
# REPORT FROM THE 33rd INTERNATIONAL SCIENTIFIC AND EXPERT MEETING OF GAS PROFESSIONALS Opatija, Croatia, 9-11 May 2018

**The 33rd International Scientific and Expert Meeting of Gas Professionals with an extensive international exhibition of gas equipment and technologies was successfully held in the Congress Centre of the Grand Hotel Adriatic from 9 – 11 May of this year and organised by the Croatian Gas Centre Ltd and the Croatian Gas Association (CGA).**

Over a period of three days, the largest international gas conference and exhibition in South-Eastern Europe gathered around 600 participants from 22 countries in Europe and across the world. The meeting was attended by gas and energy professionals, managers from leading European energy companies, scientists from reputable Croatian and European universities, transportation representatives, equipment suppliers, gas suppliers, gas producers and distributors, as well as representatives of large industrial gas consumers and producers as well as representatives of gas equipment from countries and abroad. A total of 230 individual gas and energy companies and organisations were represented (of which 90 were foreign) and 48 equipment exhibitors (of which 13 were foreign). The meeting is covered by 15 journalists from 10 media companies.

The sponsors of this meeting were the Ministry of Environmental Protection and Energy in the Republic of Croatia and the Ministry of Construction and Physical Planning also in the Republic of Croatia, where organisation of the meeting was supported by the main partners Prvo plinarsko društvo d.o.o., and numerous sponsors: INA – Industrija nafte d.d., Plinacro d.o.o., Siemens d.d., Universal Vortex, Inc., Međimurje-plin d.o.o., HEP d.d., SC Eurogas Systems Ltd., Powernext SA, KONČAR-KET d.d., Gradska plinara Zagreb-Opskrba d.o.o., Benussi d.o.o., IOT NET ADRIA d.o.o., and the co-organisers were Podzemno skladište plina d.o.o., EVN Croatia plin d.o.o. and LNG Croatia.

During the three days of the expert meeting, more than 40 scientific and expert papers were presented (of which 4 were invited talks and 7 papers presented at the poster session) along with 6 round table discussions addressing 9 topical units, and also 3 interesting panel discussions were held.

In the initial greetings, Ivana Ivančić (board member of the Prvo plinarsko društvo d.o.o.) on behalf of this year's main partner addressed the meeting, while the persons addressed the meeting on behalf of the

sponsors were Jerko-Jelić Balta (director of Field Development at the company INA -Industrija nafte d.o.o.) and Darija Krstičević, (board member of the company Plinacro d.o.o.) in presenting the business results of the companies for the coming period based on future investment plans. Danijel Žamboki (assistant minister at the Ministry of Construction and Physical Planning) in his presentation emphasised the role of the Ministry as a partner in the gas sector in the Republic of Croatia and gave full support to new infrastructure projects.

The introductory presentation at the meeting titled: "Natural Gas – A Green Fossil Fuel and Key Transitory Energy Source for the 21 Century" was held by the President of the Croatian Gas Association, Dalibor Pudić, PhD, who pointed out that the global plan for gas consumption 11 years ago, regardless of the expansion of renewable energy sources and competitive energy sources, increased by 23.5%. He especially pointed out the role of gas in reducing $CO_2$. Specifically, if all coal power stations producing electricity were replaced with gas (40% of production from coal) by 2050, $CO_2$ emissions would be far less than if all electricity were produced from renewable sources. Croatian data suggests that of the 110 TWh of energy consumed in Croatia, 27 TWh stems from gas and 17 from electricity, of which solar and wind power stations account for only 1 TWh, which through incentives costs us an additional 500 million kuna, For comparison, our country yearly emits 16 million tons of $CO_2$, and renewable sources account for emission reductions by 200,000 T, which is equivalent to only 1000 ha of forest. He pointed out the potential of gas with respect to costs of incentivising renewable energy sources and equipment effects of $CO_2$ reduction in electricity generation. Specifically, total production in the Republic of Croatia (from coal and gas) today amounts to 3.4 TWh of electricity, where a total transfer to generation from renewable sources, would have the effect of reducing CO2 by only 950,000 tons in addition to a total incentive cost of 2.5 billion kuna/year. Nonetheless, a much greater benefit would result from totally transferring to gas as a substitute for coal and liquid fuels for electricity generation.

He also expressed concern due to the continual decrease in gas production in Croatia. Back in 2007, we still recorded production totalling 2.9 billion $m^3$ from domestic sources, whereas in 2015 there was a noticeable decreased to 1.75 billion $m^3$. Besides the undiscovered new deposits, planned production for 2023 was only 700,000 $m^3$ of gas. In such a scenario, the annual gas imports will drastically increase by 3.3 billion kuna, which is practically 0.9% of GDP and which surely should be taken into account when developing new energy strategies.

