JULY/AUGUST 2021

ENERGY INDUSTRY REVIEW

GEOTHERMAL ENERGY

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TAXATION OF OFFSHORE GAS PRODUCTION IN EUROPE

Romania to Have the Highest Effective Tax Rate

Scott Moore, CEO Euro Sun Mining

Rovina Valley Project Heads for First Production in 2024

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

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Fit for 55%, Pros and Cons

For several years there has been more and more talk about global heating and environmental activists are increasingly imperative in requesting measures to make things right before it's too late. No one disputes that summers are increasingly warm, that we have 4 seasons only in theory, that pollution is rampant, but all these come from studies and statistical data. Which are made by people and, isn't it, they can be called into question to some extent.

Something else is interesting: almost all developed countries rely on this concept, and large global companies (and here those in the energy sector are no exception) adjust on the go their CSR policies under the umbrella of sustainability (an increasingly used term in the last year), of the care for the environment and for the planet that we leave to future generations. Now, the European Commission programme came into sight. In this work programme for 2021, the revisions and initiatives linked to the European Green Deal climate actions and in particular the climate target plan's 55% net reduction target are presented under the Fit for 55 package.

The Covid-19 pandemic has accelerated a process that under normal circumstances would have been difficult to implement and would also have hit serious resistance from actors (economic and political), who would have intuited that they would lose positions and privileges in the long run. Instead...

OPEC+ ministers have recently cancelled negotiations on oil production, following the United Arab Emirates' dissatisfaction, which did not accept an eight-month extension of supply cut. The inability to reach an agreement means that the expected majority of oil production starting August will not take place, which has led to an increase in Brent oil prices by around 1%, to a closing price of USD 77/bbl. Oil prices are at the highest level since 2018 and have already caused concern that inflation could divert the recovery of the global economy after the Covid-19 pandemic.

OPEC+ last year agreed on a record cut of oil production, by almost 10 million barrels per day, accounting for about 10% of global production, in the context of the pandemic, but now the figure reached is 5.8 million barrels of oil per day, in conditions in which the decisions of OPEC+, which includes OPEC member states, Russia and other large oil producers, must be unanimous.

Returning to our country, the measures announced will not be easy for Romanians, in conditions in which the focus will be on reducing greenhouse gas emissions from transport and the residential sector, says Environment Minister Barna Tanczos. The high official has set sights on taxes to be paid by owners of old cars, extremely polluting. To reach this goal, citizens with low income will be supported to give up their old cars.

The crusade of electric cars is not mentioned for the first time, and young people seem to be the easiest to convince. And as they are the future of the planet, it seems that the trend is irreversible. Much to the joy of those who promote it. But it remains to be seen what the states and companies that currently make from oil and natural gas an important leverage in the global economic and geostrategic context feel about it.

Daniel Lazar

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AFEER Dedicated to Gas Market Regulations in Romania

The Association of Energy Suppliers in Romania (AFEER) has started internal discussions on improvement of gas market regulations, as part of association's activity in the natural gas sector. Therefore, it supports all suppliers and traders of energy (electricity and natural gas).

At the invitation of AFEER's Management Board, a first meeting took place with representatives of companies operating in the gas sector, as well as with representatives of 10 companies' member of the association that have chosen a multiple membership (electricity and natural gas). Participants in the meeting appreciated AFEER's initiative, this extremely important activity in the area of regulations in the natural gas sector, which has missed. A meeting followed with the working group for regulations in the field of electricity having as topic ANRE's proposal to change the performance standard of the supply activity.

Competition Council Authorizing Outsourcing of Some Services by OMV Petrom

The Competition Council has authorized the transaction through which OMV Petrom outsources some workover and well repair services, operations related to oil and gas extraction and production activities, together with the assets and servicing employees, to the consortium consisting of Christof MB Well S.R.L., J. Christof E&P Services S.R.L. and MB Well Services GmbH Germany (Christof Consortium). Therefore, Christof consortium has signed with OMV Petrom a framework agreement for workover and well repair services. Following a procurement procedure, Christof Consortium was designated the highest-ranking bidder for Moesia Asset.

The procedure involves the sale of movable property, the rental of immovable property of OMV Petrom, as well as the transfer of employees to Christof Consortium, at the end of the framework agreement some assets following to be returned to OMV Petrom.

The Competition Council has analysed these operations and found that they do not raise significant obstacles to effective competition on the Romanian market or a substantial part thereof and there are no serious doubts on their compatibility with a normal competitive environment.

Enel X and Kaufland to Build EUR 1mln Photovoltaic Park

Enel X Romania is implementing a photovoltaic system for Kaufland Romania retailer in Turda, with an installed capacity of 1 MWp. The project involves the turnkey delivery of a system that integrates over 2,000 photovoltaic panels located on the land in the close vicinity of the Kaufland logistics centre in Turda, a 1 million euros investment.

"Enel X continues to support the business environment in the energy transition and offers customized solutions for companies that put sustainability at the forefront. Beyond the positive impact on the environment, photovoltaic systems lead to lower electricity costs, giving beneficiaries the opportunity to track their production and, consequently, to streamline their energy consumption. We are happy to work with companies that have repeatedly demonstrated care for the environment, and we are glad that they carry this value in the field of electricity and chose our products. We encourage business partners to invest in renewable energy today, to be prepared for tomorrow," said Laurentiu Brumaru, Head of Sales & Marketing e-Industries, Enel X Romania.

The photovoltaic system implemented on the ground in the vicinity of the Kaufland logistics centre ensures an annual electricity production of 1,277 MWh, contributing to cutting carbon dioxide emissions by 595 tons/year. The project developed together with Enel X brings retailer Kaufland annual electricity savings estimated at about 112,000 euros..

ESM Moving Forward with Permitting Process for Rovina Valley Project

Euro Sun Mining (ESM) announced a significant milestone in the permitting process required under Romanian legislation to continue to advance the Rovina Valley Project. With the issuance of the Avizul de Oportunitate, (approximate translation: opportunity opinion and/or permit), by the County Council of Hunedoara County, the Company is now approved to proceed to the next stage of permitting for the Rovina Valley Project, namely the Planul Urbanistic Zonal ('PUZ') or Certificate of Urbanism for Land.

The PUZ process takes the existing pastoral or forest lands and re-zones the required area for commercial activity. The definitive feasibility study, filed on April 14th, 2021, provided the necessary engineering details required for the submittal of the approximately 3,000-page application and ultimately approval of the permit.

As announced on April 5th, 2021, the Company officially initiated the Strategic Environmental Assessment ('SEA') with the Environmental Protection Agency of Hunedoara County ('EPA'). The legislated eighteen-day period for public comment on initiation of the SEA has passed with no comments received by the EPA. The Company and the EPA are now working towards receiving the agreements and/or opinions from all the administrative authorities for the environmental opinion on the PUZ and preparing for public consultations expected to occur in Q3 2021.

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A New Leadership for FIC

During its first meeting of the 2021 – 2022 mandate, the Foreign Investors Council (FIC) Board decided on the new Officers team, electing Cristian Secosan, CEO Siemens Romania and Moldova, as FIC president. He will be supported by Ramona Jurubita, Country Managing Partner KPMG Romania and Eric Stab, Chairman & CEO of ENGIE Romania, Executive Director ENGIE Eastern Europe as vice-presidents. Daniel Anghel, Tax and Legal Services Leader, PwC Romania has been appointed as treasurer.

In addition, the Board decided that this year's agenda should focus on identifying measures for sustainable economic growth, with a focus on the environmental, social and governance components - known as ESG criteria. The FIC will pay more attention to the PNRR related topics addressed in its working groups to contribute to the implementation of the projects proposed by the Government.

As Romania recovers from a difficult period, both from a health and economic perspective, FIC believes policymaking designed based on consultation and transparency and centred on all relevant stakeholders is more important than ever.

Blast Furnace Slag Used to Produce Low Carbon Footprint Cement

LIBERTY Galati has for the first time exported 50,000 tonnes of blast furnace slag, a by-product of the steel making process carried out at the plant, so that it can be converted into very low carbon cement at a specialist factory in France.

A ship loaded with granulated blast furnace slag, which is produced in LIBERTY Galati's own facilities through the processing of hot liquid slag, has been sent to a prestigious cement manufacturer in France. That company operates an innovative technology which uses slag, clay and plaster in a kiln and clinker-free production process. The new process is environmentally protective as it does not involve the extraction of limestone, does not release gases into the atmosphere and – eventually – reduces the carbon footprint of the cement by 80%. The classic cement-making process uses a rotary kiln where the raw materials are heated up to 1,450 degrees Celsius, which also generates the clinker by-product, largely responsible for the carbon footprint of the cement.

LIBERTY Galati produces about half a million tonnes of blast furnace slag yearly. Of this, the granulated slag is used by cement producers in Romania but also in other countries across Europe and Africa. The use of slag in the cement industry reduces the use of natural raw materials and – implicitly – its carbon footprint.

Romania's Golden Gate Bridge Reaching New Heights

Europe's third-longest bridge, which is being built over the River Danube at Braila, is taking shape with the construction of a platform that will be used to pull two massive steel cables into place. The ERDF is providing funding of EUR 363 million for the suspension bridge and 23 km of roads linking Braila, on the western bank of the Danube, with Tulcea County on the eastern side.

The bridge and connecting roads will make for faster, safer travel between Romania's North-West region and the Black Sea, and to neighbours Moldova and Ukraine.

Building the platform is expected to take two-and-half months. The 60 cm-thick cables that will hold the deck of the bridge are made by a Japanese company and come with a 120-year warranty. The distance between the bridge's two 192 m-high towers is 1120 m, compared with the Golden Gate's 1280 m. Romania's engineering marvel will have a total length of 1974 m, 4 m longer than its American counterpart. It will have four traffic lanes, and two lanes for pedestrians and bicycles. Construction began in 2019 and is expected to be completed in 2023.

EUR 70mln for Replacing the Coke Drums at Petrobrazi

OMV Petrom will invest approximately EUR 70 million at the Petrobrazi refinery, to replace certain facilities that are essential during the refining process. These are the four Coke Drums which, at very high temperatures, ensure the stage of upgrading heavy components to superior products.

"We are constantly investing in the modernization of the Petrobrazi refinery. The replacement of the Coke Drums is a project with a very high degree of technical and organizational complexity. The new units will have an important contribution to increasing the efficiency and safety of our operations," Radu Caprau, member of the OMV Petrom Executive Board, responsible for Downstream Oil, said.

The four Coke Drums are designed for a lifespan of over 20 years and 5,000 operating cycles and will be produced in Romania. The weight of one coke drum is almost 200 tons, with a diameter of approximately 6 meters and a length/height of around 30 meters. The crane that will be used to replace the Coke Drums will have a height of around 140 meters and, depending on weather conditions, it will be able to be seen from Bucharest. The process of replacing the Coke Drums will take place between 2021 and 2023; approximately EUR 11 million will be invested this year.

Ørsted, Fred. Olsen Renewables and Hafslund Eco to Develop Offshore Wind

Ørsted joins consortium with Fred. Olsen Renewables and Hafslund Eco establishing a long-term partnership to develop offshore wind in Norway and to compete in Norway's upcoming application round for offshore wind areas.

The Norwegian part of the North Sea holds great potential for the development of large-scale offshore wind farms that can supply green energy to Norwegian industries and households, and potentially also to other countries in the North Sea through the offshore grid needed to enable the massive build-out of offshore wind across Europe towards 2050. Offshore wind and offshore grid combined will create a profitable solution for Norway, utilising Norwegian flexible hydropower and delivering renewable power at low cost.

The consortium has the aim to deliver both bottom-fixed and floating offshore wind power, while developing the Norwegian supply chain for the expected large-scale build-out of offshore wind in Norway and in Europe.

Romgaz and ExxonMobil Signed Deal for Black Sea Block Buy

Romgaz has signed an exclusivity agreement with ExxonMobil's subsidiary in Romania for the acquisition of a Black Sea offshore block. Romgaz representatives stated that the exclusivity agreement grants it an exclusivity right for a period of four months for the acquisition of all shares of ExxonMobil Exploration and Production Romania Limited. According to the company, the exclusivity period ends on 15 October 2021.

Romgaz submitted a binding offer to acquire the 50% stake in Neptun Deep in April. Also in April, OMV Petrom said that if ExxonMobil accepts the offer submitted by Romgaz, it will join in the project as operator. ExxonMobil Exploration and Production Romania holds a 50 per cent stake in the XIX Neptun Deep Block in the Black Sea. The other 50 per cent stake in the block is held by OMV Petrom. The block covers an area of approximately 7,500 square kilometres in water depths ranging from 100-1,700 metres.

OMV Petrom Enters LNG Distribution Market

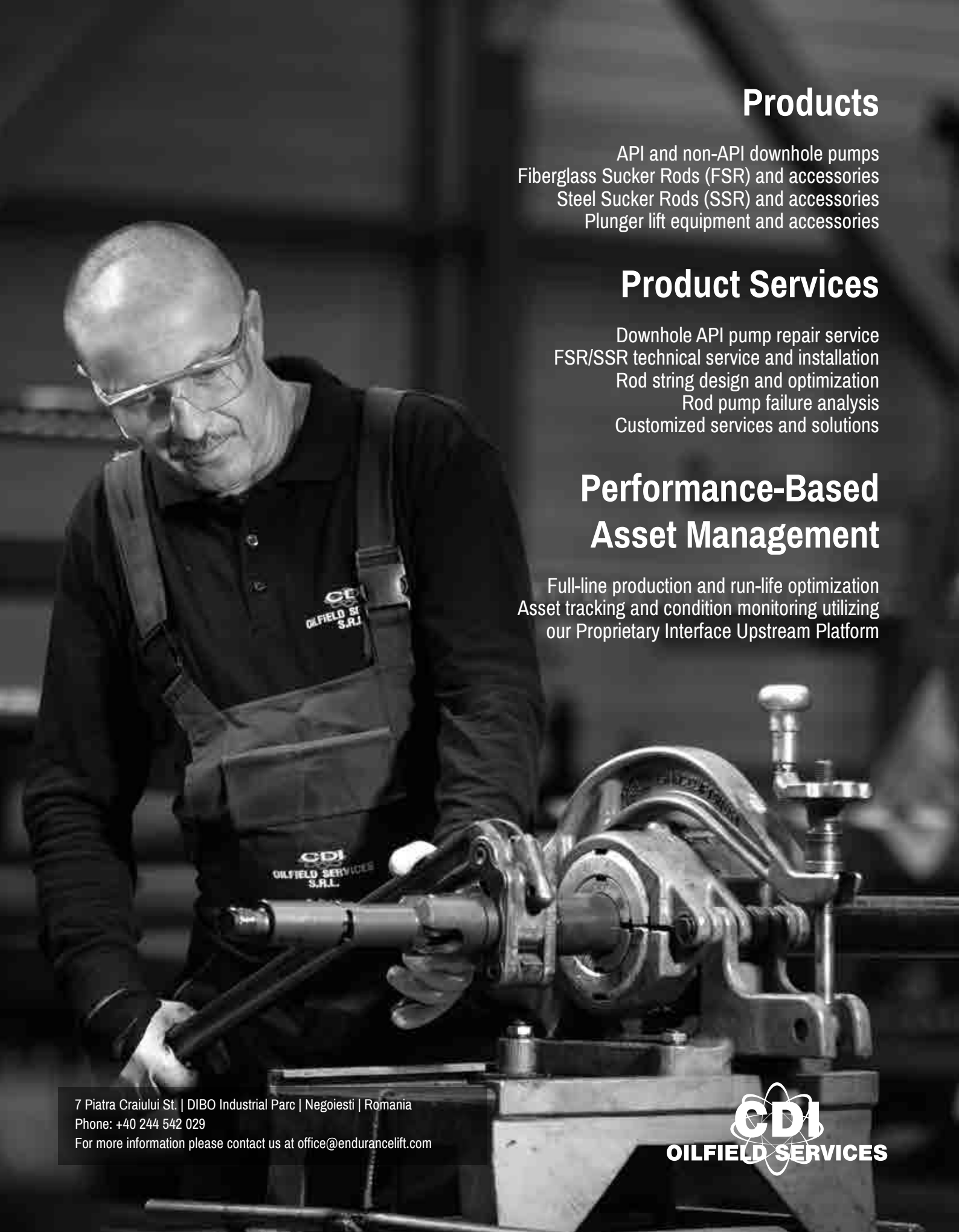
OMV Petrom has obtained a license to commercialize liquefied natural gas (LNG), thus diversifying its activities on the gas market and related products.

„OMV Petrom's entry on this market is a natural development. We believe that natural gas plays an essential role in the energy transition of Romania, especially because we can access these resources. Natural gas has multiple applications in power production, transportation, and industry, and can also contribute to reducing emissions and strengthening energy security. And liquefied natural gas represent a cleaner solution for the mobility sector," Franck Neel, member of the OMV Petrom Executive Board, responsible for Downstream Gas, said.

Following liquefaction, natural gas can be safely stored and transported on very long distances, with a high degree of economic and energy efficiency. The liquefied natural gas can be used in the mobility sector as an alternative to conventional fuels, providing a cleaner alternative with emissions of up to 15% less CO2, 50% less nitrogen oxide, and 50% less noise compared with diesel trucks. Liquefied natural gas is also a solution for the supply of the areas that are not connected to natural gas transmission networks. In terms of industrial uses, the liquefied natural gas can be utilized as energy source, providing added efficiency and operability.

OMV Petrom is the largest integrated energy company in South-Eastern Europe, with an annual Group hydrocarbon production of 53 million boe in 2020. The Group has a refining capacity of 4.5 million tons annually and operates an 860 MW high efficiency power plant. The Group is present on the oil products retail market in Romania and neighboring countries through 790 filling stations, at the end of March 2021, under two brands – OMV and Petrom.

OMV Aktiengesellschaft, one of the largest listed industrial companies in Austria, holds a 51% stake in OMV Petrom. The Romanian State, through the Ministry of Energy, holds 20.6% of OMV Petrom shares, Fondul Proprietatea holds 7%, and 21.4% is the free float on the Bucharest Stock Exchange and the London Stock Exchange.



Products

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Fiberglass Sucker Rods (FSR) and accessories
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The Establishment Authorization

MANDATORY DOCUMENT FOR REACHING THE RTB STATUS

Most of the development contracts currently concluded within the Romanian wind/solar realm, refer to the ANRE establishment authorization (the "**Establishment Authorization**") as one of the two key elements (the other one being the building permit) required for the start of the construction works. While some beneficiaries acquire the special purpose vehicle (created solely for the purpose of the development of the respective project) long before the application by the developer of the ANRE Establishment Authorization (sometimes at the very start of the project), others impose on the developer the obligation to complete all formalities (except proof of funds) for the issuance of the Establishment Authorization and only once all such formalities are fulfilled, the SPV is transferred from the developer to the investor. Irrespective of the selected contractual set up, most of the development contracts link a portion of the price/development services to the issuance of the Establishment Authorization. As such, within the current context of rising investors' interest in developing renewable facilities and the numerous projects currently in different stages of development, we thought it may be useful to present several considerations on the main steps and implications of the procedure for the issuance of the Establishment Authorization.

Following the last wave of renewable projects (suddenly stopped by the removal of the green certificates subsidies back in 2013), a new order was issued by ANRE (i.e., Order no 12/2015 - the "**Regulation**") regulating the framework for granting licenses and authorizations in the electricity field (which replaced the former ANRE Order 48/2013). However, even if there is a new normative act currently in place, the complexity of the procedure has not been radically modified. As such, with ANRE being the only national entity having the authority to issue such Establishment Authorization, one may argue that the current procedure is quite well known by the market stakeholders and ANRE and, as such, if the applicant robustly prepares his "homework" in advance, surprises should not happen.

Concept

It is important to highlight from the beginning that the Establishment Authorization regulates the electrical aspects of the electricity production facility, while the building permit regulates the urbanistic aspects. As such, the regulatory development of a renewable facility always entails two streams of permitting activities: (i) the "ANRE stream" entailing – as main steps – preparation of a solution study, the issuance of an ATR, execution of a connection to the grid contract and would complete with the issuance of the Establishment Authorization and (ii) another

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stream of activities on the urbanistic side ending with the building permit. The two streams are now less interconnected (compared to the prior-2013 period) and there are rarely situations when one could hold back the other; as such, RTB status must carefully consider completion of both streams dealing with different technical aspects related to said facility.

The Establishment Authorization is defined as *the administrative deed granting the permission to establish or re-technologize facilities for electricity production issued by ANRE* [as per Article 5 para. (2) letter a) of the Regulation].

Only facilities exceeding 1 MW are subject to the Establishment Authorization; for clarity, it is to be obtained also if, following the re-technologization, a facility's installed capacity would exceed 1 MW.

The duration of the Establishment Authorization is set depending on the applicant's request, but also considering the duration required to install and put into function the respective facility (ies). In any case, the *validity of the Establishment Authorization cannot be less than one year* (Article 8 of the Regulation).

Procedural aspects

The application file

When filling for the Establishment Authorization, the applicant must simultaneously observe the conditions under the Regulation and also the Law no 123/2012 for electricity and natural gas (the "**Energy Law**"); said conditions relate both to the applicant/its shareholders[1] and also to the envisaged facility.

Among the most important specific documents that must be provided, one should mention:

- proof of secured land [even though not specified how such land may be secured, this condition is to be corroborated with the fact that a building permit may be issued only on the basis of a right in rem (e.g., ownership right, superficies right etc.)]; It must be highlighted that Article 41 para 3 of the Regulation allows for the suspension of the Establishment Authorization issued on the basis of wrongful land title only on the basis of a final court decision[2];
- technical connection endorsement (**ATR**) and the connection agreement (should the latter was concluded; there is a one-year deadline as of the issuance of the ATR when the connection agreement may be concluded);
- environmental agreement or scoping decision (Romanian: *decizia privind incadrarea proiectului*) related to the construction of the facility;
- presentation of the technical and economic parameters of the facility;
- description of the works to be performed (including timing of different milestones, if the case);

1 E.g., the controlling shareholders or administrators should not have acted before within/ for other titleholders not having honored their payment obligations under energy transactions.

2 Yet, considering the duration of a court case in Romania (i.e., potentially several years), one could hardly produce such final court decision before end of the construction.

- statement regarding observance of safety distances towards other permitted facilities (even if such neighboring facilities are only in the process of being built);
- proof of available financial resources (for building the project).

Proof of funds

Let us detail the aspect of available financial resources [as imposed under Article 19 para 1 letter h) under the Regulation]. To our knowledge, all developers (even the very large and financially solid ones) do not assume, by themselves, the fulfillment of this condition. General practice shows that the investor (that will eventually build the project) is to provide proof of funds for construction. This raises a number of contractual complications as the investor would like to acquire the project with the corresponding Establishment Authorization already issued and such authorization is not issued as long as ANRE is not presented with satisfactory proof of available construction funds … In most cases, various legal solutions are created in order to enable the beneficiary to take over control over the project's special purpose vehicle before the issuance of the Establishment Authorization and create the necessary comfort for the said beneficiary that the project will finally obtain the Establishment Authorization.

It worth highlighting that the Regulation (with the exception of applicant's own resources) does not mandatorily impose supplying said proof by the applicant itself/its shareholders/its affiliates: The Regulation allows for bank credit lines/ comfort letters/other instruments to be accepted, shares public offerings, loans granted by third parties/other means enabling available funding for the project etc. As it is only normal to be like that since there are numerous other fields where the third-party supporter concept is implemented in the Romanian legal framework (such as public procurement) and in line with the practical nowadays requirements of the economic environment. As such, it should be accepted that if the beneficiary that *entered* into a binding development contract or a sale purchase agreement of the SPV with the project's developer *could provide such proof* of available financial resources (again, provided clear contractual arrangements are put in place). Such a solution could remove practical (and justified!) concerns on the beneficiary's side in relation to the acquisition of a SPV (i.e., to be read: the project) at a time when the Establishment Authorization is not formally issued.

Timing of the procedure

Upon receipt of an application, of course, ANRE is entitled to ask for clarifications (and, if deemed necessary, perform site visits). Once the application file is considered completed, the **issuance term** of 60 days starts being computed. In case of renewable facilities, the issuance term is reduced to **30 days** (As per Article 27 para. (6) of the Regulation). It is important to mention that if the file is not completed within 6 months as of its registration, the application is automatically closed.

Closing remarks

The Establishment Authorization closes the loop on the ANRE regulatory stream of permitting for renewable facilities. Its issuance procedure allows for a broad review by ANRE of all aspects of the investment (i.e., technical, financial, organizational etc.). While the number of documents and aspects analyzed by ANRE are quite large (and potential clarifications requested by ANRE may delay the issuance moment), one may state that the room for interpretation is relatively restricted as compared to other procedures and, as such, the outcome should be rather clear (provided all documents are in good order): i.e. proof of funds/organizational resources should be straightforward, technical parameters – the same, existence of ATR/ connection agreement/environmental agreement should not pose interpretation problems etc. Moreover, as it is the only issuing authority and since the relevant legal framework was relatively stable for a long period, ANRE created a rather stable practice which should provide additional comfort to the investor that once ANRE is satisfied with all required conditions, the Establishment Authorization will eventually be issued. ■

Kraftanlagen Romania

A member of Bouygues Construction

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- Plant revisions
- Pipeline and bracket corrosion protection
- Insulation
- Scaffolding

A Strategic Issue

Wind Energy

In general, in a National Energy Strategy, the chapters related to the production of energy from renewable sources were given and will continue to be given a special attention. From the list of these sources, none is missing, neither the most used nor sources that are still the subject to research, innovation, achievement, promotion etc.

The development of these topics intensively studied by energy specialists is obviously in a two-way relation with the level of investment in the energy sector in general and in the wind sector in particular, but also of strategic approaches of the respective countries.

The regulatory and especially bureaucratic difficulties linked to aid schemes have slowed down, even blocking investments at some point.

Those constraints also diminished the significant increases in this type of electricity production.

According to data provided by Global World Energy, at global level, Germany ranks third after the US and China.

Steve Sawyer, Secretary-General of the Association, says that by 2030 20% of global energy demand will be provided by wind power.

The installed capacity, so the installed power in the EU, is dominated by Germany with 47%, followed by Spain with half of this figure, i.e., 23%; the ranking continues with the UK, France and Italy, with 10% of GW of installed power. For Italy, for example, the growth was continuous.

The same happened in Romania. Following Italy's example, the moment of opportunity provided by mini-wind farms installed in agricultural areas continues.

The small agricultural firm was and is interested in two arguments: one related to the technical balance between sowing, fertilization, timely care etc. and profit after harvesting and selling most of the production.

The second argument is related to energy expenditure, watering, harvesting and transportation equipment, and even greenhouses when needed.

Based on energy needs, small wind power stations installed in agricultural areas that benefit from the presence of wind are advantageous, being a solution in terms of cumulative management of energy consumption.

In a previous article, we talked about the installed power of a mini-wind configuration that does not exceed 25 kw on each pillar, a pillar which supports the corresponding propeller.

Multitude of advantages of electricity generation with wind power installations versus disadvantages

The advantages of using mini-wind farms in agricultural associations include much lower costs compared to other forms of electricity generation, coverage of investments related to the installation of these types of mini-wind farms is very rapid, but also the possibility of using the energy produced within the agricultural company, by selling it in the network, i.e., the unused amounts, if the wind manifests its presence for sustained periods of time.

Therefore, it's about a great flexibility in terms of energy production and its use, a defining pair for energy efficiency.

However, this is a current topic, but also very easy to build in our agriculture. For

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example, we could mention the research that analyses and supports the installation of mini-wind installations, of adequate constructive form, on large highways with heavy traffic, installations that transform the air blown at the passage of motor vehicles, trucks and not only, which circulate at normal speed on highways. Experts in energy calculations have estimated that 10% of wind power could come from this method.

