fuels, substituting grey hydrogen in the refinery. This would reduce OMV's carbon footprint by up to 15,000 metric tons of fossil CO2 annually, and enables by using green hydrogen more than 17 million CO2 emission free bus or truck kilometers each year.

"By building Austria's largest electrolysis plant in the OMV Schwechat Refinery, we are making another contribution to reducing CO2 and to meeting climate targets, whereby hydrogen is a key technology. We deliberately opted for green hydrogen production on an industrial scale as we see the potential it holds – for lower-carbon road use as well as for reducing CO2 emissions in industrial operations," said Thomas Gangl, OMV Chief Downstream Operations Officer.

OMV laid out its ambitious climate targets back in July 2020. These include reaching net-zero emissions in operations (Scope 1 and 2) by 2050 or sooner. OMV will achieve net zero through energy-efficiency measures, new technologies such as carbon capture and storage or carbon capture and utilization, hydrogen, renewables (like the photovoltaic plant in Austria), and measures to optimize the portfolio. The successful and economic feasible implementation of these sustainable and innovative technologies will require an incentive system that extends beyond Austrian and European legislation.

Promoting the EU's Green Deal, the energy transition and sustainable infrastructure and energy financing, Kommunalkredit is focused on advancing innovative technologies in its Austrian home market to address major challenges such as economic growth, job creation, and climate-protection measures.

"This project is a milestone in Austria's industrial policy under the EU Green Deal. We take our responsibility towards society seriously, to contribute to measures that help to prevent climate change. As a member of the 'European Clean Hydrogen Alliance', we are backing our words with actions, supporting the construction of the electrolysis plant with green financing, and thereby making an important contribution, together with OMV, to the United Nations' SDGs," said Bernd Fislage, CEO of Kommunalkredit Austria AG.

The project is supported by the Austrian Climate and Energy Fund and is part of the Hydrogen Initiative Energy Model Region Austria Power & Gas (WIVA P&G). ■

Scope of the EU Border Carbon Tax Widened

European Parliament's Committee on Environment, Public Health and Food Safety will vote on the introduction of a carbon tax at the borders of the European Union. This tax would apply to non-EU imports coming from the energy sector and energy-intensive industrial sectors, such as cement, steel, chemicals, and fertilizers. According to the amendments to the initial version of the draft, added to them will be the imports of petroleum and refined products, glass, paper and aluminium.

by **Adrian Stoica**

The document will be subsequently adopted, by the end of June, as a resolution of the European Parliament to show the lawmakers' position before the official proposal of the European Commission regarding the border tax. "The European Parliament Considers that this tax should eventually cover all imports, but that in an initial phase, from 2023, it should cover the power sector and energy-intensive industrial sectors like cement, steel, aluminium, chemicals, glass, paper, oil refining and fertilizers, which continue to receive substantial free allocations, and still represent 94% of EU industrial emissions," reads the decision of MEPs. The current version of the document did not include oil refining, glass, paper, and aluminium, but the representatives of green, liberal, socialist, and centre-right groups joined forces to present an amendment to widen the scope of the tax. Frans Timmermans, Executive Vice-President of the European Commission for the European Green Deal, has recently stated that the EU would introduce a carbon border tax for non-EU states, unless they undertake to reduce their emissions. This measure could strongly affect the major economies, such as China, but also the Western Balkans and other countries.

Taxation of carbon dioxide emissions

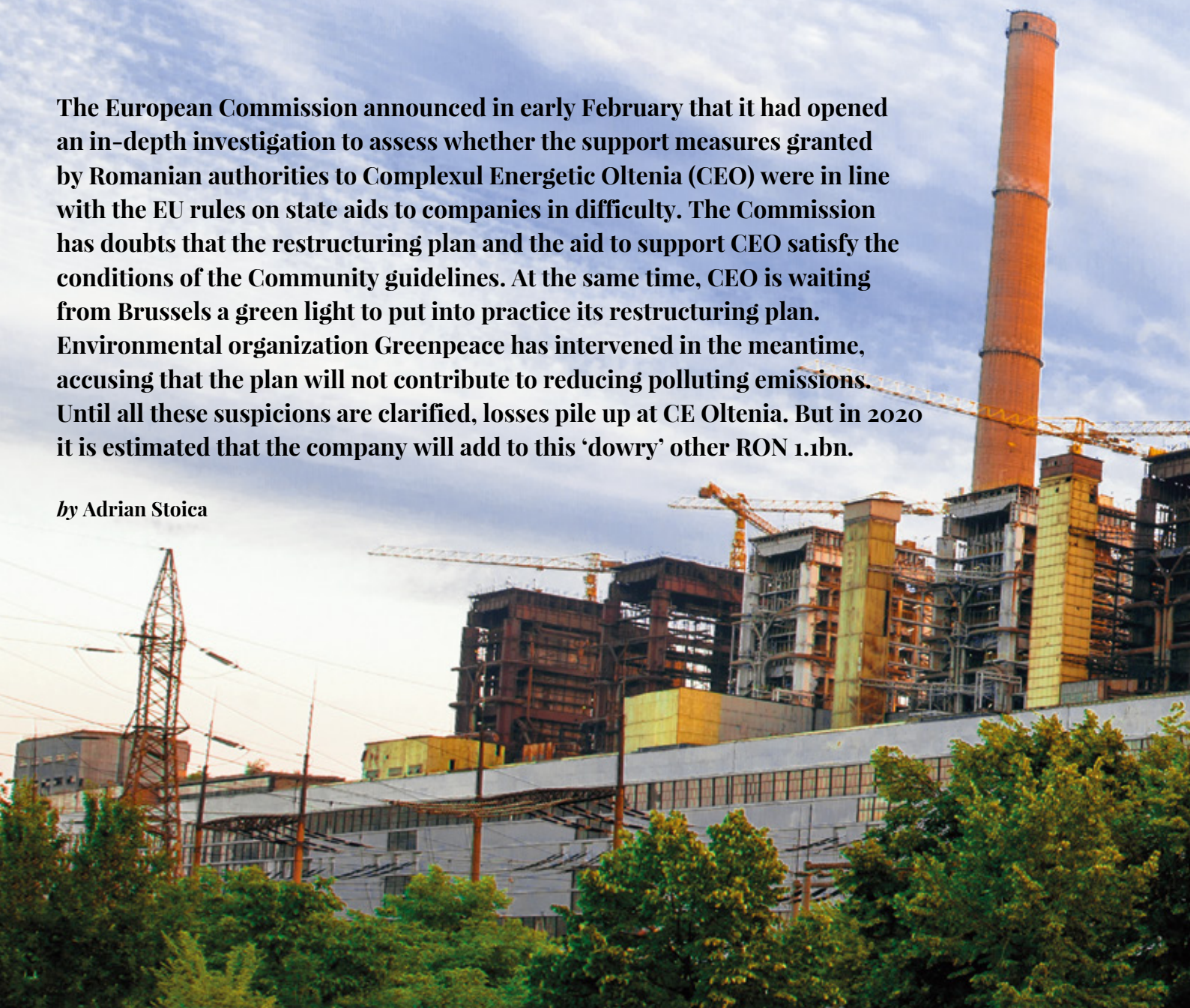
Under the European Green Deal, the European Union has announced its intention to become the first climate neutral continent by 2050. In this context, there is a need to introduce the "carbon border adjustment mechanism", which in essence means the introduction of a border tax for non-EU imports of products coming from polluting industries. Currently, at EU level there is a single market for carbon emission allowances (EU-ETS), which polluters in sectors such as energy, steel production, cement or commercial aviation pay for each ton of CO2 emitted. Some operators receive free allowances, either to afford upgrades or because they cannot be competitive. The carbon border tax is meant to reduce and regulate the import of goods with high carbon footprint from countries that do not have an emission taxation system.

Regarding the energy sector, mainly electricity, all managers of facilities in the ETS system are required to pay the CO2 allowances. In Romania, the list of idling facilities covered by the scheme for the sale of greenhouse gas emission allowances for the period 2021-2025 includes a number of 138 units, including Uzina Termoelectrica Midia, CET Govora, Linde Gaz Romania, Arcelormittal Galati, OMV Petrom (Bulbuceni Compressor Station, Bustuchin Compressor Station), Heidelbergcement Romania, CIECH Soda Romania, Automobile Dacia, Rompetrol Rafinare - Petromidia, RADET Bucharest, Electrocentrale Bucharest, Petrotel-Lukoil, Silcotub, CET Arad, Veolia Energie Prahova, ALRO, Electrocentrale Paroseni, Rompetrol Rafinare - Vega, Petrobrazi, Chimcomplex Borzesti and others.

European Commission Deepens, Greenpeace Disputes and CEO Accumulates Losses

The European Commission announced in early February that it had opened an in-depth investigation to assess whether the support measures granted by Romanian authorities to Complexul Energetic Oltenia (CEO) were in line with the EU rules on state aids to companies in difficulty. The Commission has doubts that the restructuring plan and the aid to support CEO satisfy the conditions of the Community guidelines. At the same time, CEO is waiting from Brussels a green light to put into practice its restructuring plan. Environmental organization Greenpeace has intervened in the meantime, accusing that the plan will not contribute to reducing polluting emissions. Until all these suspicions are clarified, losses pile up at CE Oltenia. But in 2020 it is estimated that the company will add to this 'dowry' other RON 1.1bn.

by Adrian Stoica




C.E.O.
SUCURSALA ELECTROCENTRALE
TURCENI

The restructuring plan of CEO is estimated at EUR 3.5 billion. The amount includes a support of approximately EUR 2 billion, of which EUR 1.326 billion is aid from the Romanian state, in the form of grants and loans (including the rescue loan of EUR 251 million that CE Oltenia hasn't repaid). Further, to reach the amount of EUR 2 billion, the money will come from EU funds, specifically from a grant under the Modernization Fund, for which Romania would apply for financing.

Objectives of the in-depth investigation

"EU State aid rules, more specifically the Commission's Guidelines on rescue and restructuring aid, enable Member States to support companies in difficulty, under certain strict conditions. In particular, aid may be granted for a period of up to six months ('rescue aid'). Beyond this period, the aid must either be reimbursed, or Member States must notify a restructuring plan to the Commission for the aid to be approved ('restructuring aid'). The plan must ensure that the viability of the company can be restored without further State support, that the company contributes to an adequate level to the costs of its restructuring and that distortions of competition created by the aid are addressed through compensatory measures, including in particular structural measures," the European Commission said. From this point of view, the in-depth investigation of the European Commission will examine in particular:

- Whether the proposed restructuring plan can restore the long-term viability of CEO in a reasonable time frame without continued State aid;
- Whether CEO or investors would sufficiently contribute to the restructuring costs, thus ensuring that the restructuring plan does not rely mainly on public funding and that the aid is proportionate; and
- Whether appropriate measures to limit the distortions of competition created by the aid would accompany the restructuring plan.

Continuous dialogue with the European Commission

The European Commission in November last year invited CEO to trigger the notification procedure, the final stage of the process of approval of the Restructuring and Decarbonization Plan, document sent to Brussels on August 31, 2020. "We showed our dialogue partners in Brussels that our main source of revenues was the sale of electricity and we provided explanations about the sales strategy. The Commission also wanted to know why CEO contracts were annual and not multi-annual and we explained that it wasn't possible due to Romanian legislation. This specific legislation is being amended and will be completed early next

year. Of course, these are natural questions, especially that it is a complex Plan covering 5 years and which involves a financial effort of EUR 3.5 billion. Dialogue with the European Commission will also continue in the notification period, and I and my team are ready to answer and clarify any question from Brussels," said on the occasion of receiving the request for notification Daniel Burlan, President of the Executive Board of CEO.

What does the restructuring program involve

The total cost of implementing the Restructuring and Decarbonization Plan of CEO, provided to be

carried out during 2021-2025, is approximately EUR 3.5 billion and involves investments to diversify energy sources, modernize the existing assets and protect the environment, as well as expenses to streamline the activity of CE Oltenia, so that the company becomes viable by making operations efficient and switching to renewable and less polluting resources. According to the plan, the number of employees would drop to 7,179 in 2025 and 4,419 in 2030, compared to 12,107 in 2020. CEO will continue coal-fired production, but at a rate that will gradually decrease, beyond 2030. The plan provides for gradual closure of production capacities and mining exploitations, as well as the outsourcing of some activities. Investments in new production units with a total installed capacity of around 2,000 MW are provided. Therefore, it is considered to build eight photovoltaic parks in Turceni, Rovinari and Isalnita, with a total installed capacity of around 700 MW; rehabilitation/retrofitting and modernization of the small hydro-power station in Turceni, with an installed capacity of 10 MW; development of new gas-fired capacities with a total installed capacity of around 1,300 MW, in Turceni and Isalnita.

At the end of the restructuring and decarbonization process, CEO will benefit from an energy mix - coal, natural gas, non-polluting sources - that will ensure its viability, turning it into a modern, less polluting company (specific CO2 emission will be reduced by approximately 38%), which will be able to further support the local and national economy.

Restructuring increases the direct and indirect impact that CEO has in the local economy. The direct

impact will be around RON 1.5 billion, through contribution to the state budget, local budget and environmental fund; the indirect impact will be provided by keeping collaboration with other employers in the region, by ensuring new jobs for local economic operators and by developing new activities within service providers, throughout the performance of these investments and by commissioning the new capacities.

State aid of EUR 1.326 billion

We recall that the Government of Romania in November 2020 approved a Memorandum granting to Complexul Energetic Oltenia a state aid for restructuring of EUR 1.326 billion during 2021-2025.

"With this memorandum, the Government has committed to financially support CEO and it is a very clear message for CEO employees that we will not turn our back on them, that the Government respects its promises and basically the memorandum paves the way to the Commission for the notification that we have made, guaranteeing the European Commission that the Government will ensure this amount from the state budget as restructuring aid," said at the time Virgil Popescu, Minister of Economy, Energy and Business Environment. The state aid for restructuring will be granted to Complexul Energetic Oltenia during January 1, 2021-December 31, 2025, in the form of grant and loan(s) with state guarantee, to partially cover expenses with CO2 allowances, current expenses and investments in the existing assets. Payment of the state aid will be made in instalments and will be subject to annual corrections, based on actual costs and revenues recorded by CE Oltenia, including the state aid granted.

Greenpeace disputes the plan in Brussels

However, the results estimated to be obtained following the restructuring plan have been recently disputed by Greenpeace Romania.

"An analysis by Greenpeace Romania has discovered that the restructuring and decarbonization plan of Complexul Energetic Oltenia (CEO), worth a total of over EUR 1.3 billion, leads to an increase in total CO2 emissions of the company by 28% in 2030 and is against principles of granting European funds," reads a press release of the environmental organization. At the same time, Greenpeace has announced that it would request the European Commission to open an investigation and that "it has notified the competent authorities in Romania". The restructuring plan provides that "specific emissions at company level will diminish from 0.82 tCO2/MWh in 2020 to 0.74 tCO2/MWh starting with 2025, reaching 0.51 tCO2/MWh starting with 2026, representing a decrease by approximately 38%".