## 1. GUEST LECTURES AND PANEL DISCUSSION: "EFFICIENT GAS TECHNOLOGIES AND ENERGY STRATEGIES FOR A COMPETITIVE ECONOMY – TODAY AND IN THE FUTURE"

The first presentation from the guest lectures was given by Prof Dr Igor Dekanić from the Mining and Geological – Petroleum Faculty, University of Zagreb, who pointed out the importance of the Energy Strategy which must contribute to developing the economy, and where the most optimal feasibility scenario should be given. The features of the EU energy policy directed towards a low carbon strategy or decarbonisation, which will also be a subject addressed in the Republic of Croatia. The starting point for a competitive energy strategy must address energy supply security, activation of domestic energy potential, and energy projects as a catalyst for economic activity and employment. Focus should be directed towards natural gas and defining its position as a transitory fuel. Albert van den Noort from DNV GL Netherlands BV company then went on to explain the role of power-to-gas technology in a cost-effective energy transition. He presented a prognosis form the EU by 2050 that anticipates 80% electricity production from renewable energy sources, which is a big challenge due to increases in energy requirements. Frank Grewe from 2G Energietechnik GmbH presented an argument that a key role in the world of changeable gas conditions is gas system for electricity generation. He considers that power-to-gas technology is ideal, due to gas production from renewable energy sources. Dr Stevo Kolundžić from Croatian Gas Association stated in his presentation that the energy transition with new technologies will have a significant impact on economic

transformation in the future. He considers that the time of the energy transition will be determined in three coordinated documents. Winter Packet, Low Carbon Strategy and the Energy Strategy. Accordingly, the acceptance of the Winter Packet means that the European Union by 2021 anticipates the commencement of investments totalling 177 billion euros and the creation of 900,000 new jobs. The estimated amount for the Republic of Croatia is 2 billion euros.

The round table titled “Attitudes of Equipment Manufacturers” was commenced by the director of the company Vaillant, Mario Opačak, presenting the topic “New Thoughts on Managing Energy Consumption in Germany”. The focus on defining an energy direction is efficient use of energy in households and energy systems with respect to very ambitiously set EU goals: “increasing renewable energy from 27%, increasing energy efficiency by 27% and reducing emissions of greenhouse gases by 40%”. The German strategy defines 7 theses on integrated energy which involves implementation of energy renewal in the building sector, new production and system technologies, digitalisation, electrification, which cannot be in itself a goal but instead must aim to achieve climate protection goals, adaptation of the tax system, energy storage where power-to-gas has a key role and finally the introduction of smart meters.

The director of the company Viessmann d.o.o., Vladimir Turina, then presented the program Efficiency Plus, a strategically sustainable project that include environmental protection, efficient resources and security of employment as the basic policies of the company. Also presented were successful projects involving proprietary technological applications in Germany, where results have already been achieved such as reducing CO2 by 80%, reducing the share of the use of fossil fuels by 70%, and increasing the share of renewable energy sources to 60%, which in essence is the set goal of the European Union by 2050. Furthermore, numerous projects implemented in the Republic of Croatia were also presented and which have considerably contributed to energy efficiency.

The first panel discussion at this year’s meeting with the given topic of “Efficient Gas Technologies and Energy Strategies for a Competitive Economy – Today and in the Future” was commenced by the moderator Dr Igor Dekanić, form the Mining, Geology and Petroleum Engineering, University of Zagreb, where he also in his introduction reflected on the previous talk. He stated that the set goals of decarbonisation in the economy are directed towards a low carbon strategy, in accordance with the Paris Agreement.

Joining the discussion were other panellists as well: Asst Prof Dr Dalibor Pudić, Dr Stevo Kolundžić from the Croatian Gas Association, Asst Prof Dr Darko Pavlović from Plinacro, Albert van Den Noort from DNV GL Netherlands BV, and Frank Grewe from the company 2G Energietechnik GmbH.

Assist Prof Dr Dalibor Pudić, President of the Croatian Gas Association, pointed out how natural gas will certainly through the use of new and modern technologies, mark the transition period towards renewable energy sources, and which is supported by proven gas reserves, and also the reality of substituting coal power stations. He points out the importance of developing a new low carbon strategy in which natural gas should assume a significant role as the catalyst for the economy in the coming period. He believes that investing maximum effort into gas exploration is exceptionally important to achieve energy efficiency and to have a competitive industry as well as increasing GDP.

Dr Stevo Kolundžić emphasised the potential which the Republic of Croatia has and how the existing gas infrastructure can be used for economic transformation in line with future energy strategies. Entrepreneurial investments might very well generate new service and production companies as “new models” of the traditional industry, where exhausted reservoirs may be used for disposing of CO2, some high temperature fields as artificial geothermal sources, and may also consider the use of already existing platforms and pipelines in the North Adriatic for the production of renewable energy sources.

Asst Prof Dr Darko Pavlović (who participated in the draft as a member of the Committee for Drafting the Proposed Energy Development Strategy in the Republic of Croatia) illustrated that the new Energy Strategy in the Republic of Croatia should be viewed as a mathematical equation in which the denominator is known and comprises energy security and reliability, while the numerator includes (five key variables according to him) which should be taken into account: flexible and sustainable production of proprietary energy, development and better connection of the energy infrastructure, greater energy efficiency, development based on smart energy and a very important variable – evaluation and monitoring of demographic trends.