Compared to the multitude of advantages of electricity generation with wind power installations, the disadvantages are also obvious, the balance being anyway inclined, without a doubt, to the positive side of the use of wind force in the areas where it is truly efficient.

However, the supporters of this method are complaining about the long absence of strategic approaches, norms concerning the future of the wind power generation system and, of course, state aid schemes.

It is argued that wind power generation should be seen as complementary to photovoltaic production, both being part of what was established to be a necessity in Paris several years ago, that is the even more intensive use of renewable sources in electricity generation.

With the promotion of electric propulsion for the entire existence of vehicles, to put it this way, the future trajectory imposed in Paris is beginning to be more than obvious, as a global necessity.

It is more obvious than ever that there is a need for a National Energy Strategy that takes into account the possible risks of global warming, accelerating the decarbonization of industry as much as possible.

Extrapolating, the same applies to the industries of European countries and not only.

ROVINA VALLEY PROJECT HEADS FOR FIRST PRODUCTION IN 2024

Interview with Scott Moore, CEO Euro Sun Mining

by **LAVINIA IANCU**

Photographs by **JUSTIN IANCU**


EUROSUN
MINING

Euro Sun is a Toronto Stock Exchange listed mining company focused on the exploration and development of its 100%-owned Rovina Valley gold and copper project located in west-central Romania, which hosts the second largest gold deposit in Europe and 14th largest undeveloped gold deposit in the world.
In May this year Euro Sun received approval to initiate Strategic Environmental Assessment for the project. Currently, the company and the Environmental Protection Agency of Hunedoara County are preparing for public consultations which are expected to occur in Q3 2021.
Scott Moore, CEO Euro Sun Mining, unveils the development plans, progress, and future priorities for the Rovina Valley Project in Romania.

Scott Moore is a business executive with over 30 years of experience in the resource and durable goods sectors. He is the former President and CEO of Dacha Strategic Metals, former Director of Avion Gold and former EVP of Sulliden Gold. Scott Moore holds a Bachelor of Arts degree from the University of Toronto and an MBA from the Kellogg School of Management. Presently he is the CEO of Euro Sun Mining.

Dear Mr. Moore, first of all, how did your activity start in Romania?

The predecessor company to Euro Sun Mining (ESM) was called Carpathian Gold and made the discovery of the Rovina Valley Project in 2004.

I took over management of ESM in 2016 after previous management was unsuccessful in building a new mine in Brazil.

What are the main data and coordinates of the Rovina Valley project? What is the potential of this project in terms of resources?

Rovina is located in Hunedoara County, approximately 35 kilometers north of Deva and just outside the City of Brad, home to the past producing Barza mine so the area has a long history and familiarity with mining.

Rovina currently has measured and indicated resources of approximately 7 million ounces of gold and 1.4 billion lbs of copper in three separate ore bodies.

How are Environmental, Social and Governance (ESG) principles integrated into this business?

ESG principles are the key driving factors for the company as without these we would not be successful moving towards operating the mine.

Euro Sun is aligned with the United Nations Sustainable Development Goals to build and operate the most environmentally responsible new mine in Europe.

Environmentally we are using dry-stack tailings not wet tailings so there is no opportunity for dam failures using this method.

Additionally, we re-cycle 95% of process water compared to 30% for a similar operation using wet tails.

We use zero cyanide in the processing operations and the project will be re-habilitated during the operation of the mine thereby minimizing the impact to the environment.

Socially we are part of the community since 2004 and have a policy of openness and transparency for all our affected stakeholders.

Governance is also key to our success.

Like I said earlier, Euro Sun is aligned with the United Nations Sustainable Development Goals to build and operate the most environmentally responsible new mine in Europe. The Company aligns with the UN goals 5, 8, 9, 10,12,13 and 15 to achieve Social Inclusion, Economic Development and Responsible Operations.

Euro Sun received approval to initiate Strategic Environmental Assessment for the project. How important this step is for the company? What comes next?

The Strategic Environmental Assessment is essentially the environmental opinion on our Planul Urbanistic Zonal or PUZ. It is a major step in the process following the approval of the Avizul de Oportunitate for the project.

Along with the submission of our PUZ we expect public consultations in September this year. The next major step will be the submission of our Environmental Impact Assessment later this year with the Ministry of Environment.

Often, major development projects do not deliver tangible benefits to local residents. What will be the impact of the Rovina Valley Project for the communities throughout the county of Hunedoara?

Euro Sun will have a meaningful economic impact to all our local residents.

We will employ directly approximately 500 full time employees

and generate likely over 1000 indirect jobs to support the project.

During construction we would likely employee 2000 people to build the project. Additionally, we estimate over US$500 million in royalties and corporate taxes paid to the state over the life of the mine with a large percentage of the royalty going back to the affected local communities and the county.

With a mine life already approaching twenty years, Euro Sun will be a meaningful economic contributor to Hunedoara County for decades.

According to the International Energy Agency, the world won't be able to tackle the climate crisis unless there is a sharp increase in the supply of metals required to produce electric cars, solar panels, wind turbines and other clean energy technologies. How do you assess the current situation on the electric metals market in Europe and worldwide and what are your expectation from this project in this context?

De-carbonization of the economy means copper.

All clean technologies rely on copper and the European Union needs to ensure access to this critical metal.

Copper mines require huge investments in order to build or expand and the supply side response to the new demand for copper in electric cars, charging stations, wind turbines can take decades to meet.

Copper from the European Union to the European Union is one of the key goals for Euro Sun.

The only product produced at Rovina is a clean copper concentrate containing gold; no gold bars are being poured on site and we fully intend to deliver our concentrate to smelters within Europe.

Meeting the goals of the Paris climate agreement will require a significant increase in clean energy. Reaching net zero emissions by 2050 would require even more investment. What are your plans and sources of investment in this regard?

Our project is already designed to optimize our carbon footprint by utilizing electric conveyors versus

trucks in moving the majority of material in Rovina. As we tap into the Romanian national grid, we are mainly utilizing clean power such as hydroelectricity for our project and when available would migrate to an all-electric fleet to further reduce our site emissions. As you know in Romania, we are required to replace three times the amount of forests removed during operations and in reality we will re-forest the project during production ultimately adding 300 percent more forests than current on the Rovina Valley Project.

As countries switch to green energy, demand for copper, lithium, nickel, cobalt, and rare earth elements is soaring. All these are yet vulnerable to price volatility and shortages. Also, mining companies face stricter environmental and social standards. How do you manage to overcome these challenges?

Definitely social and environmental opposition to mining in general is high globally yet the push for De-Carbonization will require more mines.

You can't have one without the other. Hence our industry has to move into technologies and practices that limit the environmental and social impacts and think of the life cycle of the project from the beginning.

We have seen opposition in Romania to mining driven around potential environmental legacies such as wet tailings or using cyanide.

At Rovina we have adopted dry stack tails which recycle 95% of the process water used, we do not use cyanide; our two proposed open pits will be completely re-habilitated during the mine life with one pit fully backfilled and re-forested and the second becoming a new clean lake for the enjoyment of the local communities.

The waste areas will also be fully re-forested as well in addition to the process plant location. This cradle to grave mentally is necessary for all stakeholders to benefit.

Could you give us some more details on the advancement of Rovina Valley Project? What about the Definitive Feasibility Study and the final construction permit?

We have just completed the Bankable Feasibility Study outlining a simple to build, simple to operate, environmentally leading project approaching 20-year mine life with growth well beyond that already outlined.

As I previously stated we will have no wet tailings and no cyanide.

We have the full support of the County of Hunedoara and our three local communes who have all recently signed our opportunity agreement and are fully supportive in getting the permitting phase completed and into construction.

We will file our Environmental Impact Assessment by the end of 2021, and we hope to be in possession of our construction permit in the second half of next year.

What are the key achievements of this year, long-term priorities for this project and potential future upside developments of Euro Sun Mining?

2021 is shaping up to be a big year for Euro Sun Mining and the Rovina Valley Project.

We have delivered the technical details of an outstanding project. We have received full support of the County and local authorities and all our communities through the opportunity agreement process.

We are well advanced with the Strategic Environmental Assessment with the EPA on our PUZ and we will file our Environmental Impact Assessment with the Ministry of Environment this year.

Longer term we believe this area holds much more resources such as we discovered under a prospecting permit at Stanija, directly adjacent to the Rovina project.

We have requested an exploration permit for this area from the National Agency of Mineral Resources which we believe has the ability to substantially extend the mine life of our project by decades.

When do you target first production from this project?

Provided we receive all permits in a timely manner from the Romanian government we are targeting first production in 2024. ■

TRANSGAZ and GAZ-SYSTEM to Cooperate on Security of Natural Gas Supplies

TRANSGAZ and GAZ-SYSTEM agreed to cooperate in the field of security of natural gas supplies, market integration and sustainable development, in particular in relation to the EU Green Deal. Within the framework of Memorandum, the Parties agreed to cooperate closely on the activities undertaken on the regional and EU level.

By signing on the Memorandum, both Parties confirm their intention and commitment to take all actions to lay the foundation of a cooperation relationship and to identify opportunities to substantiate new lines of support.

The Parties shall strive to ensure that the energy transition is implemented in both fair and cost-effective manner allowing to achieve diversified and well-integrated energy market in the CEE & SEE region. The Parties are committed to strengthen the cooperation regarding the natural gas & LNG markets, as these energy carriers will play a crucial role in the decarbonisation process in both Poland and Romania. Moreover, the companies shall also explore the potential for cooperation within the area of new gases and hydrogen, that will have a crucial impact for further functioning and development of national transmission systems in both countries.

TRANSGAZ and GAZ-SYSTEM are committed to take further actions to make the MoU effective. Both Parties are convinced that bilateral cooperation within the framework of the MoU will be beneficial not only for involved countries but also for the CEE & SEE region.

The Memorandum of Understanding has been signed by the Management of both companies.

Strategic investment projects worth EUR 4.1 billion

TRANSGAZ is the technical operator of the National Gas Transmission System (NTS) and ensures the fulfilment under conditions of efficiency, transparency, safety, non-discriminatory access and competitiveness of the national strategy on domestic and international natural gas transmission, natural gas dispatching, as well as research and design in the field specific to its business, in compliance with the requirements of the European and national legislation and the quality performance, environment and sustainable development standards.

With a tradition of over 107 years, TRANSGAZ operates a network of over 13,980 km of natural gas transmission pipelines, of which BRUA gas pipeline phase 1 project – co-financed by the European Union with a grant of approximately Euro 180 million and commissioned in November 2020 - represents 479 km.

With its commissioning, Romania connects to the regional transmission corridors and will be able to ensure its gas supply from new sources, which will

better meet the existing domestic market demand and will lead to a higher level of predictability and energy security. BRUA phase 1 also represents a way for the potential Black Sea gas production to access the European markets.

BRUA Phase 1 is a key step in the development of the National gas Transmission System and allows for the provision of transmission capacities and bidirectional gas flows between the interconnections with Bulgaria and Hungary. For the next decade, the plan prepared by TRANSGAZ and approved by ANRE for the development of the NTS contemplates strategic investment projects estimated at over Euro 4.1 billion.

TRANSGAZ is a company listed on Bucharest Stock Exchange, with the symbol TGN, to the Premium category.

Over 2000 km of new gas pipelines in Poland

GAZ-SYSTEM is a strategic company for the Polish economy. It is responsible for the transmission of natural gas, manages the most important gas pipelines in Poland and owns the President Lech Kaczyński LNG Terminal in Świnoujście.

As part of the 2015-2025 investment programme, GAZ-SYSTEM is constructing over 2000 km of new gas pipelines in the western, southern, and eastern parts of Poland. Over a dozen new gas pipelines are under construction within the North-South Gas Corridor and the compressor station in Kędzierzyn Koźle, as well as interconnections with Lithuania and Slovakia. Onshore gas pipelines are planned to connect the planned FSRU floating terminal in the Gulf of Gdansk with the national transmission system. The LNG Terminal in Świnoujście is also being extended, as a result of which the regasification capacity of this facility will be increased by more than a half.

The company is also implementing one of the most important infrastructural projects in the country - the Baltic Pipe project which consists in the construction of a two-way offshore gas pipeline connecting Poland and Denmark, expansion of the local transmission network and three gas compressor stations. ■

Comparative Study on Specific Taxation of Offshore Gas Production in Europe

Romania Continues to Have the Highest Effective Tax Rate

The latest and most comprehensive comparative study on specific taxation of offshore gas production in Europe, conducted by PwC Romania for the Oil and Gas Employers' Federation (FPPG), will be launched within a series of events and actions aimed at informing on the technical aspects of regulation of offshore gas production in Romania.

In recent years, the study shows, operators' revenues from gas (and oil) production have had a constant decline. This trend comes following the great pressure put by declining hydrocarbon prices and decrease in production from fields under exploitation. But the development of offshore production could have a significant contribution to cover gas demand in the future, according to study's data. Costs and risks related to such projects, especially the deep ones, are high and are made in the long run. Therefore, the study finds, very few global companies have the know-how, the technology, and the financial resources necessary for such projects.

"The results of the comparative analysis show significant differences between the effective tax rates applied to (offshore) gas production. Both in 2020 and 2019, Romania had the highest effective tax rate, of 23%, a level over 4 times higher than the average for the European states considered in the study," says the coordinator of the study, Andreea Mitirita, Tax Services Partner, PwC Romania.

The study concludes that predictability and stability of the legislative and regulatory framework are a major prerequisite for investment decisions that require high initial costs, high risks, and a long period to recover them, such as those in the offshore gas production. Also, the tax regime must be stable and competitive, in order to retain and attract investors. In this regard, to restore balance and competitiveness of the tax regime applicable to Black Sea gas projects, it is necessary to amend the Offshore Law.

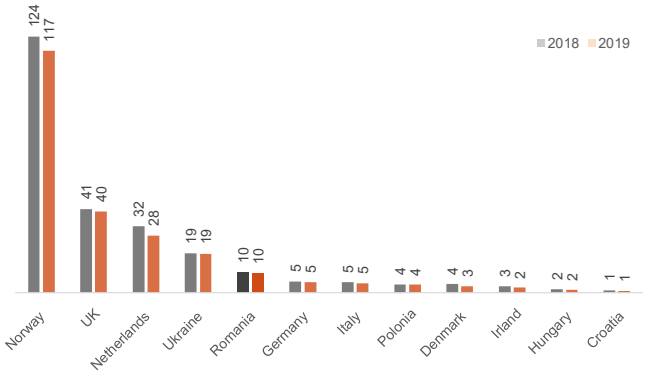
"Dialogue between public policy-makers and the representatives of the sector is essential to develop an optimal framework for investments in offshore gas production, benefiting both the state, citizens and investors," believes Catalin Nita, Executive Director of FPPG.

FPPG points out once again that the opportunity of the moment on the development of Black Sea gas reserves must be capitalized now, in the context in which natural gas has the chance to be a transition fuel. Otherwise, there is a risk that Romania's

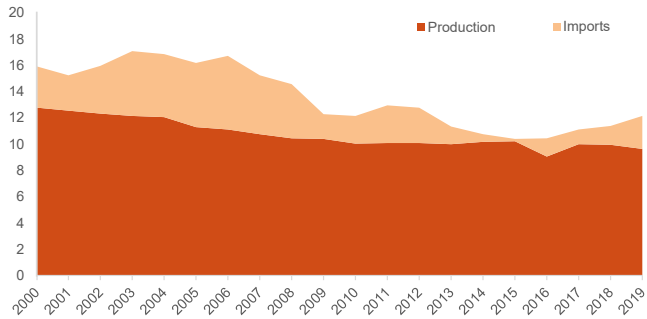
"Dialogue between public policy-makers and the representatives of the sector is essential to develop an optimal framework for investments in offshore gas production, benefiting both the state, citizens and investors."

Catalin Nita, Executive Director of FPPG

Natural gas production in Europa (bcm)



Natural gas production and imports in Romania (bcm)



development potential from the perspective of holding this competitive advantage be lost.

The study analysed from a comparative point of view the effective tax rates specific to offshore gas production in European states considered relevant, available as of May 31, 2021, in order to identify an updated image of the tax 'burden'.

The effective tax rate for each state was calculated by reporting the value of royalties and specific taxes paid by the main players in the industry to revenues obtained from the production and sale of natural gas.

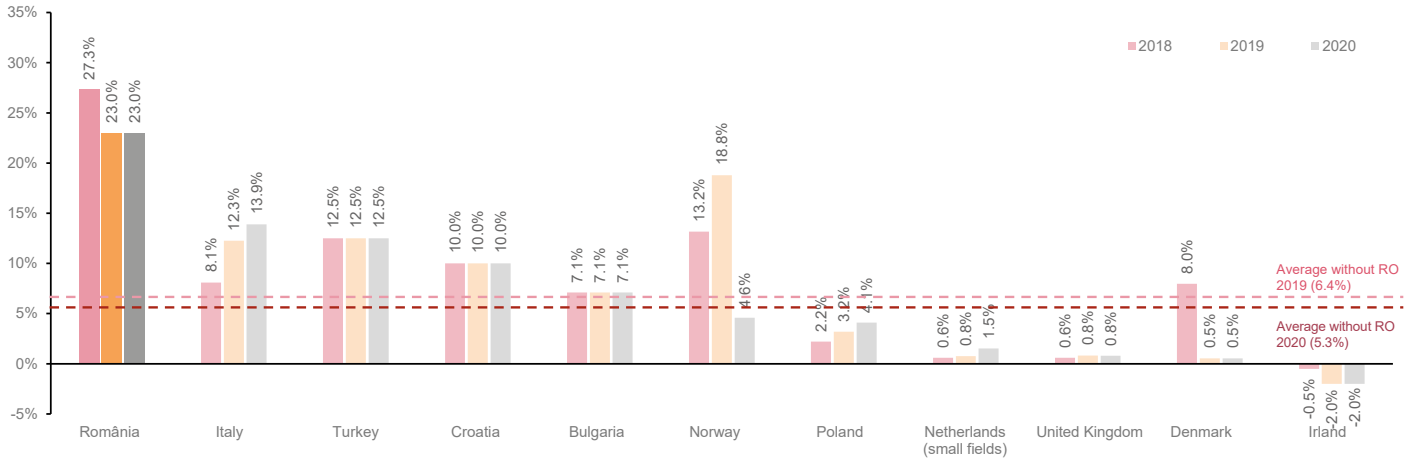
Conclusions and recommendations

Conclusions

• The results of the comparative analysis show significant differences between the effective tax rates of offshore gas production. In 2019, the maximum level is in Romania (23%), and the minimum in Ireland (-2%). Also, in 2020, Romania maintains its position, with the highest rate at 23%.

• Despite the high nominal tax rates in the Nordic countries such as Norway, Denmark, the Netherlands,

Romania has the highest effective tax rate for the offshore natural gas production (23%) among the analysed European countries, approximately 4.3 times more than their average (5.3%)



Source: PwC Analysis based on available public data

*Bulgaria - the latest available data are for 2014. Source: FPPG, Biriș Goran, 2019;
UK, Denmark and Ireland - for 2020 the effective tax rates are those calculated for 2019, as at the time of the Study's development, no public data were available for 2020;
Turkey and Croatia – the fixed rates of hydrocarbon production royalties / taxes established through the Legislation were taken into consideration. Thus, for the two states, the actual tax rate could vary, for example, depending on allowances;
Romania – the decrease of the effective tax rate was due to the downward trend of the natural gas price in recent years;
Norway - the taxation of upstream companies was reduce in 2020 in order to stimulate investments (PwC Norway's Tax Blog).

and Ireland, we note that the effective tax rates (payments to the state as share of total revenues) are very low, even negative (e.g., Ireland) compared to other countries. This is generated by the level of allowances, amid pressure on the sector in recent years and to support an industry that has a major contribution to the economy.

• In recent years there has been a major decrease in the oil and gas operators' revenues. This trend is due to the high pressure from the falling prices of natural gas and oil.

• The development of offshore production has a significant contribution to meeting future natural gas demand. The costs and risks associated with such projects, especially the Deepwater ones, are high and the investments are characterised by long payback periods. Globally, very few companies have the know-how, technology and financial resources needed for such projects.

Recommendations

• The predictability and stability of the legislative and regulatory framework is a major precondition for investment decisions that require high initial outlay and a long payback period, such as for offshore gas production.

• The tax regime must be stable and competitive in order to retain and attract investors. Therefore, in order to restore the balance and competitiveness of the fiscal regime applicable to natural gas projects in the Black Sea, it is necessary to amend the Offshore Law.

• The natural gas sector is an essential contributor to the development of the Romanian economy, thus, the fiscal regime should be tweaked in order to generate attractiveness for investors, as investments generate a multiplier effect in the economy by driving the development of other sectors.

• The dialogue between policy makers and representatives of the sector is essential in order to develop an optimal framework for investments in offshore natural gas production, on the background of which both the state/citizens and investors should benefit.

• The opportunity of the moment to develop the Black Sea natural gas reserves must be used as soon as possible, as natural gas has the chance to represent the transition fuel. Otherwise, Romania's development potential from the perspective of owning this resource/this competitive advantage will decrease. ■

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CREATING THE BEST POSSIBLE SOLUTIONS TO KEEP PEOPLE COMFORTABLY COOL AND AVOID HEAT STRESS SYMPTOMS

BODYCOOL PRO

This rugged all-round Bodycool Pro PCM cooling vest offers constant cooling and heat stress protection for professionals who need expert cooling over or underneat their personal protective clothing (PPE) in extreme heat situations.

Offering exact temperatures, the Bodycool Pro is often used on top of or underneat military combat gear, PPE, hazardous materials suits, mascot costumes and other professional apparel. The inside of the vest is provided with 4 pockets in which bio-based PCM cooling packs (to order seperately) can be inserted.

Recommended PCM coolings for work activities are: 21°C/ 70°F, 24°C/ 77°F or 29°C/ 84°F.

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Why You Should Take Personal Cooling Seriously

Despite being preventable, many people still die by heatwaves every year world-wide. With global temperatures rising we are facing a lot of challenges. Death by heat being one of them. The mortality risk increases between 0.2 – 5.5% for every 1°C increase in temperature.

Between 1989-2017, 166.000 people died because of heatwaves and during the summer of 2003 alone, 70.000 heat-related deaths were recorded in Europe. Heat-related deaths per year in cities like Budapest, Rome, Athens, Bucharest, and other cities are expected to be 400 per year from 2030 onwards.

Your body's core temperature

Your body's heat combined with environmental heat results in what's called your core temperature – your body's internal temperature. Your body needs to regulate the heat gain from the environment to maintain a normal core temperature of approximately 37°C (98.6 F).

How your body cools itself naturally

In hot weather, the body cools itself mainly by sweating. However, when you exercise or work in hot, humid weather, your body is less able to cool itself efficiently. The harder it is to cool off, the easier it is to suffer from heat related syndromes. Your body may develop heat cramps. Untreated, heat cramps lead to heat exhaustion and eventually heatstroke.

What is a Heat Stroke?

Heatstroke occurs when your core body temperature reaches 40°C (104 F) or higher. Heatstroke requires immediate medical attention to prevent permanent damage to the brain and other vital organs, which eventually can result in death.

How to stay cool

- Stay hydrated (Drink enough fluids)
- Wear loose-fitting, lightweight clothing
- Wear a hat for sun protection
- Take it easy during the hottest parts of the day
- Limit time spent working or exercising in heat
- Wear personal cooling products

Heat-related syndromes

Heatstroke

Painful, brief muscle cramps. The muscles may spasm or jerk involuntarily. Usually involves muscles that are fatigued by heavy work, such as calves, thighs, and shoulders.

Heat exhaustion

Illness that can occur after you have been exposed to high temperatures, often accompanied by dehydration. Two types: Water depletion or salt depletion.

Heat stroke

Most serious form of heat injury and is considered a medical emergency. Heat stroke can kill or can cause damage to the brain and other internal organs.

Heat and productivity

Employees who work in hot conditions are not as productive and can suffer from kidney injury, dehydration, and other health problems, according to a new review of 111 studies published in the Lancet Planetary Health. The included studies involved 447 million workers in over 40 different occupations, including outdoor and indoor jobs.

The work area temperature can have a huge impact on how productive you are. The study shows that productivity drops by as much as 4% per degrees °C (!) when temperatures rise above 27 degrees °C in workplaces requiring manual labour.

Less productive workers means a less productive business – So keep your workers cool to stay comfortable, healthy and productive!

dosco.ro

New PeWeTe Base for Oil and Gas Operations

Petro Welt Technologies (PeWeTe) on June 24 inaugurated in Ploiesti its new base of operations dedicated to Romania and Central and South-Eastern European region, PeWeTe Evo Europe, in the presence of numerous officials, representatives of companies in the oil and gas industry.

***by* Daniel Lazar**

The new hub was launched in the presence of Gerd Bommer, Commercial Counselor, Advantage Austria in Romania, Christian Jennevin, Vice-President Global Business Development and Operations, Petro Welt Technologies, and George Capatina, General Manager, PeWeTe Evo Europe.

PeWeTe Evo Europe will provide the Romanian market with over 160 new jobs in the medium term, currently having 25 employees. Delayed due to the Coronavirus pandemic, the official opening marks the launch of regional operations in the following segments: oil and gas well drilling with the help of mobile equipment, workover at the existing wells and remedial of damaged wells, well stimulation and pumping, drilling of geothermal wells, of gas storage wells and mining drilling.

In 2018, PeWeTe made the decision to expand its area of operations in several geographical areas, including Romania. This is how PeWeTe Evo Europe was born, a company that became operational in 2019, with the help of several mobile drilling and workover equipment.

"Romania will be a service hub for the region. Our intention is to have in Romania a long-term business and we want to provide, in time, the entire range of services that PeWeTe group has in its portfolio. We chose Romania as it is, first of all, part of the European Union. We have a huge and long tradition in the oil and gas industry. Romania has some of the best specialists in this field. We benefit from the local presence of international companies, without the support of which drilling services, workovers, and repairs at the level beneficiaries currently request cannot be performed. To prepare this equipment and the necessary infrastructure, PeWeTe made important investments in Romania and wants to continue to work a lot with local and international partners, in the best relations and with a focus on maximum performance," said George Capatina, General Manager, PeWeTe Evo Europe.

The parent company, Petro Welt Technologies, was created in 1991, is listed at the Frankfurt Stock Exchange and is based in Vienna, Austria. The company has numerous lines of business dedicated to the oil and gas sector.

"So far we have drilled over 450 wells globally. We benefit from a long experience and a great knowledge. In addition to drilling, we have an excellent service activity, which we plan to develop in Romania and at regional level. Sustainability is the word of the future, and we are eager to also be involved in local and regional geothermal projects," said Christian Jennevin, Vice-President Global Business Development and Operations, Petro Welt Technologies.

PeWeTe Evo Europe has already successfully performed several operations in Romania and Hungary and in the context of new European funds dedicated to the energy industry, of transition and coal phasing out with the help of gas, an unprecedented growth of works is expected in the near future.

New Gas Pipeline in Maramures

Habau Romania recently signed with Transgaz the contract for the construction of the project 'Natural gas transmission pipeline in the direction of Sighetu Marmatiei - Viseu de Sus – Borsa'.

Habau Romania is a construction company that is specialized in executing pipeline construction projects and EPCC projects focused on the oil and gas industry, and it has been on the Romanian market for over 20 years. During this time, it has worked with various local and international companies such as Transgaz, OMV Petrom, NAMR (National Agency for Mineral Resources), Government of the Republic of Moldova and many others. Habau Romania recently worked for Transgaz on a major and complex project – BRUA, a development project on Romania's territory of the National Gas Transmission System on the corridor Bulgaria – Romania – Hungary – Austria.