Instead, Greenpeace claims that "total annual emissions of the company will increase between 2020 and 2030 from 7 Mt CO2/year in 2020 to approximately 9 Mt CO2/year in 2030, with a peak of 10.7 Mt Co2/year in 2024". CE Oltenia "aims to use coal even in 2030, without setting a deadline to eliminate this fuel from energy production". Also, replacement of coal-fired power plants with gas-fired capacities "contributes to the balance of harmful emissions," Greenpeace also mentions.

Photovoltaic parks in which the company plans to invest would have "a negligible importance (below 6%) in the energy mix that CEO plans to sell in the following decade," Greenpeace also shows.

At the same time, "the decrease in greenhouse gas emissions by aggregating the production of energy from renewable sources and gas with that based on lignite is not compatible with the EU ETS Directive and with the objectives of the Modernization Fund, which CEO hopes to access. The only chance to receive financing is to withdraw from operation all lignite-fired capacities," Greenpeace also claims. The organization also says that "there are substantial European funds for transition to the production of energy from renewable sources. Romania, through the plan proposed by CEO and the lack of ambitious public policies of decarbonization, could miss however this unique chance to achieve a fair energy transition for coal-dependent and polluted communities, especially the mining areas of Gorj and Hunedoara."

CEO's answer: Misinterpretation

In a press release sent by CEO management on Greenpeace analysis it is mentioned that "it took as reference the year 2020, affected by COVID crisis, in which electricity production was at an all-time low. Therefore, CO2 emissions in 2020 were by 50-60% below the level of the previous years, of around 7 million tons, compared to an average of 12 million tons during 2018-2019." Also, "as regards the new gas-fired capacities that will replace equivalent lignite-fired capacities, the feasibility studies already conducted show that they will contribute to a reduction by around 3 million tons CO2/year, if the same electricity volume were produced, being in line with the principles on accessing specific European funds. Moreover, gas-fired capacities have a specific emission three times lower than lignite-fired ones. CE Oltenia will invest in power plants that will have the option of using hydrogen in combination with natural gas, which will lead to a further reduction of emissions by up to 25%," the press release of CEO also mentions. ■

EC to Support Rehabilitation of District Heating System in Bucharest

The European Commission has approved, under EU State Aid rules, Romanian plans to support the upgrade of the district heating system of the municipality of Bucharest.

This €254 million aid measure, funded thanks to EU structural funds, will help Romania achieve its energy-efficiency targets and will contribute to the reduction of greenhouse gas and other pollutants emissions, without unduly distorting competition," Executive Vice-President Margrethe Vestager, in charge of competition policy, said.

Romania notified the Commission of its plans to provide public support of approximately €254 million (1,208 billion RON) for the rehabilitation of the distribution network (notably the 'transmission' pipelines of hot water to the main distribution points) of the district heating system in the urban area of Bucharest. The planned support will take the form of a direct grant financed by EU Structural Funds managed by Romania.

The Bucharest district heating system is the largest in size in the EU, and the second largest in the world, serving 1.2 million inhabitants, covering around 940 km of thermic pipes for the transmission system and 2,800 km pipes for the distribution system. The rehabilitation of the Bucharest district heating will consist in the replacement of sections of main hot water transmission pipelines for approximately 10% of the overall length of Bucharest's district heating network. This investment will reduce heat losses, water refill losses, network maintenance costs, as well as other losses. The measure will therefore contribute to energy savings and reduce greenhouse gas emissions and other pollutants emissions.

As demonstrated by the Romanian authorities, despite the reduction by around 10% of operating costs, the overall operation of the district heating system will not generate sufficient revenues to cover the investment costs. Therefore, the project would not be financially viable without public support. The contribution of a grant from EU Structural Funds is needed to cover the financing gap of the project.

EU State aid rules allow Member States to support district heating generation installations and distribution networks, subject to certain conditions set out in Commission's 2014 Guidelines on State aid for environmental protection and energy. In particular, the Guidelines provide that the projects must meet the criteria of "efficient district heating" set out in the Energy Efficiency Directive in order to be considered compatible under EU State aid rules.

On the basis of the type of heat fed into the system - about 80% of its input comes from 'cogeneration' sources – the Commission has found that the Bucharest system fulfils the definition of efficient district heating and cooling system, as set out in the Energy Efficiency Directive and in line with State aid rules. The Commission also found that the measure is necessary, as the project would not be carried out without the public support, and proportionate, as the project will deliver a reasonable rate of return.

On this basis, the Commission concluded that the measure does not distort competition and is in line with EU State aid rules, notably thanks to the reduction of greenhouse gas emissions and other polluting substances and the improvement of the energy efficiency of the district heating system.

Need for Speed: Electrification of Europe's Vehicle Fleets

The electrification of Europe's vehicle fleets will be the catalyst for clean mobility throughout the 2020s, accelerating the decarbonisation of transport, improving air quality in cities, boosting the deployment of charging infrastructure and spurring the creation of a second hand EV market. A 24-fold increase in fleet electrification is expected by 2030, according to 'Accelerating fleet electrification in Europe: When does reinventing the wheel make perfect sense?', a joint undertaking by Eurelectric and EY.

Europe's vehicle fleets consist of 63 million cars, vans, buses and trucks, operated by private companies or public authorities. However, despite only representing 20% of the vehicle parc, they account for 40% of all kilometres travelled, and 50% of CO2 emissions from transport. This means they hold a significant potential for supporting accelerated transport decarbonisation.

"Electrification of car fleets can be a real game changer. It comes with tangible reductions of total costs of ownership and CO2 emissions. So, it is a good deal both for fleet owners and society at large," Kristian Ruby, Secretary General of Eurelectric said.

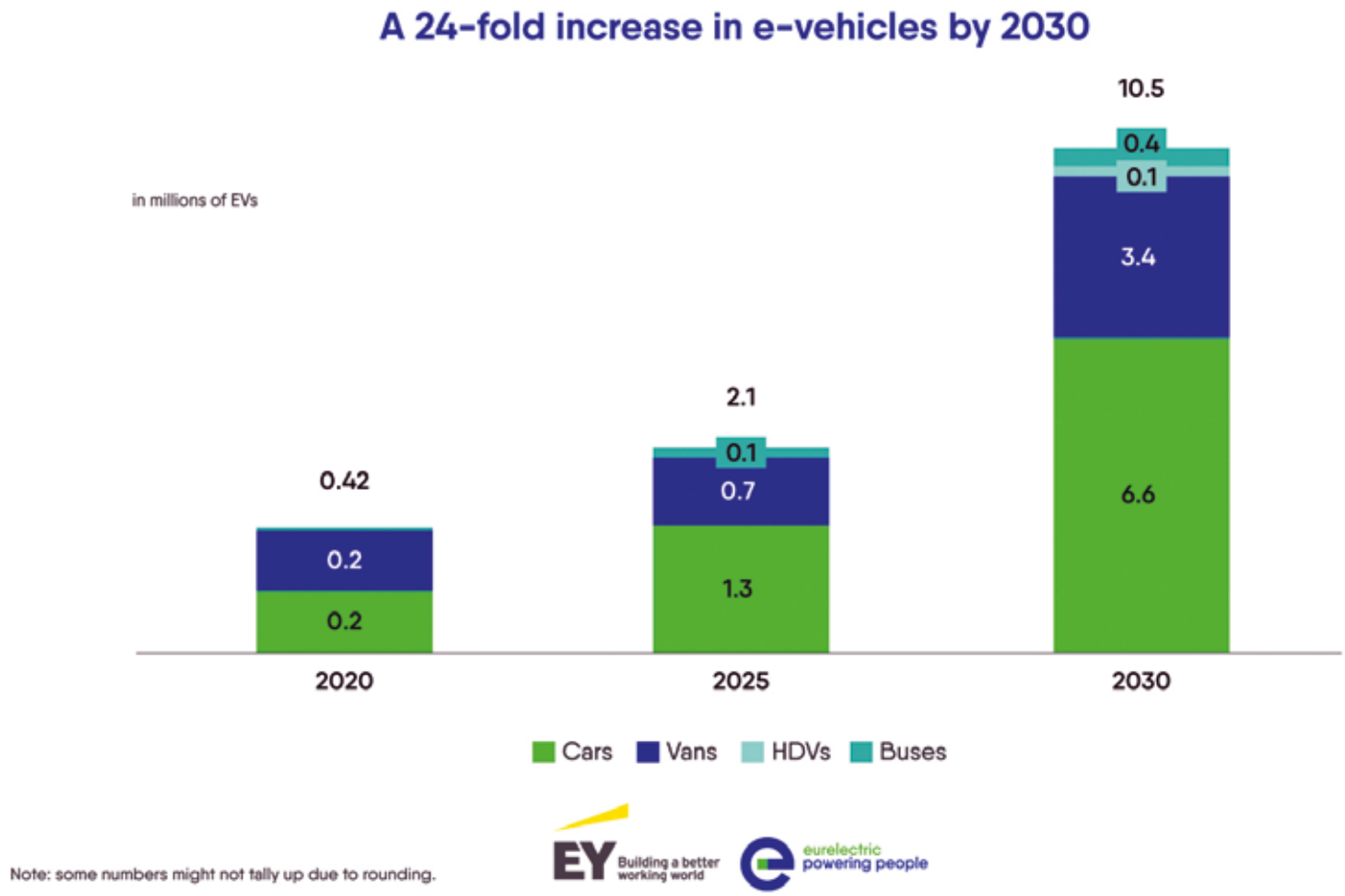
Fleets are the prime candidate for electrification for a number of reasons. First, the public incentives and the discounts applied to bulk sales, raise the attractiveness of EV purchases. Secondly, the route predictability, which is a general operational characteristic of fleets, would enable and accelerate the deployment of charging infrastructure in key locations, making EVs more reliable also for private individuals.

The study finds that fleet electrification is expected to grow at pace, totalling 10.5 million EVs by 2030. By then, the bus segment will have electrified 42% of its parc, followed by the car and van segments that will have electrified at 17.5% and 12% respectively. These uptakes will be further enabled by shifts in company policies towards electric vehicles, and greater vehicle choice.

Accelerating the rollout and interoperability of the charging infrastructure

Europe's existing 213.000 public EV charging points, of which only 14% are fast chargers, are well below target. A 13-fold increase is needed to meet the European Commission's ambition of installing three million public charging points by 2030. The study finds that EUR 20 billion are needed for public charging infrastructure and EUR 60 billion for the private one. An additional EUR 25 billion is required to enable the power distribution grids to support charging infrastructure rollout.

"Electrifying transport is critical for Europe to meet its tough emissions targets and create a decarbonised future. Transitioning fleet first will pave the way, creating synergies for the underlying e-mobility ecosystem and generating new commercial opportunities. However, achieving this will require a fleet-centric approach across both government and industry, as well as an increased focus on the end customer with a greater choice of vehicles and a seamless charging experience. It is clear that no one sector can drive this transition alone – collaboration between all e-mobility players is critical to success," Serge Colle, EY Global Power & Utilities Leader, underlined.



The carrot and stick approach

Fleet electrification will be spurred by increasingly stringent rules and regulations, as well as advantageous taxation schemes. At a local level, over 300 cities have introduced low- and zero-emission zones, pressing last-mile delivery and logistics companies to electrify or face penalties. At EU level, mandatory requirements for automakers to sell zero emissions vehicles should be introduced, in addition to the CO2 standards, thereby catalysing the shift of cars and light duty vehicles to clean mobility.

About the study

The coproduced study includes outputs from discussions with industry leaders within automotive, utility, oil and gas, battery manufacture, fleet management, leasing and charging infrastructure businesses. It collates insights and opinions, identifying key value pools and actions to accelerate and build out e-mobility solutions at scale. To identify the size of the fleet electrification opportunity in Europe, the study analyses the make-up and characteristics of 600 fleets operating across 16 industry segments.

Key facts and figures

The total number of fleet vehicles – both EVs and internal combustion engines – is expected to grow by around 15% by 2030, to 73 million vehicles. The electrified segment of fleet vehicles, with an anticipated 24-fold increase, will bring actual numbers to 10.5 million by 2030, up from 420,000 EVs today.

In Europe, vehicle fleets travel 2.25 times more kilometres than personal cars, accounting for 40% of the total kilometres travelled, and half of the CO2 emissions from road transport.

The European Commission estimates that by 2030, three million public charge points will be needed for 40 million EVs. This represents a 13-fold increase, up from the 213,000 installed so far.

Battery costs are coming down globally. From more than US$1100/kWh in 2010, they averaged US$137/kWh in 2020 and are forecasted to drop to around US$100/kWh by 2023. At this level, automakers are expected to be able to produce and sell EVs at prices comparable with traditional vehicles. ■

KAESER COMPRESOARE®

Sigma Air Manager 4.0

TOMORROW'S TECHNOLOGY TODAY

Photo: KAESER KOMPRESSOREN SE

SAM 4.0: The Sigma Air Manager 4.0 (SAM 4.0) not only ensures highly efficient monitoring and control of all compressed air station components, it also enables them to take advantage of the future-oriented benefits that Industrie 4.0 has to offer.

Industrie 4.0, or the Internet of Things: The Sigma Air Manager 4.0 (SAM 4.0) makes it all possible, the ability to make predictions far in advance, know today what the future holds, network components and exploit much larger data volumes than ever before, whilst also ensuring significant energy cost savings and delivering a reliable, consistent, and efficient compressed air supply.

Presenting the latest generation of SAM 4.0 – the master control system for all your compressed air production and treatment components. It optimises pressure values, automatically adjusts compressor system air delivery to

accommodate fluctuating pressure demand and optimises system efficiency based on control losses, switching losses and pressure flexibility. Moreover, the SAM 4.0 enables your compressed air station to take advantage of future services such as Sigma Smart Air, for predictive maintenance. All of these features not only boost operational reliability and efficiency, but also significantly reduce energy costs.

Best possible pressure quality, tailored to specific needs

This is in no small part made possible by Kaeser's adaptive 3-Dadvanced Control, which takes into account additional factors, aside from switching losses (start/stop), that affect compressed air system energy efficiency. These include control and idling losses, frequency converter operation and pressure flexibility (average increase above required pressure). The patented optimisation method predictively calculates the optimum achievable configuration and adjusts the connected components accordingly – all based on the specific pressure required by the user.

When machines talk

The SAM 4.0 supports operation in 30 languages, while the easy-to-use 12-inch colour touchscreen shows at a glance whether the station is operating in the 'green zone' from an energy management perspective. Operating status, pressure history, free air delivery, power consumption, as well as maintenance and any error messages can be easily displayed and analysed – both in real-time and retroactively. Using a PC and network connection, this data can be accessed conveniently from anywhere, not just at the machine itself. This not only gives users peace of mind and lays the foundation for digital products in the pipeline, it also enables energy management in accordance with ISO 50001.

Sigma Network

The far-reaching benefits of the SAM 4.0 are expanded even further when users take advantage of Kaeser's Sigma Network. Based on Ethernet technology, the powerful Sigma Network is a closed and secure network that has been specially developed to support optimal monitoring and coordinated control of compressed air stations.