Albert van den Noort is of the opinion that 80% of yearly electricity production by 2015 will come from renewable resources. He also believes that the power-to-gas technology will play an important role due to flexibility in consumption relations and consumption of energy, as well as in time of peak loads. Accordingly, the Netherlands is working intensively on analysing possible energy scenarios along with decade simulations of various types of commercial applications.

Frank Grewe concluded that in Germany will experience the gradual replacement of energy sources, i.e., the use of goal and oil will be replaced with gas. He especially points out the uncertain substitutions of coal for gas at power stations which is the subject of wider discussion within the profession and society. The important role of the gas system in the production of electricity using power-to-gas technology has been confirmed in Germany, due to the great potential of gas storage and developed network infrastructure, and also due to still unresolved issues regarding access and control of the use of renewable energy sources in integrating into the energy system.

## 2. CONDITIONS FOR THE JUSTIFICATION OF APPLYING SMART TECHNOLOGIES IN GAS AND OTHER TYPES OF ENERGY SYSTEMS

The next topical was presented by Davor Kodba familiarising those present with experience in implementing the G-4 ultrasound gas meters equipped with remote reading and remote control of block valves by the company Termoplin Varaždin. Since 2016 until today, approx. 1000 units have been installed to connect new consumers and in the reconstruction of gas connections when undertaking repairs to the gas network. The positive effects of the installation are evident in the great precision operation and successful readings, reduction of costs compared to classical reading techniques, reduction of losses due to the inability to collect payment for consumed gas.

During the talk a picture of countries in the European Union was also presented where the territorial expansion relating to the introduction of smart meters can be seen. This was followed by Onofrio Sciddurlo, MSc, who explained the role of new “smart device” technology in transport and distributive systems that ensure their efficiency, reliability and safety or operation. The module system was presented as a so called “smart skid” that unifies all functions in managing the gas network. Thereafter, the third talk showed implementation of a technology involving an ICT system for determining gas quality by the company Končar – power and transport engineering, on the gas system belonging to the company Plinacro. New gas chromatographs were installed on the gas pipeline network as well as various gas quality analysers that enable tracing of all relevant parameters relating to gas quality, along with telemetry connections in the central dispatch centre.

## 3. DEVELOPMENT OF THE GAS INFRASTRUCTURE IN THE REPUBLIC OF CROATIA

“Technology and Method of Inspecting Underground and Underwater Gas Pipelines” in the initial talk was presented by Elisa Latona, MSc, from the company Bureau Vertias from Italy. She showed the mechanism for preliminary analysis of potential damage, in-line inspection activities, and data analysis of

acquired results. After that, Dubravko Proštenik form the company Plinacro submitted in the second talk the “Project Involving the Future DN 1000/100 bar Zlobin-Omišalj Main Gas Pipeline”. The purpose of the new gas pipeline was the uptake of gas from the future LNG terminal on the island of Krk and connecting it to the existing transport system in the Republic of Croatia, i.e., onto the Pula-Karlovac gas pipeline. The specifics of the project are reflected in the construction of a section of extending a length of 700 m on the sea bottom using concrete lining and fixed steep carpeting, and whereby active cathode protection will be carried out. The location permit was obtained in 2017, with the constructed permit expected in 2018, whereupon construction should commence next year in 2019. Zoran Bulić, also from Plinacro, supplemented the topic with his talk in which he explained the continuing activities on the project involving construction of the compressor station at the Ludina where the transport system for the Republic of Croatia is located. The stated project has entered a mature phase of preparation, whereby a double flow will be ensured towards the interconnection with Hungary but also for security in supplying users of the 75-bar transport system. The complex administrative phase has also been performed, and the construction permit is expected in 2018. Next year in 2019 should see the start of constructing the basis equipment and rolling out units. The role of the LNG terminal on the island of Krk and its importance for the further development of new industries in Croatia’s economy was explained in the subsequent talk by Andreja Ana Lopac from the company LNG Croatia. The terminal at the island of Krk is the base for further redistribution of LNG along the coastal region and hinterland area through so called small scale bunker stations. Primary attention is given to the development of filling stations for ships from the local fleet and transit fleet along with filling stations for heavy trucks (with respect to the development of the TEN-T network). The development of infrastructure filling station and the sale of LNG provides benefits for opening new jobs, construction of dedicated ships and associated industries alongside service activities. Finally, the third topical unit was held in the form of a round table in which Dr Lev Tunkel from the company Universal Vortex, Inc. from the US presented the new “patented Vortex cooling technology with non-heating pipes” which significantly reduces (up to 35%) energy consumption for classic metering-regulation stations, LNG filling stations and pressurised natural gas.