The Romanian branch of the Habau Hoch und Tiefbaugesellschaft, led by Karl Leidenfrost, has signed on July 13, 2021, as a builder and association leader, with Transgaz the contract for the construction of the project 'Natural gas transmission pipeline in the direction of Sighetu Marmatiei - Viseu de Sus – Borsa', a project of national importance in the field of natural gas. They will be joined by another local company, Antrepriza Montaj Instalatii (AMI) SA Baia Mare. Moreover, the project is financed from Transgaz's own funds.

Currently, in the Maramures area there are no natural gas supply pipes, and the inhabitants use firewood, coal, and liquefied gas to heat the houses and commercial spaces in the area. The gas pipeline is designed and constructed to supply natural gas to the local administrative units. It will have a length of 88 kilometres, with an execution period of 18 months, starting August 2021. The construction of the gas

transmission pipeline will spread over the territory of several localities, including: Sighetu Marmatiei, Viseu de Sus, Sarasau, Vadu Izei, Giulesti, Oncesti, Barsana, Stramtura, Rozavlea, Sieu, Bogdan Voda, Dragomiresti, Salistea de Sus, Viseu de Jos, Sacel and Moisei. The designed pipeline route is divided into 17 sections. The tubular material has a diameter of DN 300. It underpasses in its route, railways, watercourses, canals and valleys. The construction of the Sighetul Marmatiei - Viseu de Sus - Borsa pipeline creates the premise of interconnecting the natural gas transmission system from the North-West part of the country (Maramures area), with the North-East part (Campulung Moldovenesc - Vatra Dornei area). Consequently, the natural gas supply is provided for each area from two directions.

This is an important project for Maramures and is now going in a straight line for its implementation. At the end of the execution, it will be possible to provide natural gas to the localities in the area of interest of the objective, respectively a number of approximately 51,500 household consumers, 500 public institutions (schools, town halls, dispensaries, cultural centres, medical offices, etc.) and approximately 2000 economic agents.

The opportunity of the project results from the fact that by building the natural gas pipeline, several objectives will be achieved, such as: development of the national natural gas transmission system and implicitly, development of the natural gas distribution system in the area, natural gas supply of the tourist resorts Ocna Sugatag and Borsa, creating new jobs during the construction period, stimulating other investments and related businesses, stimulating the development of the local economy by providing non-polluting energy sources, ensuring a healthy environment by reducing greenhouse gases and attracting additional revenues to the state budget and local budgets. ■

Serinus Energy's New Gas Discovery at Sancrai

© Photo: Serinus Energy

Serinus Energy announced that the drilling of the Sancrai - 1 well has discovered gas. The drilling of the well has concluded achieving the total planned drilling depth of 1,600 metres.

The well was drilled five days ahead of schedule and approximately 19% below budget.

Continuous formation gas shows were recorded over 20 metres of gross pay over four sand intervals from the measured depths of 855 metres to 875 metres. At this drilling interval the measured total gas ranged from 5.5% to 11.1% with an estimated average porosity of between 23% and 27%. Open-hole petrophysical analysis undertaken during the drilling operations has further confirmed this gas-bearing Pliocene sand zone. The Company will now proceed to perforate and test the Pliocene sand zone prior to completing the well for future production.

This newly discovered gas field lies approximately 7.8 km to the south of the Moftinu Gas Development project and provides Serinus with a high value, high return development opportunity similar to the Moftinu Gas Development project. The close proximity of the Sancrai – 1 well to the Moftinu Gas Plant provides the Company with the option to bring this well onto commercial production while drilling additional appraisal development wells into the structure in order to fully delineate the gas field.

The Board of Directors and the Management of the Company are very pleased to have discovered a new gas field in Romania as it provides further affirmation of the Company's belief that there are multiple shallow gas fields within the Satu Mare Concession Area.

Background

Sancrai-1 exploration well commenced drilling in Romania on 29 June 2021.

The Sancrai-1 well has been designed to test two prospective hydrocarbon zones. The Sancrai-1 well is the final commitment of the third exploration phase of the Satu Mare Concession.

The Sancrai-1 well is located on the southern flank of the Carei Basin, in the northern Satu Mare area.

Existing discoveries in the northern Satu Mare area, including the Company's Moftinu gas field which is approximately 7.5 kilometres due south of the Sancrai-1 well, are similarly on the flanks of the Carei Basin, which is a proven hydrocarbon source. The Sancrai-1 exploration well is seeking to access further hydrocarbons on the migration path from the Carei Basin source kitchen and utilise the operational experience of the Moftinu gas plant to commercialise a discovery.

New Software to Smarten Predictive Maintenance in Oil & Gas

Dietsmann Smart Labs has selected Arundo as its partner for a breakthrough development in the Predictive Maintenance of industrial plant. Dietsmann operates and maintains Oil & Gas and Power plants for major national and international energy companies in over 20 countries. The company has successfully pioneered Predictive Maintenance as a way to maximize output, save costs and achieve more sustainable performance by improving energy efficiency and reducing emissions.

Arundo's advanced machine learning and data analytics software 'Marathon' will be utilized to provide accurate and timely warnings of imminent equipment failures. Avoiding unplanned downtime increases asset availability, extends equipment lifetime, and reduces maintenance costs. Improved planning and execution of maintenance activities also lead to more sustainable operation of industrial installations.

Dietsmann sees its alliance with Arundo as a strategic partnership to enrich its services with an Integrated Predictive Maintenance software solution. Arundo's Marathon delivers continuous analytics and failure prediction models, on premise or in the cloud, through a user-friendly interface tailored to the operator's needs. Dietsmann considers anomaly detection and failure prediction crucial to substantially optimize operations and avoid costly standstills, and to prevent safety and environmental risks.

The collaboration between Dietsmann Smart Labs and Arundo is an important step forward. Dietsmann's experts present on local sites will be able to read and translate Marathon's insights into technical recommendations and actions, potentially saving their clients millions of dollars for each incident predicted and prevented.

Dietsmann Smart Labs is the Dietsmann Group New Technology entity dedicated to identifying, develop and test technologies that will subsequently be used on Dietsmann customers' sites. It is working on Maintenance Engineering, Process Digitalization, Remote Support, 3D Model, Failure Prediction and Task Robotization. Dietsmann is a major international maintenance company with 40+ years of experience in the energy industry and is a leader in Advanced Predictive Maintenance Technology.

Arundo, founded in 2015, is an innovative software company, developing software which helps to solve the many challenges of deploying Artificial Intelligence and Machine Learning Solutions in the heavy asset industries. Through a practical and value first approach, Arundo helps its clients to deploy analytics solutions efficiently in a way that can be scaled effectively across their organization.

Arundo's Marathon provides asset owners, equipment operators and reliability engineers with actionable insights into condition and operating performance of industrial equipment. Arundo's Marathon provides decision making support, combining machine-learning with equipment domain expertise, to improve productivity, efficiency, and sustainability, including:

- Increase asset availability and production through advanced anomaly detection and failure prediction
- Extend equipment lifetime through optimizing equipment operations
- Reduce maintenance cost through improved planning and execution of maintenance activities
- Improve sustainability performance through improved energy efficiency, reduced CO2 footprint, and emission reduction ■

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OPERATION & MAINTENANCE
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Dietsmann
Maintaining Energy

Eneria CAT

Exceptional Engines for Exceptional Projects

Eneria, the energy solutions division within **Bergerat Monnoyeur SRL**, is a recognized supplier of diesel and gas generator sets in Romania, with an extensive portfolio of functional and efficient projects, for more than 2 decades.

Here we briefly present that activity of Eneria that includes the supply and integration of diesel/gas Cat engines in a wide range of applications.

- Industrial applications, in which the engine drives special equipment: special cranes, compressors, draglines, crushers, irrigation motor pumps and/or other industrial pumping applications, mining, forestry machinery etc.
- DGB «Dual Gas Blending» engines, which can operate both with liquid fuel and with gaseous fuel, with high performance in reducing fuel consumption and emissions resulting from its combustion
- Engines with superior reliability and durability for railway and road transport applications that comply with European emission standards EU 1628/2016
- High-efficiency engines with low operating costs for agricultural machinery (harvesters, tractors etc.)
- Safe and efficient engines for oil applications: workover services, fire pumps, gas compressor stations, onshore and offshore drilling rigs, hydraulic fracturing and oil and gas well drilling facilities, cementing units, as well as other special equipment used in drilling and intervention in oil and gas wells
- Propulsion engines and auxiliaries for marine applications
- Gas engines used both in the compression and in pipeline transmission of gas extracted from oil and gas wells

It is known that the technology of Cat® engines lives up to the toughest requirements and conditions of operation in the industrial field, complying with the highest quality standards, being in line with the latest requirements of reduction of pollutant emissions imposed in the European Union. Moreover, Eneria specialists are experienced in choosing and integrating engines in a large range of applications. Eneria engineers and technicians support the manufacturers of equipment since the design phase, providing technical assistance for choosing customized motorization solutions, providing specialized advice in completing the equipment. From the provision of Caterpillar equipment to its integration in client's equipment according to the requirements and until the commissioning and testing or final approval of machinery, Eneria specialists come with all the technical expertise for implementing a successful project. The client therefore benefits from the most appropriate characteristics for complex projects. After delivery, throughout the warranty period and the period of operation of the provided equipment, Eneria provides equipment warranty, servicing, and maintenance services, so that the beneficiary obtains a maximization of operating parameters and a long life of Caterpillar engines and the equipment in which they were integrated.

No project is too small or too large for the world-class product line of Caterpillar industrial diesel engines. With powers range between 8.2 and 6100 kW (11 to 8180 hp), Cat® engines are strong enough to withstand the harshest working environments in the world, while being flexible enough to be configured on almost any machinery.

The Caterpillar range of engines can be delivered in various arrangements fully equipped with all the systems necessary for operation, ensuring for manufacturers of special machinery a minimum degree of integration. These engines called Caterpillar IOPU - Industrial Open Power Unit, once purchased by the client are easy to integrate on the equipment, they being a Plug & Play solution. Exhaust gas treatment systems mounted in the factory on the engine, tested and approved by Caterpillar, ensure an easier final approval of the final equipment in which they were integrated. Optionally, they can be delivered with various engine-driven power outlets, which ensure flexibility and a decrease in the complexity of integration works.

For the installation and integration of engines on various equipment, Eneria specialists provide the customer with execution drawings in 2D/3D formats, guides with mechanical and electrical installation recommendations, performance calculations of power groups, as well as technical assistance throughout the design of the final equipment.

Here are some recent images from behind the scenes of the process of motorizing some equipment.

Modernization by Remarul Cluj of **narrow-gauge locomotive** for the Heidelberg cement factory in Fieni. The locomotive transports stone conglomerates from the quarry, loading the train: 550 tons (wagons + stone).

Cat® C15 engine STAGE IIB 540CP@2100rpm pollution standards + Caterpillar TR43 transmission and Cat® TC45 torque converter mounted on engine.

Other equipment and services provided by Eneria: hydraulic motor + transmission + converter circuit, converter motor coupling, crosshead between converter and transmission, extended warranty 24 months or 10,000 hours of operation, technical assistance for installation, commissioning, and final approval test for the locomotive.

Narrow-gauge locomotive

VMS **Vehicle Multi-Service** - Hiarom. Special intervention equipment on roads and/or railways with two control cabins. Final destination: client from France, for use in subway intervention, for transporting various materials and equipment needed for tunnel repairs.

Cat® C7.1 engine STAGE V pollution standard power 205kW (275HP) @2200rpm, IOPU-Industrial Open Power Unit arrangement, 48-liter urea tank, engine-mounted hydraulic pump power take-off, technical assistance, mounting and commissioning.

The engine drives a hydraulic pump that provides all the controls of the equipment - the transport of the installation by road or rail. The platform on which the engine is mounted is also equipped with a hydraulically operated crane by the pump driven by the Cat® engine.

Vehicle Multi-Service

Dragline Promex – Braila; end-client Apele Române.

Cat® C4.4 engine with STAGE IV pollution standard power 129.4 kW @2200 (173.5 hp).

Engine delivered in IOPU-Industrial Open Power Unit arrangement, 38-liter urea tank, accumulator batteries, Cat® control panel, technical assistance at installation, product approval audit, commissioning, and maintenance plan during the warranty period.

The engine drives a hydraulic pump, which drives the various systems on the dragline: tracks, storage winch, lifting cable, excavation coupling, dragline arm control etc.

Caterpillar engines are optimally and productively operated, ensuring performance and longevity for the projects they power up.

Dragline

The key element at the heart of every exceptional product is an exceptional engine that runs day by day, month by month, year by year. This reliability is the result of a thorough and rigorous design and validation process.

FLOWSERVE

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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.

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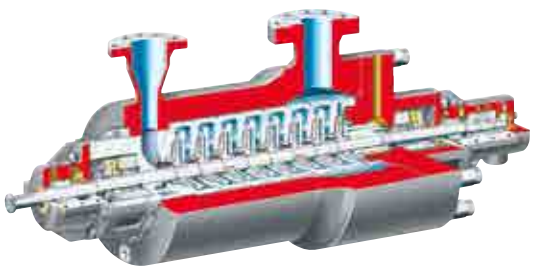

WIK Pump - according to API 610 (BB5) Standard

Experience In Motion

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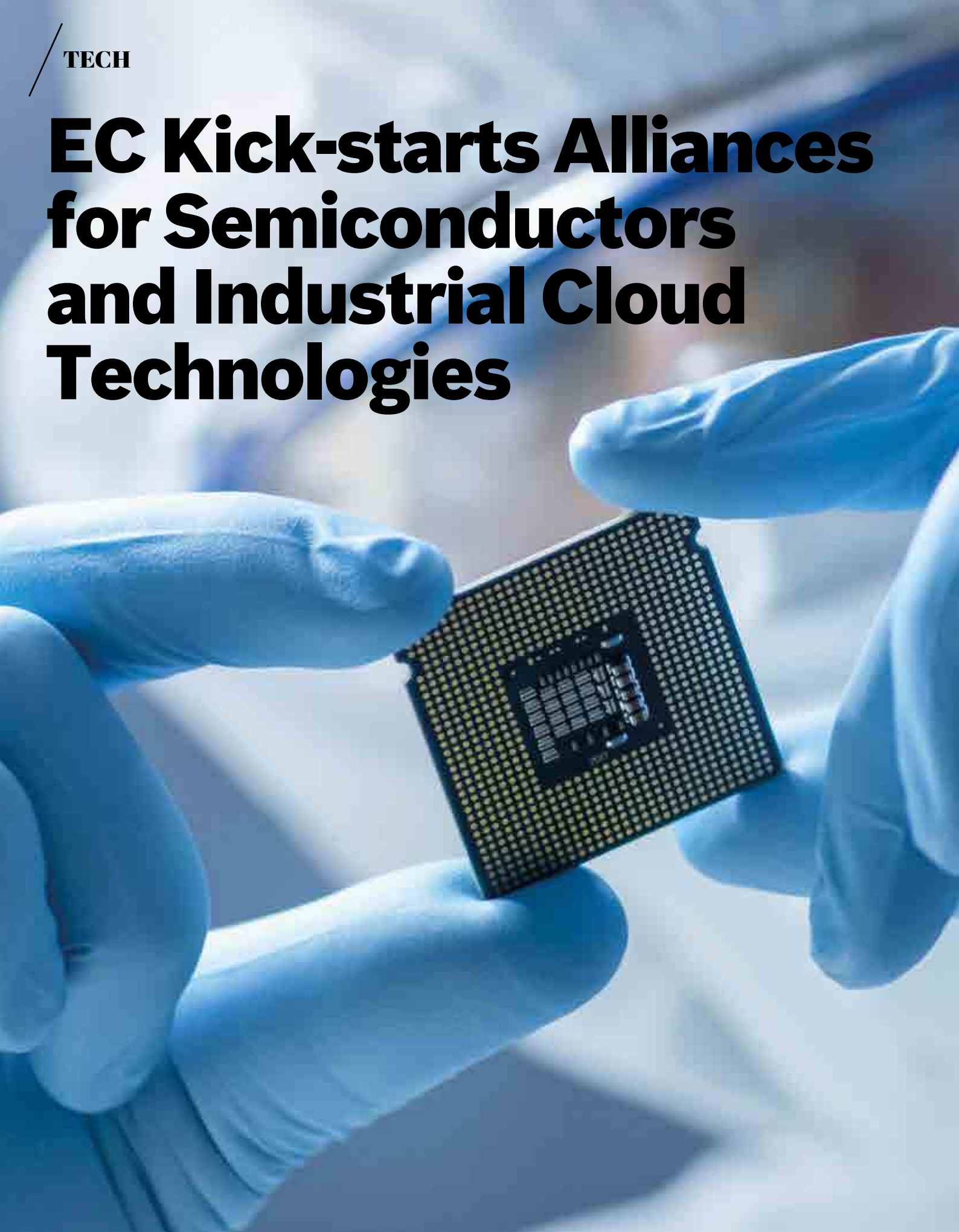
EC Kick-starts Alliances for Semiconductors and Industrial Cloud Technologies



The European Commission (EC) kick-starts on July 19 two new Industrial Alliances: The Alliance for Processors and Semiconductor technologies, and the European Alliance for Industrial Data, Edge, and Cloud.

The two new alliances will advance the next generation of microchips and industrial cloud/edge computing technologies and provide the EU with the capabilities needed to strengthen its critical digital infrastructures, products, and services. The alliances will bring together businesses, Member State representatives, academia, users, as well as research and technology organisations.

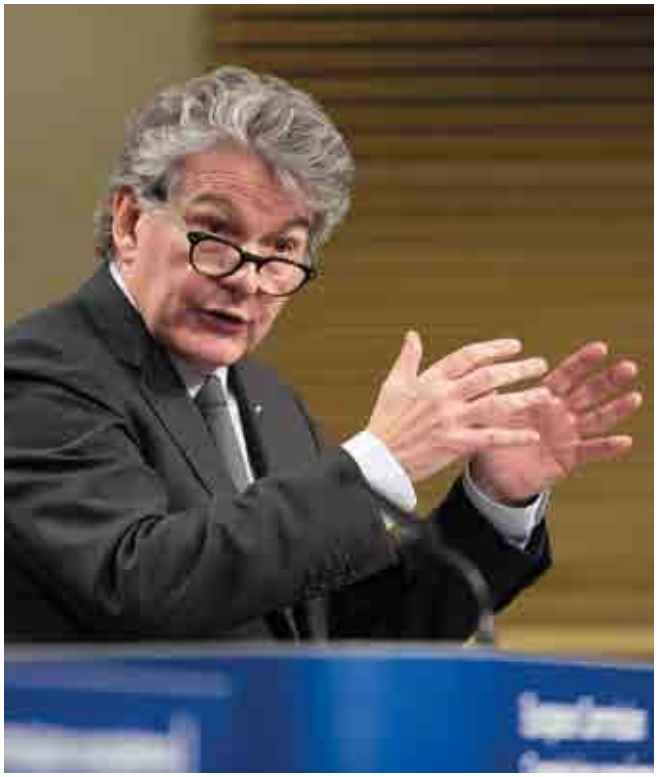
"Cloud and edge technologies present a tremendous economic potential for citizens, businesses and public administrations, for example in terms of increased competitiveness and meeting industry-specific needs. Microchips are at the heart of every device we use nowadays. From our mobile phones to our passports, these small components bring a wealth of opportunities for technological advancements. Supporting innovation in these critical sectors is therefore crucial and can help Europe leap ahead together with like-minded partners," Margrethe Vestager, Executive Vice-President for a Europe fit for the Digital Age, said.

"Europe has all it takes to lead the technological race. The two alliances will devise ambitious technological roadmaps to develop and deploy in Europe the next generation of data processing technologies from cloud to edge and cutting-edge semiconductors. The alliance on cloud and edge aims at developing energy-efficient and highly secured European industrial clouds, which are not subject to control or access by third country authorities. The alliance on semiconductors will rebalance global semiconductor supply chains by ensuring that we have the capacity to design and produce, in Europe, the most advanced chips towards 2nm and below," Commissioner for Internal Market Thierry Breton mentioned.

Industrial Alliance for Processors and Semiconductor technologies

Microchips, including processors, are key technologies that power all electronic devices and machines we use today. Chips underpin a large variety of economic activities and determine their energy efficiency and security levels. Capabilities in the development of processors and chips are crucial to the future of today's most advanced economies. The Industrial Alliance on processors and semiconductor technologies will be a key instrument to further industrial progress in the EU in this area.

It will identify and address current bottlenecks, needs



"Europe has all it takes to lead the technological race. The two alliances will devise ambitious technological roadmaps to develop and deploy in Europe the next generation of data processing technologies from cloud to edge and cutting-edge semiconductors. The alliance on cloud and edge aims at developing energy-efficient and highly secured European industrial clouds, which are not subject to control or access by third country authorities. The alliance on semiconductors will rebalance global semiconductor supply chains by ensuring that we have the capacity to design and produce, in Europe, the most advanced chips towards 2nm and below."

Thierry Breton, Commissioner for Internal Market

and dependencies across the industry. It will define technological roadmaps ensuring that Europe has the capacity to design and produce the most advanced chips while reducing its overall strategic dependencies by increasing its share of the global production of semiconductors to 20% by 2030.

To this aim, the Alliance aims to establish the design and manufacturing capacity required to produce the next generation of trusted processors and electronic components. This will mean moving Europe towards a production capacity of 16 nanometre (nm) to 10nm nodes to support Europe's current needs, as well as below 5 to 2 nm and beyond to anticipate future technology needs. The most advanced types of semiconductors are more performant and have the potential to cut massively the energy used by everything from phones to data centres.

European Alliance for Industrial Data, Edge, and Cloud

As highlighted in the European Strategy for Data, the volume of data generated is greatly increasing and a significant proportion of data is expected to be processed at the edge (80% by 2025, from only 20% today), closer to the users and where data are generated. This shift represents a major opportunity for the EU to strengthen its own cloud and edge capacities, and hence its technological sovereignty. It will require the development and deployment of fundamentally new data processing technologies, encompassing the edge, moving away from fully centralised data processing infrastructure models.

The European Alliance for Industrial Data, Edge, and Cloud will foster the emergence of disruptive cloud and edge technologies that are highly secure, energy and resource-efficient and fully interoperable, fostering trust for cloud users across all sectors. The Alliance will serve the specific needs of EU citizens, businesses, and the public sector (including for military and security purposes) to process highly sensitive data, while boosting the competitiveness of EU industry on cloud and edge technologies.

Throughout its lifespan, the work of the Alliance will respect the following key principles and norms:

- Highest standards in terms of interoperability and portability/reversibility, openness and transparency;
- Highest standards in terms of data protection, cybersecurity, and data sovereignty;
- State of the art in terms of energy efficiency and sustainability;
- Compliance with European cloud best practices, including through adherence to relevant standards, codes of conduct and certification schemes.

Participation in the Alliances

These Alliances are open for participation by all public and private entities with a legal representative in the Union and with relevant activities, provided they meet the conditions defined in the Terms of Reference.

Due to the strategic relevance of the activities in the respective sectors, membership of the Alliances is subject to compliance with a number of conditions. Relevant stakeholders must meet eligibility criteria, related notably to security (including cybersecurity), security of supply, IP protection, data protection and data access and practical utility to the Alliance. They must sign the Declarations and fill in an application form, which will be assessed by the European Commission.

Background

The European Alliance for Industrial Processors and Semiconductor Technologies builds on the Commission's ambitions to bolster Europe's microelectronics and embedded systems value chains and strengthen leading-edge manufacturing capacity. In December 2020, Member States committed to work together to reinforce Europe's capabilities in semiconductor technologies and offering the best performance for applications in a wide range of sectors. 22 Member States are currently signatories of this initiative.

The European Alliance for Industrial Data, Edge, and Cloud builds on the political will, expressed by all 27 Member States in October 2020, to foster the development of the next generation cloud and edge capacities for the public and private sectors. In their Joint Declaration, the signatory Member States agreed to work together towards deploying resilient and competitive cloud infrastructure and services across Europe.

Alliance on Processors and Semiconductor technologies

The Alliance on Processors and Semiconductor Technologies brings together key actors to design and produce microelectronics chips.

The Commission launched the European Alliance on Processors and Semiconductor technologies in July 2021. From smartphones to 5G to the Internet of Things and beyond, processors and semiconductor technologies are crucial for a successful Digital Decade.

The overall objective of the Alliance is to identify current gaps in the production of microchips and the technology developments needed for companies and organisations to thrive, no matter their size. This will help the competitiveness of companies, increase Europe's digital sovereignty, and address the demand for the next generation of secure, energy-efficient, powerful chips and processors.

The Alliance will enhance and foster collaboration across existing and future EU initiatives. It will help to provide the EU with the necessary capabilities in semiconductor technologies to power its critical digital infrastructure and communication networks. And it will support a range of sectors and technologies, including automotive, industrial automation, healthcare, and AI-enabled systems.

This translates in 2 main lines of actions, addressing the main gaps Europe is facing:

The reinforcement of the European electronics design ecosystem. This includes design at leading-edge nodes and open-source hardware solutions, which will help develop powerful and resource efficient processors.

The establishment of the necessary manufacturing capacity. This includes assembly testing and advanced packaging, by a mix of local and global players, to produce the next generation of trusted processors, electronic components, and technologies. This will translate into a twin track to be developed in parallel: moving Europe towards producing technologies from 16 nanometres (nm) to 10 nm, as well as from 5 nm to 2 nm and beyond. These most advanced type of semiconductors which, in addition to performance increases, have the potential to cut massively the energy used by everything from phones to data centres.

European Alliance for Industrial Data, Edge, and Cloud

The European Alliance for Industrial Data, Edge and Cloud aims to foster the development and deployment of next generation edge and cloud technologies.

The Alliance will bring together businesses, Member States representatives and relevant experts. It should strengthen the position of EU industry on cloud and edge technologies. It aims to serve the needs of EU businesses and public administrations that process sensitive categories of data and has the objective to increase Europe's leadership position on industrial data.

Cloud and edge technologies are strategic innovation enablers for the uptake of emerging technologies, such as artificial intelligence, the Internet of Things, and 5G. They provide the infrastructure for highly innovative use cases. Europe needs to strengthen its position of EU industry on cloud and edge technologies.

Cloud and edge technologies are key enablers for Europe's digital transformation. The Alliance aims to bring together relevant stakeholders from the private and public sector to jointly define strategic investment roadmaps to enable the next generation of highly secure, distributed, interoperable and resource-efficient computing technologies. In addition, the Alliance will serve as a platform for exchange on issues of cloud governance, for example relating to the public procurement of cloud services. ■

Horizon Europe: EUR 14.7bln to Accelerate Green and Digital Transitions

The European Commission has adopted the main work programme of Horizon Europe for the period 2021-2022 to accelerate the green and digital transitions. This programme, which outlines the objectives and specific topic areas that will receive a total of EUR 14.7 billion in funding, will contribute to sustainable recovery from the coronavirus pandemic and to EU resilience against future crises.

These investments will support European researchers through fellowships, training, and exchanges, build more connected and efficient European innovation ecosystems and create world-class research infrastructures. Moreover, they will encourage participation across Europe and from around the world, while at the same time strengthening the European Research Area.

"This Horizon Europe work programme will support European researchers, deliver top quality, excellent research and innovation, for the benefit of us all. Covering the full research and innovation cycle, from the lab to the market, it will bring researchers and innovators from all over the world closer together, to address the issues we are facing," Margrethe Vestager, Executive Vice-President for A Europe Fit for the Digital Age, said.

"With 40% of its budget devoted to making Europe more sustainable, this Horizon Europe work programme will make Europe greener and fitter for the digital transformation. Horizon Europe is now fully open for business: I would like to encourage researchers

"Horizon Europe is now fully open for business: I would like to encourage researchers and innovators from all over the EU to apply and find solutions to improve our daily lives," - **Mariya Gabriel, Commissioner for Innovation, Research, Culture, Education and Youth**

and innovators from all over the EU to apply and find solutions to improve our daily lives," Mariya Gabriel, Commissioner for Innovation, Research, Culture, Education and Youth, added.