SAM 4.0: Future-ready

Moreover, the SAM 4.0 is versatile in other ways. An interface for plugin communication modules lends itself to flexible adaptation to accommodate future requirements. The SAM 4.0 is up to date with the latest trends and ensures the reliable, cross-system exchange of data and information.

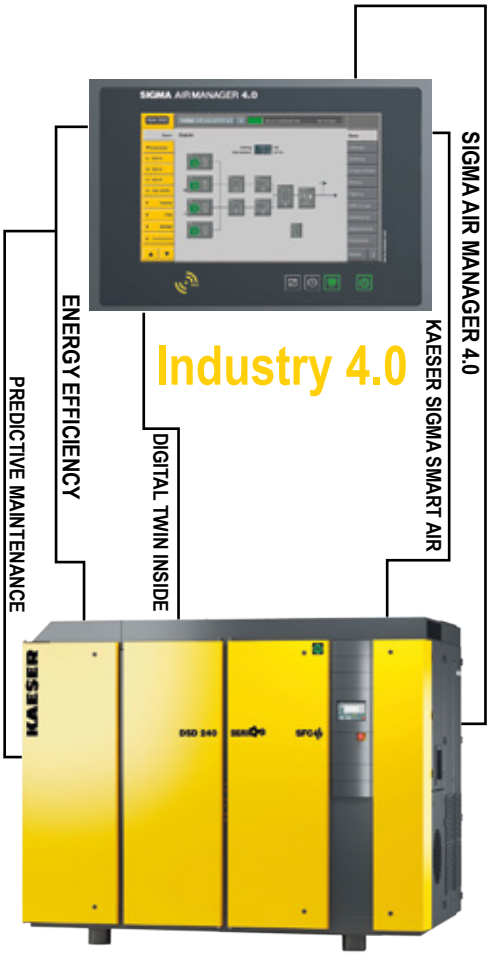
SAM 4.0: Upgradable

The SAM 4.0 is designed to accommodate potential future compressed air system expansion. A straightforward software upgrade allows for expansion with no need for additional investment in new hardware..

KAESER KOMPRESSOREN S.R.L.
Address: 179 Ion Mihalache Blvd.,
011181 - Bucharest
Tel.: +40 21 224 56 81
Fax: +40 21 224 56 02
Web: www.kaeser.com
Email: info.romania@kaeser.com

KAESER COMPRESOARE®

Ready for Industry 4.0



KAESER KOMPRESSOREN S.R.L.
Address: 179 Ion Mihalache Blvd.,
011181 - Bucharest
Tel.: +40 21 224 56 81
Fax: +40 21 224 56 02
Web: www.kaeser.com
Email: info.romania@kaeser.com

Saving Jiu Valley
European Vision

by Adrian Stoica
Photos: Viktor Mácha

In 1997, the Jiu Valley was going through a painful reform, started brutally and without long-term vision, and Romania was affected by the miners' rampages that terrified Europe. The authorities at the time, but also those that followed, did not manage to replace mining with something to provide an alternative for the tens of thousands of people who by then had made a living from coal. Only promises and many strategies that have miserably failed, one by one. Extreme poverty, unemployment, despair, accentuated aging of the population and rising crime are the words that best describe the situation today in Jiu Valley, 24 years after the great restructuring. Now, Complexul Energetic Hunedoara is preparing for a new restructuring that will also mean its division.

Transelectrica endorsed the transfer to the Ministry of Energy of the operational energy assets in Paroseni of the coal-fired power producer controlled by the state Complexul Energetic Hunedoara (CEH) against the cancellation of its budgetary debts. Also, the fate of Mintia power plant will soon be decided, being likely to be taken over by the local authorities in Hunedoara County, according to the representatives of the insolvency administrator of the Complex, Expert Insolventa SPRL. At CEH, the situation is extremely tensed.

A new chance

A new chance for Jiu Valley could be the current policy of the European Commission to support countries in process of coal transition, in this regard launching in 2019 the Coal Regions in Transition Initiative and the European Green Deal, whose goal is to transform Europe into a climate neutral area by 2050. The Just Transition Mechanism was introduced to this end, as a tool targeting the mobilization of funds for investments intended to regions in energy transition during 2021-2027. Jiu Valley is one of the beneficiaries of this European initiative, together with other 18 regions in seven countries (Poland, Germany, Czech Republic, Greece, Slovakia, Spain and Slovenia), but to obtain funds the authorities will have to prepare and submit projects. For now, a new strategy is being prepared for the development of Jiu Valley that will be approved in the first half of this year by the Government, then following to be sent to Brussels. Named 'Jiu Valley Strategy for the transition from coal', the document is being prepared by the consulting firm PricewaterhouseCoopers. According to a draft of this development strategy that extends until 2030, the analysis of the historical evolution of the mono-industrial area of Jiu Valley and of the current profile of the microregion highlights significant differences of development in relation to the rest of the country. Moreover, the prospect of closing the last four operational mines brings new challenges. Through this document the officials of the local administration in Jiu Valley undertake the 'just transition strategy', which will be approved at central government level, in the perspective of a significant transformation of the area during 2021-2030 in terms of recalibrating the perception of inhabitants on the local identity and their role in the energy transition process, as well as unlocking the potential of the area for the economic development of Jiu Valley on multiple levels, for improving the life of the inhabitants, for promoting innovation and decarbonization. The prospect for developing the area is carefully calibrated to be sustainable in the long run by preparing specific projects that are the basis for the implementation of the strategy. All these objectives are aligned to the good European practices specific to coal regions in transition and the directions targeted through important European initiatives, such as the Just Transition Mechanism, the European Green Deal, the EU Cohesion Policy, capitalizing on the local competitive advantages of Jiu Valley.

During 1995-2007 over 650,000 employees have been made redundant

Trade took the lead in the race with mining

Transition from the mono-industrial period proves to be a complex and slow process, with significant challenges for all stakeholders. Although the previous attempts of economic recovery of the area have failed to materialize, Jiu Valley has a high potential for economic diversification, if the existing resources are put to their best use and the adopted actions target the creation of an environment conducive to supporting economic development. Jiu Valley is an area with industrial tradition in the mining field and coal exploitation and power production have represented over time the main driver for the local economy. Jiu Valley has witnessed an important economic growth before 1989, a development supported by the policy of ensuring the country's energy security in that period. But over the last 20 years this sector has been exposed to sudden changes, layoffs and restructuring of the mining industry contributing to a sustained demographic decline in Jiu Valley, falling from approximately 170,000 inhabitants in 1997 to around 133,000 inhabitants in 2019. The restructuring process continues to date, in line with the evolutions related to coal transition at European level, with the prospect of closing the four mines that are still active. The current structure of Jiu Valley economy reflects the results of both the initiatives of transformation aimed at

Photo 1: Mina Petrila ▶

Photo 2: Mina Petrila coal washery

Photo 3: Ropeway at Mina Petrila

phasing out the dominant mining activity and the attempts of diversification implemented in the region. The latter have focused mainly on sectors characterized by a low level of technology, low technical skills and limited investment capital. Consequently, the current economic profile of Jiu Valley is dominated by the service sector - especially trade, over 40% of the total number of active companies in the private environment in Jiu Valley operating in this sector.

556 mines have disappeared

During 1995-2007 over 650,000 employees have been made redundant in the five mining areas in Romania (Jiu Valley, Deva, Rovinari, Motru, Baia Mare), which has generated significant social problems. Also, 556 mines have been closed, the draft strategy shows. In the early 1990s, the Jiu Valley had a population of about 140,000 and more than 45,000 employees in 15 mining units that supplied about 22 million tons of coal annually. Currently, only four mines are still operational (EM Lonea, EM Livezeni, EM Vulcan and EM Lupeni), but they will also be closed in the following years.

General objectives of the strategy

According to the draft strategy, the general objectives of transition from coal in Jiu Valley are the following:

- Sustainable development of urban multi-modal mobility, in a unitary manner, facilitating accessibility in all areas of the microregion by consolidating connectivity between the component towns/municipalities and immediately adjacent areas would open the Jiu Valley to new opportunities for all industries.
- Creating a diversified economic environment, focused on consolidating

Photo 1, 2 and 3: Lonea Mine

growth and competitiveness of small and medium sized enterprises with activities and products with high added value, supported by initiatives favouring innovation and local entrepreneurship.

- Consistent and sustainable development of tourism and creative industries in Jiu Valley, by stimulating local producers, enhancement of natural and cultural heritage of the area and connecting to the neighbouring regions.
- Creating a dynamic and performing social and professional climate in order to optimize standards of living and ensuring in a responsible manner the transition of Jiu Valley to green economy.

Reshaping the energy sector

Maintaining electricity production in Jiu Valley will continue to remain an objective of the transition. From this perspective, projects in this field will aim at making investments in new capacities to produce energy from renewable sources, using the viable energy assets in Jiu Valley to produce electricity and heat based on a different fuel than coal, as well as supporting the development of a centre of excellence in the energy sector in Jiu Valley. It will focus on research-development-innovation and should contribute to creating opportunities for the whole ecosystem starting from public institutions, large companies, technological SMEs that could contract studies in the field or could implement the results of research.

According to UN Climate Agreement, signed in Paris, Europe and OECD countries must give up coal by 2030 and even earlier, an evolution assumed by the signatory governments of Powering Past Coal Alliance. Romania has postponed the decision of giving up coal, but amid increased economic pressure on the energy sector, in 2018 the

Photo 1, 2 and 3: Maleia Mine ▶

Ministry of Energy announced for the first time the prospect of considering the process of coal transition by 2040. To capitalize on opportunities given by energy transition at global level, Romania has committed to address new directions of development of the energy sector according to the Energy Union Strategy and Clean Energy Package. Reaching the decarbonization targets set under the 2021-2030 Integrated National Energy and Climate Plan (INECP) will require significant investments, in the following main dimensions: Decarbonization - GHG emissions and removals; Decarbonization - energy from renewable sources; Energy efficiency; Energy security; Internal energy market; Research, innovation and competitiveness.

Sources of funding in the support of coal transition

An important component of this strategy is funding projects proposed for development on the dimensions related to the development pillars, funding following to be ensured mainly from European and national funds, the quoted document mentions. It is relevant to mention The Just Transition Mechanism, which also includes the Operational Program for Just Transition, dedicated to coal regions for supporting transition to a climate neutral economy, which will be implemented through three pillars:

- The Just Transition Fund, which is not dedicated to energy transition, but to the social and economic costs of transition (economic diversification, retraining etc.) and provides for the allocation of sources of funding in addition to those for the cohesion policy, to which transfers from European Regional Development Fund and the European Social Fund Plus national allocations will be added, as well as national co-financing.

◄ **Photo 1 and 2: Livezeni Mine**

- Dedicated scheme under InvestEU
- A loan facility granted by the European Investment Bank for the public sector (EUR 10bn) for investment projects in energy and transport infrastructure, heating networks, public transport, energy efficiency measures, social infrastructure and other projects directly benefiting the communities in the affected areas and which will contribute to reducing the social and economic costs of transition. Also, financing mechanisms aimed at supporting the energy intensive industrial sectors and the electricity sector will be capitalized, in order to answer the needs in the field of innovation necessary for transition to a low carbon economy, respectively:

- The Innovation Fund will finance highly innovative technologies and flagship projects with European added value, which can bring significant emission reductions;

- The Modernization Fund will support investments in the generation and use of energy from renewable sources; energy efficiency; energy storage; modernization of energy networks, including heating, pipelines and networks; just transition for carbon-dependent regions: redistribution of labour, retraining of workers, education, job search initiatives and start-ups.

In the context of post-COVID-19 economic recovery efforts of Member States, the European Commission has launched a new initiative of interest - a budget of EUR 166.7 billion for 2021, which will be complemented by EUR 211 billion in grants and approximately EUR 133 billion in loans under Next Generation EU, the temporary recovery tool for mobilizing investment and reviving the European economy. The budget is fully in line with the commitment to invest in the future for a greener, more digital and more resilient Europe. Once adopted, it will be the first budget in the new multiannual financial framework 2021-2027 and the first annual budget proposed by the European Commission under the von der Leyen mandate. In addition to the European programs and mechanisms, co-financing through the national operational programs proposed by the Ministry of European Funds for the new financial year will be added:

- Operational Program Just Transition (OPJT)
- Operational Program Sustainable Development (OPSD)
- Operational Program Transport (OPT)
- Operational Program Smart Growth, Digitization and Financial Instruments (OPSGDFI)
- Operational Program Health (OPH)

Photo 1 and 2: Vulcan Mine ▶

- Operational Program Education and Employment (OPEE)
- Operational Program Inclusion and Social Dignity (OPISD)

Regional Operational Programs - implemented at region level (ROP West) the National Recovery and Resilience Plan prepared to use the funds allocated through the Recovery and Resilience Mechanism through three pillars: green transition and climate change, public services, urban development and capitalization on heritage and economic competitiveness and resilience.

Major losses at CEH

As a result of losses accumulated by CEH since establishment to date, the company in insolvency is facing serious problems, the achieved revenues covering only partially expenses, which has led to a substantial increase in debts. The poor financial situation has not allowed investments to support current activities, which has led to diminished production of electricity. Moreover, CEH is facing the risk of withdrawal of operating licenses due to non-compliance with the timely purchase of greenhouse gas emission allowances. In 2019, CEH conducted a technical and economic analysis on the procedure of giving assets in payment. As a result of this analysis, a possible scenario resulted, namely: giving in payment certain assets belonging to Electrocentrale Deva Branch to Hunedoara County Council and the Local Council of Deva Municipality in order to ensure supply of thermal energy in centralized system in the city of Deva; as well as giving in payment certain assets belonging to CEH (SE Paroseni, EM Lonea, EM Livezeni, EM Vulcan, EM Lupeni, Prestserv Petrosani) and the incorporation of a new company. The context and structure of CEH, the inadequate technical condition and the high degree of wear and tear of certain energy and mining assets due to lack of investment and the difficult financial situation of the company limit the implementation of viable recovery measures, the only possibility in the opinion of CEH to continue the activity of electricity production for the national electric power system (NPS) as well as the provision of thermal energy for the cities in the Jiu Valley being the application of the procedure of giving in payment the functional assets. With an installed power of 150 MW and a net power of 130 MW, Paroseni power plant currently covers less than 0.5% of the national needs, CEH delivering in NPS less than 1.5% of energy produced by dispatchable power plants in the first three months of 2020. Although Romania continues to rely on the existing thermal power plants to maintain the safe operation of the national energy system and to ensure a reasonable level of energy independence, according to the working version of the Energy Strategy of Romania 2019-2030, with an Outlook to 2050, lignite exploited in Oltenia area will remain in the energy mix after the following 10 years and not hard coal from Jiu Valley. As regards energy efficiency, according to the

◀ **Photo 1 and 2: Paroseni Mine**

preliminary version of the Regional Strategy for Smart Specialization 2021-2027 (RIS3) of the Western Region, the building sector is one of the major energy consumers (40% of the final energy consumption) and responsible for a significant quantity of CO2 emissions (36% of CO2 emissions). ATUs in Jiu Valley have benefited from opportunities of accessing European funds for the thermal rehabilitation of buildings, all ATUs being actively involved in steps necessary to perform energy efficiency works. The area is distinguished at national level by the first prize obtained by Vulcan Municipality for the materialization of projects initiated by the United Nations Development Program in Romania, through the Global Environment Facility (thermal rehabilitation and endowment of thermal power plants of all education units).