## 4. THE SOUTHERN CORRIDOR, LNG TERMINAL, INTERCONNECTIONS WITH THE SURROUNDINGS AND STABILISED DOMESTIC PRODUCTION IS THE BASIS FOR SUPPLING GAS IN THE FUTURE

Increasing production from the Duboka Podravina mature gas fields was placed before INA’s experts as a technological challenge due to the age of the field (Molve 37 years) and altered production parameters. Due to the many years of exploration at the gas fields, gas pressure has significantly fallen in the deposits and there is a real danger of the wells ceasing to operate. Dr Svetlana Petrović emphasised in her talk that INA’s experts after comprehensive analysis arrived at the solution with the aim of increasing natural gas production, by initiating a project to install optimal compressors at key locations on the Duboka Podravina production fields. The compressors will be integrated into the existing infrastructural system into order to deliver and process gas at CPS III and prepare it for transport. The economic analysis of the investment confirms justification of the investment, along with the extended lifespan of the gas fields. The next talk on the state of the transport and distribution of natural gas in the Republic of Serbia as well as the need for a new interconnection, was explained by Dr Sofija Adžić. The problem with secure supplies for the Republic of Serbia is evident due to only one entry interconnection from the direction of Hungary. The opinion is that ensuring one more alternative supply route is essential also for flexibility of supply, and due to future development of the economy, continuation of introducing main gas pipelines, where is the Republic of Croatia is deemed the best supply solution. Referring to the respective talk was Tomislav Kovačić from Podzemno skadlište plina who provided a general presentation of the geopolitical situation and importance of new gas deposits in the eastern Mediterranean. He analysed all the complex intertwined political and geographical interest-based relationships, and with respect to discovered and proven reserves of natural gas. He also emphasised Israel’s intention of achieving the EAST MED Project involving construction of 1,300 kilometres of pipeline through Cyprus to Greece and joining it to the TAP gas pipeline. The belief is

that achieving the IAP gas pipeline (with a capacity of 5 billion m3/year) in such circumstances may launch Croatia as an important transit country for natural gas upon commencement of operation of the LNG terminal on the island of Krk.

## 5. INTRODUCTORY TALK AND PANEL DISCUSSION: "ISSUES CONCERNING GAS SUPPLIES ON A LIBERALISED MARKET"

The latest events in gas trading in Central and Eastern Europe was a topic at the subsequent round table which was presented by Roland Wolk from the company Central European Gas Hub AG. Those present were informed about the organisation chart and operation of Central European Gas Hub as well as the trading platform used for gas trading. He presented the continual increase in trading amounting to 16.7% at the virtual trading point for 2017. He also showed the Pegas Platform with an emphasis on the market in the Czech Republic along with an overview of the relationship between the price of natural gas and other trading platforms in Europe. He drew attention to the jump in the price of natural gas during the time of the explosion at the gas node in Baumbarten against which the market in Italy reacted in particular compulsively due to fear of possible limited gas supplies. Croatia's complete integration into the EU gas system became evident in the talk given by Daniel Gračan from Plinacro. The successful stabilisation (flexibility) of the transport system on the natural gas market is undertaken by the national operator of the transport system. It was pointed out that from 1 April 2017, new rules come into force for stabilisation of the gas transport system by providing information 8service) to balance group heads on a daily and hourly basis, whereby the price of stabilisation energy serves as an incentive to conduct balancing, because all network users are primarily responsible. Antonija Glavaš in the last presentation addressed the topic titled Gas Supplies in a Fully Liberalised Market and provided an overview of the new regulatory framework and its repercussions on the business of market participants. Based on the new Gas Market Act, she analysed the role of "Wholesale Suppliers, Suppliers as Public Service Providers" and "Guaranteed Suppliers". She believes that in the future there shall occur an increase in the price of natural gas due to a correction in gas prices at the reference spot market which in turn will affect the subsequent regulatory period.

The presentation by Antonija Glavaš was a good introduction to the panel discussion titled "Isues Concerning Gas Supplies on a Liberalised Market which was moderated by Marko Biočina, executive editor of Jutarnji list (The Morning Herald newspaper), where the participating panellists were: Dr Nikola Vištica, Croatian Energy Regulatory Agency, Antonija Glavaš, Prvo plinarsko društvo d.o.o., Prof Dr Daria Karasalihović, Faculty of Mining, Geology and Petroleum Engineering, University of Zagreb, Marko Blažević, HEP – Opskrba plinom d.o.o., Damir Škugor, INA – Industrija nafte d.d. and Nenad Hranilović, Međimurje-plin d.o.o. In a very popular and interesting discussion, immediately at the start, an imposed discussion covered price corrections for natural gas for industries. For households (which comprise 25% of the market), during the transition period leading to the complete deregulation of prices in 2021, prices will continue to be regulated.

On account of that, the board member of Prvo plinarsko društvo (PPD), Antonija Glavaš, pointed out that she would have to see at what price would the company be able to offer gas to its buyers after concluding all the necessary agreement for this year.