Horizon Europe delivers on climate neutrality and digital leadership

More than four-in-ten euros - around EUR 5.8 billion in total - will be invested in research and innovation to support the European Green Deal and the Union's commitment to make the EU the world's first climate-neutral continent by 2050. The funds will support projects that advance the science of climate change, and that develop solutions to reduce greenhouse gas emissions and to adapt to the changing climate. For example, activities will accelerate the transition towards clean energy and mobility in a sustainable and fair way, help adapt food systems and support the circular and bioeconomy, maintain and enhance natural carbon sinks in ecosystems, and foster adaptation to climate change.

Making this decade Europe's Digital Decade and laying the groundwork for new digital enterprises even further into the future are also core objectives of the programme, which will ensure a substantial increase of investment in this area. For instance, it will help maximise the full potential of digital tools and data-enabled research and innovation in healthcare, media, cultural heritage and creative economy, energy, mobility, and food production, supporting the modernisation of industrial models and fostering European industrial leadership. The development of core digital technologies will be supported with around EUR 4 billion over 2021-2022.

Finally, this work programme will direct investments of around EUR 1.9 billion in total towards helping repair the immediate economic and social damage brought about by the coronavirus pandemic. In line with NextGenerationEU, the funding will contribute to building a post-coronavirus Europe that is not only greener and more digital but also more resilient for the current and forthcoming challenges. This includes topics that aim to modernise health systems and contribute to research capacities, in particular for vaccine development.

International cooperation for bigger impact: strategic, open, and reciprocal

International cooperation in research and innovation is essential for tackling global challenges and to enable Europe to access resources, know-how, scientific excellence, value chains and markets that are developing in other areas of the world. In May 2021, the Commission presented a Global Approach to Research and Innovation, Europe's strategy for international cooperation in a changing world. With this, the EU aims to deliver solutions and facilitate global responses to global challenges, based on multilateralism, openness, and reciprocity.

The work programme of Horizon Europe for 2021-2022 includes dedicated actions to support and strengthen cooperation through multilateral initiatives in areas such as biodiversity and climate protection, environmental observations, ocean research or global health. It also includes targeted actions with key non-EU partners, including the first ever ambitious and comprehensive 'Africa Initiative'.

Horizon Europe is by default open to the world. The association of non-EU countries to Horizon Europe will enlarge the geographical scope of the overall programme and will offer additional opportunities for researchers, scientists, companies, institutions, or other interested establishments to participate, with generally the same conditions as those of the Member States. In order to safeguard the EU's strategic assets, interests, autonomy or security, and in line with Article 22.5 of the Horizon Europe Regulation, the programme will limit participation in a very small number of actions. Such limitation will be exceptional and duly justified, in agreement with the Member States and in full respect of the EU's commitments under bilateral agreements.

Next steps

The first calls for proposals will open on the Commission's Funding and Tenders Portal on 22 June. The European Research and Innovation Days on 23 and 24 June mark the occasion to discuss Horizon Europe amongst policymakers, researchers, innovators, and citizens. Horizon Europe Information Days targeting potential applicants take place between 28 June and 9 July.

Background

Horizon Europe is the EU's EUR 95.5 billion research and innovation programme for 2021-2027 and the successor of Horizon 2020. This Horizon Europe work programme is based on Horizon Europe's Strategic Plan, which was adopted in March 2021 to set the EU's research and innovation priorities for 2021-2024. Most of the funding is allocated based on competitive calls for proposals, set out in work programmes. New funding opportunities have already opened up since early 2021: in February the Commission launched the first European Research Council calls under Horizon Europe and in March it launched the new European Innovation Council. Furthermore, in April, it quickly mobilised EUR 123 million for research and innovation into coronavirus variants.

Digital Economy and Climate Impact

New Research and IT Innovation to Meet the Demands of a Digital-First Future

The new report titled Digital Economy and Climate Impact predicts IT-sector related electricity demand is expected to increase by nearly 50% by 2030.

Schneider Electric, the leader in digital transformation of energy management and automation, released a research report to foster an understanding of how digitised and smart applications will be powered in the future. Yet, as the electricity system decarbonizes, emissions would not increase by more than 26% by that time. To help mitigate this rise in emissions, the Schneider Electric™ Sustainability Research Institute recommends continued efforts in achieving efficiencies on the IT and energy sides at both the component and system levels. Released at an exclusive media event presented virtually from Schneider Electric's Boston Hub, the report highlights how the rise of edge computing requires a specific focus as these systems are expected to be less efficient than hyperscale data centres from a PUE standpoint.

"When the world locked down it also logged on and internet traffic soared," said Pankaj Sharma, EVP, Secure Power, Schneider Electric. "It's misleading to assume that digital activity will inevitably result in a deeply problematic increase in CO2 emissions. The analysis from the Schneider Electric Sustainability Institute puts to rest many of the worst-case scenario claims predicting IT-related electricity use will double every five years. That said, as an industry we must remain vigilant in finding new sources of sustainability gains while ensuring resiliency as digital keeps life moving forward."

In addition to releasing the research report, Schneider Electric also announced updates to its EcoStruxure™ IT data centre infrastructure management software and Galaxy™ VL 3-phase uninterruptable power supply (UPS). All introductions are designed to advance the industry forward in meeting sustainability goals while increasing resiliency of IT and data centre infrastructure.

EcoStruxure IT software updates reduce complexity in managing hybrid data centre and edge IT environments

Increasing demands on digital consumption, which are explored in the new research report, create a more complex hybrid environment inclusive of enterprise, cloud, and edge data centres. To address the unique management challenges of a hybrid IT environment, Schneider Electric has announced updates to its EcoStruxure IT software to increase efficiency and resiliency, including:

- Increased remote management capabilities: New granular remote device configuration features enable users to change configurations on one or more devices – including the new Galaxy VL UPS unit – from one centralised platform with EcoStruxure IT Expert. This update, combined with previously released software insights on device security health, enables the user to identify faulty devices or

configurations and address them in a matter of clicks, keeping their hybrid IT environment secure.

- Improved environmental monitoring: Environmental monitoring systems ensure users have eyes and ears on data centre and IT deployments from anywhere, anytime. With this update, users can push mass configurations remotely for NetBotz cameras 750 and 755 quickly and efficiently increasing security across the critical infrastructure.
- Enhanced remote capacity modelling and planning: With EcoStruxure IT Advisor's new capabilities, users can remotely compare an unlimited number of racks and easily identify available capacity, view what assets are deployed and their dependencies.

Redesigned Galaxy Lithium-ion battery solution enables greater space savings, faster recharge and installation and enhanced safety

The newly released Galaxy VL, the most compact of its class, modular and scalable 3-phase UPS in the 200 - 500 kW range with efficiency levels up to 99 per cent, now features redesigned Galaxy Lithium-ion battery cabinets, providing a sustainable, high-density, and innovative energy storage solution for data centres, industrial processes, and critical infrastructure. The exclusive cabinets are compatible across the full Galaxy V Series.

A Green Premium™ offer, this UL9540A-compliant battery solution reduces battery footprint and weight by up to 70 per cent, allowing more effective use of space. The new cabinets enable two to three times faster recharge than VRLA solutions as well as faster installation and enhanced system availability with patented redundant self-powered internal power supplies.

Lithium-ion batteries reduce total cost of ownership by doubling battery life, lowering installation and maintenance costs, plus reducing cooling needs, as they operate at higher temperatures than VRLA. The included real-time battery management system improves battery system visibility, predictability, and manageability. The modular, touch-safe design simplifies maintenance and increases operator safety.

"Schneider Electric has been focused on sustainability for the past 15 years and was recently named the most sustainable corporation in the world. We have embraced the mindset that future innovation will deliver better efficiency across the broader connectivity landscape," continued Sharma. "By making smart intentional choices, our industry can help mitigate how much electricity and emissions result from the rising appetite for digital technologies."

EcoStruxure™ is Schneider Electric's open, interoperable, IoT-enabled system architecture and platform. EcoStruxure delivers enhanced value around safety, reliability, efficiency, sustainability, and connectivity for their customers. EcoStruxure leverages advancements in IoT, mobility, sensing, cloud, analytics, and cybersecurity to deliver Innovation at Every Level. This includes Connected Products, Edge Control, and Apps, Analytics & Services which are supported by Customer Lifecycle Software. EcoStruxure™ has been deployed in almost 500,000 sites with the support of 20,000+ developers, 650,000 service providers and partners, 3,000 utilities and connects over 2 million assets under management.

World's First 400kV Green Gas for Grid (G3) Substation

In Scotland, Omexom has been awarded the contract by SSEN Transmission to build the world's first 400kV green gas substation (G3) at Kintore. The project is part of the client's plans to upgrade its network in the east of Scotland from 275kV to 400kV and to facilitate increased renewable energy generation in the region.

"We are delighted to have Omexom on board to support us in delivering the world's first 400kV Green Gas for Grid (G3) substation. We look forward to building on our already successful working relationship to deliver this industry leading and innovative substation, that will play a key role in supporting the transition to net zero emissions," Alison Hall, SSEN Lead Project Manager, said.

The project consists of building a new 400kV GIS substation including design, civil works, installation of the GIS switchgear and all associated primary equipment and the diversion of overhead and underground cable circuits.

The design phase of the contract started in March 2021 and construction is scheduled from June 2021 to 2026.

"This project will not only bring more renewables into the UK grid's energy mix, but its innovative substation will also significantly reduce emissions and could pave the way for new SF6-free 400kV substations across the country. We are delighted to be involved in this project and would like to thank SSE for trusting us once again with one of their major infrastructure projects," Innis Simon, Director Omexom in UK and ROI, stated.

GE Supports Scotland's Decarbonization

On December 03, 2020, SSEN Transmission announced it has awarded a contract to GE Renewable Energy's Grid Solutions business to manufacture, deliver and commission a 420 kilovolt (kV) Green Gas for Grid (g^3) gas-insulated substation (GIS) at its new Kintore 400 kV substation in Aberdeenshire, on the north-east coast of Scotland. This will support SSEN Transmission in moving a step closer to reaching its carbon reduction targets by building the transmission infrastructure necessary to connect and transport renewable energy, while avoiding the addition of about 350,000 tons of CO_2 equivalent to the grid.

The 420 kV g^3 circuit breaker at the core of the substation is being co-funded over a two-year period by the EU's LIFE Programme dedicated to climate change. SSEN Transmission joined GE's LifeGRID project to contribute to the specification of the circuit breaker's main performance requirements.

GE's g^3 technology is a game-changing alternative to sulphur hexafluoride (SF_6), an insulating and switching gas that has been used for decades in high-voltage substation equipment. Identified as the world's most potent greenhouse gas by the 1997 Kyoto Protocol, SF_6 is estimated to contribute 23,500 times more emissions than CO_2, if leaked, and can remain in the atmosphere for up to 3,200 years.

While SSEN Transmission's most material contribution to action against climate change is enabling the transition to a low carbon economy, the Scottish utility is also determined to tackle its own emissions. SSEN Transmission has set an ambitious goal to cut its greenhouse gas emissions by one third by 2026, making SSEN Transmission the world's first electricity networks company to receive

external accreditation for a Science Based Target in line with a 1.5°C global warming pathway.

g^3 products feature the same high performance and reliability as SF_6 equipment but with a greatly reduced impact on the environment over their lifetime. According to life-cycle assessments (LCAs), based on international ISO 14040/14044 standards, their CO2 equivalent impact is reduced by 99%, compared to SF_6. At the same time, because g^3 products have the same compact dimensions as SF_6 products, there is no increase in emissions during the manufacturing process due to additional material.

SSEN Transmission is one of 21 leading utilities in Europe – along with UK's National Grid, France's RTE and Germany's TenneT – that have chosen GE's g^3 equipment to help reduce their greenhouse gas emissions. Together, these utilities are avoiding the addition of more than 900,000 tons of CO_2 equivalent to the grid.

The 420 kV g^3 substation is SSEN Transmission's fourth g^3 order. SSEN Transmission ordered the construction of a 1-km long g^3-gas insulated line at its New Deer substation, as well as a 145 kV g^3-gas insulated substation and a 420 kV g^3 gas-insulated busbar for its Fort Augustus site.

GE's ground-breaking g^3 technology is a culmination of dedicated research and development efforts from teams in France, Germany, and Switzerland, in collaboration with the 3M Company. ■

First UK Data Centre to Transition from Diesel to Renewable HVO Fuel

Harlow campus

Kao Data, the specialist developer and operator of advanced, carrier neutral data centres for high performance colocation, has announced it has taken a further step towards its Net Zero ambitions by becoming the UK's first data centre to transition all backup generators at its Harlow campus to HVO (hydrotreated vegetable oil) fuel. This pioneering move, made possible by partnering with Crown Oil, means Kao Data will eliminate up to 90% of net CO2 from their backup generators and significantly reduce nitrogen oxide, particulate matter, and carbon monoxide emissions.

Currently Kao Data delivers one of the UK's most sustainable colocation data centre campuses. Its existing initiatives include using 100% renewable energy, utilising 100% refrigerant-free indirect evaporative cooling technologies, and incorporating hyperscale inspired design to deliver a market-leading PUE of <1.2, even at partial loads. In line with its commitments as a signatory of the Climate Neutral Data Centre Pact (CNDCP), the use of Crown Oil HVO fuel marks another significant step in the company's plans to become a fully carbon neutral data centre operator by 2030.

HVO is one of the cleanest fuels on the market, and is a second-generation, advanced renewable diesel alternative. Synthesised from vegetable oils using a specialist hydro treatment process, HVO has been designed to combat the performance inadequacies of earlier biofuels. It offers improved burning efficiency, delivering the same level of resilience as traditional fossil fuels. Kao Data will replace an initial 45,000 litres of diesel and switch to an HVO provision of more than 750,000 litres when the campus is fully developed. Using HVO also offers several additional benefits in respect of infrastructure reliability. It eliminates microbial growth, which generates sludge that can contaminate fuel lines and potentially lead to engine shut down.

Furthermore, HVO requires no modification to existing infrastructure and can be used as a direct replacement for diesel. It has a storage life that is ten times that of standard diesel and offers resilient year-round performance in both low and high temperatures. It is also easier to maintain, free from aromatics, sulphur, and metals, odourless and completely biodegradable.

"HVO fuel is dramatically better for the environment compared to traditional, mineral diesels. It is 100% renewable, biodegradable, sustainable and non-toxic," said Simon Lawford, Technical Sales Manager, Crown Oil. "We're proud to have worked with Kao Data to initiate a first-of-its kind project, which will be transformative for the data centre industry, and help point the way forward for significant reductions in industrial greenhouse gas emissions."

"This pioneering approach to replace our generator's diesel provision with HVO fuel, is a key step in the company's efforts to become Net Zero, and a further demonstration of our leadership in the international data centre sustainability field," said Gérard Thibault, Chief Technology Officer at Kao Data. "This move effectively eliminates fossil fuels from our data centre operations and helps us reduce Scope 3 emissions in our customers' supply chain, while delivering no degradation to the service they receive. Most importantly, it shows how our industry can take a simple and highly beneficial step forward for the good of the environment, ahead of COP26."

One of the largest campus developments in the UK

Founded in 2014, Kao Data develop and operate advanced data centres for high performance colocation. From their hyperscale inspired campus in the heart of the UK Innovation Corridor between London and Cambridge - Kao Data provides cloud, HPC, AI and enterprise customers with a world-class home for their compute.

Their Harlow campus - built on the site of Sir Charles Kao's pioneering discovery of fibre optic cable in 1966 - is a development of four state-of the-art, OCP-Ready™, carrier neutral data centres. When fully completed the 15 acre, +£230m campus will support an ITE load of over 40MW, across 150,000sq ft of technical space – all powered by 100% renewable energy.

Backed by Legal & General and Goldacre - Noé Group, Kao Data is one of the largest campus developments in the UK and represents the future in sustainable, efficient, and scalable computing - providing an industry blueprint to develop further best-in-class data centres.

Crown HVO fuel - Reducing up to 90% of net CO2 emissions

Global warming is everyone's business. But what can businesses do to help? We all have a responsibility to reduce our local emissions – and Crown HVO fuel is invaluable in doing so.

Simply switch your fossil fuel for Crown HVO and you will reduce your net CO2 greenhouse gas emissions by up to 90% right away.

Crown HVO fuel offers a fast and simple step towards 'net zero' rather than the leap needed for electrification. With a large number of OEM approvals, HVO can be used without changes to infrastructure or capital expenditure, removing cost barriers and enabling a practical step towards decarbonisation.

For every 1,000 litres of diesel burned, you will produce 3.6 tonnes of greenhouse gas CO2, compared to just 195kg GHG CO2 for every 1,000 litres of HVO burned.

Why use HVO fuel?

- Up to 90% reduction in net CO2 greenhouse emissions: significantly better for the environment than regular diesel or biodiesel
- Renewable, sustainable and 100% biodegradable: synthesised from waste fats and vegetable oils
- Reduces notifiable particulate matter (PM) and nitrogen oxide (NOx) emissions: improved air quality
- Drop-in replacement for regular diesel & gas oil: meets EN15940 standard for paraffinic fuels and Fuel Quality Directive 2009/30/EC Annex II. A wide range of OEM approvals means it can often be used without needing engine and machinery modification
- Excellent cold-weather performance: higher cetane number (up to 90) and low cloud point (-32OC) provides better starting performance, clean combustion, and less chance of waxing in extreme temperatures
- High flashpoint: improved safety, storage and handling compared to regular diesel
- Reduced need for regular testing: impurities are removed during the production process, eliminating the key factors for fuel degradation, and increasing shelf life to around 10 years

What is HVO fuel?

Crown HVO (hydrotreated vegetable oil) is a premium, high quality diesel fuel made from renewable, sustainable raw materials – all which do not release any new CO2 into the atmosphere.

HVO is part of the paraffinic family of fuels which are stable, renewable, sustainable, and high quality, making it perfectly suited for a wide range of applications including vehicles, generators, and industrial power systems.

HVO meets EN 15940 standards and Fuel Quality Directive 2009/30/EC Annex II so can be used as a direct, drop-in alternative to mineral diesel without modifications to infrastructure or high initial investments. Simply place an order of Crown HVO fuel today and start reducing your CO2 emissions right away.

The feedstocks used to manufacture Crown HVO are 100% waste, drawn from primary sources which have bypassed damage to the environment, natural ecosystem, and the drive for global deforestation. All raw materials are checked and verified, and the fuel's credentials audited by the Department for Transport (DFT) to ensure both sustainability and product integrity are certified.

HVO meets bio content requirements with no FAME included and, to that point, avoids the instability and operability issues seen by many low blend diesel fuels and high blend biofuels.

KAESER COMPRESOARE®

Pilot Project: Kaeser Joins Vaccination Campaign

KAESER KOMPRESSOREN SELECTED BY COMPANY DOCTORS FOR COVID VACCINATIONS

Company doctors at the Coburg-based compressed air systems provider were scheduled to start vaccinating the first employees against COVID-19 in May. Kaeser, with its Coburg location, is one of the 17 companies selected to join the national vaccination campaign in the second phase of the Bavarian state government's pilot project.

Kaeser is doing everything in its power to safeguard the health of its employees and therefore to keep its business operations running. Since the start of the pandemic, it has used all available options to achieve this goal. This has included the development of an extensive COVID protection concept, which the company has continually adapted to reflect current conditions and the latest knowledge and regulations.

The company has been successfully implementing social distancing, hygiene and mask advice, systematic testing, the mandatory use of masks in the workplace, strict separation of shifts, and mobile work for large sections of the workforce for many months.

Kaeser is delighted to have been selected for the pilot project, which will enable it to make a further contribution to the fight against the pandemic. The company is aware of its role and the responsibility this involves. Providing vaccinations on this scale is a special challenge for all of the participating companies. To be fully prepared, Kaeser is creating an extensive vaccination concept backed by sophisticated logistics.

Image: KAESER KOMPRESSOREN SE

The Kaeser Kompressoren headquarters in Coburg

Kaeser Kompressoren is a manufacturer and supplier of compressors and compressed air systems. It now employs around 7000 people all over the world.

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DigiTEL, First Digital Laboratory in Romania

DigiTEL is a unique initiative in Romania, in view of partnerships between the economic environment and academia. DigiTEL is part of the pilot project of retrofitting Alba Iulia 220/110/20 kV Substation, with a digital station concept. DigiTEL essence consists of two main components: testing of state-of-the-art technologies before being implemented in the operational environment and continuous transfer of know-how to and from the university environment, contributing to the adaptation of the process of training future engineers to the requirements of real evolutions in the sector.

The National Power Grid Company Transelectrica and the Polytechnic University of Bucharest (PUB) sign a strategic partnership for the technological future of the Romanian energy sector. The two partners undertake to develop and operationalize a bold project in the field of research and innovation: DigiTEL - the unique integrated digital laboratory in Romania, for testing future technologies in the energy field (state-of-the-art technologies: digital twin, expert asset management systems, virtual and augmented reality, 3D CAD etc.).

In materializing a 10-year vision, DigiTEL will operate as an environment of testing and validating the integrated concepts used in the development of the pilot project of the first digital substation in Romania, which will be implemented by Transelectrica, i.e., Alba Iulia 200/110/20 kV substation.

With the implementation of the project of retrofitting Alba Iulia substation, DigiTEL will become an incubator of the new standards and technologies that support digital transformation of the energy sector. The project of the digital substation is provided in Transelectrica's PTG Development Plan for 2020-2026 with an allocated budget of around EUR 30 million, of which approximately EUR 3-5 million will be allocated to the laboratory. The project of the digital substation spearheads Transelectrica's strategic initiatives, ensuring materialization of company's strategy in the field of innovation and research.

"At global level, the energy sector is in a rapidly advancing transition. Therefore, we believe that in order to successfully deal with this challenge in the long run the only way is to join forces and strengthen the partnership between real economy and academia. We are delighted of the openness show by the Polytechnic University of Bucharest, not only as regards this pioneering project - DigiTEL, but also other initiatives we have implemented and continue to implement within the partnership. Transelectrica aims to remain leader in promoting new technologies and this is possible through a mix of operational excellence, professional excellence and strong partnerships with the academia and technology leaders. With this goal, we started on the path of digitization having a clear and ambitious vision of the future, and the digital substation in Alba Iulia is the central pillar of transition to smart power grids," mentioned Catalin Nitu, President of CNTEE Transelectrica SA's Management Board.

"For the success of transformation of the energy sector and transition to the digital era, the 'key ingredient' is adequate training of the human resource, in the spirit of innovation. Currently, at global level, there is a small number of fully digital electric substations and the fact that we propose together this bold objective creates the prerequisites for carrying out projects of a scale at least as large," added Corneliu Bogdan Marcu, member of the Management Board.

"In recent years, digital transformation has become one of the priorities of our community. Whether we talk about digitization

The National Power Grid Company Transelectrica and the Polytechnic University of Bucharest sign a strategic partnership for the technological future of the Romanian energy sector.
© Photo: Transelectrica

of administration or services, Romania needs the support of the largest community of engineers in the country, that of the Polytechnic University of Bucharest. In the project we develop together with our partner, Transelectrica, we have tried to look to the future. We will develop a laboratory of Digital Technologies for Electric Substations to help students familiarize themselves with the technologies they will use in the near future. Basically, through the project we create infrastructure to help training specialists in digital technologies intended for the energy sector. I believe it is an extraordinary contribution of Transelectrica and of the Energy Faculty within PUB to the process of digitization of the energy infrastructure of the country. I thank our partners and all those involved for their openness and for launching this project and partnership."

Within the partnership, the Polytechnic University of Bucharest will provide the necessary space for arranging the laboratory and Transelectrica will ensure its endowment with the equipment, systems, and technologies necessary for the testing infrastructure, as well as the transfer of know-how acquired through the operational activity.

The main objectives of the partnership are:

- Testing and commissioning of equipment and systems installed in the laboratory
- Participation in training and certification sessions to capitalize on the laboratory's capabilities
- Development of knowledge and skills of students and specialized teachers within PUB regarding the equipment and systems necessary for the operation of the Power Transmission Grid, as well as of Transelectrica specialists
- Testing and validating the digital technologies related to energy systems
- Promoting the best practices, standards and technologies that will influence the future generations of equipment and systems, among Transelectrica experts, teachers, and students of PUB
- Identifying competent young students who can consolidate the teams of Transelectrica and PUB
- Creating a learning environment as close as possible to the operational environment used within Transelectrica and European transmission and system operators (ENTSO-E)

Steps to implement the DigiTEL laboratory will be initiated this year, operationalization being aimed for 2024.

Main pillars of Transelectrica-PUB partnership

1. Training of future electrical engineers
2. Supporting students' performance
3. Integrated digitization - the most advanced Digital LAB in the country

Specific objectives of DigiTEL laboratory

- Implementing an integrated solution similar to Alba Iulia substation (primary equipment, secondary equipment, expert systems, digital technologies)
- Implementing a modular structure allowing the simultaneous development of several disciplines
- Involvement of teachers in processes of assimilation of new technologies and standards (training and certification with technology leaders)
- Mass dissemination of the newly acquired knowledge, both in the area of student training and in the research area ■

Electrica, Total Investments of Over RON 4.2bln in Recent Years

Electricity distribution companies within Electrica Group have made investments of over RON 4.2 billion over the past few years, the most ambitious program so far. Last year, Distributie Energie Electrica Romania (DEER) made investments at a rate of 100.5% compared to plans approved by ANRE. Therefore, the total value of investments made and already commissioned was RON 596 million, compared to 593 million planned (RON 202 million in North Muntenia area, 190 million in North Transylvania area and 204 million in South Transylvania area).

by **Daniel Lazar**

Total investments assumed and made by electricity distribution companies within Electrica Group during 2018-2020 exceeded the value of RON 2 billion, representing by far the largest investments of distribution operators. Moreover, after the listing in 2014, Electrica Group became the largest investor in the upgrading and retrofitting of electricity distribution networks, with a total of over RON 4.2 billion invested during 2014-2020.

The most important investments targeted the improvement of quality of the distribution service and increasing operational efficiency, by modernization, automation of installations, implementation of modern technologies and increasing the energy efficiency by reducing network losses.

The record investments made in recent years have led to an improvement of key quality indicators of the electricity distribution service.

Therefore, one of the most important investment works in Cluj County is the upgrading of Nadas 110/20/10kV substation, commissioned in in 1978. Here, 4 cells of 110 kV, 27 medium voltage cells, protection and automation equipment at the station level were modernized and the new equipment was integrated in the SCADA system. From this station, through 10 kV and 20 kV electricity distribution networks, household, commercial and industrial consumers from the city of Cluj-Napoca are supplied. The investment was completed on 25.08.2020 and the value of works was RON 8.21 million.

Another investment work was made in Mures County, in Corunca 110/6 kV substation. The investment made increased the safety in electricity supply to users and increased the capacity of connection of new users, the locality of Corunca being in continuous development. The value of works performed was RON 7.3 million.

Another important investment project of modernization and SCADA system integration

was carried out in Satuc 110/20 kV substation, in Buzau County. The Satuc 110/20 kV substation was commissioned in 1975 and serves both industrial and household consumers in the northern part of Buzau County. Given the wear and tear of power equipment and the fact that the development of the service area has led to increased electricity consumption, it was necessary to modernize the substation, so as to ensure safety standards in operation and increase efficiency in electricity supply to consumers. The investment amounted to RON 9.17 million.

For 2021, the investments planned from own sources total around RON 639 million planned expenses, of which approximately 28% are aimed at energy efficiency works, 22% at works for the improvement of the quality of the distribution service (supply continuity and quality of energy) and 27% works for creating the conditions for connecting consumers.

Moreover, compared to the approved annual investment plan, each distribution operator has the legal obligation to finance the installations for connecting household consumers and non-household end-customers whose connection installation is less than 2,500 meters.