Electricity production will not disappear from Jiu Valley

Maintaining electricity production in Jiu Valley will continue to remain a desideratum of transition; therefore, projects in this field will be prioritized, their feasibility following to be analysed from both the perspective of potential (especially of renewable energy sources in order to identify the optimal sites for promoting and attracting private investors for making investments in new production capacities) and from the perspective of technical limitations and possibilities of additional investments. Depending on renewable energy sources available and exploitable in the Jiu Valley, it will be considered to attract and/or make investments in new capacities to produce energy from renewable sources, both operational (connected to the grid) and for the use of renewable energy at the level of public, economic and/or industrial operators. Depending on the identified potential, including investments in building capacities to produce energy from renewable sources placed on lands belonging to former mines will be considered, therefore developing integrated

Photo 1 and 2: Lupeni Mine ▶

Photo 3: Supplementary Pit

projects of decontamination - regeneration - reconversion. To assess the potential of renewable energy sources in Jiu Valley it will be considered to start a study in order to identify the types of renewable energy (solar, wind, hydro, geothermal, bioenergy - biomass, waste etc.) available and exploitable in Jiu Valley and the optimal sites for these types of investments. The possibility of using the viable energy assets in Jiu Valley to produce electricity and heat based on a different fuel than coal within Paroseni thermal power plant will also be analysed. In order to identify the best solutions, the aim will be to streamline electricity and heat production, diversify the energy mix (for example, using natural gas as transition fuel, unconventional energy sources, hydrogen), contribute to the safety and adequacy of NPS, reduce CO2 emissions and ensure a long-term sustainable economic viability. Taking into account the social benefits of large-scale use of district heating systems (for example, accessibility of thermal energy for population with low income) and the economic and environmental benefits (for example, the reduction of the number of individual heating systems and implicitly of pollution), while analysing the opportunity to converting Paroseni thermal power plant, including the potential of modernization, rehabilitation, retrofitting and extension of the district heating system in Jiu Valley will be analysed, to ensure heating for the localities in Jiu Valley. The viability of these initiatives will be assessed following evaluations and technical and economic analyses and will require the favourable opinion of the Ministry of Economy, Energy and Business Environment, of Transelectrica and of ATUs (if it is decided that they take over certain assets). Modernization, rehabilitation, retrofitting and extension of the district heating system will consider the efficiency of the district heating system by reducing the consumption of energy resources and reducing greenhouse gas emissions. The social benefits of large-

◄ **Photo 1: Aninoasa Mine**

Photo 2: Stefan Pit

scale use of district heating systems will also be considered (accessibility of thermal energy for the population with low income), as well as the economic and environmental benefits (from the point of view of energy efficiency and control of pollution) and the contribution of these systems to strengthening energy security and facilitating flexibility in the use of the various categories of primary resources. The establishment and development of a centre of excellence in energy in the Jiu Valley, focused on research-development-innovation will be able to contribute positively to creating opportunities for the entire ecosystem starting from public institutions, large companies, technological SMEs that could contract studies in the field or could implement the results of research (including by starting strategic projects in the field of advanced technologies, in order to develop a hydrogen industry). The focus will be on identifying viable solutions and projects in the field of energy production/distribution/storage and reducing carbon emissions. Pilot projects to exploit the energy potential of the area will be considered (e.g. recovery of methane gas from the degassing of operational coal deposits using cogeneration plants for the production of electricity and heat, extraction and recovery of methane gas from coal deposits which are no longer in operation using surface drilling, underground pumped storage hydropower plant etc.) in order to identify viable solutions and projects in the field of energy production, distribution and storage (e.g. implementation of a pilot energy supply project using as fuel with 'zero carbon' green hydrogen, produced by electrolysis using solar energy converted into electricity by photovoltaic panels), followed by the scaling of these pilot projects, depending on the demonstrated technical and economic potential. Finally, the improvement of the energy performance of the housing stock and public buildings will be considered, by continuing the projects of thermal rehabilitation and modernization of buildings (both public and residential), in parallel with population information and

Photo 1: Uricani Mine ▶

Photo 2: Barbateni Mine

Photo 3: Jiet Pit

awareness campaigns in the Jiu Valley on responsible energy consumption and energy efficiency measures. The projects of thermal rehabilitation and modernization of buildings will be carried out on the basis of energy audits (the aim will be to identify the energy situation of each building, as well as the concrete measures to be applied to improve the energy efficiency of buildings, reduce electricity and heat costs and implicitly the reduction of adverse effects on the environment) and technical expertise where appropriate (the identification of the necessary measures on seismic risk/ fire protection will be considered). These investments will aim at reducing energy costs, increasing comfort and standard of living and creating new economic opportunities and jobs (within specialized companies).

Proposed actions

Identifying the types of renewable energy (solar, wind, hydro, geothermal, bioenergy - biomass, waste etc.) available and exploitable in Jiu Valley by conducting a study in order to capitalize on potential from renewable energy sources in Jiu Valley.

Identifying the optimal sites for these types of investments (developing maps).

Attracting/making investments in new capacities to produce energy from renewable sources depending on the potential identified as a result of studies conducted, both operational (connected to the grid) and for the use of renewable energy at the level of public, economic and/or industrial operators.

Using the viable energy assets in Jiu Valley to produce electricity and heat based on a different fuel than coal within Paroseni thermal power plant.

Reducing GHG emissions and increasing energy efficiency by developing the district heating system in Jiu Valley, by launching

an advisability study to establish the potential for modernization, rehabilitation, retrofitting and extension of the district heating system from Jiu Valley to ensure the thermal agent in the localities from Jiu Valley in conditions of economic efficiency.

Starting the investment, depending on the result of the study and the feasibility.

Establishing a centre of excellence in the field of energy in Jiu Valley, focused on research-development-innovation.

Carrying out research-development-innovation projects in order to identify and start pilot projects for capitalizing on energy resources in Jiu Valley and integration with smart technologies and low emissions.

Starting strategic projects in the field of advanced technologies, in order to develop a hydrogen industry.

Scaling pilot projects, based on studies and research conducted, depending on the demonstrated technical and economic potential.

Improving energy efficiency in public buildings (including consolidation measures if necessary).

Improving energy efficiency in residential buildings (including consolidation measures if necessary).

Carrying out information and awareness campaigns for the population of Jiu Valley on responsible energy consumption and energy efficiency measures.

Providing support/advice for the preparation and submission of financing files and subsequent settlement for individuals wishing to access financing through national programs (for example, carried out through the Environment Fund Administration - Energy Efficient House).

Utility networks, technologically obsolete

From the perspective of utilities, the energy networks are mostly those installed before 1980, both for transport and distribution, in this sense developments adapted to what will happen in the future in terms of energy in the Jiu Valley being necessary - namely, whether local production will continue to exist, even if diminished, or it will be necessary to bring energy from another production area in the country, shows the document prepared by PwC. The district heating network no longer exists on the entire Jiu Valley, currently the heating of the population in all six cities being provided in a decentralized way, based on gas and wood or coal-fired power plants and stoves, individual for each household. Natural gas is present in all the six main localities in the Jiu Valley, only extension works being necessary, in order to offer access to all households and economic agents to the distribution network. The expansion of the gas network is also one of the development opportunities in terms of energy for the Jiu Valley through the transition from coal technology to energy production through natural gas blocks.

Steps towards a smart city

Starting from the current situation, the development of utility networks and street lighting networks will aim, on the one hand, to ensure comfort at normal standards, such as by expanding the gas network, and on the other hand, to improve services that can generate added value, such as telecommunications networks, increasing citizen safety and urban comfort through public lighting networks. According to an analysis conducted by RDA West, the development of smart cities is at an early stage in the West Region, especially for the Jiu Valley, the integration of technology and communications to boost the efficient use of infrastructure and resources not being exploited by local public administrations. One of the first directions, considered basic for this transition to smart cities, is the digitization of ATUs (public environment). According to RDA West estimates, there are 680 companies in the region whose main activity is the production of custom software, with a total of approximately 3,310 employees, an industry that has the highest labour productivity. These companies could provide the necessary software solutions in the digitization process of the region, and consequently, collaboration with these companies will have a significant impact at the level of the Jiu Valley - IT specialists will be maintained in the region and specialists from other regions will be attracted and the turnover of the sector in the region will increase significantly. Collaboration with the IT industry in the Jiu Valley in order to develop and modernize the infrastructure in the region, but also with the help of various financing mechanisms aimed at technology and communications, is achievable to a large extent and with a major impact on the development of the region. Using technology and improving basic needs, integrating smart city elements as far as possible (e.g., street sensor networks, smart utility metering, traffic monitoring systems and citizen safety surveillance), the Jiu Valley could be transformed into a modern post-coal region adapted to the needs of its citizens, attractive for those outside the Jiu Valley.

Entrepreneurship did not attract former miners

The entrepreneurial spirit that the authorities hoped to economically relaunch the Jiu Valley area proved to be just an illusion.

The registered evolutions are relatively modest, in the period 2017-2019 only 627 companies being established, most with one or maximum two employees. Of these, most were established in 2017, while in 2019 only 100 new companies were established. In total, most companies, about 40%, have trade as their field of activity, ensuring 30% of the turnover of companies in the Jiu Valley and attracting 20% of the workforce employed in the private sector. Therefore, out of the total number of employees in the Jiu Valley, about 25,000 employees in 2018, the share of those in the public sector was over 40%, well above the situation registered at national level.

What does the strategy propose

Despite all the initiatives to revitalize the area, today the Jiu Valley is unattractive for investors, who are reluctant to set up businesses here to the detriment of other more accessible and better-connected areas. To change the situation, the strategy proposes: supporting energy activities alternative to mining that maximize the use of the area's natural resources; creating an investment-friendly ecosystem; supporting local economic operators in developing and diversifying the offers of goods and services with high added value; creating a stable and predictable environment; promoting entrepreneurship.

Attracting investments and developing the economic environment

Attracting investments in the Jiu Valley is an important component that will underpin future economic growth and the development of the local business environment, providing the capital needed for the development of the Jiu Valley, complementary to public sources of funding and local private investment. The contribution of technology and knowledge will be able to facilitate a transfer of technology and innovation that will spread throughout the value chain (at the level of companies involved in making a product or service), by exposing local companies to skills and abilities that are currently missing or are underdeveloped as well as by increasing the competitiveness and productivity of local companies.

Conducting territorial analyses in order to identify areas, lands and buildings with industrial functional potential (including the reintroduction of closed mining perimeters in the economic circuit) and the development of an integrated plan for the Jiu Valley for the development of a business infrastructure by establishing of technological/industrial/scientific areas/parks will be an important step in attracting investors.

In order to ensure the business infrastructure, the development of integrated offers will be considered, with locations for several types of activities with a high degree of technology. In order to revitalize the local economic environment, the aim will be to stimulate investments located in areas with high added value, which can benefit from the steps taken in the research and development area as well as the use of local values, specifics and resources.

The steps will be taken to support the growth and development of the manufacturing industry (e.g., light industry, but not only) but also to support the efforts of local economic operators to enlarge product and service portfolios, put resources to their best use and a high degree of digitization, of clean and environmentally friendly technologies and industrial processes. The growth and economic development of the Jiu Valley depend to a large extent on the ability to stimulate and capitalize on the entrepreneurial spirit of local businessmen and young people in particular. The entrepreneurial environment in the Jiu Valley will benefit from support in identifying new business ideas and developing initiatives, not only to grow and expand, but also to be competitive, resilient and sustainable, benefiting from specific, customized skills and support infrastructure needed to put ideas into practice, to help them identify and develop competitive advantages and identify new markets.

Lack of jobs

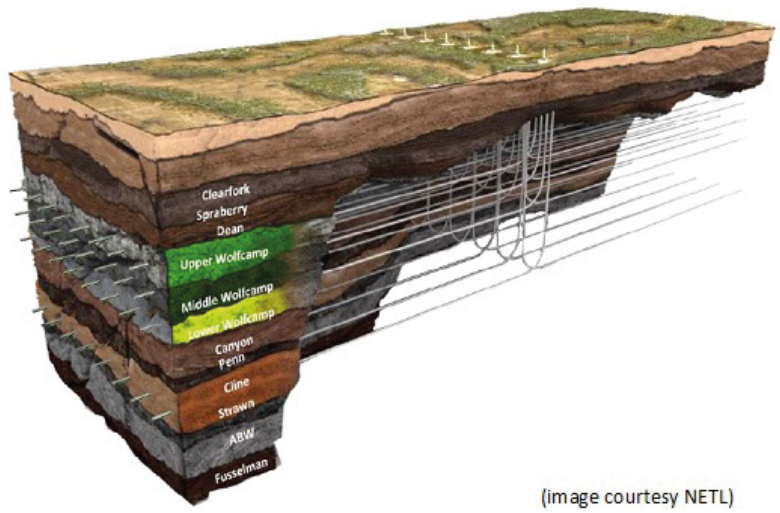
In 2019, the Jiu Valley registered about 100,000 people able to work, of which only a quarter benefited from a stable job. Maintaining a high unemployment rate would exacerbate financial difficulties and poverty, social tensions and isolation. The Jiu Valley is facing a significant social decline (134,000 people in 2019 compared to 166,000 in 1998) amid pronounced migration, with an estimated trend of annual population decline until 2030 when the population could reach about 114,000. The actions proposed to reduce unemployment include:

- Development of learning centres specializing in IT, public administration, energy, in partnership with schools and universities;
- Implementation of diversified continuous training programs (short courses, specialization/improvement courses, qualification, retraining, vocational retraining) adapted to the needs of the local labour market, in line with the requirements of economic sectors with competitive potential (e.g., smart specialization);
- Introduction of diversified practical training programs within companies. ■

Technology Disruption in US Shale

The oilfield has got used to turbulent times, but this one looks to be a real game changer for oilfield personnel! Changes were evolving, due to the advent of factory-completion techniques in US unconventional's (UNCON's or 'Shale'). Research conducted nearly two decades ago indicated that a fully integrated approach was only needed for initial wells, then a "minimal value" drilling and completions (D&C) operation could be used development. Such an approach became known as the 'copy-paste' or 'factory' drilling is now the subject of extensive research and used extensively.

by **Dr Christopher A. Green, Chief Technology Officer at eFrac**



Permian Hydraulic Fracture Test Site (HFTS)

The Shale Revolution

It is often stated that the main enablers for the advent of the shale industry were horizontal wells and hydraulic fracturing. Technology wise this may be true, but the biggest single reason was cost! Technology became cheap enough to be used in marginal reservoirs and therein lies the origins to the deflationary trends that are facing the industry (and indeed society) today.