Regarding further discussions, the dilemma was mentioned involving the companies HEP, PPD, INA as well as other gas traders concerning the profitability of applying for tenders to receive the status of wholesale supplier because the companies still do not know whether it will be profitable to supply gas for the requirements of supplying gas to households, given that the activity will no longer be carried out by HEP – Opsrkrba plinom but instead new wholesale suppliers who will be selected for a period of another three years through a public tender. Damir Škugor from INE pointed out that INA is interested in applying for the public tender, but it all depends on the conditions that will contribute to making the decision. In the

event that no one applies for the tender, in line with laws, the Croatian Energy Regulatory Agency (HERA) has the mechanism to appoint wholesale suppliers.

The company director of HEP – opskrba plinom, Marko Blažević, said that from 1 April 2017, INA has no longer been obliged to delivery gas to wholesale suppliers at regulated prices, which had led to changeable market entry prices for gas and regulated market entry prices for gas, hence in such conditions it is difficult to find a financial balance. Prof Daria Karasalihović Sedlar from the Faculty of Mining, Geology and Petroleum Engineering in Zagreb said that prices for households in Croatia have for a number of years been the lowest in the EU and the perception of consumers is that the current manner of determining prices should not change.

Dr Nikola Vištica from the Croatian Energy Regulatory Agency (HERA) said that according to obligations from March 2018 for the passed Gas Market Act, currently underway is the drafting and adoption of as many as 13 by-law acts for which the statutory deadline is only three months, which represents a big problem for preparations. On the other hand, all wholesalers, suppliers and distributers are already intensively preparing for large changes which such stipulations will bring, that is why the territorial deregulation of distributive areas in public supply will encourage the start of new market competition. Specifically, from 1 April 2021, regarding deregulated distributive areas, any supplier will be able to apply for a tender for any distributive area, which practically creates a situation where one or more suppliers take over the territory of Croatia, and consequently the survival of a significant number of smaller suppliers would be jeopardised, and who will not be able to cope with market pressure. That is why everyone is trying to increase their market competitiveness while reducing and rationalising costs of business. In that sense, Nenad Hranilović pointed out the readiness of the company Međimurje-plin for its market competitiveness, and basing its business philosophy on procuring gas outside the scope of the market of wholesale suppliers, which they deem to be a good business move.

Prof Daria Karasalihović Sedlar mentioned that household consumers will also become better informed leading up the announced deregulation in 2021, as to what the suppliers will be offering and under what conditions, as is the case in today's process with teleoperators, in order to better know their rights and clear benefits with the aim of removing any doubt and confusion with the news methods offered. The expectation is that market competition will be far more aggressive and a better devised approach by suppliers in attracting and also retaining their buyers.

For the market to function normally, Dr Nikola Vištica announced that HERA as the regular will endeavour to optimise the process of replacing suppliers. This certainly will be aided by the ability to lease the transport system on a short-term (daily) basis which has brought about the replacing of supplier previously taking 15 or so days to a current maximum of 10 das. By 1 October of this year, the Croatian Energy Market Operator (HROTE) has the obligation to develop a register of consumer metering locations which will include more than 600,000 consumer metering locations with all data on suppliers, type of consumer and their rights, etc. and which will be strictly controlled in accordance with the General Data Protection Regulation (GDPR). Accordingly, when changing a supplier, the new consumer will only need to provide two pieces of data: OIB and the unique number of the metering location.

The honorary president of the Croatian Gas Association, Miljenko Šunić, referring to the new regulations asked as to who will react in the event of any kind of technical or other type of problem in Croatia or abroad and ensure the supply of gas considering today's gas production and availability of gas capacities in underground gas storage?

Prof Daria Karasalihović Sedlar replied that a particular regulation exists which regulates supply in crises, and in time the inter-connection system between countries is nonetheless improving, however she cautioned that the securing supplies undoubtedly comes at a price. These comments were confirmed by Antoniija Glavaš, board member of Prvo plinarsko društvo when the company intervened at night during extremely cold weather this winter, and procured the additional and necessary quantities of gas. Finally, the discussion pointed out that consumers in the Republic of Croatia may nonetheless expect a correction

to prices, probably in the vicinity of a 10% increase, whereas traders and suppliers would like an approx. 30% increase.