For medium term, the company plans, in addition to continuation of modernization of network infrastructure, to accelerate digitization, develop alternative channels for interaction with users and create a modern working environment for employees, by implementing the concept of Digital Distribution. In the long run, company's projects aim at focusing on the smart grid concept, in line with trends in the industry. ■

Siemens Energy to Build New Grid Supporting Plant to Secure Germany's Power Supply

Siemens Energy will build a new grid supporting plant in Leipheim, southwestern Bavaria, in a contract with LEAG, an energy provider based in eastern Germany. The turnkey gas-fired power plant will be used at the request of the transmission grid operator Amprion to ensure grid stability in an emergency and therefore ensure a reliable power supply in southern Germany. Emergency situations can occur when there's a failure of equipment in the grid, like cables.

The Leipheim gas-fired power plant will be used exclusively to protect and ensure the reliability of the transmission grid. It's therefore not available to the free energy market, according to the German Energy Industry Act (Energiewirtschaftsgesetz). The special grid-related equipment in Leipheim will be able to supply an electrical capacity of up to 300 Megawatts in a maximum period of 30 minutes. Siemens Energy will also manage its operation and maintenance (O&M), initially for five years, in collaboration with LEAG. The plant will be operated entirely from Siemens Energy's ISO-certified Remote O&M Support Center (ROMSC) in Erlangen, Bavaria. This means that it will be one of the first power plants worldwide to be operated purely digitally from a remote location.

The special grid-related equipment will be installed on the grounds of the former military airbase in Leipheim. Siemens Energy's scope of supply includes turnkey construction and the O&M agreement as well as an SGT5-4000F gas turbine, an SGen-2000P generator, and the SPPA-T3000 control system. The company will also provide a system for cooling the intake air and a system for injecting fully desalinated water into the gas turbine. These systems will ensure that the plant can generate up to 300 Megawatts in as little as 30 minutes, even in hot weather.

"Leipheim gas fired power plant is an important building-block in the energy transition of power generation," said Karim Amin, Executive Vice President Generation at Siemens Energy. "We're very pleased that the project development of Leipheim was successful and that we're able to help make the security of electricity supply in Germany more robust. An interesting aspect in this project is our digital solution for operating the facility entirely remotely, a real step towards unlocking the power of digitalization."

Siemens Energy successfully developed the project with Stadtwerke Ulm/Neu-Ulm and STEAG. The approval required for building and operating the plant in accordance with the German Federal Immission Control Act (BImSchG) has been obtained. In February 2021, the Gaskraftwerk Leipheim GmbH & Co. KG (GKL) special-purpose company was transferred to the LEAG

Drawing of the new gas-fired power plant in Leipheim, southwestern Bavaria: As special grid-related equipment, it will make an important contribution to securing the power supply in southern Germany | © Siemens Energy

energy provider, and GKL was awarded the contract to build the gas-fired power plant in Amprion's Leipheim location during the bidding process.

"By making this investment, we're taking responsibility for a secure power supply in southern Germany in our capacity as an experienced power plant operator," said Hubertus Altmann, LEAG Managing Board Member responsible for power plants. "Like the other two gas turbine power plants operated by LEAG in Thyrow and Ahrensfelde near Berlin, the Leipheim gas-fired power plant will also help stabilize the grid once it's completed. These types of plants are urgently needed to ensure stable grid operation and ultimately the success of the energy transition."

Siemens Energy's modern service centre (ROMSC) has obtained the ISO certification 27001 and is able to operate power plants remotely. This permits the plant to be operated locally by a two-person team during the day shift, while control and monitoring are handled from Erlangen. To enable the optimal collaboration with the ROMSC, the local maintenance team is equipped with cutting-edge connected worker technology. Outfitted with a helmet-mounted camera, microphone, and headset, the connected worker can communicate with the remote-control centre over a secure Internet connection.

Modern software solutions that employ speech recognition, artificial intelligence, and augmented reality functions provide additional support. This combination of on-site and remote specialists guarantees that the power plant remains available round the clock. ■

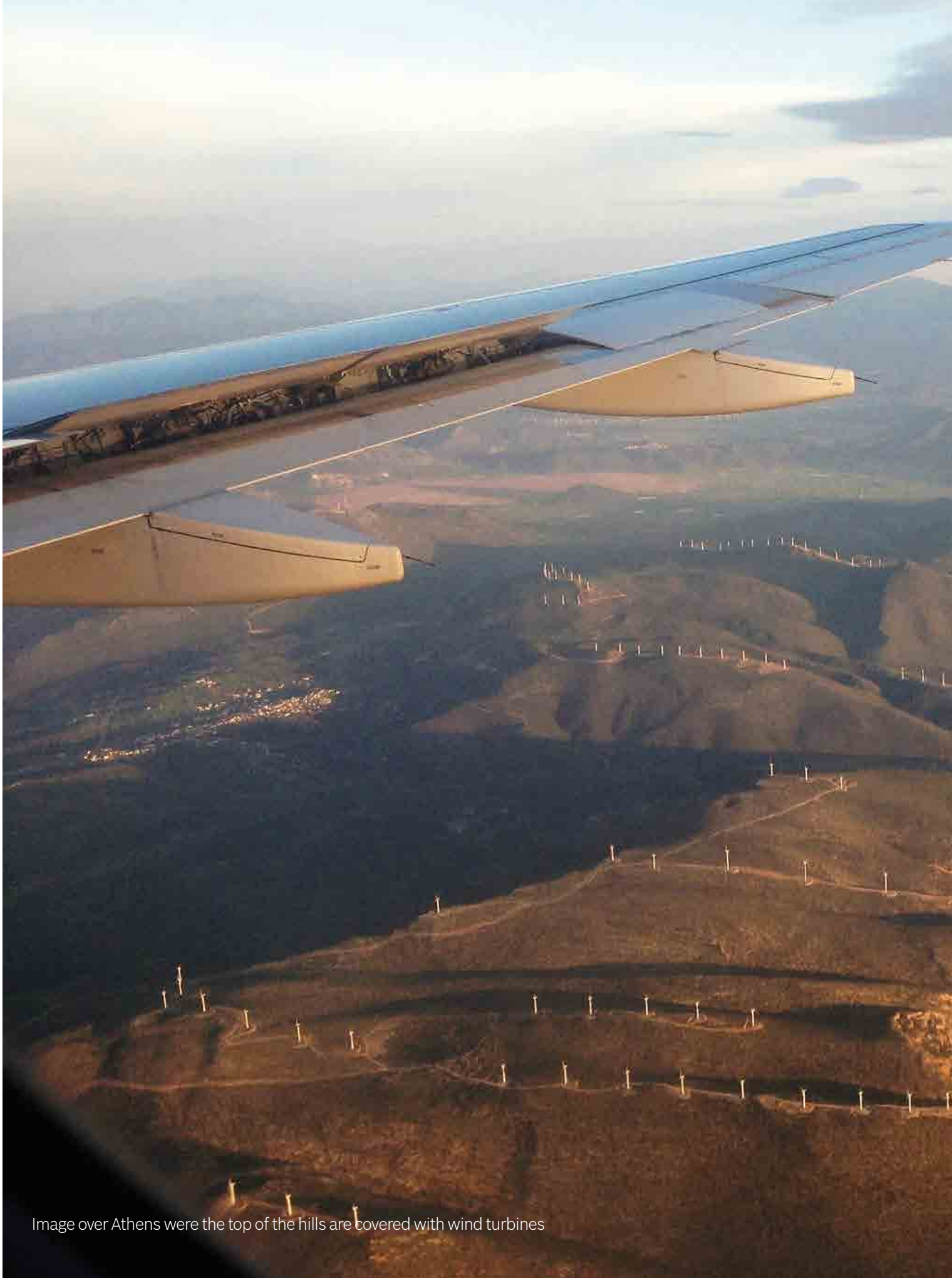


Image over Athens were the top of the hills are covered with wind turbines

Greece and its Renewable Energy Sources Opportunity

Greece is strategically located at the edge of Europe, facing toward the East and the South, with strong (and not always friendly) ties with Asia and African counties. Its place, right at the crossroads of continent, combined with the strategic alliances Greece has forged with Cyprus, Israel (and the recent close collaboration with Egypt) it now has opportunity to play a key role in several regional energy markets, like the one of the Balkans or the immensely important one of South-East Mediterranean.

by **Evgenios Zogopoulos**

Greece is also blessed with vastly available renewable energy potential (solar, wind, geothermal and more) combined with many ongoing massive infrastructure projects involving Greece (TAP, EastMed Gas Pipelines, EuroAsia Interconnector etc.) show that Greeks can claim a significant place at EU's decision-making table about its Energy strategy.

Greece has been emerging as a key player in the transportation of energy from East to West through pipeline projects, electricity grid interconnectivity and alternative means of ensuring security of supply through offshore reserves.

Greece's energy system has been plagued by multiple factors, but it is undergoing significant transformation. A main characteristic of today is the effort to decrease consumption of conventional (fossil) fuels, like lignite. Greece strategically chose to invest in lignite and consider it foundational for its energy mix, after the oil crisis of the 70s. There is still significant dependency on the imports of crude oil (and other oil products) along with natural gas. Over the last years we have been seeing increasing penetration of natural gas into the energy mix of Greece although its share of the pie is still small and far less than the European standards.

Greece is actively pursuing convergence with the European standards, employing national policies like the introduction of the CO2 tax. The energy sector in this country has a higher contribution to gross value added most EU countries and it the projections indicate further expansion due to a number of factors.

- The necessary further optimization of the energy mix, meaning the reduction of fossil-fuel generated electricity and increased contribution from RES. This will be driven both by the revised EU policy of 35% renewable energy sources by 2030, and by the preference for cheaper and cleaner energy sources such as natural gas.
- The Greek government's planned privatization of major energy assets such as the Public Power Corporation (PPC), the natural gas distributor (DEPA), the Hellenic Electricity Distribution Network Operator (HEDNO) and the Hellenic Petroleum.
- The liberalization and total privatization of the electricity and natural gas markets and the further separation of production and supply from transmission networks.
- The potential to become gateway for natural gas, electricity, and oil resources through mega-infrastructure projects such as the TAP-IGB-EastMed gas pipelines, EuroAsia Interconnector or gas and oil exploration and production.
- New advancements in technologies like smart metering, smart grid technologies, LED lighting, energy efficient buildings, etc.

Greek recovery plan and the Energy stakes

Kyriakos Mitsotakis, the prime minister of Greece, has brought forth a national plan aiming at shifting "the country's economic and institutional paradigm" with the objective to modernize and render them more efficient.

The Greek recovery strategy (referring to recovering from the Covid impacts) which is in accordance with the EU recovery principles agreed in July, counts on deep reformational efforts suggested and enforced by the Mitsotakis administration since its election in July 2019.

The endgame of many of those policies have a 2030 energy and climate plan epicentre; it focusses on phasing out of fossil fuels by 2028 along with the adoption of a new, digital RES licensing regime. The four pillars of the recovery plan suggest:

1. The green energy transition and digitization of the economy.
2. The new social sector policy, for employment schemes and education, and private sector reforms of taxes, export programs, R&D and the like.
3. The green energy transition bid aims to invest €6 billion of EU grants towards clean energy, with that sum intended to be topped up by €4.4 billion of private investment.
4. With the EU 'recovery and resilience facility' also offering loans, total liquidity for green power projects is expected to extend to some extra billions.

The Greek plan aims to secure €12.73 billion of EU funds on top of €18.2 billion in grants–and expected to attract €26.5 billion of private-sector cash–the €54.5 billion being eyed by Athens would boost Greek GDP 7% by 2026.

The Greek energy sector is undergoing a major transformation, pursuing moving away from its reliance on lignite (up to a fifth of its energy production in 2019) to renewable energy sources and less carbon intensive gas generating units. The aim at achieving reduction in greenhouse gas emissions by more than 55% by 2030 through:

- Phasing out of all 4 GW of lignite generation capacity by 2028.
- Employing 8.7 GW of new renewable generation capacity to added by 2030.
- Adding 2 GW of new gas generation capacity added for system support and security.

The Greek recovery program includes plans for up to 1.38 GW of hydro and battery storage, with a dedicated team working on energy storage regulation framework this

year. Smart energy systems and further PV installations are also significant aspects of the program. Commercial vehicle infrastructure will also be moving toward electric vehicles, a move financed (or at least supported by state funds); there are also plans to expand a national EV charging network to support the move towards EVs. The partly operational electricity interconnector between the mainland and the Cyclades complex of islands will also be expanded.

The country's move towards a more sustainable energy future and the subsequent fundamental transformations will have challenges and some great implications:

- Reengineering the country's distribution network in order to support the large-scale adoption of intermittent renewable energy.
- Addressing the social and economic impacts of the transformation, probably against the will of local interests and syndicates that are depending on ecosystems built around the current infrastructure.

Major Greek private corporations are leading the way with RES projects across Greece (and not only); such companies are GEK Terna, Mytilineos Group and HELPE among others.

Solar & Wind projects

The government recently approved four new major investment projects in electricity production from renewable energy sources with a total budget of 2.02 billion euros. The projects that the Ministerial Committee for Strategic Investments approved have a combined amount of 2,810.3 megawatts.

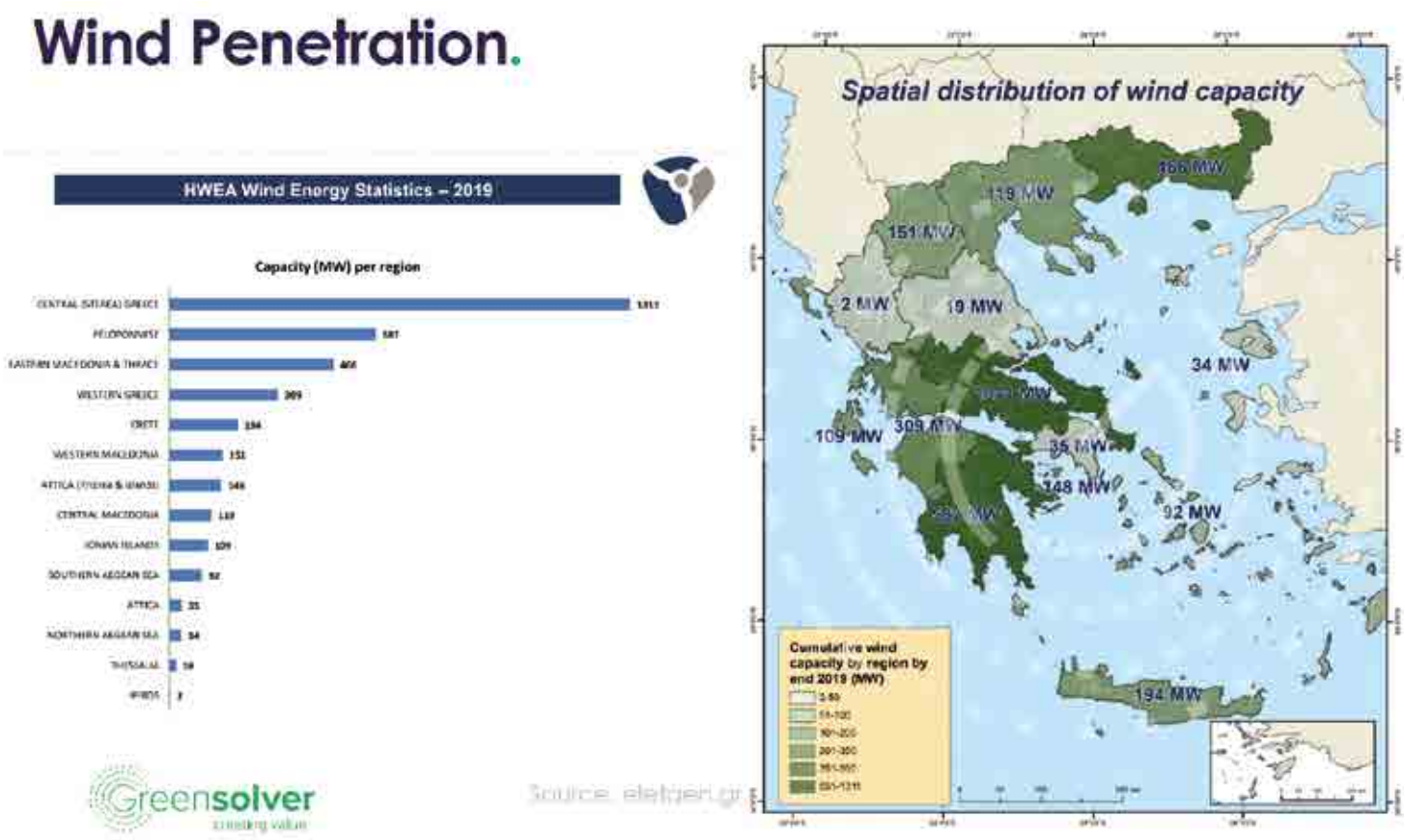
One of the first projects concerns major photovoltaic parks bearing capacity of 1.5 gigawatts in 12 regional units, to be constructed by the Egnatia Group with a budget of €888.14 million.

GEK Terna Energy is responsible for another project, concerning the development of 18 wind parks with a capacity of 360 MW on the island of Evia, with a budget of €585 million.

The third project is aiming at the establishment of five wind power investments of €121.28 million in total, with a combined capacity of 120.3 MW in Thrace, on the north-eastern part of Greece.

Another significant initiative is that one led by Karatzis SA - the construction and operation of 37 photovoltaic stations of 830 MW in total in Larissa, Magnesia and Kilkis with an estimated budget of €421.6 million.

Of course, the challenges related to such transformations are always ample; one of the leading ministers of the Greek government mentioned: "There has recently been some criticism, both within and outside of Parliament, of the Energy Ministry's financial and structural interventions, especially in projects of strategic significance; the answer today comes from the investors themselves, who continue to have a very strong interest in investing. The answer also came recently, from US Energy Secretary Dan Brouillette, who underscored the investment-friendly character of our policy and noted the similar interest of UAS investors". Kostis Hatzidakis, the same minister, went on with the number of applications for new RES projects in the last invitation for expressions of.



Another major initiative is that of the Greek public electricity giant (not necessarily the good type of giant), PPC and German (somewhat) equivalent RWE which are expected to sign for the joint development of renewable energy source projects in Greece. The agreement provides for RWE and the Greek Public Power Corporation to launch a commonly supported project, with stakes of 51% and 49% respectively, and reach a total combined capacity of 1 gigawatt each within the next 5 years. PPC will contribute with licensed projects and RWE will accordingly contribute licensed projects domestically. The key is to develop the first projects early next year, the region of West Macedonia in Greece being prioritized as a prime location.

The epitome of such a project, located in Kozani (Western Macedonia), is the Kozani solar park. Such PV modules harness the energy of the sun from both sides (front and back) of the module. This characteristic renders them much more efficient, and thus more energy/electricity can be generated much more efficiently.

The idea was not a new one, but it's a recent technological advancement developed and proved to be not only more efficient, but also less expensive. These modules can also harness reflected and diffused light achieving additional yield of up to 10% compared to conventional ones.

The Kozani park, reaches up to 5% of additional yield. The project has reached key milestones achievement becoming one of Europe's biggest bifacial solar parks. After breaking ground on the project site with racks and frames, Juwi Hellas installed the first rows of photovoltaic modules at the park in hundreds of thousands more following.

Takis Sarris, managing director of the Greek juwi stated: "Solar energy is already the cheapest form of electricity generation in Greece. The technology with bifacial modules reinforces this development again. In this way, we can generate more electricity in less space at even lower costs. Despite the COVID-19 pandemic and restrictions on the construction site we are still on schedule. The plant is scheduled to be connected to the grid by February 2022". After its completion, the Kozani solar park will be handed over to Hellenic Petroleum and it will be delivering more than 300 million kWh of climate-friendly electricity a year, being capable of supplying up to 75,000 Greek households. ■

Read the magazine everywere.

You will always find a good story!

ENERGY
INDUSTRY REVIEW

Renewables 2021 Global Status Report

REN21 is the only global renewable energy community of actors from science, governments, NGOs, and industry. They provide up-to-date and peer-reviewed facts, figures, and analysis of global developments in technology, policies, and markets. REN21 goal is to enable decision-makers to make the shift to renewable energy happen – now.

More than 2,000 community members guide their co-operative work. They reflect the vast array of backgrounds and perspectives in society, collect information and share intelligence, by sending input and feedback. REN21 takes all this information to better understand the current thinking around renewables and change norms. They also use this information to connect and grow the energy debate with non-energy players.

This year's report shows that governments need to act more aggressively and press forward with renewables in all sectors. The window of opportunity is closing, and efforts must be ramped up significantly. This will not be easy. The share of fossil fuels in overall final energy demand is as high as it was a decade ago. While renewables grew almost 5% per year from 2009 to 2019, fossil fuel shares remained at around 80% over the same period. And with fossil fuel subsidies in 2019 totalling USD 550 billion – almost double the total investment in renewables – the last 10 years of climate policy promises have shown themselves to be mostly empty words.

One way to accelerate development is to define the uptake of renewable energy as a key performance indicator (KPI).

How better to measure our progress towards a clean energy transition? We must use the share of renewable energy in final energy consumption as a KPI and link it to every economic activity, every budget, every single purchase. This may sound overly ambitious, but we need urgent action. According to the authors of this report, we cannot afford to make any more commitments that do not produce action. This needs to happen now.

The renewable energy story during a crisis year was one of resilience and adaptation, yet significant challenges remain. During the year, restrictions on movement and goods as well as the introduction of COVID-19 recovery packages all had an impact on the production and use of renewable energy.

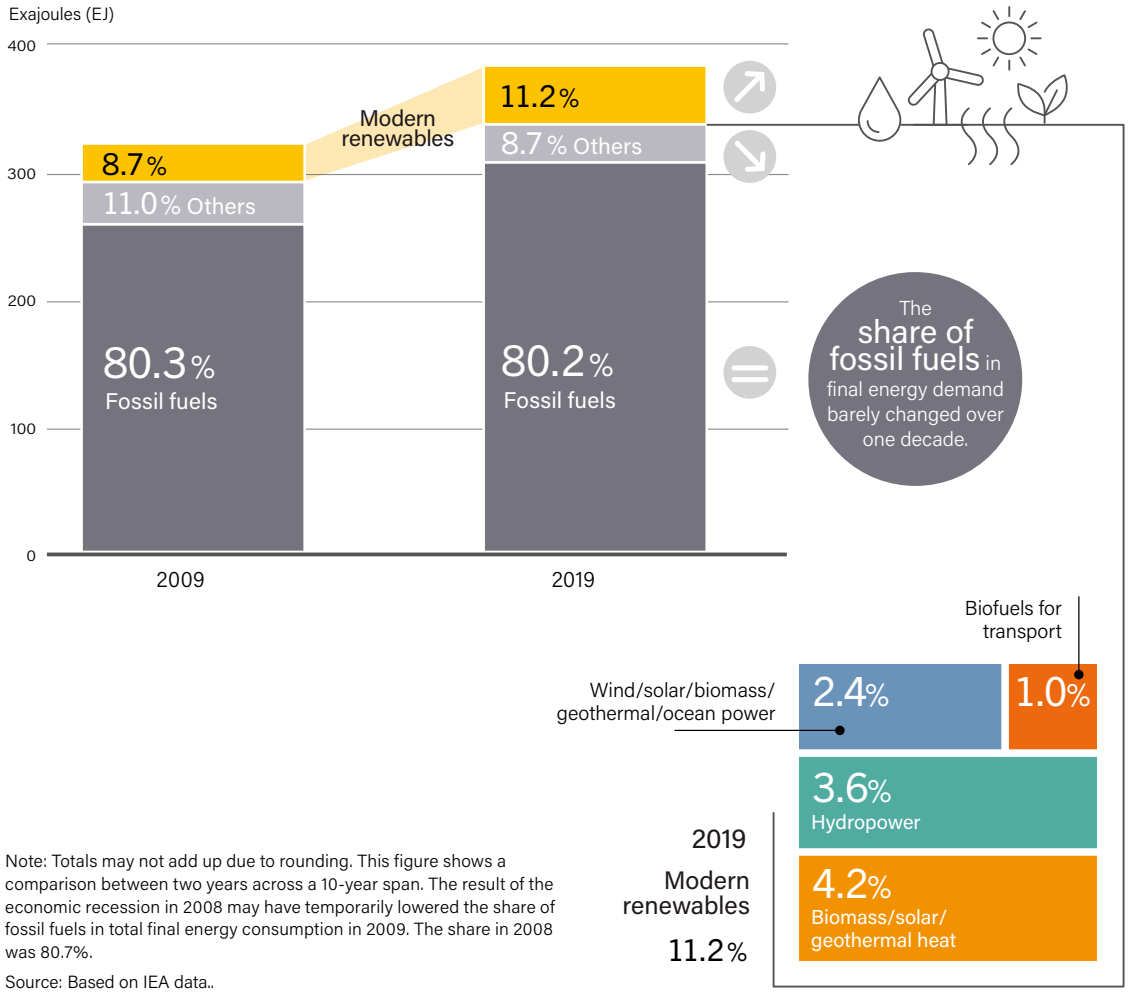
Despite suffering during the onset of the pandemic, renewable energy saw a record increase of new power capacity in 2020 globally and was the only source of electricity generation to experience a net increase in total capacity. Investment in renewable power capacity increased (albeit slightly) for the third consecutive year, and corporations continued to break records for sourcing renewable electricity. More countries are turning towards electrification of heat with renewables, and although production of transport biofuels decreased, sales of electric vehicles (EVs) expanded as did the linking of EVs to renewable power (to a lesser extent). A wave of commitments to action on the climate crisis included a carbon-neutral target by China, while the United States re-joined the Paris Agreement in early 2021.

At the same time, obstacles that have slowed progress in the renewables sector in past years persisted during 2020. For the first time ever, the number of countries with renewable energy support policies did not increase from the previous year. While renewable energy targets are in place in nearly all countries, many countries were not on track to achieve their 2020 targets in multiple sectors, and many had not yet set new targets as their 2020 targets came to term. Moreover, in COVID-19 recovery packages, investment in fossil fuels was six times greater than for renewable energy.

Key facts

- Despite the impacts of the COVID-19 pandemic, renewable energy set a record in new power capacity in 2020 and was the only source of electricity generation to register a net increase in total capacity.
- Renewables continued to meet low shares of final energy demand in the buildings, industry, and transport sectors, where policy support remains crucial to spurring uptake but is insufficient.
- For the first time, the number of countries with renewable energy support policies did not increase from the previous year. While renewable energy targets are in place in nearly all countries, many countries were not on track to achieve their 2020 targets in multiple sectors, and many had not yet set new targets as their 2020 targets expired.

Estimated Renewable Share of Total Final Energy Consumption, 2009 and 2019



Note: Totals may not add up due to rounding. This figure shows a comparison between two years across a 10-year span. The result of the economic recession in 2008 may have temporarily lowered the share of fossil fuels in total final energy consumption in 2009. The share in 2008 was 80.7%.

Source: Based on IEA data..

- With the atmospheric concentration of CO2 rising to record levels even as emissions have fallen, it has become increasingly clear that a structural shift is needed to reach long-term climate and development goals.

Ongoing challenges towards a renewables-based world

The developments during 2020 highlighted some of the key ongoing challenges impeding the widespread adoption of renewable energy. They include the slow increase of renewables in total final energy consumption (TFEC), the need for more innovation in some sectors, the need for infrastructure development and increased affordability in some markets, the lack of sufficient policy support and enforcement, and persistent support for fossil fuels.

The share of renewables in TFEC has increased only moderately due to:

- Rising global energy demand
- Continuing consumption of and investment in new fossil fuels, resulting in fossil fuels meeting most of the increasing demand, and
- Declining traditional use of biomass, which although a positive development due to sustainability and health concerns has meant that as people shift towards modern sources of energy, much of this is via fossil fuels.