Shale 1.0 - Technology

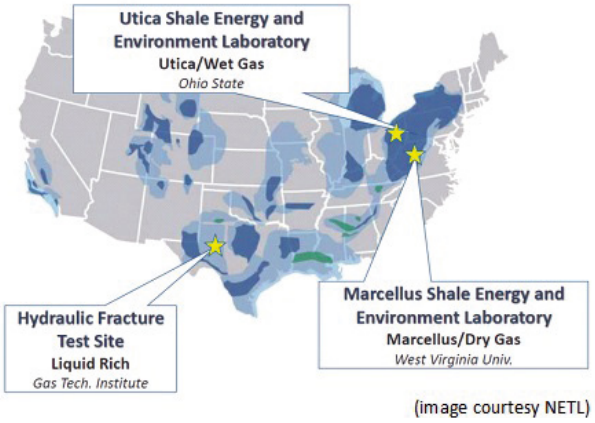
Shale development has always been about cost, small operators were the pioneers in introducing technology and new practices that set them on a path to dramatically lower operating costs. The MWX studies in the 1990's developed optimized D&C practices and that have now evolved to using a 'worst case' completion, together with batch drilling from large central pads. Optimization developed along this 'bigger is better' concept and completions were optimized by trial-and-error as drilling progressed on ever closer spacing.

Shale 2.0 - Completion

Smaller companies grew in size and completions evolved from single large treatments to using ever more stages and drilling multiple wells from a single pad. Testing and comparing concepts became easier and more widespread, though "plug & perf" (P&P) was initially discarded on price and an initial desire for frac "complexity". However, P&P performance improved dramatically as smaller start-ups innovated technology and the industry realized that "simplicity" was more effective for reserve recovery. The increased material volume led to vendor competition and an associated cost reduction, so that P&P is now the preferred completion technique.

(image courtesy P Branagan 2009)

DOE/GRI MWX Site in 1980's



(image courtesy NETL)

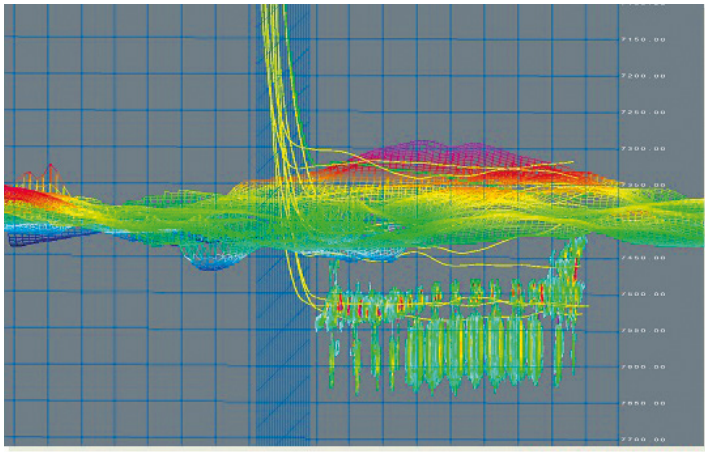
DOE/NETL Shale Technology Test Sites

Shale 3.0 - Pumping

Originally, operators would use a single service company for turnkey operations, but fluids became simpler and the main chemical was sourced separately, and operators discovered that they were able to realize significant cost reduction, as well as introduce better products. Completion engineers then started to use this approach to look for new technology, set-up competition and then optimize purchasing and logistics, cost has become the main selection criteria. Interestingly, as job size and operational simplicity grew the operations now became more aligned with the expertise of major oil companies. Technology then trended towards the cheapest, locally sourced fluids and proppants as oil prices tumbled and this approach has shown that what is done to shale rock (strain) is often more important than what is put in (conductivity).

Shale 4.0 - Remote working & Automation

The perfect 'Tsunami' hit the industry with low oil prices and the world-wide pandemic. A trend was happening anyway, based on continued improvements in cost reduction and safety, but there was a growing investor pressure that O&G was no longer the sustainable energy future. These recent changes will be permanent, and the industry is now aggressively pursuing remote working and automation of wellsite operations. This phase will not only drive down costs but should address many of the ESG concerns demanded by investors.



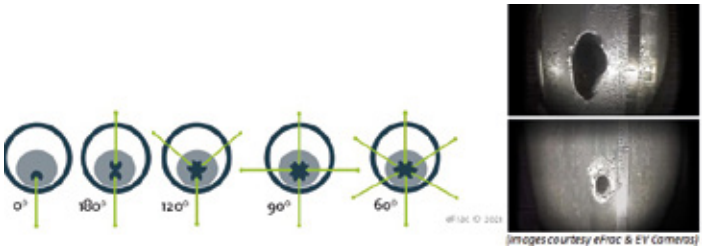
(image courtesy eFrac)

Sub-surface Simulation Optimization

Technology

Completions

Plug and perf is now established as the completion of choice and increasingly components are being commoditized. Technical advances are helped by the ability to easily conduct multiple field trial comparisons in a single well and our understanding of wellbore proppant transport processes is improving using simulations. Recent advances in perforation



Perforation phasing influences complexity and erosion

design now gives more consistent, equal perforation holes and the importance of perforation phasing, friction and erosion processes are shedding new light on what might be required for future cluster designs. Increasingly designs are looking to optimize frac initiation and subsequent reservoir frac growth, mitigating risk, reducing material and ultimately cost.

Pumps

Frac pump operations are increasingly being electrified and this makes sense, particularly as it addresses concerns about maintenance, operational noise and pollution. The main stumbling block to use is cost and 'electric only' pumps will probably remain a niche application for now. The main market seems to be for 'dual fuel' pumps (operating a diesel engine on a combination of both diesel fuel and natural gas simultaneously) especially attractive due to the potential to use surplus gas.

(image courtesy NOV)

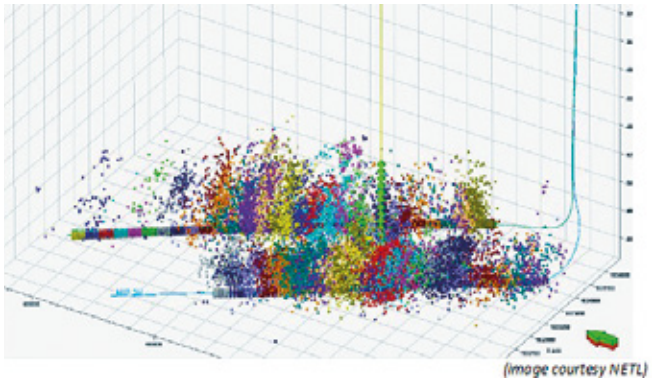
Electrification of pumping operations

Automation

The main change now being aggressively pursued is the automation of wellsite pumping operations, based on Data Analytics & AI. This is evolving quickly and experts companies are already developing techniques to identify data and processes that can be used to help streamline wellsite operations. Presently, it is only being used to optimize the time to ramp up to job rate, but it is evolving with the aim of having the whole process able to be designed, monitored and controlled remotely, with minimum personnel required on site.

Diagnostics

Diagnostics technologies are also being developed to allow real time decision making. Downhole measurements are usually always better than surface, but for 'ease of use' technologies will increasingly attempt to use surface measurements, until a suitable method is found that can easily measure and transmit data to surface.

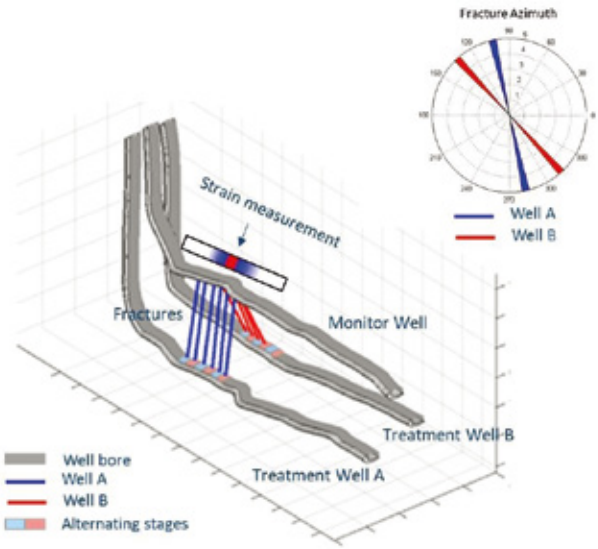


(image courtesy NETL)

MSEEL (Marcellus Shale Energy & Environmental Laboratory) Microseismic

Imaging is one of the main areas of interest with technology looking at ways of seeing the created fracs from the surface, as well as assessing the well design itself.

- Cameras are an easy way to look at the inside of wellbores. However, inside is only part of the picture and without analyses from outside pipe it is difficult to really assess results. The technique is simple in application but can only be used when it can see, so that also means limited application.
- Sound waves are one of the most versatile and promising technologies and large scale seismic has been used for monitoring reservoirs for decades now. Smaller scale, microseismic has found widespread use but has limitations in indicating actual frac growth and stimulated reservoir volume (SRV) but can be useful as part of a mitigation strategy. Surface sound measurements are also being investigated as a means of indicating differences between stage performance, but it is remains to be seen whether such technology can give frac data without some kind of integrated calibration? The technology also offer promise for logging or looking at the near the wellbore region. Presently, this technology is looking to be applied to calibrate perforation erosion with treatment parameters and production, as well as assess wellbore integrity.
- Fiber optics and Pressure changes are also being investigated and are increasingly being used in offset wells. The results offer promise, but the question remains about how the reservoir influences the effect and what do you do when a measurement is made, stop pumping?
- Electromagnetic measurements are also being investigated but there are issues associated with the required sensor surface area. The technology is still in

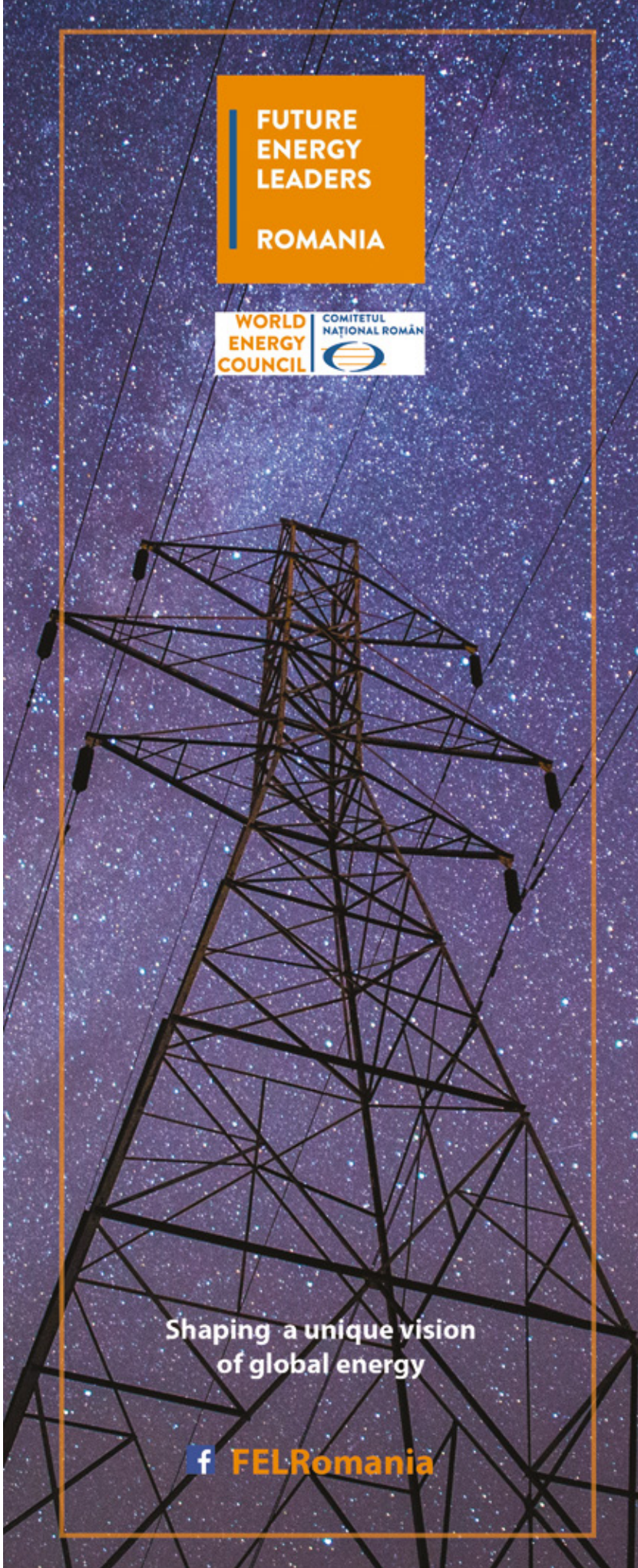


Fiber optic stimulation results

its infancy as there are questions about what threshold are required for monitoring water migration in reservoir types and what the results actually mean? Downhole measurements would be better and when properly calibrated and integrated with other technologies, there could be potential for routine use, given that real time measurements should be possible.

The big unknown that needs to be addressed is how does the reservoir change along the wellbore, particularly the rock mechanic heterogeneity in the near wellbore region? If we could get the required detailed data to properly engineer and model completion design, it would be a game changer for understanding some of the technology being developed. Also, it is worth remembering that the completion design only controls the treatment for the short initiation phase at the beginning of the job. Once the frac is several wellbores out, the reservoir takes over and this happens in minutes, not hours! Sometimes, anything is better than nothing, but ideally any new technology development should at least be properly calibrated on actual reservoir data.