## 6. UNDERLYING ISSUES IN THE GAS PROFESSION AND SOLUTIONS IN REGULAR AND URGENT PROCEDURES

Stanko Banjamin from Gradska plinara Zagreb (Zagreb City Gasworks) opened up a new topic and described application of the procedure and methodology for assessing the condition of the steel gas system from the aspect of regular and urgent maintenance in the company. He emphasised the importance of continual preventive and corrective maintenance with the aim of reducing the number of faults and costs. An explanation was given as to the procedure and implementation of repairing faults, use of the so called "stop system" without termination of gas supply to end consumers and showing numerous examples from practice. Nikica Dujmović then showed application of the contactless magnetometric method for testing a buried high-pressure gas pipeline belonging to Gradska plinara Zagreb as one possibility of non-invasive testing of gas pipelines along their entire route. He described the principle and test methods involving contactless magnetometric diagnostics in identifying deviations, potential faults (leaks) along the steel pipeline. After the analysis, the results are mapped and can be opened in GIS software containing maps and then the necessary classical work on rectifying damage along the route is commenced. The new approach to repairing pipelines incorporating high-pressure flexible pipes on short section was shown by Ivan Fugaš who explained the procedure for revitalising the DN 200/50 Kozorac-Stružec pipeline cover a length of 6 km. The existing gas pipeline was in poor condition and in terms of costs there was no justification for conventual repairs or replacement. The operation was carried out by introducing high-pressure flexible pipes in the existing gas pipeline. Preparations prior to commencement of works includes cleaning and calibration of gas pipelines. Given that the flexible pipe has a maximum length of 500 m, they are connected using a special weld neck connection. The next talk provided an insight in to the achieved level of gas network development in Dalmatia and specific benefits in the development of the economy as well as quality of life for people. Vlado Mandić from the company EVN Croatia gas revealed information that the 10 largest consumers that used some other energy source, the transfer to natural gas would enable them to save on energy by more than 24 million kuna and through a period of 5 years reduce $CO_2$ emissions by 16,138 tons. Highly energy efficient projects have been achieved, revitalisation of the industry has occurred due to activation of the equipment market and gas installation works totalling 100 million kuna, and this solely refers to Croatian companies. Up until now, a total of 120 km of gas distribution network has been constructed. In the coming period, the expectation is that the expansion of gas infrastructure will continue in the area of concessions and final connection of the capital consumer, the Split Clinical Hospital Centre (KBC) as the largest polluter in the County using liquid fuel. The new round table was prepared by the company Yokogawa with Lee Chee Hoe's talk and who presented the program for operation technology as well as techniques and organisational and security challenges in maintaining gas networks. Modern sensory equipment and its management on gas pipelines has become a target of hacker attacks with the aim of causing faults, damage and functional termination of gas pipeline operation, and which not long occurred with the explosion in Turkey. In preventing attempts at cyber attacks, a security model for protection was shown which is offered by the company and an organisation mode. Security of the gas infrastructure was the closing presenting by Dražen Guberac from Prvo plinarsko društvo – gas distribution, which presented a project for testing the extinguishing of fires caused by natural gas. The company simulated practical conditions of possible accidents at a facility and showed the most effective solution for extinguishing which was carried out by the Vukovar Fire Department. Due to further advancements in the security system, the company is in the process of adopting an electronic application for notifying of accidents to the technical department and devised a schematic plan for intervention closing of underground valves on the distribution network, in order to repair gas leakages and extinguish fires as soon as possible, and which is recommended as the model for all distributers.

## 7. INTRODUCTORY TALK AND PANEL DISCUSSION: "DEVELOPMENT, POTENTIAL AND ISSUES IN THE USE OF GAS IN TRANSPORT TODAY AND IN THE FUTURE"

In the first talk, Alexey Mozgovoy from the company Biogas e.V presented issues involving the use of biomethane in Germany in the transport sector. He presented a cost structure for investments in a facility for the production of biomethane and connecting to the gas network infrastructure. With respect to countries in the European Union, Germany is the leader with 200 biomethane facilities, and 860 filling stations providing compressed natural gas. Today in Germany, there are 77,000 vehicles running on compressed natural gas out of a total of 45,803,000 vehicles, comprising 0.17% of such vehicles. The contentious position of gas in transport with respect to other conventional and alternative fuels in the Republic of Croatia was addressed with caution by Zoran Dojčinović from the Croatian Gas Association. The consumption of diesel fuel comprises almost 70% of the total consumption of all fuels. He believes that financial incentive system for "green transport" should be changed in the redistribution of funds towards gas as a propulsion fuel, primarily in the purchasing of new OEM vehicles in public urban transport and fleets for business use as well as retrofit gas installations in personal vehicles running on benzine. This would encourage the reinvigorate the sale of cars from manufacturers, servicing activities, open new jobs and what is most important, improve the quality of air for inhabitants. The last two talks from the topic were address at two round table discussions. At the first round table discussion, Ross Gale, MSc, from the company Universal Vortex, Inc. showed the advancement of technology in producing compressed natural gas using the patented Vortex pipes, which is eliminates temperature reductions due to the Joule-Thomson effect during pressure reductions. This enables achieves significant energy savings, which is shown in implementation examples in the US. The stated new product has been practically used only for a few months and experts in Opatija were able to practically encounter an exclusive promotion. This was followed by another round table discussion where Marko Hodalić from the national office of IVECO S.p.A from Belgrade spoke about IVECO's Natural Power technology.

A complete product program from the company IVECO was presented, with emphasis on an assortment of gas-powered vehicles. The main focus was placed on heavy truck vehicles that use LNG as fuel and the operation performance of the motors that satisfy the EUR VI standard. An analysis was provided of the advantages of LNG with respect to diesel fuel which emits 60% less Nox compounds, 99% less solid airborne particles, 90% less non-methane hydrocarbons (NMHC). The IVECO company currently has 800 buyers from the LNG heavy vehicle program from 19 countries of the European Union with expectations that 300 units will be sold in 2018.

After the talk, the panel discussion was initiated by the moderator Davor Matić, MSc, from the company Energetska akademija d.o.o.