As of 2019, modern renewable energy (excluding the traditional use of biomass) accounted for an estimated 11.2% of TFEC, up from 8.7% a decade earlier. The largest portion was renewable electricity (6.0% of TFEC), followed by renewable heat (4.2%) and transport biofuels (1.0%). ■

EBRD Supporting DEER's Digital Transformation

Reinforcing its position as a green development bank, the European Bank for Reconstruction and Development (EBRD) is supporting greater network efficiency and the digital transformation of electricity distribution in Romania's regions with new financing.

The Bank is extending a €40 million loan in RON-equivalent to Distributie Energie Electrica Romania SA (DEER), the electricity distribution subsidiary of Electrica Group. DEER serves more than 3.8 million users – residential and industrial – in the regions of Northern Muntenia, Northern Transylvania and Southern Transylvania. It operates 198,988 km of electric lines in 18 counties, representing just over 40 per cent of Romanian territory.

DEER is implementing a comprehensive investment programme to upgrade its distribution network as well as improve the quality of its services and operational safety. Priorities in this upgrade also include digital transformation through systems such as SCADA, which is used to monitor and control industrial processes.

The investment programme supports the roll-out of smart meters and will enable more renewable capacity to be connected to the distribution network. It will significantly improve the network's reliability, reduce grid losses, and consistently contribute to increased renewable energy use to the detriment of conventional energy, saving about 67,100 tonnes of CO2 equivalent a year.

The guarantee and loan agreements were signed by Mark Davis, EBRD Regional Director for Romania and Bulgaria; Corina Popescu, CEO of Electrica; and Valentin Branescu, Deputy CEO of DEER, on the side lines of the EBRD's 2021 Annual Meeting and Business Forum.

"Our new financing will help Electrica Group build a resilient distribution network in Romania with enhanced efficiency and ready to integrate more renewable projects to achieve the country's ambitious renewable targets," Mark Davis said.

"In view of the business development opportunities and the ambitious investment plan, Electrica Group is exploring several options for diverse financing sources. The main objectives of the strategy defined for the distribution segment consider optimisations in three areas: operational performance, quality of services and optimisation of costs to the final consumer. Added to these are the long-term strategic directions, focused on the business model's development, corroborated with the preparation of the distribution networks to face the challenges of energy transition," Corina Popescu added.

As part of its cooperation with the EBRD, Electrica Group has committed to providing a more equal workplace and improving working conditions for women. The company will adopt a gender-based violence and harassment policy in line with international best practice and offer training to employees and contractors on how to implement this.

The EBRD's overall investment in Romania stands at almost €9 billion, with 76 per cent in the private sector. Its focus is on financing infrastructure, especially in less-developed regions, boosting private sector productivity and further developing the financial sector and capital markets. ■

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COBALT

Strategic Materials and Energy Transition

In the following 30 years demand for strategic materials necessary for energy transition is expected to grow 50-fold. China provides 90% of the global demand for rare earth elements, South Africa 80% of the PGM (Platinum Group Metals) requirements, the Democratic Republic of the Congo 65% of cobalt and Turkey 40% of borates. Europeans depend overwhelmingly on China and other emerging countries for future supplies.

by **Rona Rita David**

What answer should we expect from Europe?

The European list of critical raw materials continues to evolve in accordance with technological priorities: it has gone from 14 materials in 2011 to 30 critical materials in 2020. Unfortunately, their supply is linked to very concentrated global markets.

The European Union has developed a strategic plan based on 10 different axes and established a European Raw Materials Alliance. The top priority is selective recovery, within Europe's borders, of an extractive and processing industry by financing sustainable mining projects.

The inventory of European mineral resources indicates germanium and cobalt in Finland, gallium in Germany, strontium in Spain, hafnium, and indium in France. Other metals, such as lithium, could be produced in Europe, but this is not the case for economic reasons.

A second alternative for Europe is to develop a 'substitution' strategy, namely, to develop independent substitution technologies for these rare metals. Technological challenge is possible in certain fields. In absence of 'raw materials', it will be necessary to concentrate huge research resources, such as research in energy storage.

Even if today, from an economic point of view, the cost of recycling is often higher than the purchase price of certain raw materials, recycling of materials opens up interesting prospects for which new resources have to be mobilized. There is no doubt that for Europe the supply of raw materials will continue to depend on trade agreements, but the old continent's strategy cannot come down to this form of dependence.

According to the plan of European institutions, exposure to geopolitical risks, to global market shocks must be reduced and resilient supply chains must be built. But the most difficult step remains to be taken, namely operationalization of the strategic plan through priorities and clear decisions. National interests will have to be left behind and cooperation agreements will have to be found between the European institutions, national authorities, and the private sector. Europe's future will depend on its ability to establish a true alliance for raw materials.

Cobalt or 'Blood Diamond', a particularly fragile economic and strategic situation

Cobalt has the particularity of having a high melting point and retains its strength and magnetic properties even when subjected to high temperatures. Therefore, this makes it an essential element for many strategic areas, such as aerospace, defence, chemical industry etc. We also find it as a component of superalloys used in gas turbines and nuclear reactors, but also in radar magnets, missile guidance systems, marine propulsion systems and sensors.

Cobalt increasingly owes its visibility mainly due to its use in low carbon technologies, also called green technologies (renewable energies and rechargeable batteries); it is present mainly in wind turbine magnets, but also in the cathode of lithium-ion batteries and nickel metal hydride batteries used in electric or hybrid vehicles.

Cobalt Resources. Who produces? Who consumes?

The highest concentration of cobalt, in Copperbelt

In 2020, according to the USGS (United States Geological Survey), terrestrial resources amount to 25 million tons. Most of these resources are located in the 'Copperbelt', a mining area that includes much of the province of Kantanga in the Democratic Republic of Congo (DRC).

The rest of the resources are distributed mainly in Australia, Cuba, Canada, Russia, and the United

States. Another 120 million tons of cobalt are believed to be found in the lower Atlantic, Indian and Pacific Oceans. However, their exploitation is not yet relevant due to technological, economic, and legal barriers.

China, Japan and the United States, the world's largest consumers of cobalt

In 2019, almost 70% of the mining production came from the Democratic Republic of Congo, while this country accounted for only 21% of world extraction in 2000. Some of the most important producers include Russia, with 6,100 tons (which means 4.3% of the total); Australia, with 5,100 tons (3.6% of the total). The share of each of the other 'big' producing countries - the Philippines, Cuba, Madagascar, Canada, Morocco, China, and New Caledonia - does not exceed 3.2%. Therefore, the extractive activities are extremely concentrated from a geographical point of view.

The same is true for refining, which is 50% controlled, compared to 3% in 2000, by China, the rest taking place mainly in Finland, Belgium, and Canada. China, Japan, and the United States are the world's largest consumers of cobalt. In 2019, China is at the forefront of the podium and 80% of the cobalt consumed there is used for battery manufacturing (USGS).

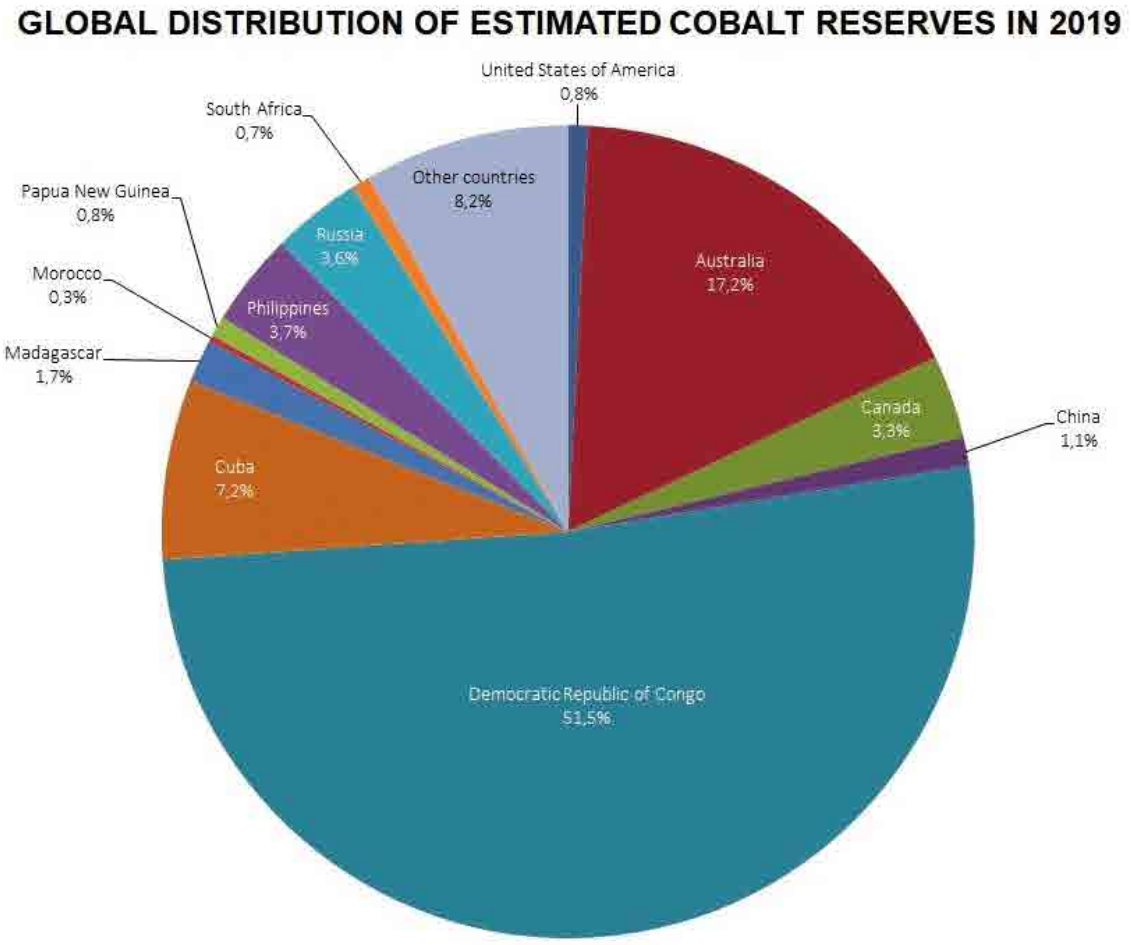
Are there cobalt resources available until 2050?

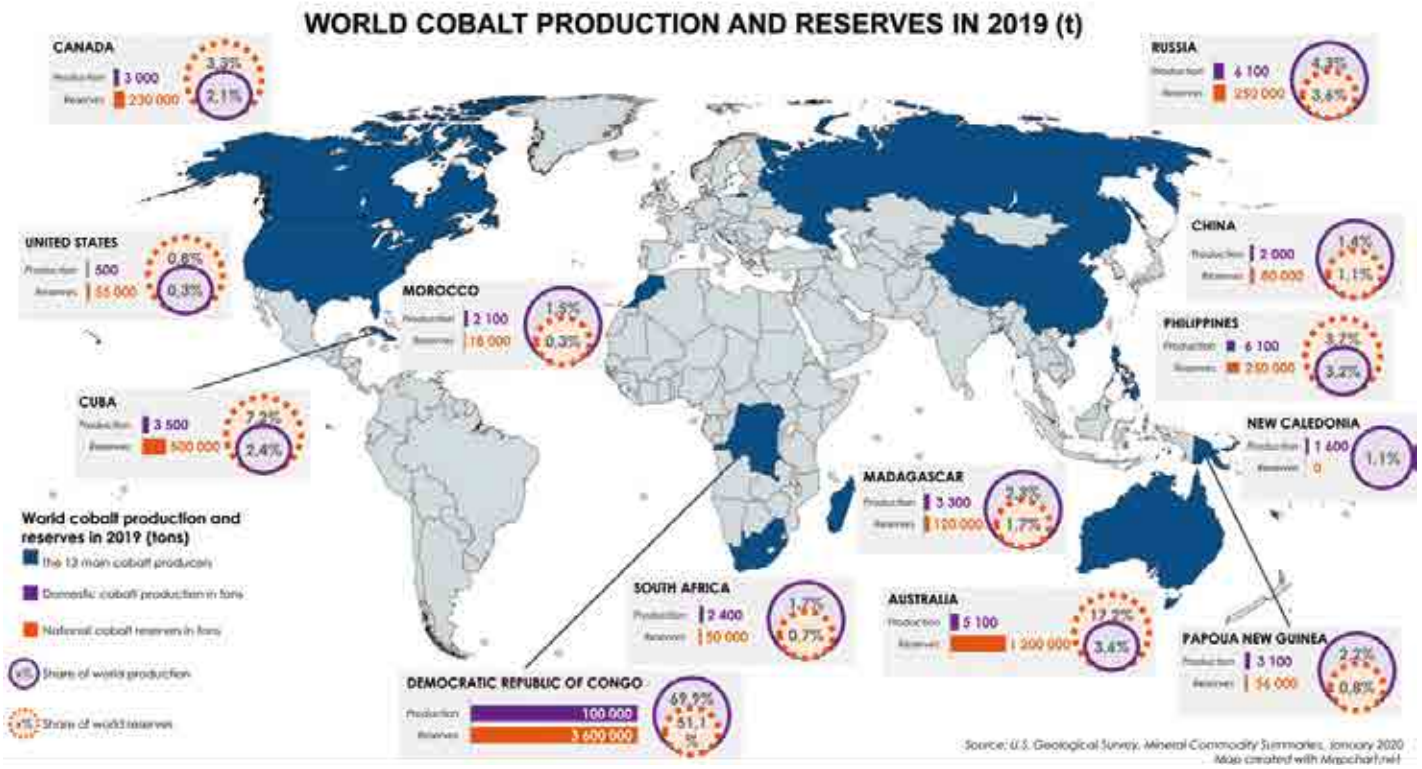
High geological criticality

To assess the availability of cobalt until 2050, the TIAM-IFPEN model was used. Two climate scenarios were used, 2D (2°C) and 4D (4°C), each with two different mobility scenarios:

- Business As Usual (BAU) mobility, i.e., a continuous increase in dependence on cars, property, consumerism
- Sustainable mobility - stronger fiscal and regulatory policies, with priority granted to sustainable modes of mobility, such as public and non-motorized transport.

For each mobility scenario, three trajectories of the chemical mixture of the lithium-ion battery were considered: one with a high cobalt content (10%





NCA, 90% NMC622), an intermediate (10% NCA, 40% NMC622) and a low intensity cobalt mixture (10% NCA, 90% NMC811) until 2050.

83.2% of cobalt resources could be consumed between 2013 and 2050

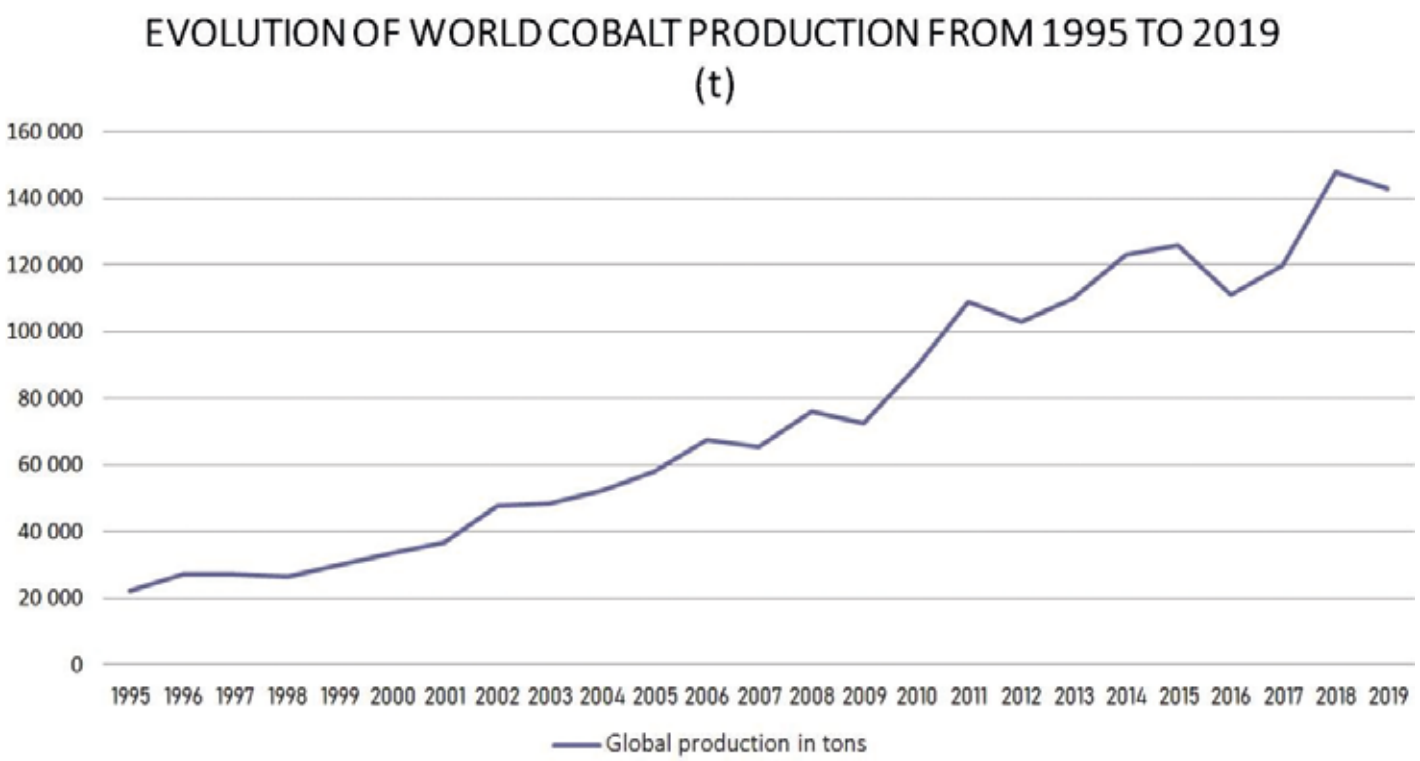
To assess the level of criticality related to cobalt, cumulative demand ratios were calculated until 2050 compared to the resources known at the moment, varying the three groups of parameters previously described. Based on a BAU mobility scenario with a mixture of lithium-ion batteries with high cobalt content, the demand ratio of this metal goes from 64% in the case of a climate scenario to 83.2% in the case of a more ambitious climate scenario. This last ratio means that 83.2% of cobalt resources would be consumed between 2013 and 2050 in such scenario.

If we consider that limiting global heating to 2D will be the chosen target, then two leverages can be mobilized to moderate the pressure exercised on cobalt resources. First of all, promoting battery technologies with reduced cobalt intensity seems the most efficiency way to reduce the level of criticality related to cobalt. Secondly, the results of the modelling activity show the positive impact of implementing a sustainable mobility policy on the level of criticality of the blue metal. Finally, recycling is to play a key role in meeting the strong growth in cobalt demand by 2050.

Cobalt, a by-product of copper and nickel mines

Cobalt demand is not very sensitive to price changes. In the event of a sharp increase in prices, the cobalt market will respond in three ways: by increasing recycled volumes, by leveraging technological innovations to exploit a wider range of resources, and by further mobilizing informal cobalt production in the DRC. In 2015, 98% of the cobalt extracted from the earth was a by-product of copper or nickel mines. Only the Bou-Azzer mine in Morocco made cobalt its main product. This characteristic of cobalt reinforces the supply risk associated with it, as the amount of by-product generated by the extractive activities depends closely on that of the main metals. As a result, the cobalt market's ability to adapt to growing demand is limited.

According to NGOs, cobalt is the 'Blood Diamond'. More than 70% of the cobalt mining production was controlled by the Democratic Republic of Congo in 2020, compared to 28% in 2000. However, the country suffers from strong political instability, as well as a worrying security situation, with many conflict areas in the east of the country. Dangerous working conditions,



exposure to potentially carcinogenic dust, child labour, and a proliferation of clandestine mines linked to the high market value of cobalt, have earned the latter the nickname 'Blood Diamond'.

China's strategy of ensuring supply reduces the cobalt amount available to other consuming states

According to Gulley/2019 Report, Chinese refineries account for 50% of the global volume, compared to only 3% in 2000. The Chinese power has also implemented a strategy of investment abroad to ensure its supply with metals considered strategic. Therefore, while for 2016 the share of foreign cobalt production held by Chinese entities added to domestic production, the Chinese influence will move from 2% to 14% for cobalt extraction and from 11% to 33% to produce cobalt intermediates (Gulley, 2019). These figures highlight the risk that a country that gains importance in the value chain may represent; China's strategy of securing its supply potentially reduces the amount of cobalt available to other consuming states.

Cobalt extraction contributes to global warming

Although an essential element for certain low-carbon technologies, cobalt - mainly mining and refining activities - has an environmental impact that should be taken into account. For example, cobalt extraction requires energy from fossil resources, which contributes to global warming. These activities also have a significant impact on the health of minors and populations located in the respective areas. It was also proven that cobalt production emits various types of pollution. This metal shows that, far from meaning the end of reliance on raw materials, energy transition and electrification of mobility modes bring new constraints on other types of resources.

States and companies pursue or take into account several paths: first of all, diversification of supply sources; then technological innovation by designing batteries that consume less cobalt (or the use of other types of batteries); and, in the end, electronic waste and battery collection and recycling.

Therefore, while the secondary cobalt sources are still underexploited today, they could be an important resource in the future. ■

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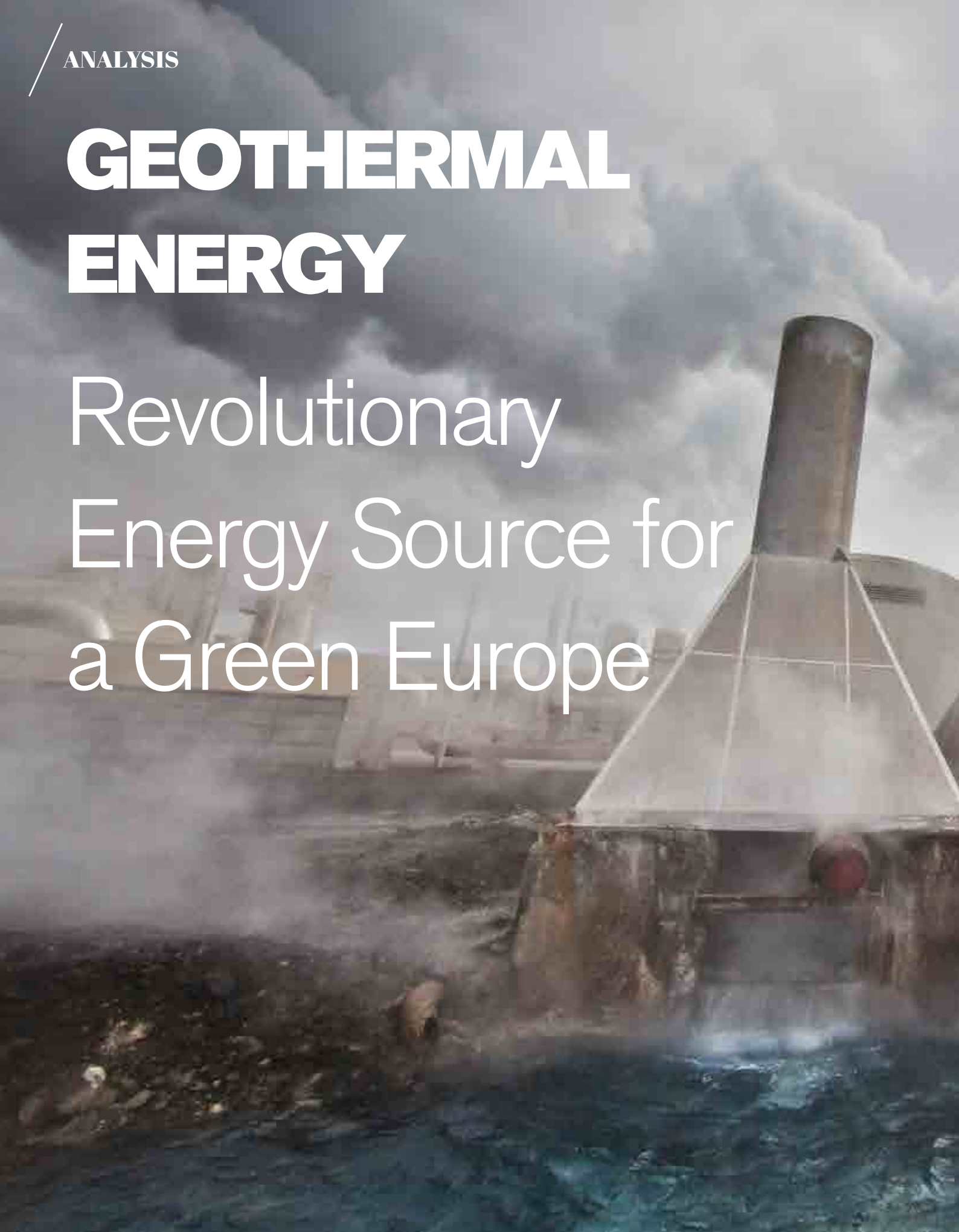
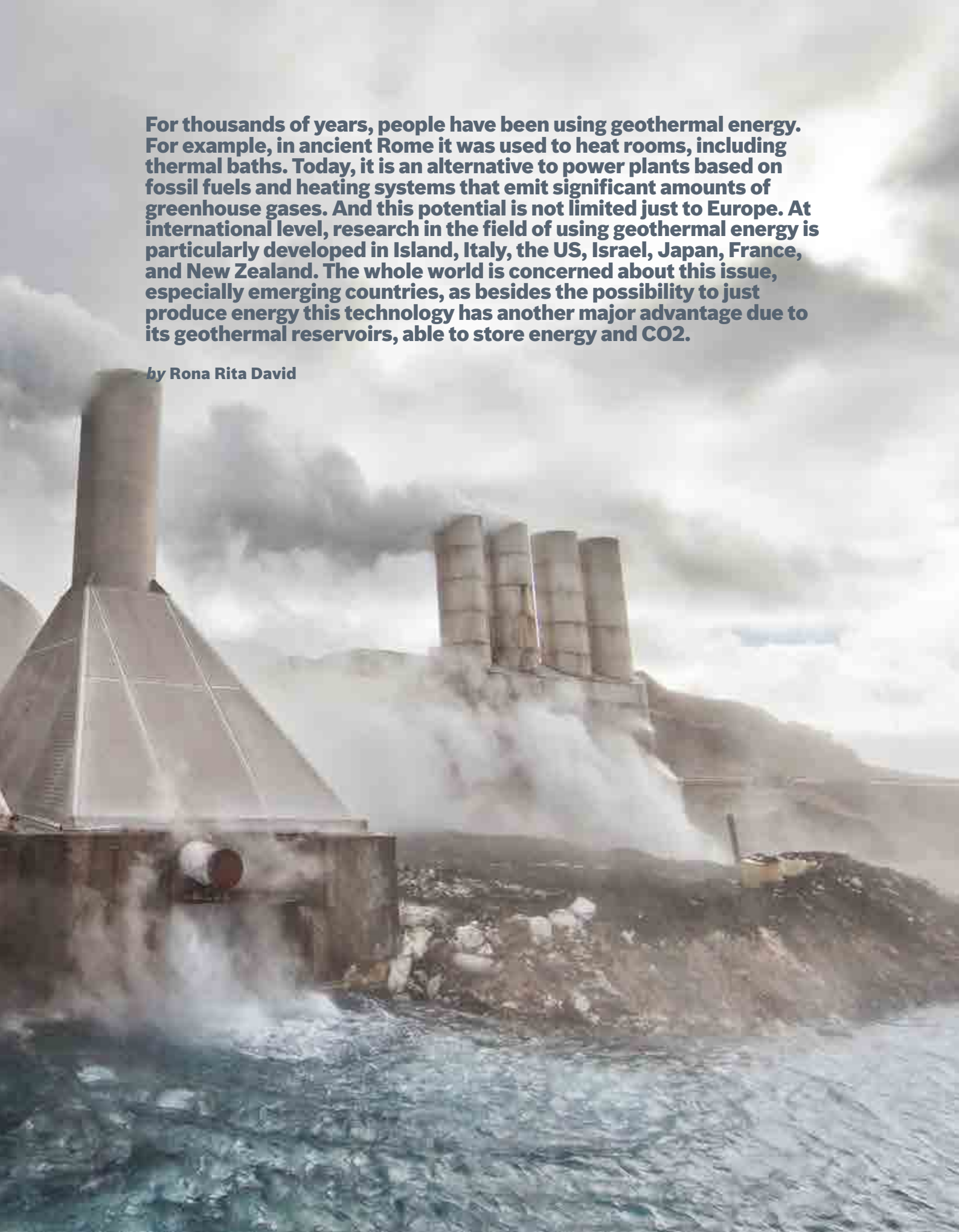
GEOTHERMAL ENERGY

Revolutionary Energy Source for a Green Europe



For thousands of years, people have been using geothermal energy. For example, in ancient Rome it was used to heat rooms, including thermal baths. Today, it is an alternative to power plants based on fossil fuels and heating systems that emit significant amounts of greenhouse gases. And this potential is not limited just to Europe. At international level, research in the field of using geothermal energy is particularly developed in Island, Italy, the US, Israel, Japan, France, and New Zealand. The whole world is concerned about this issue, especially emerging countries, as besides the possibility to just produce energy this technology has another major advantage due to its geothermal reservoirs, able to store energy and CO2.

by **Rona Rita David**



Types of geothermal energy

Depending on the depth of geothermal resources there are 3 types of geothermal energy.