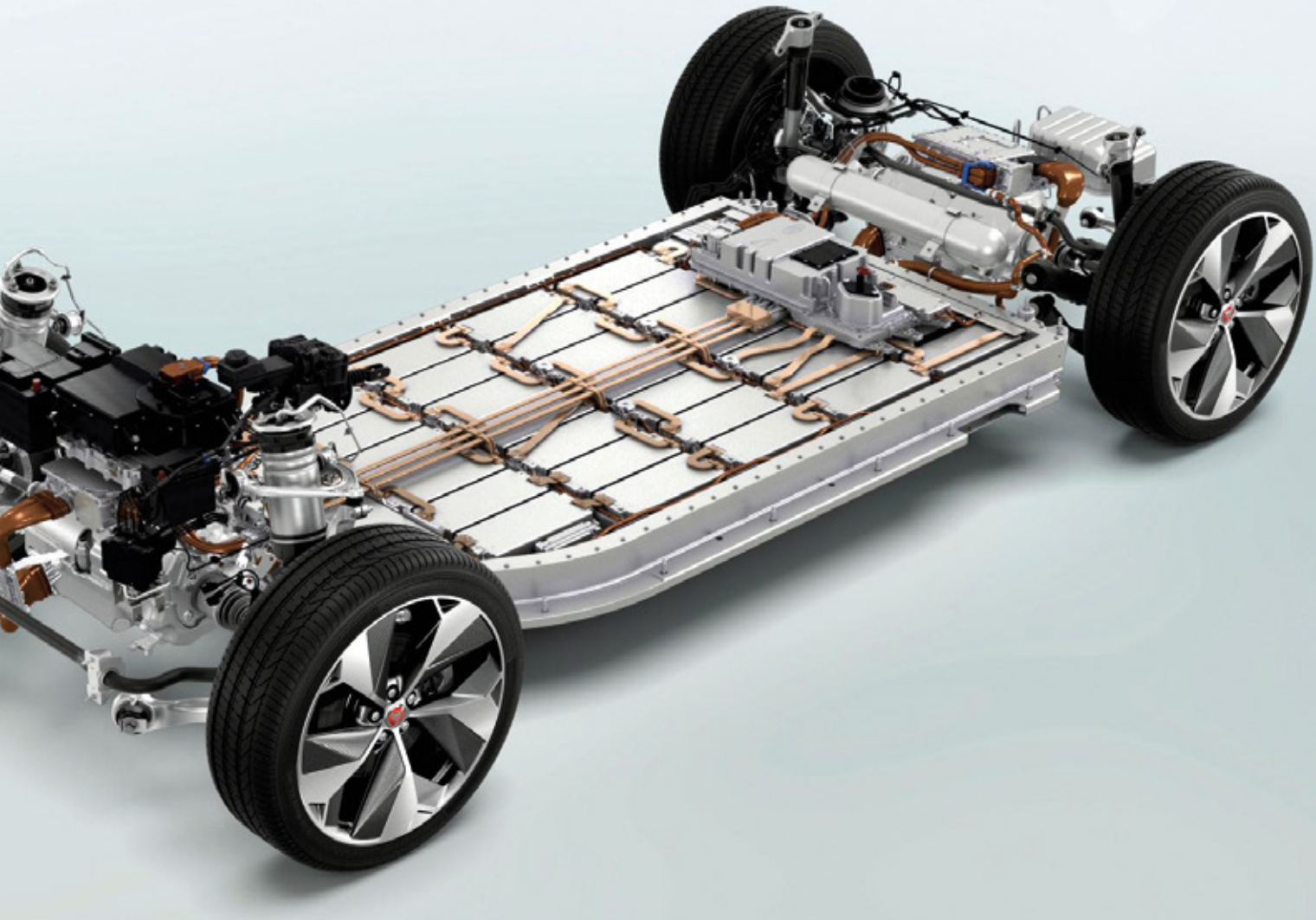
If the industry is to mitigate future development impacts and maximize reserve recovery it cannot apply technology that ignores the reservoir; it is always there, but cannot be seen from the surface? ■



Battery Technology **A New Era Emerging**

by **Evgenios Zogopoulos**
Co-author: **Mihai Petcu**

The continuum of battery technology development has been varying from stagnant periods to significant breakthroughs, in an almost unpredictable fashion. The inception of the idea about a battery charged-electric vehicle is indeed as old as the motor car itself. The trend has been consistently directing away from heavy and acid batteries to compact, light and far more efficient nickel/metal (NiMH) accumulators. One of those significant breakthroughs mentioned above came with the introduction of lithium-ion technology. Of course, many additional technological advances seem to be imminent, within the next years, through the introduction of post-lithium-ion technology.



Lithium-ion batteries are named after the movement of lithium ions within them and they power most rechargeable devices today. The element lithium (Li) has some interesting properties that allow batteries to be both portable and powerful; the 2019 Nobel Prize in Chemistry was awarded to scientists who worked on the idea during the 1970s. But despite their widespread use, lithium-ion batteries remain extremely complicated and still intrigue scientists to unlock their secrets and open up the road for optimal efficiency.

These new batteries have also displaced the Ni-Cd (Nickel-Cadmium) ones, dominating in portable electronic devices market of smartphones and laptops. Li-ion batteries are also extensively utilized in the aerospace domain, like in the new Boeing 787, where weight and environmental-friendliness are significant factors.

Lithium-ion seems to be the most efficient battery technology available, indicating a lot of space for further improvements. They are capable of having a very high voltage and charge storage per unit mass and unit volume. They are also incomparable with the older batteries in terms of quality, output, half-life and cost. A lithium-ion (Li-ion) battery uses lithium ions as a key component of its electrochemistry. More specifically, as it goes through its discharge cycle, lithium atoms in the anode are ionized and separated from their electrons. Then, those charged lithium ions move from the anode and pass through the electrolyte until they reach the cathode, where they recombine with their electrons and practically neutralize. In principle, rechargeable batteries shouldn't expire but they can only practically be recharged a limited number of times before they lose their ability to hold a charge. The ordinary types of battery will stop working when their terminals, the electrodes, are altered due the ions passing from one terminal of the battery to the other. In a rechargeable battery, the electrodes recover when an external charger sends those ions back where they came from.

During the last two decades, lithium-ion batteries have reached the status of being the spearhead of the automotive market. They are the same technological advancement that enabled automakers to redefine their positioning towards fossil fuels and internal combustion engines (ICE). We observe a global transition towards electric vehicles (EV), which continually pushes the boundaries of lithium-ion batteries for more power, longevity and cost-effectiveness.

For example, the ranges of 500 km are already feasible for electric vehicles, while the charging times are constantly being reduced thanks to rapid charging technology. The launch of what are known as post-lithium-ion systems are considered within-reach. New technologies, and especially the kind aimed at material-related improvements, plus ever-increasing production volumes leading to further price decreases, will determine the evolutionary development stages of the next few years. But the beauty of the battery system is not only in the cell itself and the related materials, but in the whole system that incorporates it. This includes the electronics, software, integrated cooling and the highly secure housing that is tailor-made for the vehicle and the cells.

A brave new world

A brave new world is upon us, with many pioneers leading the way of developments. Tesla is one of those in the lead, pushing the electric vehicle market to new frontiers and probably the eventual domination over the ICE vehicles. The big catalyst here, is that the internal combustion engines are replaced by cars solely powered by lithium-ion batteries, so the battery performance defines eventually the car's performance. There are still problems though, with charging times and mile capacity being still barriers to be overcome. For fast charging and discharging of Li-ion batteries, methods that reduce the particle size of electrode materials were used so far. However, reducing the particle size has a disadvantage of decreasing the volumetric energy density of the batteries.

In light of this, a POSTECH (South Korean university) research team has developed a much faster charging and longer lasting battery material. Professor Byoungwoo Kang and Dr. Minkyung Kim of the Department of Materials Science and Engineering along with professor Won-Sub Yoon of the Department of Energy Science at Sungkyunkwan University have conducted some really interesting research. Their findings were published in the recent issue of Energy & Environmental Science and proved to enable further longevity for Li-ion batterie leading to the production of Li-ion battery electrodes that charge up to 90% in six minutes and discharge 54% in 18 seconds. Professor Byoungwoo Kang mentioned that: "The conventional approach has always been a trade-off between its low energy density and the rapid charge and discharge speed due to the reduction in the particle size. This research has laid the foundation for developing Li-ion batteries that can achieve quick charging and discharging speed, high energy density, and prolonged performance."

Building a European battery industry

In the massive migration from fossil to electric, the availability of capable batteries is a major issue. The need for efficient batteries – for transport, power and industrial applications – is growing fast and at an increasing pace.

The European Commission launched the European Battery Alliance in October 2017 to address this industrial challenge. The annual market value is estimated at EUR 250 billion from 2025

Construction of Northvolt's giga-factory outside Skellefteå is in full swing. The site covers an area of more than 400,000 square meters, one of the largest industrial sites in northern Scandinavia. Photo: Northvolt

onwards. For Europe, the establishment of a complete domestic battery value chain is imperative for a clean energy transition and a competitive industry.

The industrial development programme of the European Battery Alliance, the EBA250, is managed by EIT InnoEnergy. Today, EBA250 is a project-driven community which brings together close to 600 industrial and innovation actors, from mining to recycling, with the common objective to build a strong and competitive European battery industry.

A blueprint for next-generation battery manufacturing

Northvolt is developing a blueprint for next-generation Lithium-ion battery manufacturing that is fundamentally different to conventional battery production facilities. With a concept leveraging scale, vertical integration and automated manufacturing, they seek to push the boundaries of battery performance, quality and cost.

While the Northvolt blueprint is geared for technological excellence, it is rooted in a commitment to sustainability. Clean energy will power battery cell manufacturing, circular systems will be embedded into their processes and effective recycling solutions will be delivered to recover materials from end-of-life batteries and redirect them back into manufacturing.

Compared to traditional Lithium-ion battery manufacturers, this production process spans across many portions of the value chain and Northvolt gigafactories are designed to achieve optimal scale benefits. This approach provides them a structurally lower cost level and allows for a high degree of cost and quality control.

The company's first large-scale battery factory is being established in Skellefteå in northern Sweden. Northvolt Ett will serve as Northvolt's primary site for manufacturing of active material, cell assembly, recycling and auxiliaries. The factory is powered by 100 percent clean energy. Large-scale manufacturing will commence in 2021 and annual capacity will ramp up to at least 32 GWh by 2024, with the potential to expand to 40 GWh in the future.

The Northvolt–Volkswagen Group Joint Venture is establishing a battery factory in Salzgitter, Lower Saxony, Germany. Northvolt Zwei takes its design from the Northvolt blueprint for battery manufacturing developed for Northvolt Ett. Start of construction is slated for 2021 and start of

operations scheduled for early 2024. Initial annual output will be 16 GWh.

Northvolt's demonstration manufacturing line and research facility is in Västerås, 100 kilometers west of Stockholm. Northvolt Labs is used to qualify and industrialize battery cells and manufacturing processes together with the customers. Once cells are ready for mass production, they will be produced at Northvolt Ett. As of December 2019, Northvolt Labs is producing cells and ramping up to an annual capacity of 350 MWh per year.

Northvolt's smallest facility - Northvolt R&D, is built for cell design concept validation and is in Västerås, Sweden. Outfitted with all the capacities necessary for Northvolt to develop, manufacture and validate Li-ion materials and cells, the facility has been online since spring 2019.

The company's facility for battery module and energy storage system assembly has been established in Gdańsk, Poland. Northvolt Battery Systems Jeden hosts state-of-the-art production capacities and serves as an R&D platform for industrializing battery solutions. As of spring 2019, the facility is in production and ramping up to 10,000 modules/year.

A French company called NAWA Technologies claimed that they are already in production on a new electrode design that can radically boost the performance of existing and future battery chemistries, tripling energy density, and producing tenfold the power, with immensely faster charging and much longer battery life spans, almost quintupled. It all comes down to how the active material is held in the electrode, and the route the ions in that material must take to deliver their charge. The company's CTO, Pascal Boulanger explains it like that: "The distance the ion needs to move is just a few nanometres through the lithium material, instead of micrometres with a plain electrode." He continues: "Since the beginning of the battery industry, most performance increases have come from materials, but it has reached a plateau today. Combine abundant carbon with nanoscale electrode architecture advances and you have a game-changer. NAWA's Ultra-Fast Carbon Electrode brings a step change in electrode design and performance thanks to our vertically aligned carbon nanotube technology. Offering huge increases in power, energy storage and lifecycle, as well as being clean and cost-effective, the potential is enormous."

This development can radically increase power density, which can be translated as the battery's capacity to deliver faster charge and discharge. By radically we mean a tenfold increase, which results to smaller batteries that can offer 10 times more power with decreased charging times. For example, NAWA claims that a short charge of a few minutes charge could give a 0-80% charge. Also, with the proper modifications on the battery's surface area, and by employing nanotubes, NAWA claims that lifespan could increase by five times. Boulanger stated: "Making a battery is very difficult; you have to master a lot of parameters. But if you want to master those parameters, you need to have the highest electrical conductivity. You need to have the highest thermal conductivity. You need to have the highest ionic conductivity. And that's exactly what our material can bring to battery makers."

Ulrik Grape, CEO of NAWA Technologies also said: "NAWA's Ultra-Fast Carbon Electrode will allow us to charge batteries faster, go further and for longer – and all with a product based on one of the world's most abundant and green materials: carbon. Our technology can help to dramatically reduce the environmental impact of battery systems, so much so that we believe this electrode innovation could halve the time in which an electric vehicle pays back the CO2created in its manufacture – as well as being able to recharge at the same time it takes to refuel and drive the same distance on electricity as a tank of gas."

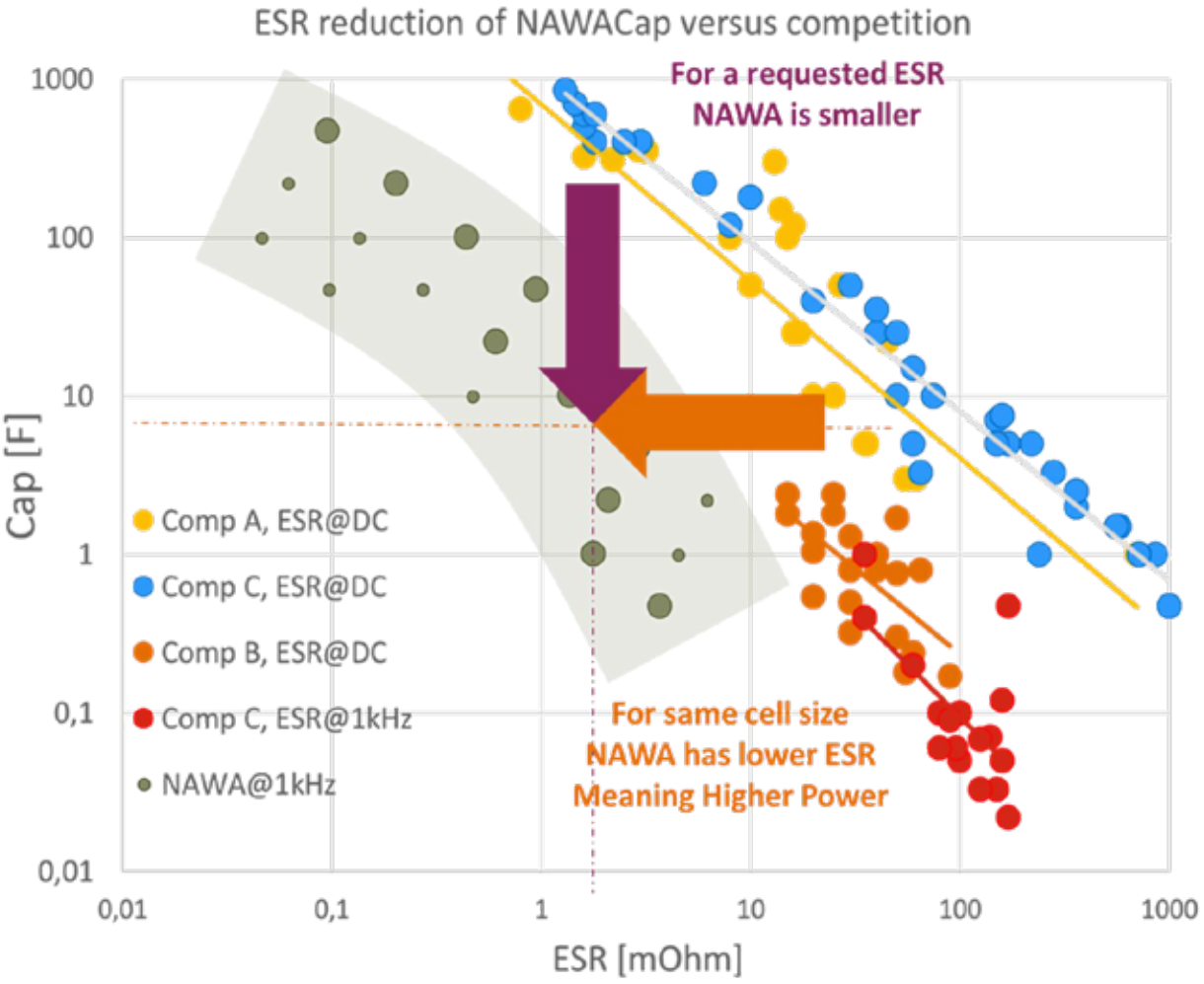
A Research Fellow at the School of Chemical and Physical Sciences at Flinders University, Dr. Cameron Shearer, and a batteries expert specified on this point: "Research has shown vertically aligned – or even just well distributed – carbon nanotubes have far greater properties than randomly placed carbon nanotubes. I am not surprised a x10 in conductivity is possible. Controlling the placement of carbon nanotubes is really the way to unlock their potential. The issue in commercialization is the cost associated with producing aligned carbon nanotubes. My guess is the cost would be much more than x10."