The sponsor of the panel discussion was the company Benussi d.o.o. from Fažana, and participating as panellists were Marko Hodalić, from the national office of Iveco S.p.A from Serbia, Branko Mihalić from the Management Board for EU Funds and Strategic Planning, Ministry of Maritime Affairs, Transport and Infrastructure, Captain Darian Turk, Commander on LNG ships from the Association of North Adriatic Ship Captains – Queen of the Sea, Igor Grozdanić, MSc, from the Sector for Energy and Environmental Protection before the Croatian Chamber of Economy, and Zoran Dojčinović from the Croatian Gas Association.

Marko Hodalić cautioned the meeting about the potential for LNG as a propulsion fuel for operating heavy trucks. This is also supported by the EU Directive 94/2014 on the deployment of alternative fuels infrastructure for filling stations which determines the construction of filling stations each 600 km in the European Union in the period by 2025. For that purpose, the decision of the EU Commission was to form the so-called transit European "blue corridors" which have been successfully developed over the last few years. Special emphasis was placed on the properties of LNG as an ideal fuel to replace diesel, due to its

energy and ecological properties. Iveco heaving trucks are recognised for the premium quality and technology of deliveries throughout and outside of Europe. The expectation according to available information is that soon the Republic of Croatia will also commence constructing a larger number of filling stations in order to expand the area of LNG usage to road transport.

Captain Darian Turk referred to the fact that the shipping industry has accepted LNG as the prospective fuel for ships. He believes that with rigours specifications on the quality of conventional ship fuel which can only have 0.1% sulphur, that it provides a wide space to LNG primarily due to price and the ecological aspect. By declaring the ECAS zone in the region of the Baltic Sea, Northern Sea and La Manche, LNG as a ship fuel is increasingly being used in territorial waters and ports. The opinion is that soon declaring the Mediterranean Sea as a Sulphur Emission Controlled Area as is the case in northern Europe, means that the Republic of Croatia will have the opportunity to develop its infrastructure and fleet powered by LNG, because a new terminal on the island of Krk would be an ideal starting point for supply our but also the surrounding market.

That is not all that ideal and it a lot of time will still be needed for greater use of gas in transport, especially LNG, was supported by Zoran Dojčinović. He highlighted worrying data on enormous diesel fuel consumption in road transport and the issue of large imports of new and used diesel vehicles with an average age of 8 years. He believes that the system of incentivising alternative fuels in the Republic of Croatia is intended solely for the purchase of electric vehicles, whereas gas has been completely excluded from all financing schemes. This situation is corroborated by claims concerning the financial focus of all previously announced tenders by the Environmental Protection Fund for the development of various forms of electromobility, which was the case this year as well. He proposes a more balanced approach and financial incentives for the development of all types of alternative fuels especially gas, which today many European countries have such as Spain, the Czech Republic, the UK and France. He advocates introducing the use of gas as a propulsion fuel in buses wherever there is public city transport in urban areas. Also, he also added that gas in transport should most certainly have its place in the new low carbon strategy of the Republic of Croatia as a green and transition fuel.

Branko Mihalić from the Ministry of Maritime Affairs, Transport and Infrastructure believes that there is a need for greater communication between the relevant ministries and the gas sector. He points out the need for registering new projects for the building of filling stations in order that these stations be listed in tenders for EU funds (because there is still large funds available) and that they be incorporated into the coming financial period after 2020. He agrees that there is a need for more uniform financing of other alternative fuels where gas has its place.

Davor Matić then said that during the time of OMV's presence on the Croatian market, he was involved in projects for the construction of filling stations for compressed natural gas along so called transit routes in the Republic of Croatia, and for which large funds had been secured. Unfortunately, due to the then ambiguous regulations and existing ordinances, implementation had been halted for a number of years, and with the arrival of the financial crisis in 2008 a complete halt to the company's business program. He pointed out that at that time, he was able to achieve an ambitious program for establishing filling stations for OMV's natural gas, and believes that the situation today in our region would have been completely different.

Igor Grozdanić highlighted information that of all alternative fuels used in transport in the Republic of Croatia, only car gas (liquid petroleum gas) accounts for continued growth in consumption during the last few years, which is about 3% of the total consumption of all fuels. He attributes this to a well devised and implemented program of building filling stations which was key for expanding the enlargement of the associated fleet of vehicles and consumption., and which last year accounted for close to 70,000 tons. He emphasised the need for intense communication between the gas sector and town representatives so that in the future orders for buses running of diesel fuel in public city transport be excluded (which was the

case in Split and Zagreb not so long ago), but instead that natural gas be used. This encourages at the same time the development of infrastructure for filling stations which can then be expanded and wider commercial application.