• Very low geothermal energy (between 30 and 600 meters): water, at a very low temperature, requires the use of heat pumps for the direct heating of spaces. However, it can be used directly, especially for heating pools or greenhouses.

• Geothermal energy with low energy consumption (between 600 and 2,500 meters): the high-water temperature (between 30 and 90 degrees) allows its direct use to supply heating networks.

• High energy geothermal energy (over 2,500 meters): water exceeds 100 degrees and at such temperatures can even be used to generate electricity.

Cascade use of energy coming from geothermal water

Using energy in a cascade means the direct use of the energy of geothermal water from a geothermal well by several beneficiaries connected in series, each of them having as primary thermal agent thermal wastewater, discharged by the previous consumer. For example: electricity production, space heating, domestic hot water preparation, wood drying, milk pasteurization, stockfarming, fish farming, balneology, which lead to the recovery of waste heat with the help of heat pumps.

Types of geothermal systems

Geothermal systems are classified depending on temperature and pressure of the system and how thermal energy is transferred to the ground. The following types of geothermal systems are identified.

Hydrothermal convection systems

In the Earth's crust there are radial channels through which a thermal agent circulates and transfers thermal energy from a deep eruptive source (magma) to the outside. These systems are particularly advantageous, as the potentials at which thermal energy is obtained are high and can be associated with the production of electricity. In these cases, the thermal agent obtained has a reduced content of gases (CO2 + H2S), which simplifies the recovery of heat. The obtained temperatures reach 240oC.

If the thermal agent is steam, it can be used directly in power plants, and if the thermal agent is water, it is transferred by convection to a second reservoir of variable size, located at depths small enough to be exploited by drilling.

The temperature of these reservoirs is variable and depending on its value there are:

- Geothermal reservoirs with temperature exceeding 150oC; they can be used to produce electricity

- Geothermal reservoirs with temperatures of 90 – 150oC for heating homes and for industrial processes

- Geothermal reservoirs with temperatures below 90oC, which can be used for local heating and preparation of domestic hot water

- Hot springs with temperatures below 70oC, used for therapeutic purposes and for the preparation of domestic hot water.

Geothermal water systems are about 20 times more common than steam systems and are usually found in volcanic regions with strong seismic activity. Geothermal water has a pronounced salt content, which varies widely. In the case of the use of industrial water in energy installations, due to the danger of deposition, in most cases surface heat exchangers are inserted. Although they degrade the energy level of the source, their use is necessary to avoid the deposition of salts in installations with the effect of deteriorating the heat transfer coefficient and clogging the free section of water passing through pipes. Heat exchangers transfer the mentioned effect in the primary circuit, in this case deposition and clogging occurring. Replacements and cleanings affect much smaller areas, with a favorable effect on maintenance and operating costs. Due to the seasonal nature of the thermal energy needs for heating homes, for the profitability of the operation additional consumers are used, such as: greenhouses, fish farms, pulp and paper processing facilities, drying facilities etc.

Conductive transfer systems

At quite low depths there are thermal reservoirs contained in impermeable rocks, with very low porosity. The availabilities provided by these reservoirs are much higher than those of hydrothermal convection systems.

Geopressured deposit systems

Water reservoirs covered with waterproof insulation are subjected to high pressures. Water contained in these reservoirs has a low salinity and is saturated with recoverable natural gas. These systems are spread throughout the world.

Geopressured systems can be used for both thermal and hydraulic purposes. The mechanical energy obtained by using hydraulic energy can be used to drive complementary mechanical installations in buildings, with a favorable effect on the overall efficiency of the system.

Magma systems

The molten volcanic rock is a large thermal source, which could be used to obtain thermal and mechanical energy.

Geothermal heat capture

There are many methods to collect natural and free energy of the Earth. The most common methods are closed loop and open loop.

Storage of twin pipes (DN 50 Series 3 - Logstor) and building under renovation in Horsens, Denmark. | Image by Luis Sánchez-García

With any of them, only a fraction of energy comes from electricity, most of the energy coming from the earth itself. In conclusion, the price of use is smaller than for any other alternative for comfort.

Horizontal and vertical captors

Geothermal heat capture can be done using different methods, having two main categories of captors: horizontal and vertical (geothermal wells). With the help of the geothermal heat pump, 1kw of electricity consumed to supply the compressor is multiplied and recovered in the form of 3 to 5 kw of useful heat returned to the house through the heating system. The horizontal captors of the heating system need a minimum required area, the capture area being in direct proportion to the indoor area to be heated. Once the captors are installed, the excavation is obturated and the capture circuit becomes invisible. The land surface above the captors must remain free of construction, permeable to rainwater, snow, sunlight, and wind for the natural thermal regeneration of the ground. The minimum land area adjacent to the construction for capturing geothermal heat ranges between 100-180% of the indoor area to be heated, depending on the thermal power required for heating. The capture loops, once buried, have a durability of decades without any subsequent intervention. Groundwater capture involves a preliminary study of the hardness of the groundwater in the area (in the case of an 'open loop' circulation).

Another technique used is the 'closed loop' immersion of geothermal wells in capture probes. Vertical capture from groundwater involves the use of a 'water-to-water' heat pump. The vertical capture from the groundwater is done by drilling capture wells. This solution requires the existence of a minimum sufficient (and constant) groundwater flow throughout the year, especially in the cold period. The heat is taken from the groundwater present in the soil, usually at a depth of 10-20 m, where the water temperature is constant throughout the year.

A serious candidate with the potential of becoming part of the EU's energy mix

In its continuous fight against climate change, the European Commission pays special attention to geothermal energy. CORDIS study includes the latest innovative research, funded by the EU, on both deep and surface geothermal energy. The study allows a faster and more efficient development of this potentially revolutionary alternative energy source.

Although so far, the funding levels for this form of renewable energy remained low compared to alternatives such as wind, solar and biomass, the funding amounts allocated have recently increased. For example, the Innovation and Networks Executive Agency (INEA) of the EU, which manages almost all projects in this results pack, has a total budget of EUR 172mln allocated to the geothermal energy project.

With the Green Deal, the Commission has established that Europe will become the first the first carbon-neutral continent by 2050 and in this context the impetus for the development and implementation of geothermal technologies as a serious and viable candidate with the potential to become part of the EU energy mix will gain ground.

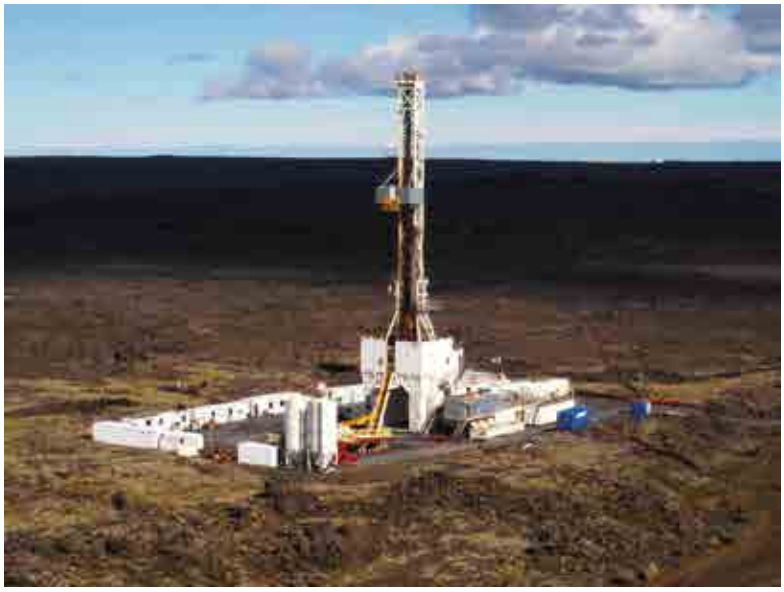
CORDIS: 12 truly innovative projects

The 11 CORDIS results refer to the latest geothermal energy projects funded by the EU, to which a brief introduction to a still ongoing but very promising initiative was added, GEOTHERMICA. These 12 projects cover the full spectrum of geothermal energy research and provide a holistic overview of what the key priorities are for further development and investment in these technologies, so they become a vital source of alternative energy for Europe.

The project DEEPEGS is worth mentioning, for which test drilling was successfully performed in Island. It pursues the objective of improving geothermal systems so that the produced energy is no longer a marginal technology but become an essential one. In turn, the team of GEMex project collaborated with Mexican researchers to assess and characterize two sites in the Trans-Mexican Volcanic Belt to come up with efficient and feasible solutions to tap Mexico's geothermal potential.

"GEMex's proposals should speed up geothermal development in Mexico and Europe, and with its predictive models reduce the risk of wasted investment," says David Bruhn, project coordinator. "We are now discussing potential follow-up projects to include new wells targeting the superhot zone in Los Humeros and perhaps to connect a permeable zone in Acoculco. As a scientist I would greatly welcome and support a Mexican deep drilling project."

At the same time, the SURE project tested the use of radial water jet drilling - as a means of improving the size and economic viability of geothermal wells, and the GeoWell project developed and tested new reliable, economical, and environmentally friendly technologies that control high temperature geothermal wells.



Back in April 2017, DEEPEGS made the headlines for its successful 4 659-metre-deep drilling into a geothermal field in Iceland. The first-of-its-kind venture offered a wealth of learning opportuni-ties for the geothermal sector and is still a world record to this day.

Looking at part of the geothermal plants in Los Humeros (Photo: A. Jentsch, GFZ)

Finally, the Cheap-GSHP, GEOCOND and GEOTeCH projects studied and launched new innovations aimed to make geothermal energy a clean energy source for heating buildings, while the MATChING project imposed itself as a spearhead for water cooling through innovative technologies in thermoelectric and geothermal power plants.

New and profitable materials for efficient geothermal energy systems in buildings

If we think about renewable energy options, maybe the first that come to our mind are photovoltaic panels. But a newcomer gains increasingly more attention in this sector: geothermal energy.

With the support of almost EUR 4mln coming from the European Union, through the GEOCOND project it is intended to materialize this potential. The consortium of the project has been working at shallow geothermal energy systems for buildings since 2017 and, given the tempting promises, these efforts seem justified.

"Shallow geothermal systems have several characteristics that arouse interest: they are electrical (heat pump), have the best possible efficiency and can be used simultaneously as heat source, cooling, and hot water. They are also easy to integrate in buildings, can be associated with other RES, such as heat and electricity sources. Their technology is robust, with the lowest maintenance costs. Shallow geothermal energy traditionally requires materials,

such as PE100, which were not especially intended to it so their use for surface geothermal energy is far from optimal. Large providers of plastic materials were not interested in producing new compounds, probably because the size of this market was still too small. Therefore, an initiative such as GEOCOND was needed," said Javier Urchueguia, Professor at the Polytechnic University in Valencia and coordinator of GEOCOND project.

There is a single problem. Due to the high initial cost, shallow geothermal energy systems have so far had little interest for end-users. GEOCOND is one of the many projects that aim to overcome this obstacle, specifically formulating new materials for the future installations of shallow geothermal system. Research conducted by GEOCOND covers four key elements at the heart of surface geothermal energy systems: plastic pipes whose conductivity needs to be optimized, joints of different sizes whose characteristics need to be improved, new materials for heat storage and new materials that increase the capacity of transferring heat from the ground.

Since the first year, the project yielded promising results. Among other things, the consortium proposed a new geometry for improving thermal efficiency, as well as a new algorithm for optimizing materials, considering the thermal, energy and economic variables.

Higher conductivity at a lower cost

The new plastic compounds in the project triple the conductivity of PE100 while maintaining their mechanical properties and other critical specifications related to weldability and workability. In cooperation with other projects aimed at solving problems inherent in surface geothermal energy systems, such as lack of training and adequate legislation and other technological constraints, GEOCOND is about to play a key role for European constructions.

The GEOCOND project's new plastic compounds multiply the conductivity of PE-100 by a factor of three, all this while maintaining mechanical properties and other critical specifications related to weldability and manageability.

Pros and cons

Geothermal energy can be used in two ways: to generate electricity or to generate heat. The first use is more in the industrial field, so in large industrial centers. The second use is rather related to the responsibility of local communities, of individuals and enterprises, which can launch projects to match their possibilities and needs. But what do professionals say about the disadvantages of this type of energy?

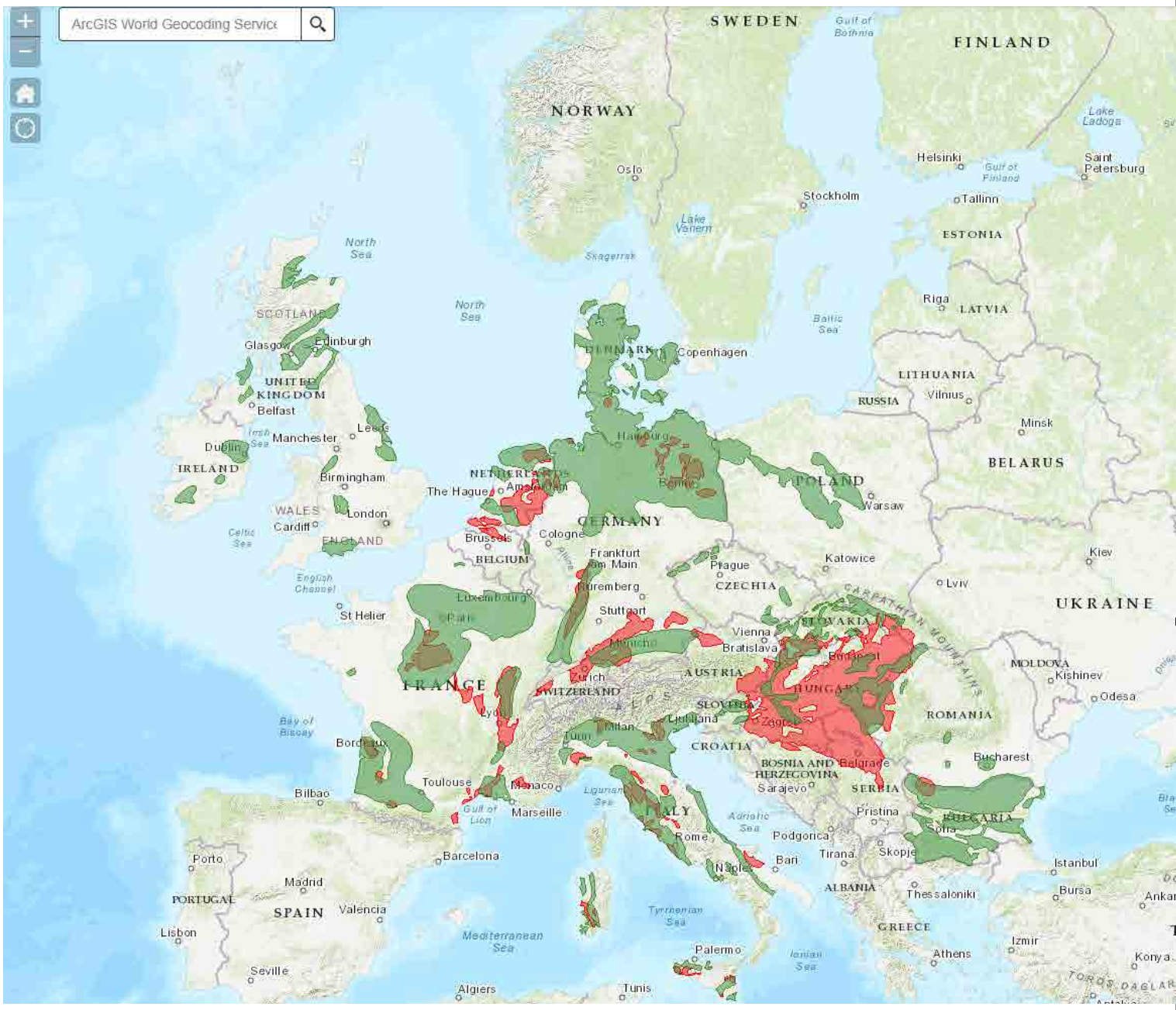
A geothermal power plant raises boiling water from the basement; on the one hand, the water is propelled into a hole; on the other hand, the natural warm water from the depths rises along a well. But this technology has two limits: first, the financial investments are quite high and then the yield of electricity production is quite low (to work, a geothermal power plant consumes, in turn, a lot of electricity).

A problem is drilling and sending water under pressure. This can cause cracks in the ground, and these cracks can lead to earthquakes! The same problem exists for the exploitation of shale gas or oil, by hydraulic fracturing. Therefore, the risk permanently remains higher than zero.

Specialists believe that only power plants are exposed to the risk of earthquakes, and this is significant for drilling between 1,500 and 5,000 meters deep. But when it comes to simple operation, the boreholes are much shallower - about 200 meters. This is named 'surface geothermal energy'. The only risk at these depths is a drop in soil.

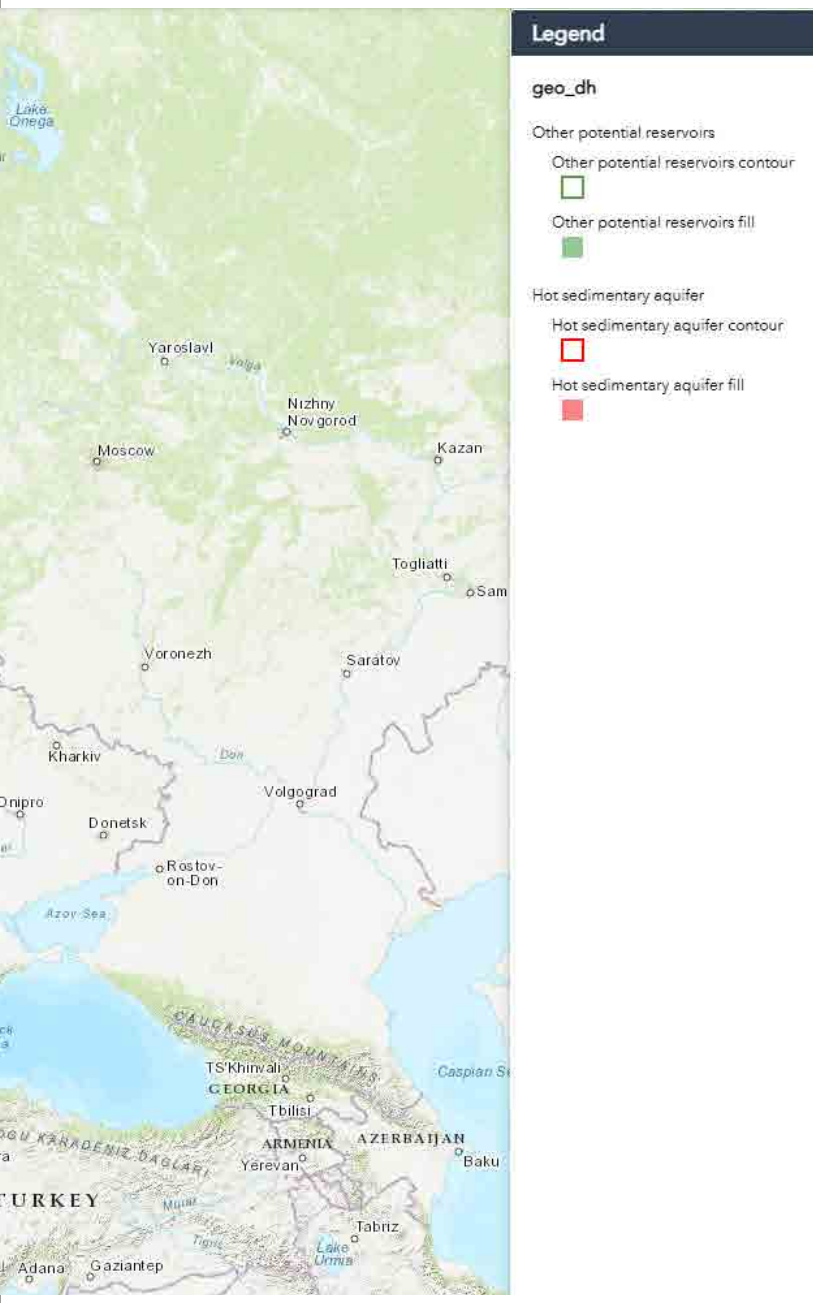
Despite the mentioned risks, the benefits are easy to see! Moreover, it is known that this energy hasn't reach maturity yet, that it will be perfected and, without any doubt, in the years to come it will hold a main place in the new policy of energy transition.

The core of the planet is expected to remain warm for several billion years, making the earth an unlimited source of renewable energy. This energy is completely clean and natural; to generate electricity, geothermal power plants do not emit CO2. Moreover, unlike nuclear power plants, they leave no waste after use and do not require the import or storage of rare or dangerous fuels. Theoretically, this source of energy is available to all countries, all over the world. Finally, unlike green energy, such as solar or wind power, geothermal energy is not intermittent. Day or night, rain or shine, the warmth of the basement remains the same! Thus, in the case of a global energy transition, geothermal energy could be used as a reserve to



compensate for fluctuations in solar and wind turbines.

To produce heat, geothermal energy is an advantageous choice, even if such system requires an investment. But once installed, the heat pump allows a reduction in energy consumption for heating and hot water production can be between 30% and 80%! This allows deep geothermal energy to replace regional power plants with baseload that are currently still based on oil and gas. Transition from conventional energy sources to deep geothermal energy allows a greater independence on imports of fossil fuels, such as oil or gas. Moving to this alternative without CO2 also helps avoid pollution with particles, unavoidable in heating systems using fossil fuels. Moreover, geothermal power plants occupy much less room than for example solar power plants providing the same supply levels. Therefore, in terms of land use too, deep geothermal energy is a quite promising energy form for the future. Finally, local use of deep geothermal energy brings added value at regional level: from the creation of new jobs and exploration of new energy sources and opportunities for know-how export to raising the standards of living thanks to low-emission heating technology.



Geothermal energy in Europe

Currently, there are over 5,000 heating networks in Europe, located mainly in Western Europe, Central Europe, and Scandinavia, of which only 280 are supplied with geothermal energy. But the potential of geothermal heating is much greater. A study that analyzed the potential and market conditions for geothermal district heating in 14 European countries shows that there are over 120 district heating networks of this type in Hungary, Slovenia, Croatia, and Slovakia alone, which are supplied with fossil fuels while being close to geothermal resources with temperatures of over 90°C at only 2000 meters below the ground. They are perfectly suited to explore deep geothermal energy for urban heating purposes.

These countries provide the possibility to switch from the old urban heating systems based on fossil fuels to supply with geothermal energy. This allows operators of heating networks to operate their heating systems not only in a manner that is more advantageous for consumers, but also independently of imports of fossil fuels, while creating added value for the region due to the supply of environmentally friendly heat.

Areas with high geothermal potential and low degree of capitalization in Romania

Regarding the geothermal potential, Romania ranks the third in Europe, after Greece and Italy. The areas with the highest natural geothermal potential in Romania are found in the Western Plain, respectively in the eastern part of the Pannonian Depression, where the crystalline foundation is at a shallow depth, respectively 800 - 1,000 m. Other areas with high geothermal potential are found in the lower Olt basin, Calimanesti - Caciulata area, in Dobrogea - south of the Harsova-Constanta alignment, as well as north of Bucharest, and in the Eastern Carpathians (Gutai-Tibles area and in the Ciuc depression) there are hot (T = 150oC at 3.000 m) and dry rocks. Many of these areas are located within petroleum exploration and/or exploitation blocks.

A source of heat is also the influx of high temperature water that comes from areas located at great depths and rises on the plane of major depth faults. This is also the case of the thermal aquifer north of Bucharest, which is fed by an important fault in Romania. It is the Intramoesian fault that starts in the Vidraru area, passes west of Moreni, east of Otopeni, Silistra and reaches the Black Sea at Shabla, Bulgaria. The category of petroleum structures with high natural geothermal gradient includes the structures from Arad - Timisoara and Oradea - Satu Mare, respectively the geological structures Bodrog, Calacea, Cherestur, Dinias, Dumbravita, Dudestii Noi, Foeni, Lovrin, Moravita, Pordeanu, Partos, Pecica, Santana, Sanmartin, Satchinez, Sandra, Sanpetru German, Socodor, Teremia, Toager, Turnu, Varias and Zimandu Nou. The oil structures Abram, Abramut, Curtuiseni, Chislaz, Ciumeghiu, Dijir, Derna - Budoi, Mihai Bravu, Marghita, Piscolt, Salacea, Scarisoara, Salonta, Suplacu de Barcau, Tinca and Viisoara are part of the Oradea - Satu Mare area.

And yet, in Romania the degree of capitalization of geothermal energy sources is low, mainly due to the

THERME complex in Balotesti

lack of adequate financial funds for the development of this sector and the lack of firm and long-term users for the amortization of investments. Using geothermal energy for purposes other than balneotherapy began in the '70s, in the late '80s the fuel savings due to geothermal energy exceeding 50,000 toe/year.

As the largest resources of thermal waters are found in the west of the country, in that area there are also the most numerous and most important users of thermal water. Therefore, in Oradea municipality the company Transgex-Dafora ensures domestic water for over 3,500 apartments and almost 300 apartments are heated. Moreover, in Oradea there is also the National Center for Geothermal Research within the Oradea University, which holds a geothermal power plant. The source of thermal water is represented by the Triassic limestones and dolomites from 2,800 - 3,200 m depth, and the exploitation is done through 12 wells that produce about 140 l/second (about 12,000 m3/day), the surface temperature being 70 -105°C.

In Bihor County, in Beius, most buildings are heated with thermal water extracted by 2 wells with a total flow of about 120 l/sec. (>10.500 m3/day), the surface temperature being 80 – 85°C, and the quantity of thermal energy consumed exceeding 200.000 Gcal/year. It is noteworthy that the geothermal projects in Beius have been started since 1996 based on feasibility studies conducted by specialists from Germany, Iceland, and Denmark. The initial investments were financed by the Danish Environmental Agency and the Ministry of Environment and Sustainable Development in Romania, then important EU funds were used. In

Beius there is an interesting geothermal project (Beius - green city project), which provides for the creation of a 'balneotherapy park' which includes a balneotherapy center, a thermal pool, a hotel, and restaurants for leisure.