Boulanger replied with facts: "Just to give you some numbers, the cost for depositing anti-reflective coating inside a PV panel is a few cents per square meter. It's the same, we just deposit our material, because we've mastered the process. The growth rate for vertically aligned carbon nanotubes is known as being very, very fast. We can grow vertically aligned nanotubes up to, let's say, 100 microns per minute. It needs only one minute in the furnace. We've scaled this process on very large surfaces, and with a process that works at atmospheric pressure, at lower temperature, we can do it a little bit like making a newspaper. Not that fast, but almost the same idea."

The company has been scaling up its production capacity, supplying vertically aligned carbon nanotubes for its ultracapacitor devices. They consider electrode as is more or less flexible; it could be used on cylindrical cells or flat cells of all sizes and the plethora of possibilities can be found in the fact that it doesn't have to be lithium-ion, either. The company is examining silicon, nickel-manganese-cobalt and sulphur chemistries, and even more exotic materials which they cannot disclose. Silicon based batteries could offer double the energy density of lithium-ion, but the active material grows to four times its size as it's charged and shrinks back again as it discharges, causing mechanical issues that lead

TECHNOLOGY COMPETITIVE LANDSCAPE

NAWACAP POWER: LOWEST ESR -> HIGHEST POWER AND FREQUENCY RESPONSE



to cracks. So, if certain constraints are dealt with, no one can imagine what the future might hold. More specifically, Boulanger states: "Nanotubes are unbreakable; any expansion is lateral, not on the electrode thickness. And the nanotube structure acts like a cage. For silicon, it seems the solution could be to create a shell nanoparticle where the expanding-contracting silicon material is constrained inside a conductive carbon shell."

Rombat to produce batteries for electric cars near Bucharest

Romania appears on the map of countries producing high voltage Li-ion batteries for electric cars due to the car battery manufacturer Rombat from Bistrita, controlled by the South African group Metair who opened a new factory in Cernica, Ilfov County, near Bucharest.

Thus, the production unit of Li-ion batteries for electric cars occupies an area of 5,000 square meters on two levels with a total batteries production capacity which can store 100 MWh per month, due to an investment of 12 million euros. High-capacity batteries are increasingly in demand by the car market, given the multitude of EV projects launched by all major car companies, including not only full electric cars, but also hybrid and mild hybrid cars. The batteries produced at Cernica can be released in two types - the NMC (lithium-nickel-manganese)

type of 20 Ah/3.65 V and LPF (lithium-iron phosphate) of 20 Ah/3.2 V. The installed production capacity is up to 1 million cells per year, enough to equip over 20,000 medium-capacity electric cars.

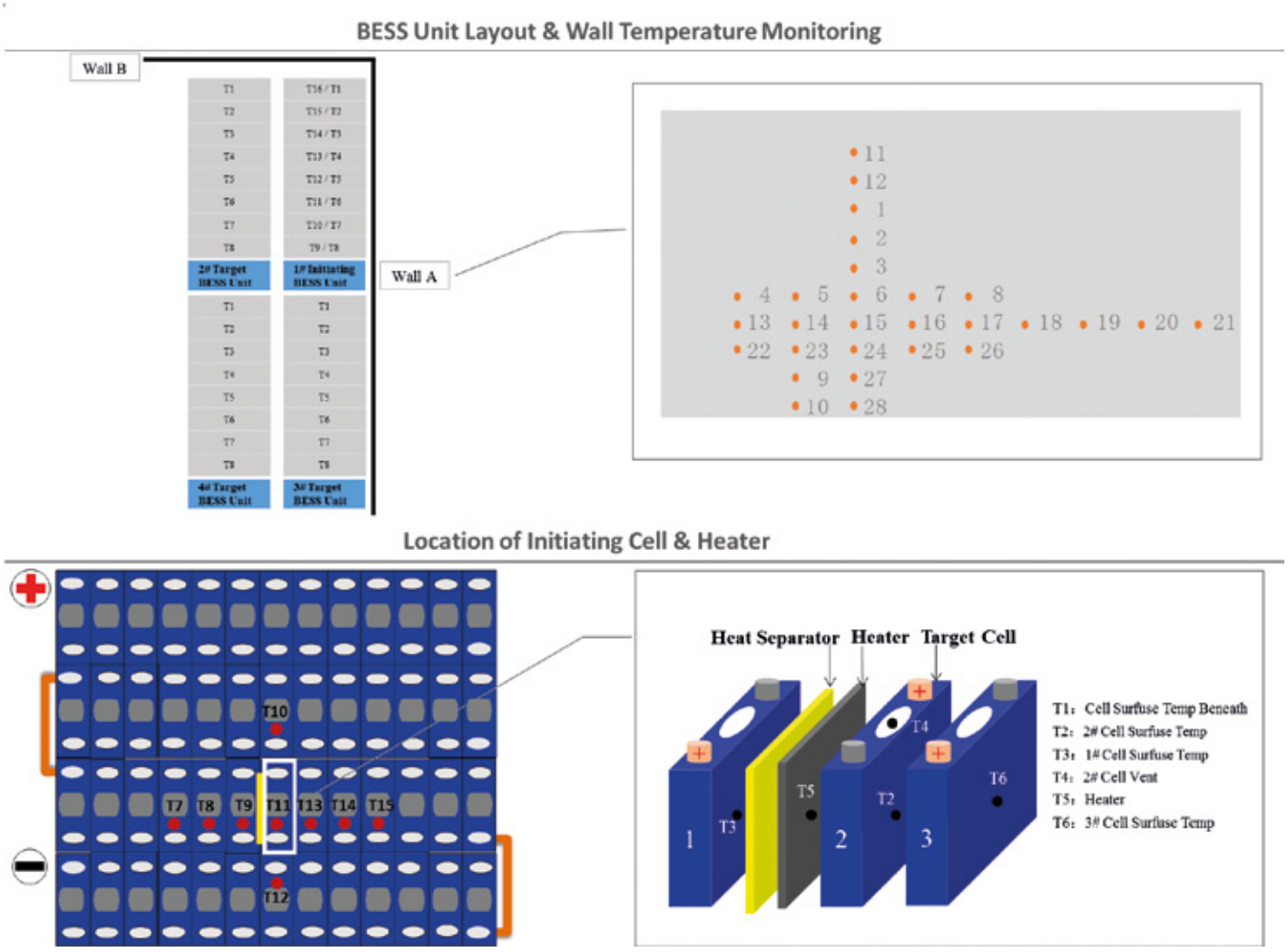
Promising technologies

As previously stated, EV adoption is becoming a catalyst for further developments in the battery industry and vice versa. For example, an 85-kWh Lithium-ion battery of a Tesla Model S is approximately 1,200 pounds consisting of 7,104 cells. It has a great range of up to 265 miles, but it can take up to 3-4 hours to recharge at a standard 220V source.

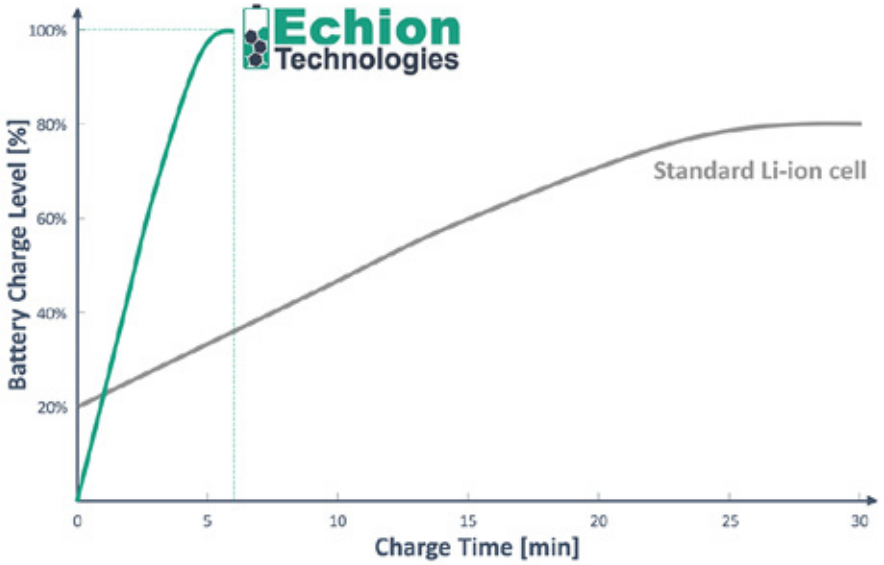
A Chinese battery-maker, supplying most of the major automakers (including Tesla) revealed they produced the first 'million-mile battery'. Contemporary Amperex Technology (CATL) says its new battery is capable of powering a vehicle for more than a million miles (1.2 million, to be precise - or 1.9 million km) over a 16-year lifespan.

This is why Tesla, which is today arguably considered the industry leader, is constantly reiterating and advancing on new battery tech. A new advancement is their lithium iron phosphate cathodes that are cobalt-free, something that takes care of the question the raw resource's scarcity. Cobalt is not only scarce but also linked with cruel and unethical mining methods in developing countries around the world. Both iron and phosphorous are easy to find and mine resources and could drastically reduce the environmental impact of mining for the scarce cobalt for battery usage. They also offer batteries with longer lifecycles and higher discharge and recharge rates. The trade-off is that iron phosphate, due to lower density

CATL's innovative liquid cooling LFP BESS performs well under UL 9540A test



Echion's Niobium-based anode materials enable cells with a unique combination of fast-charge, safety, and high energy density



capacity, could force an increase in battery size. Tesla is working on finding an engineering solution, in terms of battery shape, to optimize space utilization.

As with lithium iron phosphate, Lithium-Sulphur could become another very promising approach as a replacement for heavy metals in batteries. Researchers at Monash University have been working and finally developed a Lithium-Sulphur battery design, tested on a cell phone, that held charge for five days. That could promise a lot in terms of car applications; Monash researchers theorize that Lithium-Sulphur batteries can store more energy than Lithium-ion by a factor of six. They expect to commercialize the application within the next years.

Another very promising technology is glass batteries. The idea is to add sodium or even lithium to glass and form an electrode within the battery. This application could render it appropriate for mobility applications and it also seems that it's more stable than other sources, can handle extreme temperature better and is cheaper to produce. Glass battery technology is reportedly capable of storing three times the energy of a traditional Lithium-ion battery of a similar size and can withstand many more charge and discharge cycles than typical EV batteries. This implies reducing battery size maintaining the same range and performance or maintaining the size of a vehicle and extending the range by up to three times. The 1,000-mile EV barrier could be broken eventually.

Meanwhile, Echion Technologies- a start-up hailing from England, claims they have developed an anode for high-capacity Lithium batteries to reduce drastically recharging times. The anode, which operates as a negative pole during use and a positive pole during charge, has been called a mixed niobium oxide anode. The mixed niobium oxide anode can be used in exchange for any other anode style to improve recharging. It's compatible with conventional cathodes and electrolyte materials so it can be widely implemented. The bold claim about mixed niobium oxide anodes is that it can allow high-capacity Lithium batteries to recharge in as little as six minutes.

Applications and implications

As already mentioned, EVs have been catalytically driving the need for improvements in battery tech and they are a segment that the new technologies will definitely shape in the future. Leading EV manufacturers like Tesla, GM, Honda, BMW, NIO, Ford and Porsche offer diverse options starting from hybrid cars, all the way to fully electric vehicles. This simply means that the battery-powered electric vehicles (BEVs) rely only on electric power to drive whereas plug-in hybrid electric vehicles (PHEVs) and full hybrid electric vehicles (FHEV) work along with internal combustion engines (ICE) to generate power for the car.

When designing EV batteries, engineers must not only consider capacity but also charging times, degradation, chemistry aspects and definitely safety. Energy and power density thresholds have been realized in most EV applications, yet vehicle manufacturers are constantly tweaking module and cell sizes for optimum performance levels. Regardless of Lithium-ion battery cell and module sizes, the high-voltage battery systems that power EVs require meticulously designed battery management systems (BMS) to ensure maximum power and safety.

Tesla, along with upstart NIO, seem to be currently leading the largest global EV market, creating vehicles with up to 110kWh battery systems. These cars can store enough energy to power a standard 60W light bulb for up to 80 days and power the Tesla Model S for 400 miles. Their most recent battery packs will pack several thousand of Tesla's very own 2170 Lithium-ion cells. The 2170 Tesla Lithium-ion cells are 10-15% more energy efficient than the Panasonic 18650 cells at work in previous models. Tesla's 100kWh battery solution, built around the 18650 cells, contains 8,256 cells (12Ah/cell), evenly distributed across 16 battery modules.

Meanwhile, Porsche Taycan, Porsche's

attempt at a high-performing EV, contains a 93.4kWh battery that produces 800V, instead of the standard 400V found in most other electric vehicles. The Taycan's battery consists of 33 battery modules with 12 cells each, totalling 396 lithium-ion cells capable of storing a whopping 235.8 Wh/cell. Since battery charging speed is limited by current, the higher voltage these cells produce means lighter battery system weights and faster charging.

When it comes to hybrid solutions, Toyota is the leader. Their most popular PHEV, the Prius, boasts an 8.8 kWh battery pack, which enables the vehicle to achieve nearly 55 MPG in the city. Drivers can charge the 8.8 kWh battery at home or on the go, and because the Prius Prime consumes more electricity than gasoline, it saves money at the pump. The Prius Prime is powered by five battery stacks, each containing 19 LI cells (95 cells) that combine to a total capacity of 8.8kWh. By comparison, the standard Prius - the world's most popular FHEV - contains a much smaller battery, with only two stacks at 28 cells each (total of 56 cells), giving it a final capacity of 0.745 kWh. Many other manufacturers offer multiple models with varying battery capacity systems and battery utilization.