## 8. VARIOUS ISSUES CONCERNING THE GAS AND ENERGY PROFESSION

The issue relating to the effect of time shift on the precision of gas meters and its effect on long-term measurement stability was presented to use by Dr Berislav Pavlović from Zagreb City Gasworks (Gradska plinara Zagreb). Due to some 270,000 installed gas meters, check the long-term stable precision of the metering is essential, due to the fact that the annual requirement for verification covers from 25,000 – 30,000 gas meters. The presented satisfactory results of the testing of gas meter precision were classified according to various groups of age, which can be used even longer than 25 years. Subsequently, Sukhwinder Singh, MSc, from Hamburg University of Technology (TUHH) also referred to the matter and presented experience from Germany in terms of satisfying requirements for greater security of meters measuring gas flow installed in high-pressure pipelines. He especially pointed out that the German national metrology institute Physikalisch-Technische Bundesanstalt uses high-pressure piston standardised (benchmarked) meters as the national standard for calibrating the measuring of highly compressed natural gas. In the following talk, Max Hammer emphasised the coming of a new digital age when the impact of the energy 4.0 concept will be very important on securing gas supply. An increasing expectation by consumers and market competition will impose besides digitalisation the standardisation of security criteria in the area of gas metering. At the end of the topical unit, Aida Bučo Smajić from DVGW German Technical and Scientific Association for Gas and Water, gave an overview of the activities of DVGW in the area of biogas and the process of injecting it into the network. The activities of DVGW includes a few topics such as the production of biomethane, preparing and injecting of gas into the network, schooling of experts, and a technical security management system. According to data from 2014, Germany has injected 688 million $Nm^3$ of biomethane into the gas network with the political goal of reaching 10 billion $Nm^3$ in 2030.

## 9. TECHNICAL REGULATIONS, RULES OF THE PROFESSION AND CONSUMER RIGHTS

The final topical unit was initiated by Ivan who represents the project for applying Blockchain technology in the company Plinacro. The basic intention of the project is to create a database of interactive data and record transactions for storing data, information and documents with business partners. The application would include the design, procurement, construction and comprehensive management of the business process between Plinacro and interested users. All records are protected and pass through a hashing algorithm which provides data with a fixed length in the form of a public and private key, widely known as asymmetric cryptography. All information is stored on the distributed database but is protected by a high level of security. The talks that followed by Jelena Kuntić Grujić from the company Termoplin Varaždin, emphasised the new obligations for the operator of the distribution network in maintaining a proprietary database of the infrastructure as stipulated by the Grid Code for the Gas Distribution Network and the Act on the State Measurements and Property Cadastre. The main problem began on May 2017 which significantly complicated and exacerbated development of infrastructure to the detriment of the pipeline owner/operator. Specifically, the operators of the distribution system are obliged to create their own database and invest in the development of geoinformation systems, using their own funds. As stipulated by the law, they are obliged after complete engagement of their data, without charging a fee, submit it to the State Geodetic Administration which will charge for issuing such data, and in the event of failing to comply, enormous penalties have been stipulated. The fact that in the future the gas industry will face even greater legislative challenges was highlighted by Petra Šantić, LL.M., an attorney from Zagreb who explained the new EU General Data Protection Regulation (GDPR). She also outlined the chronology in creating GDPR from the draft in 2012, its publication in the Official Journal on 4 May 2016 and the importance of its coming into force on 25 May 2018, whereby GDPR becomes a new legal basis. She also

warned about the need to device a Plan for Adaptation to GDPR which includes controlling the flow of information, contact with service providers, verification of the legal basis of processing data, right to accessing personal data, adaptation of process flows, obligation to inform and familiarise data subjects with rights as well as monitoring the market in the context of code of behaviour. Finally, for the last presentation, Marija Bošković Batarelo, LL.M., from the attorney's office Batarelo Dvojković Vuchetich LLP., referred to the previous talk and analysed the correction between the use of smart meters and protection of personal data. She presented the principles of the General Data Protection Regulation as well as a typical example of adapting privacy in technologies that relate to smart meters.

Traditionally, as was the case in previous years, due to a significant number of registered papers, this time a poster session was also organised which published and presented a total of 7 papers from Croatia and abroad.

**At the same time, held in the exhibition area in front of the congress hall of Grand Hotel Adriatic was the largest three-day exhibition of gas equipment in South-Eastern Europe where a total of 48 exhibiters exhibited their offers on stands and/or billboards, with 13 of them from abroad.** Amongst them was a significant number of companies who have for a number of years been actively participating as exhibiters at the Opatija Meeting of Gas Professionals, and also a large number of new exhibiters of gas equipment from the country and abroad.

At the end of this year's conference, the President of the Croatian Gas Association, Asst Prof Dr Dalibor Pudić thanks all participants at the conference and exhibition, who through their participation contributed to the success and quality of this traditional and for the gas industry important meeting, and which against this year in Opatija was able to gather an impressive number of professionals and maintain a high level of professionalism and quality despite dynamic changes in the structure of the energy markets and complex economic situation.

**The next 34 International Scientific and Expert Meeting of Gas Professionals will be held in Opatija between 8th – 10th of May 2019.**

**If you did not attend the 33 meeting, and are interested in the addressed topics, you can order the Proceedings (hardcopy and online edition)** in which all papers and round table presentations presented at the Opatija meeting are published. We kindly request that you send us a request to the e-mail address: opatija@hsup.hr