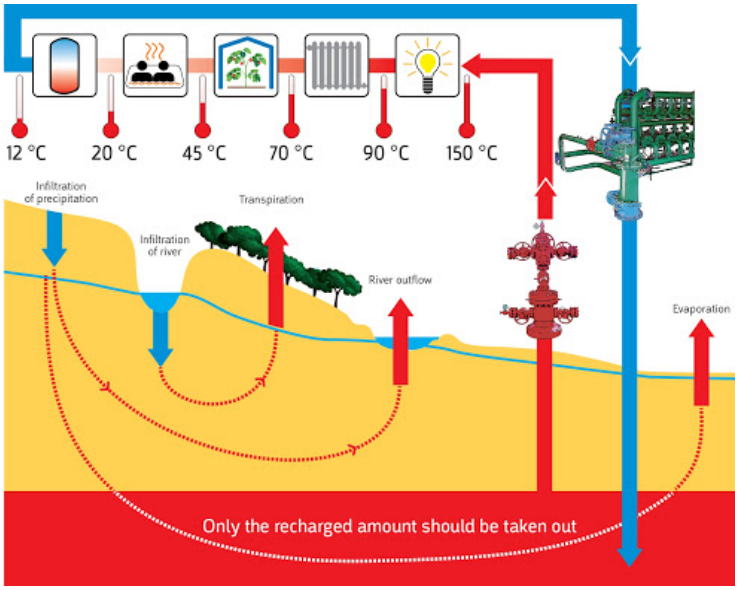
Thermal waters from Neocomian are exploited in Baile Felix, but only for therapeutic purposes and in the pool within the resort. In Bors, thermal water is extracted from the Triassic limestones and dolomites from 2,500 m. 3 production wells and 2 injection wells are active; the total water flow is about 50 l/s (4,300 m3/day), the reservoir temperature is 130°C, and the water temperature at the well head is 95 - 105°C.

50 km south of Oradea is the Salonta - Ciumeghiu area where there is a geothermal water deposit at about 2,400 m, in Pannonian. The temperature of that deposit is 120 - 130°C, at the surface the temperature reaching 100 – 105°C. In the Arad - Timisoara area (Arad and Timis counties) the surface temperature of thermal waters is lower (40 - 80°C), so that the respective waters are used only locally, for heating, domestic hot water preparation, in some flax smelters and for therapeutic purposes. In the lower basin of Olt (Cozia - Caciulata area) there are 3 active wells with blowout production, with a flow of 20 - 25 l/sec. (1.800 - 2.200 m3/day), a pressure of 16 - 20 at and temperature of 90 – 95°C, both being at the surface. The source of thermal water is the sandy Senonian located at 1,900 - 2,000 m depth. This source has been exploited since 1994 and pressure is maintained at the initial values. The thermal potential of the 3 wells is 18 MWt, of which 3.5 MWt are due to gases dissolved in thermal water.

As regards the Capital, 13 wells have been drilled, of which 2 near the Snagov lake. The thermal aquifer is found in the Neocomian cracked limestones, located at 2,700 - 3,000 m depth where the temperature is 80°C. The formation water has a salinity of 1.5 - 2.2 g/l (150 - 220 kg/salt wagon) and contains hydrogen sulfide in small quantities (about 25 mg/). That is why the water is widely used in balneology. Currently there are only 3 active wells that supply the Foradex pool near the House of the Free Press in Bucharest and the THERME complex in Balotesti. The surface temperature is 75 – 80°C, and the flow is high. THERME complex includes thermal basins, steam saunas, swimming pool, hydromassage etc. It is a German project that required an investment of about EUR 30 million, of which about 20% are Romanian funds.

Success of the DARLINGe project

The DARLINGe project - Danube Region Leading Geothermal Energy 2017-2019 (designed in common for six Balkan countries) brought together the experience of specialists in the countries of the Danube basin to obtain a common and harmonized policy that will allow the region to become a leader of the correct use of geothermal water. Partners in the joint project were: The Federation of Bosnia and Herzegovina, Croatia, Hungary, Romania, Serbia, Slovenia, but also Republika Srpska as a component part of Bosnia and Herzegovina. In these countries, almost 30% of the extracted geothermal water is used for balneological and recreational purposes. The geothermal potential in the study area of the project (which in Romania refers only to the geothermal aquifer in porous and permeable rocks of Pliocene age) would allow a more efficient use of the temperature of the extracted geothermal water, in the so-called 'cascades' (to be mentioned that there were also water exploitations



DARLINGe project

for agricultural purposes for heating vegetable greenhouses). The DARLINGe project was financed through the European Regional Development Fund ERDF (for EU partners) and through the Pre-Accession Instrument IPA (for non-EU Balkan partners). In Romania's case, this comes in addition to the contribution of the Ministry of Regional Development and Public Administration, plus 2% own contribution.

The DARLINGe project had in addition to a research component a component related to a positive change that the project aims to produce in the study area by raising awareness of all stakeholders, organizing information courses, and providing tools to help local governments and potential beneficiaries in the development of geothermal water projects. In addition to building a common strategy for the exploitation of such wealth, a fair valorization for the communities that have such resources in the basement was also pursued. At the level of the pilot area Hungary-Romania-Serbia, a numerical modeling at a detailed scale was provided to estimate the heat transfer and the effect of geothermal water exploitation through new wells (27 new wells are planned in Szeged, 9 for production and 18 for reinjection of geothermal water used in the same aquifer). For the Romanian part of the pilot area, the aim is to build a production well and a reinjection well at Lovrin, where local authorities are interested in using geothermal water to heat the town and some greenhouses, thus stimulating cascade use.

GeoDH market

Returning to Europe, among the over 5,000 district heating systems, more than 240 are systems with geothermal source (GeoDH), with a total installed capacity of over 4.3 GWth and a production of approximately 12,900 GWh. Under the conditions of the new technologies and technical solutions, the number of regions in which GeoDH solutions are implemented is on the rise. The applications start from those of small size (between 0.5 to 2 MWth) and reach 50 MWth. Some new GeoDH schemes also use shallow geothermal resource with high-capacity heat pumps.

Many GeoDH systems are based on favorable geothermal conditions, with high enthalpy and the extraction of geothermal energy in doublet systems. Modern doublet projects include two wells drilled in deviation from the same drilling field: a supply well and a return well. Geothermal fluid production is supported by production/feed pumps.

Installing GeoDH systems in high urban density areas improves their economic efficiency, as resource and demand are geographically correlated. A considerable challenge in the current context of economic crisis refers to the financing and development of new infrastructure networks for heat distribution. The rehabilitation of the existing ones is an alternative for the development of the GeoDH market.

The benefits of geothermal heating and cooling are flexible provision of energy from renewable sources at local level, diversification of the energy mix, protection against an increase in the price of fossil fuels. The use of geothermal resources is a source of economic development at national level through taxes, royalties, export of technology and jobs. The essential challenge is to promote geothermal district heating in Europe and facilitate its market penetration.

The European GeoDH market can be split into three segments:

1. Mature markets. Several European countries have a long tradition in geothermal district heating and have set ambitious targets for 2020 in this field: Germany, France, Hungary, and Italy. To achieve these goals, it is necessary to simply the procedures and supplement the sources of funding.
2. Markets in transition. This category includes several Central and Eastern European countries: Poland, Slovakia, and Romania, each with geothermal district heating systems installed. In these countries the potential is however much higher.
3. Young markets. The third group of countries includes those in which the first GeoDH systems are being developed: The Netherlands, the United Kingdom, Ireland, and Denmark. In these countries, in absence of GeoDH tradition, the

conditions for market development must be set. In other Central and Eastern European countries, including Bulgaria, the Czech Republic, and Slovenia, it is necessary to convince decision-makers and adopt a fair regulatory framework, but also to establish market conditions for the development of GeoDH systems.

Large capital investments

Geothermal heating systems involve large capital investments (CAPEX). The main costs are the initial investments in drilling production and return/injection wells, in surface and deep feed pumps, in distribution pipelines and networks, in monitoring and control equipment, in peak load takeover stations and in storage reservoirs. Operating expenses (OPEX) are however much smaller than in conventional systems, covering the cost of energy for pumping, expenses for system maintenance, operation, and control. The financial performance of the system depends on the density of the thermal load, or the heat demand per unit area. Superior economic benefits are achieved by combining heating with cooling, because in this case the resulting load factor is higher than for heating only, and the unit cost of energy is lower.

Production costs and selling prices are usually around EUR 60/thermal MWh, in a range from EUR 20 to 80/thermal MWh. It depends on the characteristics of the local geothermal resource (heat flow level, depth of location of the source), socio-economic conditions and pricing policies (kWht or m3 of hot water).

More than 25% of the EU's population lives in areas where geothermal energy is available

In 22 European countries there are GeoDH systems in operation. Although the geothermal potential is recognized by some EU Member States in national renewable energy action plans, the real potential is significantly higher. To raise awareness, the GeoDH project assessed and presented for the first time the interactive map of geothermal potential in Europe. From the map it can be seen that: GeoDH applications can be developed everywhere and can be grafted onto existing district heating systems by replacing fossil fuels during their expansion or renovation. Also, new GeoDH systems can be built in many regions of Europe, at competitive costs, and the Pannonian Basin is of particular interest in the analysis of the GeoDH potential in Central and Eastern Europe. ■

ENERGY TECH DAY 2021

Featuring Voices of Leading Experts and Highly Qualified Professionals

Energy Tech Day 2021, held on 24 June in Bucharest, united once again leading energy experts and highly skilled professionals to share their experiences on ground-breaking technologies, strategies, and investment programmes. 'Prospects and Challenges in the New Digital Era: Managing GHG Emissions and Energy Efficiency' was the main theme for this high-level conference.

by **Lavinia Iancu**

The EU aims to be climate-neutral by 2050 – an economy with net-zero greenhouse gas emissions. This objective is at the heart of the European Green Deal (EGD) and in line with the EU's commitment to global climate action under the Paris Agreement. Under the EGD, the European Commission announced a review of its energy and climate legislation to scale up emissions reductions and boost the deployment of renewables and energy efficiency. Energy efficiency is changing, with new digital technologies enabling greater control, optimisation, and analytics. Harnessing digital technologies to enhance energy efficiency will require new policies and business models.

The event brought together top national and international energy business leaders to address commercial, regulatory, geopolitical, and technical challenges impacting the future of the energy industry. The most important topics approached by the speakers, during the 3-session conference, were the European Green Deal challenges and opportunities; state-of-the-art technologies impacting each part of the value-added energy chain: sources, conversion, distribution, storage, usage; smart solutions to maximize efficiency, reduce costs and CO2 emissions; regulatory framework to stimulate innovation and investment; environmentally responsible energy uses; financing the industry.

SUPPORTING ROMANIA'S POST-PANDEMIC ECONOMIC RECOVERY

Niculae Havrilet, Energy Expert, **MINISTRY OF ENERGY,** emphasized the importance of

Niculae Havrilet, Energy Expert, MINISTRY OF ENERGY

Nagy-Bege Zoltan, ANRE Vice President

energy efficiency, in all sectors of the energy industry, and therefore of economic efficiency, along with digitization. The deepest concern, at the moment, of EU funds and even of INECP, refers to building heating-cooling system and efficient thermal insulation of buildings. Another topical issue, hydrogen, is also on the European agenda. The latest scientific research shows that hydrogen storage is the most efficient electricity storage method available at today's technological level. Hydrogen does not pose environmental risks, with the possibility to be used in heavy transport, in shipping, in electricity production; it will be a substitute for natural gas. When we talk about efficiency, we should focus on the area of hydrogen production and use, and as far as buildings are concerned to focus on homes with zero energy consumption for heating and cooling, the representative of the ministry pointed out.

The efforts of the European Union (EU) and Member States related to decarbonization and transition to a low-carbon and low-emission economy aren't just about investments in renewables or energy efficiency measures, but also about encouraging digitization of the energy industry, this goal being the basis of reaching these decarbonization targets, pointed out **Nagy-Bege Zoltan**, **ANRE** Vice President. This is reflected both in the financing mechanisms promoted by the EU, which give an advantage to research, innovation and implementation of modern technical solutions, and in the energy policies lately promoted by the European Commission, he added. In the following period, investments in renewable sources will have a massive comeback in Romania, as INECP (Integrated National Energy and Climate Plan) also provides, through which we aim to reach a 30.7% share of renewable energy in the gross energy consumption in 2030, which involves the construction of about 7 GW of new energy capacities using renewable sources, in addition to retrofitting of existing renewable capacities, which in 2030 will have had 15-20 years of operation already. The first and most important challenge will be to integrate these new capacities in the national energy system, replace the polluting power plants based on fossil fuels, but controllable and predictable in terms of production, with the

new uncontrollable renewable units but which ensure a reduction of greenhouse gas emissions. Digitization and the use of innovative technical solutions are the only way to achieve this now. Concepts such as Smart Metering, Smart Grid, electricity storage, Demand Response, consumer participation in the balancing market, virtual hubs, aggregate production or aggregate consumption, distributed production are solutions implemented and already used with success in many EU Member States, also allowed by the national legislation. Those who currently invest in digitization will very soon have an advantage in the market over the other competitors, Nagy-Bege Zoltan believes.

New Projects and Business Opportunities for Oil & Gas up to 2030

The first session of the Energy Tech Day 2021 was focused on new projects and business opportunities for oil & gas up to 2030. **Catalin Nita** - Executive Director, **FPPG**, reviewed, together with the speakers of the first panel, the main investments targeted by the industry in this period, also pointing out that natural gas has in Romania a very bright future. The role of the Romanian oil and gas industry and its contribution to budget revenues were also emphasized. Therefore, during 2017-2019, the largest oil and gas producing companies in the country (surveyed) generated 1.8% of GDP, i.e., approximately 50% of the contribution of the whole energy sector. Investments amounted in 2019 to RON 6.7bn, double compared to 2017, the equivalent of 16% of public sector investments. It is also worth mentioning Romania's dependence on natural gas, which in 2019 reached 24%, compared to 2% in 2015, the growth trend maintaining in the future.

The importance of gas in energy transition and reaching climate targets was the focal point of the presentation of **Christopher Veit** – Member of the Executive Board Responsible for Upstream, **OMV PETROM**. His presentation included the main activities, objectives, projects, and investments envisaged by the company in the following period. OMV Petrom's interest in the exploitation of Black Sea gas resources was reiterated, as well as the opportunities arising from this situation for Romania. Black Sea potential can give Romania the chance to become the largest gas producer in the EU. Natural gas is also a solution for Romania to reduce its carbon emissions and support the country in reaching the environmental targets, considering the multiple possibilities of use, from heating and electricity to mobility. The successful gas projects in the exploration and production sector could open the way for the development of projects in related industries, from gas transmission and distribution to the chemical and petrochemical products sector or turning natural gas into electricity. An alarm signal was sounded regarding cloud technologies. Due to restrictive legislation on working with petroleum data and information, local companies cannot use cloud technologies for their processing, although easy access to data improves the efficiency of the industry and, consequently, brings additional revenues to the state budget. Last but not least, the OMV Petrom representative emphasized the importance of a stable, predictable and competitive legislative framework related to the upstream sector, that would encourage the development of Black Sea resources.

The Black Sea has a huge potential, according to **Robert Chirca** - Onshore Operations Manager, **GSP HOLDING**, who brought to the audience's attention the synergies between offshore platforms that exploit natural gas and wind parks, which would add value to the whole area, thus being able to contribute to Romania's energy independence. GSP applauds the visionary project of building the first offshore wind farm in the Black Sea basin. The company operates a complex structure of bases, each with its own capabilities and objectives. Their operational structures are integrated in an intelligent work-system, that provides a robust support network for clients. GSP has the capabilities to manage, plan, develop, install, and operate a major wind farm project, Robert Chirca claims. He also revealed some key important factors to analyse when embarking on a wind farming offshore project – power, depth, distance, costs, foundation type. Constanta can become an energy hub in Southeast Europe, benefiting from all the necessary facilities. But for these things to be possible, a clear plan and short-, medium- and long-term strategies are needed, the representative of GSP Holding also mentioned.

We found out from **Adrian Staicu** – Regional Manager SE Europe, **THE SNIFFERS**, how the gas sector can approach its methane emissions management programs efficiently in compliance with OGMP (Oil and Gas Methane Partnership) 2.0. He revealed the most important steps taken in terms of reporting against OGMP 2.0, inventory, activity factors, emission factors. He reminded that methane warms the planet 84 times as much as carbon dioxide over a 20-year period; methane remains in the atmosphere for about 12 years; and globally, over 60% of total methane emissions come from human activities. He also underlined that reducing anthropogenic methane emissions is the only and necessary way to avoid a 2oC increase by 2050. On November 23, 2020, oil and gas industry committed to new framework to monitor, report, and reduce methane emissions. Recently, EU Commission announced a legislative proposal to make the measurement, reporting and verification (MRV) of all energy-related methane emissions mandatory (planned for

New Projects and Business Opportunities for Oil & Gas up to 2030 panel

14 December 2021). It remains to be seen what measures the companies in the industry will adopt to align to the imposed regulations.

Vasile Carstea – General Manager, **DEPOGAZ,** delivered a presentation on prospects for the development of underground gas storage facilities in the context of the European transition towards a clean energy. DEPOGAZ is a modern company with a rich experience in underground gas storage. It is the main storage operator in Romania with a share of approximately 90.23% of the total active storage capacity of Romania. As operator of underground gas storage facilities, DEPOGAZ has two important objectives: to increase the underground gas storage capacities; to increase the daily withdrawal capacity from its underground storage facilities. To increase the underground storage capacities, DEPOGAZ has planned, on one hand, modernization works to increase the pressures of the storage facilities close to the initial pressures of the fields, this resulting in an increase in the capacity of the current storage facilities. At the same time, DEPOGAZ plans to develop new underground storage facilities in other regions of the country. As for the increase of the daily delivery capacity, DEPOGAZ is carrying on modernizing projects on the existing storage facilities, so that in the near future, the maximum withdrawal capacity will increase from 30 million m3/day to approximately 42 million m3/day.

Oana Ijdelea – Partner, **IJDELEA MIHAILESCU**, pointed out the essential role of natural gas in energy transition. She outlined how to cover the way from coal to RES via natural gas. Summarizing, this could be possible through integrated approach and implementation; adequate and coherent legal framework; predictability; stability; transparency; realizing the offshore gas potential; accessing EU money; digitalization; power grid development.

Clean Energy for Sustainable Development

Carbon neutrality was defined as a target for 2050 and for the European Union, a goal stipulated in the European Green Deal. In Romania, decarbonization of the energy sector is based to a great extent on the support provided by the European Green Deal. Accelerating transition to clean

energy is the economic objective necessary in the context of current CO2 prices, of the price of renewable technologies, of European funds and a sustainable energy mix. For the decarbonization of the energy sector and reaching the targets established in the agreement, several European funding mechanisms were established. They include the Just Transition Fund, through which Romania has EUR 1.95 billion allocated, non-reimbursable funds. At the same time, the energy sector will benefit from an allocation of approximately EUR 1.6 billion through the National Recovery and Resilience Plan (NRRP). Moreover, Romania will receive financial support of EUR 80 billion from the European Union for economic recovery, pointed out **Iulian Harpa** - Managing Partner, **HIM PUBLIC AFFAIRS**.

In Romania, the research - development activity is a national priority and has a decisive role in the sustainable economic development strategy. **INCDT COMOTI** (Turbine Engines Research and Development Institute) is the only unit in Romania specialized in development and integration of scientific research, constructive and technological design, manufacturing, experimentation, testing, technological transfer, and innovation in the field of aviation turbine engines, gas turbine industrial machines and high-speed blade machines. As the institute is dedicated for energy saving, its major objectives are development of Romanian industrial gas turbines (1.5-5.4 MW); highly efficient generation of electric and thermal power with gas turbines (CHP); highly efficient centrifugal and screw compressors for air and natural gas; renewable energy (biomass gasification for industrial GT, wind turbines, biofuels). INCDT COMOTI capabilities include design, 3D modelling, CFD/numerical simulation, stress & vibrations analysis, automation of energetic groups, general revisions, service, maintenance, dynamic balancing, inspection and oil analysis, compressors test bench, **Leonard Trifu** – Marketing Manager within the company, mentioned. For example, INCDT COMOTI implemented the 1st RO cogeneration power plant (electric and thermal with gas turbines) in cooperation with PRATT & WHITNEY CANADA.

Sustainability is also essential for the SIGNIFY objective, not just through the innovative green products that improve people's lives, but also in the way the company acts, said **Razvan Copoiu** - CEO **SIGNIFY ROMANIA & SOUTH-EAST EUROPE**. Signify's objective is to tap the amazing potential of light for a brighter life and a better world. With a history of over 125 years, Philips was founded as a lighting company, being the first to sell the light bulb. The company that paved the way for innovations in LED and connected lighting systems and services changed its name from Philips Lighting to Signify in 2018. The global brand for the Internet of Things platform and connected lighting systems is Interact, a platform designed to manage the data collected from the growing number of light points, sensor devices and connected systems. Based on cloud, highly secure and scalable, Interact uses sophisticated and modern data management and processing capabilities, including machine learning, to make sense of all types of data and bring value beyond lighting. To reduce the carbon footprint in Romania, the 'Green Switch' program of smart ledification from Signify means approx. 700 GWh in energy savings; approx. EUR 75 million in energy bill savings and approx. 250,000 tons of CO_2 reduction in the carbon footprint, added Razvan Copoiu, who also presented the most important lighting projects of the company successfully implemented in Romania.

Siemens Energy's presentation on deep decarbonization with hydrogen and sector coupling highlighted instant ways to reduce the CO2 footprint and attractive use cases for hydrogen by 2030. Sector coupling is the key lever for decarbonization of all end user sectors, showed **Petru Ruset** – Managing Director, **SIEMENS ENERGY ROMANIA**. He also pointed out that if scaled up with the right regulatory framework, clean hydrogen costs can fall faster than expected (according to Hydrogen Council, McKinsey 'Hydrogen insights report 2021'). But lower renewable costs are not enough: for low-cost clean hydrogen production, value chains for electrolysis and carbon management need to be scaled up. Thus, a further step-up of public support is required to bridge the cost gap, develop low-cost renewable capacities and scale-up carbon transportation and storage sites. Projections show that renewable hydrogen production costs could decline to USD 1.4 from 2.3/kg by 2030, depending on differences between optimal and average regions. The representative of Siemens Energy also mentioned some of the company's most important projects: Energiepark Mainz – World's largest PEM electrolysis facility in 2015, Haru Oni pilot project - Worldwide first integrated plant to produce climate neutral e-fuel from wind and water, H2FUTURE - a European Flagship project for generation and use of green hydrogen.

The energy sector is undergoing a huge change. Not only is there a transition from fossil fuel sources to clean renewable sources, but all energy sector operations need to increase productivity and reduce costs to remain competitive. This is driving demand for smart bolting solutions that can increase operational efficiency in areas such as faster process times, less bolted joint failures, and optimized service costs. Atlas Copco, a world leader in the supply of industrial compressed air equipment and solutions, is developing innovative new solutions that are enabling Industry 4.0 to be applied not only in the factory but also in the field. Among others, the company offers a complete range of industrial and intelligent bolting tools including hydraulic torque wrenches, bolt tensioners, and continuous rotation tools for all controlled bolting needs. The smart solutions

Clean Energy for Sustainable Development panel

proposed by the company were presented by **Lukas Maly** - Product Manager, **ATLAS COPCO TOOLS EASTERN EUROPE** within the Smart connected bolting presentation: Taking the smart factory to the field. With the introduction of smart tooling, Atlas Copco is looking to drive the transition of the energy industry by delivering the bolting transformation.

In the context of a climate neutral Europe by 2050, electromobility could be a part of the solution, **Daniel Pintilie** – Founder and CEO, **WATTO STATIONS**, affirmed. He talked about electric cars and how they could become a risk or a great opportunity for the national energy system in the coming period. What will happen when, in the very near future, millions of electric cars charge their batteries at the same time, from the electrical network, without it being designed and prepared for such a thing? In his opinion, a major problem is the lack of ultra-fast charging. In this regard, WATTO offers the fastest, the easiest and the most convenient charging services in the market, Daniel Pintilie claims. While we see a worldwide acceleration of infrastructure investments, WATTO solution is an integrated network of ultra-fast charging stations across Central-Eastern Europe. Thus, integration of e-mobility into a smart energy system would be the path to carbon neutrality, Daniel Pintilie concluded.

Most Ground-breaking Technologies Transforming the Energy Lifecycle

HIDROELECTRICA's point of view on opportunities and risks in the digital era was revealed by **Cristian-Nicolae Stoina** – Member of the Supervisory Board. As a 100% clean energy producer – Hidroelectrica faces, as most energy companies, various problems related to digitization and green transition. In his presentation regarding the impact created by environmental protection on company's activities, Cristian-Nicolae Stoina highlighted a number of advantages and disadvantages. The pandemic, but also acceleration of digitization, have generated a partial adaptation of the company to the new conditions. The solution for Hidroelectrica was to diversify production. While walking away from inefficient production capacities, the company purchases private production capacities, an example being the takeover of Crucea Wind Farm, with an installed power of 108 MW. In turn, the expert points to the risks related to personnel education and training adaptation to the digital era. As he points out,

Most Ground-breaking Technologies Transforming the Energy Lifecycle panel

human force remains the most important component, and the next step in acquiring IT skills will be very costly, especially as there is also the risk of a massive redundancy. In other news, Hidroelectrica is preparing itself for integration in the European energy systems and plans to export electricity to the EU, Cristian-Nicolae Stoina also said.

For **EXIMPROD GRUP,** without a doubt, the future of energy is digital, states **Sabin Posea** – Business Development Director. Founded in 1994, with a worldwide presence, the company portfolio comprises manufacturing of electrical products from 0.4 to 400 kV, including equipment for railway; SCADA systems, automation and smart grid, software development, IoT, IioT; turnkey projects, complex energy projects rehabilitation or new installations; development, consulting & maintenance of projects in the field of renewable energy. The group is manufacturer for hundreds of products and equipment, combining and adapting them in order to help customers save resources. Its portfolio is perfectly designed for the safety, efficiency, resilience and reliability of the energy transmission and distribution grids. From the design phase until commissioning, Eximprod Grup team works to support customers in order to achieve their business goals. Their main objectives are to provide safe and environmentally friendly products and services and to conduct the operations responsibly.

Stefan Baciu – Country Manager, **SAS ROMANIA & REPUBLIC OF MOLDOVA**, brought forward advanced analytics for energy & utilities. According to him, 90% of the Fortune 500 utilities rely on SAS, which began helping utilities make decisions using data in 1976. There are 560 energy companies using SAS around the world, he added. Also, SAS is recognized as the number 1 analytics brand in utilities (according to Utility Analytics Institute). Stefan Baciu showed the capabilities of the SAS Platform for the Digital Utility. There are numerous related benefits that can result from using Asset Analytics: fewer failures and less downtime planned and unplanned across sites and assets; better equipment efficiency and higher overall quality; the ability to accurately predict outages before they occur, while running assets at peak performance. Customer Analytics offer meaningful, satisfying customer interactions across channels, top rated protection against revenue losses, and cost-effective management of customer outreach programs, sites, products, and rates. Credit and collection optimization minimizes bad debt and increases cash flow. As for Portfolio Analytics, these control customers' market, credit, and regulatory risks, identify new opportunities and use that insight to make decisions with confidence. With analytics from SAS, you can fully optimize your portfolio, pointed out Stefan Baciu.

We thank all our Partners, Sponsors, Speakers & Attendees for their collective efforts during these challenging times. With the Covid-19 situation, we stand by the industry, as we face uncertain times ahead.

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