Other futuristic ideas are related to Vertical Take Off and Landing (VTOL) planes, drones and many other very interesting applications. Now for the commercialization of a VTOL Taxi or, for the logistics industry to use EV's fully and for more widespread use of electric vehicles we will need a few things, like battery longevity, increased availability of stored energy (even within our homes – with solutions like the Tesla power wall) and faster charging facilities.

Jeff Dahn, a Professor in the Department of Physics & Atmospheric Science along with his team at their Canadian lab have long been conducting leading battery research, but over the last four years, have been proceeding in partnership with Tesla. They have also been looking at new technology that does not just slightly improve batteries but changes them completely. But Dahn and Tesla's research shows a very different path – Anode free, Lithium pouch cells with dual-salt LiDFOB/LiBF4 Liquid Electrolyte. Professor Dahn, along with Tesla's scientific team, stated in one of their papers: "Recently, we demonstrated long-lifetime anode-free cells using a dual-salt carbonate electrolyte. Here we characterize the degradation of anode-free cells with this lean (2.6 g AG-1) Liquid electrolyte. We observe deterioration of the pristine Lithium morphology using scanning electron microscopy and X-ray tomography and diagnose the cause as electrolyte degradation and depletion using nuclear magnetic resonance spectroscopy and ultrasonic transmission mapping. For the safety characterization tests, we measure the cell temperature during nail penetration."

If Tesla keeps pushing in this way, battery cell efficiency will go through the roof, meaning that not only will we have high quality cells available to us, but we will also then be able to properly utilize power wall(s) in our homes, our work and why not in public places. In theory, this would mean that we could store our own solar energy better, or in the case of commercialization, energy companies could store the wind, solar and tidal energy they produce at off-peak times saving it for when demand is increased, rather than letting it go to waste. Energy costs would plummet and, as there would be public confidence in both the range and longevity of EVs, there would most likely be a significant shift in vehicular buying habits. Especially if it was combined with a governmental incentive, similar to the current German offering. When we save the energy we produce, rather than leaving it to go to waste, we would only need to use fossil fuels to top up our energy demands, rather than using it to provide the bulk of them.

Back in 2017, Tesla helped the Australian Government with an immense 150 MWH storage facility on the southern part of the continent, co-locating with the Hornsdale wind farm. After six months of operation, the Hornsdale Power Reserve was responsible for 55% of frequency control and ancillary services in South Australia. By the end of 2018, it was estimated that the Power Reserve had saved A$40 million in costs, mostly in eliminating the need for a fuel-powered 35 MW Frequency Control Ancillary Service. Tesla also broke ground for a new energy storage facility in Monterey, California, which will be the largest installation in the world. The battery park will be able to churn out 730 megawatt hours (MWH) of energy to the grid at a maximum rate of 182.5 MWH for up to four hours. Tesla and PG&E will then upgrade the system's capacity shortly after completion to 1.2 gigawatt-hours which according to Tesla, will power every home in San Francisco for six hours.

Most car batteries offer warranties for 60,000-150,000 miles over a three to eight-year period. This is a huge improvement in battery life, but will cost just 10% more than existing products, says CATL chair, Zeng Yuqun. Having a life-long battery is obviously good news for the electric car industry. But longer-lasting batteries are also essential for what's known as 'stationary' storage too. These are the batteries we can attach to wind turbines or solar panels so renewable energy is available when the sun isn't shining, or the wind isn't blowing. Fairly soon you might even want a stationary battery in your home to store cheap off-peak electricity, or to collect the power your own solar panels generate.

When it comes to Europe, Daimler AG – and its subsidiaries, seems to be the only German manufacturer today with its own battery production set up, and they are already ramping up production eyeing a global battery network. The company is investing over one billion euros in global battery production with two factories in Kamenz, Saxony and further sites in Stuttgart-Untertürkheim, Beijing and Tuscaloosa.

Another major implication, interwoven with the

Farming under solar panels

development of battery tech has to do with solar energy. In 2020, the University of York, collaborating with NOVA University of Lisbon, immensely increased the capacity of solar panels to absorb light by a stunning 125% by 3D geometry like a square block maze. This increases the diffraction rate meaning probability of light being absorbed. Dr. Christian Schuster from the York's Department of Physics claims: "In principle, we could deploy ten times more solar power for the same amount of absorber material: ten times thinner solar cells could enable a rapid expansion of photovoltaics, increase solar electricity production, and greatly reduce our carbon footprint". This unavoidably leads to thoughts about fitting these lighter, cheaper, more efficient panels on vehicles, to render them self-sustainable. Hyundai has already installed a solar roof on its Sonata hybrid car generating up to 10% of its power. Now translucent solar panels are promised on some Hyundai battery cars. Solar panels that open up when the vehicle stops have been demonstrated, as has sun-tracking solar on vehicles. ARC solar car chargers and large area land solar track the sun in one direction, increasing electricity produced by 30%.

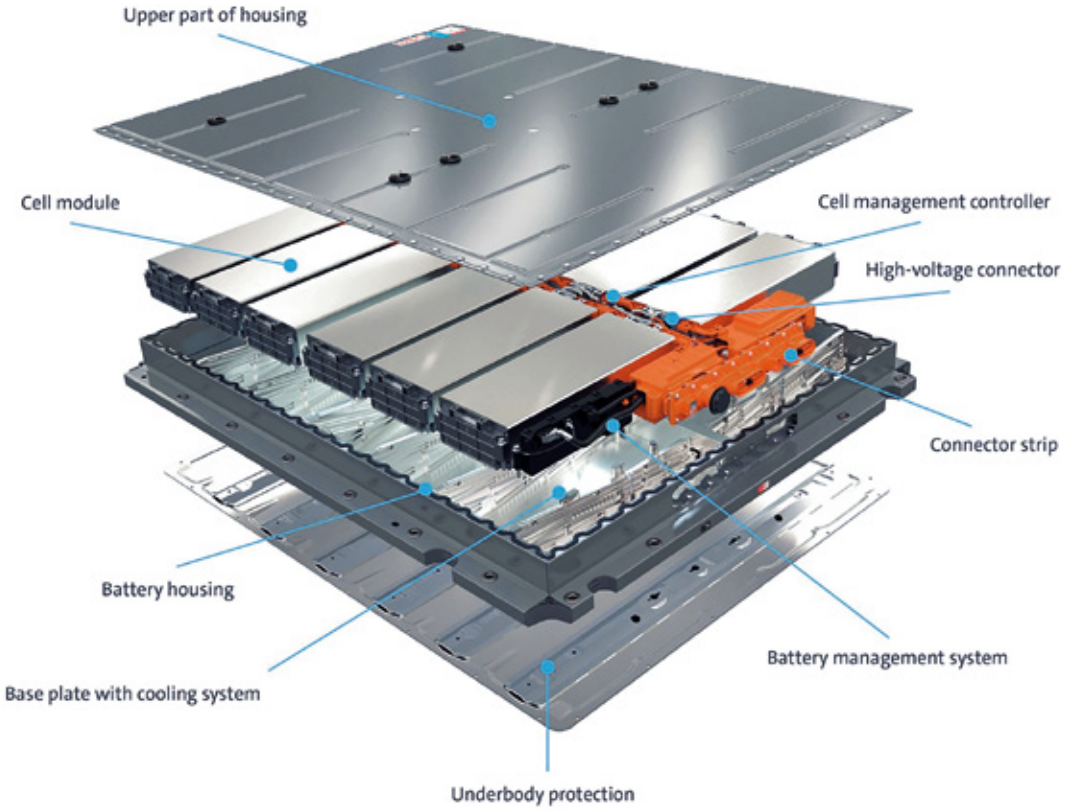
Further revolutionary ideas are also in play today: agrivoltaics and soliculture. Agrivoltaics is a clear win-win: it collects energy and boost agricultural production. Fraunhofer bifacial vertical panels work from both sides leaving ground open for agriculture. Soliculture uses translucent greenhouses which produce electricity while optimally filtering light for plant growth. There are also those photovoltaics that 'open up' like sunflowers and follow the light of the sun.

These flowers can be installed in fields, roofs and even vehicles. In Brazil, exceptionally high temperature reduces output so Sunew have used organic photovoltaic film on trucks to avoid the problem. Much solar uses infrared so that can even go on the underside of some vehicles traveling on hot roads as costs continue to plummet.

Trucks and buses may not achieve solar energy independence for some time, but all could recharge, without stopping, from solar land surfaces and buildings, if necessary, boosted by nearby wind and water turbines. Trains may viably charge mainly from traveling under long-distance solar awnings with help from solar bodywork and trackside solar and wind. Studies are taking place. Robot shuttles, cars and smaller vehicles will easily become energy independent. Indeed, a spin-off of Eindhoven University in the Netherlands is preparing a commercial energy-positive family car Stella Era and Audi has joined as a partner.

Global economic impact

The global battery technology market is driven by the increased use of electric and hybrid vehicles, growing global interest in consumer electronics, and stricter government regulations on emissions. The market in 2020 was estimated at just over $90 billion USD. It is expected to grow at a CAGR rate of around 10%, reaching over $150 billion USD in just 5 years. The Lithium-ion battery will have the greatest impact on growth, given its wide range of applications and further development potential.



According to the IEA Global EV Outlook 2020 report, electric cars, which accounted for 2.6% of global car sales and about 1% of global car stock in 2019, registered a 40% year-on-year increase. A main driver is the drastic cost reductions provided by the advancements in the Lithium-ion battery technology. From 2010 to 2018 the cost of a Lithium-ion battery pack dropped by 85%. By 2030 the average cost of a battery pack is expected to be well under $100/kWh. Government subsidies for the battery makers are another reason behind this explosive growth. After all, for electric cars, batteries are the main cost component at around 40% of total costs. However, the EV market growth is expected to slow down, compared to the current pace; the overall car market has contracted in 2019 and 2020 and purchase programs have been reduced in key markets like China and the U.S. Consumers are looking for technology improvements and new models, as the profile is shifting from early adaptors to early and late majority.

The shift from oil to electric may pose potential economic loss for governments, if not properly accounted for. A good example of this can be found in a thesis published by the Scholarship at La Salle University Digital Commons. This paper shows how the increase of EV sales and respectively the increase of EVs as percentage of vehicle stock has a direct impact on the gas tax revenue for each U.S. state. California, the state with most vehicles in the US and the largest gas tax revenue (estimated $8.4 billion in 2019) would lose $27.53 million in 2021 (representing 0.3% of the 2019 estimated revenue) and $532.03 million gross revenue between 2019-2028. This is an important loss, considering that the gas tax is the major source of funds for maintaining, replacing, and constructing state highway and transportation facilities.

As proposed in the paper, this can be adjusted by implementing a yearly EV surcharge. This solution should also be considered in Europe which holds a 39% share of the EV market and an energy tax revenue of over $360 billion in 2019. In this case the energy tax represents all NACE activities plus households, non-residents and not allocated. Energy taxation consists of four kinds of taxes that make up environmental taxes; the rest are being pollution taxes, resource taxes and transportation taxes.

Conclusion

All in all, the sky seems to be the limit regarding the applications and implications of new battery technology. From electric cars, to flying vehicles, from more efficient energy storage grids to soliculture, the eventual economic implications are very hard to predict or even imagine at this point; we cannot help but employ wild guesses and imagine futuristic solutions for tomorrow. The way that we design, produce and utilize batteries in the future seems that will be one of the major catalysts for the eventual transformation of our relationship with energy; that might actually bring humankind one step closer to becoming an eco-friendly species, instead of carving the planet and burning it to power itself. ■

Our mission is to promote the role and the importance of the entrepreneur for economic and social development.

We support entrepreneurs looking to generate evolution and an innovative approach to local business culture.

office@adaaromania.ro
www.adaaromania.ro

ADAA

THE ASSOCIATION FOR THE DEVELOPMENT OF LOCAL ENTREPRENEURSHIP

Credibility Responsibility Excellence

THINK BIG, ACT HUGE

Hydrogen Insights 2021

A PERSPECTIVE ON HYDROGEN INVESTMENT, DEPLOYMENT AND COST COMPETITIVENESS

Deployment and investments in hydrogen have accelerated rapidly in response to government commitments to deep decarbonization, establishing hydrogen as a key component in the energy transition.

To help guide regulators, decision-makers, and investors, the Hydrogen Council collaborated with McKinsey & Company to release the report 'Hydrogen Insights 2021: A Perspective on Hydrogen Investment, Deployment and Cost Competitiveness'. The report offers a comprehensive perspective on market deployment around the world, investment momentum as well as implications on cost competitiveness of hydrogen solutions.

Deployment and investments

There are over 30 countries with hydrogen roadmaps, and 228 large-scale hydrogen projects announced across the value chain, with 85% located in Europe, Asia, and Australia. If all projects come to fruition, total investments will reach more than USD 300 billion in spending through 2030, including USD 80 billion which can be considered 'mature' – meaning that these projects are in the planning stage, have passed a final investment decision (FID), or are under construction, already commissioned, or operational. Governments worldwide have committed more than USD 70 billion in public funding.

On a company level, members in the Hydrogen Council are planning a sixfold increase in their total hydrogen investments through 2025 and a 16-fold increase through 2030. They plan to direct most of this investment toward capital expenditures (capex), followed by spending on merger and acquisition (M&A) and R&D activities.

Supply

Renewable hydrogen production cost could fall faster than estimated, if scaled up with the right long-term regulatory framework and public support, continued decline in renewable costs, and a rapid scale-up of value chains for electrolysis and carbon management. Projections show that by 2030 the costs of renewable hydrogen production could be in the range of USD 2.3 per kilogram and USD 1.4 per kilogram (the range results from differences between optimal and average regions).

Low-carbon hydrogen can break even with grey hydrogen between 2028 to 2034 at a cost of about USD 35-50 per ton of carbon dioxide equivalent.

Distribution

To unlock hydrogen applications, a cost-efficient transmission and distribution will be required. Long-term, a network of pipelines offers the most cost-efficient means of distribution, while in the short- to medium-term, the most competitive setup involves co-locating hydrogen production on- or near-site that connects resource-rich regions to demand centers via trucks, trains, refueling stations, and smaller industrial users.

Longer distances can be covered by shipping, where hydrogen needs to be converted to increase its density. While several potential hydrogen carrier approaches exist, three carbon-neutral carriers – liquid hydrogen (LH2), liquid-organic compounds (LOHC) and ammonia (NH3) – are gaining most traction. The end use of hydrogen needs to be considered to determine the most cost-optimal solution.

End applications

With increased scale of hydrogen deployment and subsequent falling costs of hydrogen and various technologies, from a total cost of ownership (TCO) hydrogen could be the most competitive low-carbon solution in more than 20 applications by 2030, including long haul trucking, shipping, and steel. ■

HABAU
PPS PIPELINE SYSTEMS

Honor
sAfety
responsiBility
Achievement
qUality

Plant construction

Pipeline construction

Civil works projects

EPCC projects

Drilling projects

www.habau.com
www.pipelinesystems.de

Sinaii Street, № 3, Floor 1-3
Ploiesti, Prahova, 100357
ROMANIA

Phone: +40 244 595940
+40 244 406616
+40 244 406621
Fax: +40 244 595942
E-mail: office@habau.ro